Middlemen, Non-Profits, and Poverty

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ABSTRACT

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In many markets in developing countries, especially in remote areas, middlemen are thought to earn excessive profits. Non-profits come in to counter what is seen as middlemen's market power, and rich country consumers pay a "fair-trade" premium for products marketed by such non-profits. This paper provides answers to the following five questions. How exactly do middlemen and non-profits divide up the market? How do the price mark up and price pass-through differ between middleman and non-profits? What is the impact of non-profits entry on the wellbeing of the poor? Should the government subsidize the entry of non-profits, or the entry of middlemen? Should wealthy consumers in the North pay a premium for fair trade products, or should they support fair trade non-profits directly?

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1 Introduction

Middlemen, trading entrepreneurs who link the backwaters of developing countries to emerging markets nationally and especially globally, seem to be universally reviled despite the economic service they provide. Without their capital and specialized knowledge, high prices in growing markets might be outside the reach of the small holder in the rural area, or of the home-based artisan in the urban slum. By bridging this gap, albeit for profit, surely they help to alleviate poverty?

And yet it is this profit motive, and the claim that these middlemen make "excessive profits" because of market power, that is at the root of much of the concern. Thus, for example, McMillan, Welch and Rodrik (2004) study the case of cashews in Mozambique, and report that cashew growers only receive 40 to 50 percent of the border price, even after border taxes are allowed for. They go on to note:

> "it is clear that the marketing channels for raw cashew nuts remain imperfectly competitive. Farmers' incomes are depressed not only by transport and marketing costs, but also by the market power exercised by the traders." (p 120).

The role of middlemen and market power in determining price pass throughs has been widely commented upon.[1] Middlemen and their profits attract particular attention in remote areas, where rural households arguably bear a double burden: high transport costs, and the market power of middlemen (Goetz 1992, and Sexton, Kling and Carmen 1991). These extra margins, it would seem, render it all the more unlikely that households in dispersed agriculture, for example, can reap the full benefits of globalization (Nicita 2004, Hertel and Winters 2005). Remoteness of location and the market power of middlemen, it is thus suggested, are closely related.

Many social movements in developing countries address themselves to providing an alternative channel to the market for poor producers. For example, the Self Employed Women's Association (SEWA) India has set up the SEWA Trade Facilitation Service (STFC):

> "...the artisan women though skilled in hand embroidery had to forcibly migrate in

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[1] See for example Arndt et. al (2000), Hertel and Winters (2005), and Pokkrel and Thapa (2007).

search of work, or undertake earth digging work. The trade of their old valuable embroidered trouso would typically occur during distressed time. This would occur with traders and middlemen since the artisans had access to a very limited market... Lack of market information hindered artisans from building a strong relationship with the buyers. With the inception of STFC, integrated supply chain mechanism was created and the production became organized."

(`http://www.sewatfc.org/sewa_information.php?page_link=background`)

Some not-for-profit organizations, in the "fair trade" business, promise a number of outcomes, including an improved outcome for the impoverished producers of the products being sold. Here is how this is accomplished according to the Fair Trade Federation:

"...fair traders typically work directly with artisans and farmers, cutting out the middle men who increase the price at each level - enabling retail products to remain competitively priced in respect to their conventional counterparts, while more fairly compensating producers."

(`http://www.fairtradefederation.org/ht/display/Faqs/faqcat_id/1737`)

One interpretation of the above claim is that the fair trade organization essentially divides up the excessive profit of the middlemen between the producer and the consumer. However, in many cases fair trade products sell for a premium compared to identical products but without the fair trade label. Moreover, in many cases such "non-profits" receive direct support, from governments and other donors, to carry out their mission of being middlemen but without the (excessive) profits, helping to get more of the market price into poor producers' pockets (DFID 2009).[2]

The juxtaposition of middlemen trading for profit and non-profits with other objectives raises interesting and important analytical and policy issues. Analytically, what does an equilibrium with middlemen and non-profits look like? How precisely do the price mark up as well as the price pass through, from market price to producer price, differ in the equilibrium with

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[2]See DFID (2009, pp. 44 - 45.) for example, for one of the most recent government commitments to support fair trade through direct investment and procurements.

middlemen and non-profits compared to the equilibrium with only middlemen? What precisely is the impact of non-profits on poverty when the full round of market repercussions, including entry and exit of middlemen and of non-profits, is taken into account? Should a government interested in poverty reduction subsidize the entry of non-profits, or should it perhaps subsidize the entry of middlemen? Should wealthy consumers in the North pay a premium for fair trade products, or would the same amount of money be better used to subsidize fair trade non-profits directly?

These are the questions to which this paper is directed, and they are questions to which we believe the literature provides only a partial answer. Indeed, the literature has yet to deliver a theory of endogenous price markups and variable price pass throughs in a spatial equilibrium where middlemen and non-profits co-exist with free entry and exit. The development of such a model is the first task of this paper. We begin with a framework in which middlemen market power interacts with producer location to co-determine the degree of imperfect price transmission.[3] Match friction *à la* Mortensen (2003) due to farmers' imperfect knowledge about prices constitute the reason for middlemen market power in our setup. Equilibrium is characterized by price dispersion among otherwise identical producers. We thus depart from the multi-tiered marginalization approach used for example in McMillan, Welch and Rodrik (2004), and consider instead a setting that can accommodate heterogeneity in the distribution of the export surpluses between middlemen and producers within a given region. In addition, we also depart from the familiar match friction setting by introducing a spatial dimension to the model. This allows us to examine how the nature of price dispersion, and the implied degree of price transmission imperfection, vary with location.

Our findings are largely consistent with the empirical observations already stated. At each location, middlemen market power implies an endogenous division of export surplus between producers and the middlemen. Across locations and accounting for producers operating in increasingly remote areas, middlemen market power intensifies. This endogenous variation in middlemen market power across location further dictates the extent of imperfect price trans-

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[3]There is also a literature on the theory of middlemen as market intermediaries (e.g. Rubinstein and Wolinsky 1987). The emphasis of our work differs from this earlier literature in that we are interested in the role of non-profit middlemen in influencing the distribution of the gains from trade, and how this distribution varies endogenously along a spatial continuum.

mission. Indeed, we find that producers in more remote locations are more susceptible to an unequal division of the size of the export surplus.[4]

Within this setting, we introduce non-profits motivated by a concern for poverty either on behalf of the final consumers they serve via a price premium, or the preferences of the non-profits themselves.[5] These non-profits act as an alternative intermediary other than traditional middlemen linking the world market and individual producers.[6] Their concern for poverty will be expressed in the form of a warm glow effect, which takes effect whenever the non-profit operates in locations where poverty is known to be pervasive. In our setup with match friction and spatial differentiation, we examine how the entry of non-profit middlemen impacts the distribution of producer prices for any given location, as well as how the impact of non-profits is differentially felt across locations. In doing so, we provide answers to the questions posed above on the impact of non-profits on price pass-through and on poverty. This framework also allows us to address the questions on policy, specifically, on what if anything should a government, or rich consumers, subsidize if the ultimate objective is poverty reduction.

The plan of the paper is as follows. Section 2 sets up the framework and equilibrium with middlemen only. Section 3 introduces non-profits and characterizes equilibrium when both types of intermediaries can enter. Section 4 takes up the policy questions – who exactly should the government subsidize and what exactly should consumers interested in "fair trade" subsidize? Section 5 concludes.

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[4]These results also distinguish our setting from Gersovitz (1989), where the issue of agricultural taxation with spatial dispersion is analyzed in the the absence of (for-profit) middlemen market power.

[5]There is a longstanding literature on mixed oligopolies, in which welfare-maximizing *public firms* compete with profit maximizing firms (Merrill and Schneider 1966, Harris and Wiens 1980). Most of these models entertain Cournot competition (Matsushima and Matsushima 2003), and Cremer, Marchand and Thisse (1991) works with product differentiation in a Hotelling model. Our emphasis here is different in that non-profits are neither profit maximizing, nor do they maximize social welfare. To our knowledge, our treatment based on match friction has likewise not been emphasized in the literature.

[6]From an altogether different perspective, Bardhan, Mookherjee and Tsumagari (2007) also study the issue of middlemen margin in a model of outsourcing. Unlike our work, moral hazard and the importance of quality form the motivation for the existence of middlemen in their paper (Biglaiser and Friedman 1994).

2 The Model and Equilibrium with Middlemen

2.1 The Basic Setup

We consider a spatially dispersed economy, in which production takes place at a range of distances $x \in [\underline{x}, \bar{x}]$ away from a transport hub. At each location x there is a large number of identical producers, N. Each producer has a unit of output for sale either domestically or as exports. Any output bound for exports must be transported to the hub. For each unit exported, let p^* be the unit border price, and $p \leq p^*$ the producer price. Output not bound for exports can be used for own-consumption or sold domestically. In either case, the revenue equivalent of any output not exported is c, with $0 \leq c < p^*$.

2.2 Middlemen: The Bertrand Benchmark

Transportation is carried out by middlemen, who incur a location-specific transportation cost tx per unit output.[7] If free entry and frictionless Bertrand price competition prevail among middlemen, the equilibrium producer price $p^* - tx$ is strictly location-specific at each x, as long as $p^* - tx$ is greater than the reservation value c. All middlemen thus earn zero profit: they sell output at price p^* at the hub, after having incurred tx as transportation cost, and $p^* - tx$ as payment to producers. This simple framework yields a stark set of predictions regarding the volume of total export, the distribution of income between middlemen and producers, as well as the incidence of poverty among producers.

In terms of export volume, all producers located at $x \leq (p^* - c)/t \equiv x_o^+$ devote all output to exports. In what follows, we assume that $\underline{x} < x_o^+$, and as such there exist at least some locations where exports generates strictly positive surplus $p^* - tx - c > 0$. To furthermore accommodate the possibility of incomplete coverage and location as a binding constraint on exports for at least some producers, we assume in addition that $\bar{x} \geq x_o^+$.

The producer price implications of Bertrand competition are likewise straightforward. There is perfect one-to-one pass through of the net border price $(p^* - tx)$ to producers, and the full export surplus $(p^* - tx - c)$ at each location x, appropriately accounting for opportunity cost c, is captured by the producer. Consequently, inequality in the distribution of revenue

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[7]A Samuelson iceberg type transportation cost can similarly be imposed, by assuming for example that $t = \tau p^*$, $\tau > 0$, without affecting the qualitative implications of the model.

among producers is a strictly inter-regional phenomenon. At any given location $x \leq x_o^+$, all producers earn identically $p^* - tx$. Across locations, producer price is decreasing in x. For $x > x_o^+$, border price p^* is insufficient to cover the full cost $tx + c$, and producers receive the domestic value c per unit.

To examine the poverty implications of export, let $\bar{p}$ denote the minimal producer price required to sustain private consumption at a level no less than an exogenously given poverty line. We are particularly interested in situations where production alone without the possibility of export is not sufficient to stage an escape from poverty, or $\bar{p} > c$.[8] With Bertrand competition among middlemen, poverty incidence as measured by the share of producers living under the poverty line is thus discontinuous along the locational continuum: for $x \leq (p^* - \bar{p})/t \equiv x_o^p(< x_o^+)$, no one is poor, but immediately thereafter, every producer is poor.

In summary, there are two critical threshold locations, x_o^p and x_o^+. For $x \leq x_o^p$, export completely eradicates poverty. For $x \in (x_o^p, x_o^+)$, unit export revenue lies strictly between c and the poverty line $\bar{p}$. Producers at locations even more distant than x_o^+ from the hub have effectively no access to export markets. Figure 1 summarizes, and shows the equilibrium producer price along the location continuum.

2.3 Middlemen with Market Power

We depart now from the Bertrand assumption, where every producer is perfectly aware of each and every middlemen price offer, and consider instead an arguably more realistic scenario in which there is match friction between producers and middlemen (Mortensen 2003). Specifically, at every location x, each of an endogenous number (M_x) of middlemen first chooses a price offer from the range of feasible prices, $p \geq c$. Let $F_x(p)$ be the cumulative distribution function of such offers at location x. The middleman proposes an offer to one of the N producers chosen at random. Each producer ranks any and all offers received this way, accepts the highest offer, and rejects the rest.

Match friction arises whenever producers are not aware of the full set of price offers. Indeed, let the likelihood that a producer comes across $z = 0, 1, 2, \ldots$ offers be given by a Poisson

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[8]If $\bar{p} < c$ instead, poverty is a non-issue since all producers can live above the poverty line by simply selling their products domestically at c.

distribution with parameter $\lambda_x = M_x/N$, or, $\Pr(z; \lambda_x) = e^{-\lambda_x}\lambda_x^z/z!$.[9] Since the distribution of each such price offer is $F_x(p)$, the cumulative distribution of the maximal offer received is:

$$H_x(p) \equiv \sum_{z=0}^{\infty} \frac{e^{-\lambda_x}\lambda_x^z F_x(p)^z}{z!} = e^{-\lambda_x(1-F_x(p))}. \tag{1}$$

Middlemen are fully cognizant of and can thus take advantage of the existence of match friction. Expected middlemen profit accordingly embodies the middlemen margin $p^* - tx - p$ conditional on the price offer p, as well as the likelihood that p out-competes all other offers received by the producer, $H_x(p)$:

$$\Pi_x = \max_{p \geq c} H_x(p)(p^* - tx - p) - K \tag{2}$$

where $K \geq 0$ is a fixed cost per producer contacted. Expected middlemen profit maximization implies the following equilibrium price offer distribution:

$$F_x(p) = \frac{1}{\lambda_x} \ln\left(\frac{p^* - tx - c}{p^* - tx - p}\right), \quad f_x(p) = \frac{1}{\lambda_x(p^* - tx - p)}. \tag{3}$$

Naturally, $F_x(c) = 0$ for no producer will accept a price offer less than the domestic (reservation) value c. Meanwhile, the highest price offer given across all middlemen p_x^+ at location x can be found by setting $F_x(p_x^+) = 1$, or equivalently:

$$p_x^+ = (1 - e^{-\lambda_x})(p^* - tx) + e^{-\lambda_x}c, \tag{4}$$

a weighted average of the net border price $(p^* - tx)$, and the domestic value (c). The relative weights depend only on the extent of middlemen market power, as given by the ratio $\lambda_x = M_x/N$. As $\lambda_x \to \infty$, $F_x(p)$ puts unit mass on $\lim_{\lambda_x \to \infty} p_x^+ = p^* - tx$. In contrast, as $\lambda_x \to 0$, p_x^+ tends to the domestic price c.

In addition to the price offer distribution $F_x(p)$, middlemen market power λ_x has an important bearing also on the *realized* distribution of producer prices. Whenever $\lambda_x > 0$,

$$H_x(p) = e^{-\lambda_x(1-F_x(p))} = \frac{e^{-\lambda_x}(p^* - tx - c)}{p^* - tx - p}. \tag{5}$$

where $H_x(c) = e^{-\lambda_x}$ gives the fraction of producers who are left out of export markets, and $H_x(p) - H_x(c)$ the fraction for whom output is bound for exports, and who fetch a price at p

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[9]As is well-known, the Poisson distribution is the limit of the binomial distribution with parameter λ_x as the number of trials approaches infinity.

or less from their middlemen. With the distribution of realized producer prices from (5), it can be easily seen that all middlemen in fact earn identical expected profits anywhere along the domain $p \in [c, p_x^+]$:

$$
\begin{aligned}
H_x(p)(p^* - tx - p) - K &= e^{-\lambda_x}(p^* - tx - c) - K \\
&= H_x(c)(p^* - tx - c) - K.
\end{aligned}
$$

To ascertain entry incentives, therefore, it suffices to consider one such price, say c. Endogenous entry implies

$$
e^{-\lambda_x}(p^* - tx - c) = K \tag{6}
$$

whenever there is positive number of middlemen $M_x = \lambda_x N > 0$. It follows therefore that in equilibrium,[10]

$$
\begin{aligned}
\lambda_x &= M_x/N = \max\{\ln((p^* - tx - c)/K), 0\} \\
H_x(p) &= \max\{\frac{K}{p^* - tx - p}, 0\}. \tag{7}
\end{aligned}
$$

From (6) and (7), equilibrium middlemen market power λ_x is determined by the interplay between entry cost K, and the export surplus $p^* - tx - c$. Evaluated at the market determined $\lambda_x N = M_x$, any expected increase in export surplus with one additional middleman, $H_x(c)(p^* - tx - c)$, is equated to the cost of doing so, K. Thus, equilibrium middlemen entry is in fact constrained efficient given match friction and positive entry costs.[11]

As a special case, consider the case of cost free entry $K = 0$. From (7), middlemen market power vanishes ($\lambda_x \to \infty$), and the Bertrand outcome prevails. More generally for $K > 0$, the ratio $\lambda_x = M_x/N$ increases with border price p^* reflecting more intense competition among middlemen, and decreases with distance x reflecting instead a deepening of middlemen power along the location continuum. In the end, with positive entry cost, export is positive only in the range $x \leq (p^* - c - K)/t \equiv x^+$. In comparison with the Bertrand outcome, $x_o^+ = (p^* - c)/t > x^+$, middlemen market power robs producers in locations $(x^+, x_o^+]$ their access to export markets.

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[10]The associated maximal price offer is thus $p_x^+ = \max\{p^* - tx - K, c\}$.

[11]It can be readily verified that λ_x as displayed in (6) maximizes total producer and middlemen revenue net of entry cost at each location $N\left[(p^* - tx)(1 - H_x(c)) + cH_x(c) - \lambda_x K\right]$.

2.4 Producer Price of Exports and Pass Through

Apart from endogenous middlemen market power, match friction additionally gives rise to endogenous producer price of exports, depending on location. At any given location with positive export, average producer revenue conditional on receiving at least one acceptable offer (Ep_x) is a weighted average of the net border price $(p^* - tx)$ and the domestic value c:

$$Ep_x \equiv \int_c^{p_x^+} \frac{p \, dH_x(p)}{1 - H_x(c)} = (1 - \gamma_x)(p^* - tx) + \gamma_x c < p^* - tx. \qquad (8)$$

where $\gamma_x \equiv \lambda_x e^{-\lambda_x}/(1 - e^{-\lambda_x})$. Since $p^* - tx - c$ represents net surplus available from exports, the share that goes, on average, to middlemen is thus:

$$\frac{p^* - tx - Ep_x}{p^* - tx - c} = \gamma_x \equiv \frac{\lambda_x e^{-\lambda_x}}{1 - e^{-\lambda_x}}$$

γ_x thus captures the extent of unequal division of the export surplus between middlemen and producers. Evidently, this division depends systematically on middlemen market power λ_x, and as such the division of surplus varies endogenously along the locational continuum. From (7), it is straightforward to confirm that γ_x rises with distance for middlemen market power strengthens with distance. Producers at farther away locations are accordingly left with a smaller slice of the export surplus.

Using (6) and (7), the average producer price of exports with endogenous entry can now be expressed as:

$$Ep_x = p^* - tx - K \ln(\frac{p^* - tx - c}{K}) \frac{p^* - tx - c}{p^* - tx - c - K}. \qquad (9)$$

Thus, a mark up – $p^* - tx - Ep_x > 0$ – prevail whenever entry cost is strictly positive $K > 0$. The size of this markup, accounting for endogenous entry, is strictly increasing in the net border price $p^* - tx$.[12] Intuitively, a higher net border price encourages entry (λ_x) and simultaneously

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[12]To see the intuition here, note that whereas $N\lambda_x = M_x$ number of middlemen enter at cost K in equilibrium, and the number of middlemen with positive average markup gross of fixed cost $(p^* - tx - Ep_x)$ is equal only to the number of producers with positive sales $N(1 - H_x(c)) = N(1 - e^{-\lambda_x})$. The rest $N\lambda_x - N(1 - e^{-\lambda_x})$ fail to strike a successful match despite having incurred the fixed cost K, for their price offers are outbid by that of other middlemen. Equation (9) essentially requires that with endogenous entry,

$$p^* - tx - Ep_x = K \left(\frac{\lambda_x}{1 - e^{-\lambda_x}} \right) \Leftrightarrow N\lambda_x K = N(1 - e^{-\lambda_x})(p^* - tx - Ep_x).$$

Thus, the equilibrium size of the markup $p^* - tx - K - Ep_x$ is just high enough to justify the entry of the marginal middlemen, accounting fully for the possibility of negative profits at $-K$ subsequent to entry in case of a failure to match.

increases the number of middlemen who fail to strike a successful match $N\lambda_x - N(1 - e^{-\lambda_x})$ as they are outbid by other middlemen. To justify this risk, the mark up $p^* - tx - Ep_x$ for those who succeed in striking a match must also rise in tandem.

Turning now to the issue of pass through of border price to the average local producer, what role does distance play? Specifically, the average revenue of all producers at x can be expressed simply as the weighted average:

$$ER_x \;\;=\;\; (1 - H_x(c))Ep_x + H_x(c)c = p^* - tx - (1 + \lambda_x)K. \tag{10}$$

where $\lambda_x = \ln(p^* - tx - c) - \ln K$ from (4). The extent of border price pass through can be ascertained by evaluating the responsiveness:

$$\frac{\partial ER_x}{\partial(p^* - tx)} = 1 - \frac{K}{p^* - tx - c} = 1 - e^{-\lambda_x} < 1. \tag{11}$$

Thus, the revenue of the average producer at location x rises less than one for one with net border price. But even more important, the extent of this imperfect pass through worsens endogenously with distance from (7), all the way up until the point is reached where $x \geq x_o^+$ and thus $\lambda_x = 0$. Producers located here and beyond are by definition untouched by forces of export markets. Figure 2 illustrates, and shows the range of middlemen price offer $[c, p_x^+]$ at each location, as well as the average revenue of all local producers along the location continuum.

2.5   Intra- and Inter-regional Poverty

With price dispersion both within region through $H_x(p)$, and across regions as $H_x(p)$ varies with x, the incidence of poverty has both an intra- and an inter-regional dimension. These are shown in Figure 3, for three successively more remote regions (from H^1 to H^p and then to H^2), and accordingly three producer price distributions that can be rank ordered in the sense of first order stochastic dominance.

To have a direct gauge on poverty, respectively define $P_{x,\alpha}^m$ and $P_{x,\alpha}^c$ as the poverty of producers who gain access to export markets through middlemen, and the poverty of all other producers at location x. We adopt the Foster-Greer-Thorbecke (1984) poverty indicator:

$$P_{x,\alpha}^m = \int_c^{\min\{\bar{p}, p_x^+\}} \left(\frac{\bar{p} - p}{\bar{p}}\right)^\alpha \frac{dH_x(p)}{1 - H_x(c)} \leq \left(\frac{\bar{p} - c}{\bar{p}}\right)^\alpha = P_{x,\alpha}^c \tag{12}$$

where $(\bar{p}-p)/\bar{p}$ is the poverty gap ratio, and $\alpha \geq 0$ parameterizes the extent of poverty aversion. Naturally, overall poverty at location x can be expressed as:

$$P_{x,\alpha} = (1 - H_x(c))P^m_{x,\alpha} + H_x(c)P^c_{x,\alpha}. \tag{13}$$

As shown, of the two groups of producers living under the poverty line: (i) $H_x(c) = e^{-\lambda_x}$ are poor because they fail to export and (ii) $H_x(\min\{\bar{p}, p^+_x\}) - H_x(c) = e^{-\lambda_x}(\min\{\bar{p}, p^+_x\} - c)/(p^* - tx - \min\{\bar{p}, p^+_x\})$ remain poor despite export. Between the two, producers who fail to export are poorer since $P^c_{x,\alpha} \geq P^m_{x,\alpha}$ whenever $\alpha \geq 0$.

As long as some producers are non-poor, or $p^+_x > \bar{p}$, a small increase in the border price p^*, all else equal, alleviates both these sources of poverty. Furthermore, heightened competition between middlemen (an increase in λ_x) brings relief to both $H_x(c)$ and $H_x(\bar{p}) - H_x(c)$. In the limit, as $\lambda_x \to \infty$ or as $K \to 0$ approaching the Bertrand outcome, the first source of poverty $H_x(c)$ vanishes with the disappearance of match friction as long as the net border price $p^* - tx$ exceeds the poverty line $\bar{p}$, while the measure of the second $H_x(\bar{p}) - H_x(c)$ likewise approaches zero, since no middlemen can offer less than the full $p^* - tx$ and get away with it without match friction.

Inter-regional differences in poverty arise for two reasons in our setup. First, remote locations are naturally disadvantaged for the net border price $(p^* - tx)$ is lower there. But second, remote locations are in fact made doubly worse off for middlemen market power also deepens along the locational continuum from (7). Taken together, poverty worsens with distance, and indeed from (13), the poverty indicator can be re-expressed to reflect directly the impact of location on poverty:

$$P_{x,\alpha} = \frac{\alpha}{\bar{p}} \int_c^{\bar{p}} \left(\frac{\bar{p} - p}{\bar{p}}\right)^{\alpha-1} \frac{K}{p^* - tx - p} dp.$$

for locations where there are at least some producers who are non-poor. The threshold distance, call it x^p, beyond which producers are universally living below the poverty line is reached when the maximal price offer p^+_x can no longer cover $\bar{p}$, or equivalently $\min\{\bar{p}, p^+_x\} = p^+_x$. From (4) and (7),

$$
\begin{aligned}
x \geq x^p &\equiv \left(p^* - \bar{p} - e^{-\lambda_x}(p^* - tx - c)\right)/t = (p^* - \bar{p} - K)/t \tag{14} \\
&\leq \frac{p^* - \bar{p}}{t} = x^p_o.
\end{aligned}
$$

11

Consequently, middlemen market power deepens the incidence of poverty along both the intensive ($P_{x,\alpha} > 0$) and extensive ($x^p < x_o^p$) margins (Figure 2). For $x > x^p$, all producers are poor, and thus,

$$P_{x,\alpha} = \frac{\alpha}{\bar{p}} \int_c^{p_x^+} \left(\frac{\bar{p} - p}{\bar{p}}\right)^{\alpha-1} \frac{K}{p^* - tx - p} dp + \left(\frac{\bar{p} - p_x^+}{\bar{p}}\right)^{\alpha}$$

and $P_{x,\alpha}$ continues to worsen with distance x (say from H^p to H^3 in Figure 3). Henceforth, we assume that x^p exceeds at least the lower bound $\underline{x}$, in order to examine the set of factors that effect changes along the extensive margin.

We have so far demonstrated location as a key determinant of middlemen market power. In addition, we have demonstrated the implications of such a link in terms of mark ups and pass through, as well as intra-and inter-regional poverty. In this context, how does the introduction of non-profits impact middlemen market power along the locational continuum? And what about the related issues of mark up and pass through, as well as intra- and inter-regional poverty?

3 Non-profits

Like profit-maximizing middlemen, we henceforth incorporate non-profits who similarly serve producers by bringing output to export markets at transportation cost tx. But unlike profit-maximizing middlemen, they are additionally motivated by the location-specific implications of middlemen market power both on poverty as well as on prices.

We incorporate these concerns by a location specific price premium $p_x^n - p^* > 0$, where p_x^n is the valuation put by the non-profit on purchase of output at location x. Our restriction on $p_x^n - p^*$ is mild, and our objective is simply to capture a concern for producers in locations otherwise characterized by high mark ups and / or isolation from world markets. Specifically, we assume $p_x^n - p^* = ax$ where $a \geq 0$ captures the overall strength of the poverty and pricing concerns of the non-profit. In what follows, we further assume that the dependence of the price premium on x is not overly strong, so that the net border price accounting for transportation costs, tx, continues to indicate remoteness as a deterrence to exports, or equivalently $p_x^n - tx = p^* - (t - a)x$ is decreasing in x.[13] The (money equivalent) gains to a non-profit who serves a

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[13]The linearity of the price premium in x assumed here can be easily relaxed to accommodate any monoton-

producer located at x, and offers producer price p, is thus also location-specific

$$p_x^n - tx - p = p^* + ax - tx - p.$$

As will be seen below, this simple modification gives rise to a rich array of possible implications. But first in terms of interpretation, the price premium can be thought of as the money equivalent utility gains to a non-profit simply by virtue of serving faraway producers, who previously saw a large part of the export surplus captured by middlemen. Alternatively, a non-profit middleman can also be thought of as but another profit maximizing middleman, who has access to foreign consumer demand that embodies a concern for location, via a revised schedule of border prices $p_x^n = p^* + ax$.

We take the fixed cost applicable to non-profits K^n to be strictly greater than K, in order to account for any non-profits' cost disadvantage relative to longstanding middlemen, and other non-trivial costs of monitoring and certification to justify the final consumer price premium.[14]

3.1 Equilibrium with Middlemen and Non-Profits

Denote $F_x^n(p)$, $p \geq c$, as the cumulative distribution of price offers inclusive of both non-profits and middlemen. In analogous fashion as when there are only middlemen, let $H_x^n(p) = e^{-\lambda_x^n(1-F_x^n(p))}$ be the cumulative distribution of the realized producer price distribution, where λ_x^n is now the ratio $(m_x^n + M_x^n)/N$, and m_x^n and M_x^n respectively denote the endogenous number of non-profits and middlemen.

The problem of a non-profit is otherwise similar to that of a middlemen: they account for the net (price premium augmented) gains from serving a producer $(p_x^n - tx - p)$, adjusted appropriately to reflect the likelihood of successfully striking a match, $H_x^n(p)$, in the face of competing price offers from other middlemen:

$$\pi_x^n = \max_p H_x^n(p)(p_x^n - tx - p) - K^n \tag{15}$$

$$\Pi_x^n = \max_p H_x^n(p)(p^* - tx - p) - K. \tag{16}$$

---

ically increasing function $a(x)$ without affecting the results to follow, as long as $tx - ax$ is increasing in x and distance continues to deter export.

[14]The opposite scenario where $K^n < K$ can be easily inferred from the analysis to follow.

Since the premium adjusted gains from a match is higher for a non-profit $p_x^n - tx - p > p^* - tx - p$ for any given price offer, it is straightforward to show that the equilibrium range of non-profit price offers, if non-empty, is always higher than that of profit-maximizing middlemen.[15] Put another way, the entry of non-profits effectively confines profit maximizing middlemen to service producers who are not matched with non-profits.

Accordingly, let $\hat{p}_x$ be an endogenous price offer threshold, dividing the range of middlemen and non-profit price offers. $F_x^n(\hat{p}_x)$ thus gives the share of price offers from private profit maximizing middlemen ($M_x^n/(m_x^n + M_x^n)$), and $1 - F_x^n(\hat{p}_x)$ the share from non-profits. For any $p \leq \hat{p}_x$, (15) implies

$$F_x^n(p) = \frac{1}{\lambda_x^n} \ln\left(\frac{p^* - tx - c}{p^* - tx - p}\right) \tag{17}$$

and otherwise with $p > \hat{p}_x$ for non-profits, (15) and (16) give

$$F_x^n(p) = F_x^n(\hat{p}_x) + \frac{1}{\lambda_x^n} \ln\left(\frac{p_x^n - tx - \hat{p}_x}{p_x^n - tx - p}\right). \tag{18}$$

The threshold $\hat{p}_x$ is determined via (17) as soon as the share of middlemen at location x, $F_x^n(\hat{p})$, is known. This important share is endogenized here by way of simultaneous endogenous entry of profit maximizing middlemen and non-profits respectively:

$$e^{-\lambda_x^n}(p^* - tx - c) = e^{-\lambda_x^n(1 - F_x^n(\hat{p}_x))}(p^* - tx - \hat{p}_x) = K, \tag{19}$$

$$e^{-\lambda_x^n(1 - F_x^n(\hat{p}_x))}(p_x^n - tx - \hat{p}_x) = e^{-\lambda_x^n(1 - F_x^n(p))}(p_x^n - tx - p) = K^n \tag{20}$$

where the marginal non-profit $\lambda_x^n(1 - F^n(\hat{p}_x)) = m_x^n/N$ equates the price premium augmented expected export surplus $e^{-\lambda_x^n(1 - F_x^n(\hat{p}_x))}(p_x^n - tx - \hat{p}_x)$ and the cost of entry K^n from (20), and the marginal middlemen $\lambda_x^n = (m_x^n + M_x^n)/N$ then equates the expected export surplus $(e^{-\lambda_x}(p^* - tx - c))$ with the cost of entry K from (19). Thus for interior solutions $F_x^n(\hat{p}_x) \in (0, 1)$, the threshold price offer dividing middlemen and non-profits is:

$$\hat{p}_x = p^* - tx - \frac{axk}{1 - k} \tag{21}$$

---

[15]To see this, suppose that $\tilde{p}^n$ and $\tilde{p}$ are solutions to (15) and (16) respectively. By virtue of profit maximization, it must be the case that

$$\frac{p_x^n - tx - \tilde{p}^n}{p_x^n - tx - \tilde{p}} \geq \frac{H_x^n(\tilde{p})}{H_x^n(\tilde{p}^n)} \geq \frac{p^* - tx - \tilde{p}^n}{p^* - tx - \tilde{p}},$$

with

$$ax \geq 0,$$

it follows that $\tilde{p}^n \geq \tilde{p}$.

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where k denotes the ratio of fixed costs $K/K^n < 1$. Clearly, the higher the price premium ax, the narrower the range of middlemen price offers $[c, \hat{p}_x]$. Meanwhile, the greater the non-profit's (fixed) cost disadvantage $K^n/K = 1/k$, the higher the middlemen's maximal price offer. These show interestingly the tendency for middlemen to optimally charge a higher mark up on average to producers they continue to serve, the higher the non-profits' price premium. At the other end of the price offer spectrum, the maximal non-profit price offer is given by:

$$p_x^{n+} = p^* + ax - tx - K^n \tag{22}$$

from (20) evaluated at $F_x^n(p_x^+) = 1$. The larger the price premium, the higher of course will be the maximal non-profit offer in equilibrium.

Finally, from (19) and (20), the number of non-profits (m_x^n) and the number of middlemen (M_x^n) at an interior equilibrium are respectively,[16]

$$m_x^n = N\lambda_x^n(1 - F_x^n(\hat{p}_x)) \quad = \quad N \ln\left(\frac{ax}{K^n - K}\right) \tag{23}$$

$$M_x^n + m_x^n = N\lambda_x^n \quad = \quad N \ln\left(\frac{p^* - tx - c}{K}\right). \tag{24}$$

3.2   Producer Price of Exports and Pass Through

Depending on the price premium, fixed costs, as well as the export surplus, it follows from (23) and (24) that there are three possible equilibrium configurations, respectively when there exist only middlemen, only non-profits, and when the two coexist:

Proposition 1 *Upon introducing non-profits with price premium $a \geq t(K^n - K)/(p^* - c - K)$, producers are served*

1. *entirely by middlemen at locations closest to the hub $x < (K^n - K)/a$*

2. *by a mix of both middlemen and non-profits, for $x \in [(K^n - K)/a, (K^n - K)(p^* - c)/(Ka + (K^n - K)t))$*

---

[16]Such an allocation is once again constrained efficient in the presence of match friction and costly entry, in the sense that national welfare, as measured by the sum of expected producer revenue, expected middlemen and non-profit gains from servicing producers at entry cost K and K^n, $N[(p_x^n - tx)(1 - H_x^n(\hat{p}_x)) + (p^* - tx)(H_x^n(\hat{p}_x) - H_x^n(c)) + cH_x^n(c) - \lambda_x^n K - \lambda_x^n(1 - F_x^n(\hat{p}_x))(K^n - K)]$, can be shown to be maximized exactly by choice of m_x^n and M_x^n as shown in (19) and (20).

3. *entirely by non-profits, for $x \in [(K^n - K)(p^* - c)/(Ka + (K^n - K)t), (p^* - c - K^n)/(t - a)]$.*

Producers at even farther away locations are not served by either middlemen or non-profits.

In what follow, we discuss each of these cases in detail.

3.2.1 No Non-Profits, Only Middlemen

With no non-profits in equilibrium, $m_x^n = 0$. From (23), this occurs whenever:

$$a \leq \frac{K^n - K}{x} \equiv a^1(x). \tag{25}$$

or equivalently, whenever non-profits fail to out-compete middlemen thanks to a price premium too small to cover the added fixed cost $K^n - K$. Naturally, this occurs at locations sufficiently close to the hub where the price premium is the lowest, since:[17]

$$a \leq a^1(x) \quad \Leftrightarrow \quad x \leq \frac{K^n - K}{a} \equiv x^1(a).$$

Region I of Figure 4 illustrates all (x, a) combinations consistent with this equilibrium. Here, the distribution of realized prices are unaffected by the entry of non-profits (H^1 in Figure 5). Consequently, the average price of exports, the responsiveness of average producer revenue to world price changes, along with intra-regional poverty, all remain untouched by the possibility of non-profit entry.

3.2.2 No Middlemen, Only Non-Profits

At the other extreme, there are no middlemen, $M_x^n = 0$, or from (23) and (24), the price premium is sufficiently high:

$$p^* - tx - c \leq p^* - tx - \hat{p}_x \Leftrightarrow a \geq \frac{K^n - K}{K} \frac{p^* - tx - c}{x} \equiv a^2(x). \tag{26}$$

In locational terms, a no-middlemen equilibrium applies at distant locations:

$$a \geq a^2(x) \quad \Leftrightarrow \quad x \geq \frac{(K^n - K)(p^* - c)}{Ka + (K^n - K)t} \equiv x^2(a).$$

---

[17]The range of equilibrium price offers with non-empty support ($[c, (1 - e^{-\lambda_x^n})(p^* - tx) + e^{-\lambda_x^n}c]$) remains the same as before, while middlemen market power continues to be given by ($\lambda_x^n = \frac{M_x^n}{N} = \max\{\ln(p^* - tx - c) - \ln K, 0\} = \frac{M_x}{N}$).

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Note in addition that locations too distant $x \geq (p^* - c - K^n)/(t - a) \equiv x^{n+}(a)$ are beyond the reach of even non-profits, since the premium adjusted border price $p^* + ax$ is too small to cover costs $(tx + K^n + c)$. These two restrictions are illustrated in Figure 4 by region III including all combinations of (x, a) bounded respectively to the left and right by schedules $x^2(a)$ and $x^{n+}(a)$. As shown, region III can be further divided into two parts. The first part $x \in [x^2(a), x^+)$ represents all locations wherein non-profits take over and middlemen are completely displaced. The second include all other locations where non-profits now serve as brand new links to export markets where previously none existed.

What difference do non-profits make? We demonstrate in what follows (i) a level effect on the average producer price of exports, and (ii) a pass through effect on the responsiveness of local producer revenue to world price changes. To see the first, the maximal price offer by a non-profit is at

$$p_x^{n+} = p^* + ax - tx - K^n. \tag{27}$$

from (20). p^{n+} is thus greater than the corresponding maximal middlemen price offer $p^+ = p^* - tx - K$ since x in $[x^2(a), x^+)$ must be greater than $x^1(a)$, or, $ax > K^n - K$ from (25). Furthermore, the equilibrium non-profit to producer ratio is

$$\lambda_x^n = \frac{m_x^n}{N} = \max\{\ln(p^* + ax - tx - c) - \ln K^n, 0\} \tag{28}$$

from (20). This is likewise strictly greater than the middlemen to producer ratio $\lambda_x = \max\{\ln(p^* - tx - c) - \ln K, 0\}$ in the absence of non-profits.

Finally, from (20), the equilibrium realized price distribution accounting for endogenous entry is simply (H^4 in Figure 5):

$$H_x^n(p) = \frac{K^n}{p^* + ax - tx - p} \tag{29}$$

which lies uniformly below $H_x(p) = K/(p^* - tx - p)$ in the absence of non-profits provided that $x > x^2(a)$. Each of these observations reinforce one another, and together they imply a higher average producer price of exports with non-profits:[18]

$$
\begin{aligned}
E^n p_x &= \int_c^{p^{n+}} \frac{p}{1 - H_x^n(c)} dH_x^n(p) = p^* + ax - tx - \frac{\lambda_x^n K^n}{1 - e^{-\lambda_x^n}} \\
&\geq E p_x \geq c.
\end{aligned}
\tag{30}
$$

---

[18]The proof of inequality (30) is relegated to the Appendix.

as well as a higher overall average producer revenue across all producers

$$E^n R_x = (1 - H_x^n(c))E^n p_x + H_x^n(c)c \geq ER_x. \tag{31}$$

Furthermore, with a higher prevalence of non-profits to producer than middlemen to producers ($\lambda_x^n > \lambda_x \geq 0$) from (28):

$$\frac{\partial E^n R_x}{\partial p^* - tx} = 1 - e^{-\lambda_x^n} > 1 - e^{-\lambda_x} = \frac{\partial ER_x}{\partial p^* - tx}. \tag{32}$$

Evidently, the entry of non-profits improves the responsiveness of local producer revenue to border price changes as well.

3.2.3 Co-existence

Turning finally to the case where $m_x^n > 0$ and $M_x^n > 0$, non-profits and private profit maximizing middlemen coexist when a is in the intermediate range, $a \in (a^1(x), a^2(x))$ for fixed location x, or equivalently, $x \in (x^1(a), x^2(a))$ for fixed a. Region II in Figure 4 illustrates the intermediate locations, and price premium combinations consistent with this range.

With co-existence, the direct impact of non-profit entry on private middlemen can be seen in two regards. The first concerns entry. From (10) and (11), we note that interestingly,

$$\lambda_x^n = \frac{m_x^n + M_x^n}{N} = \ln(p^* - tx - c) - \ln(K) = \frac{M_x}{N} = \lambda_x.$$

All else constant, therefore, the entry of one more non-profit has the effect of directly displacing a middleman. The second concerns pricing. The revised realized producer price distribution accounting for λ_x^n above is piece-wise continuous, with

$$
\begin{aligned}
H_x^n(p) &= \frac{K}{p^* - tx - p} = H_x(p) \text{ if } p \leq \hat{p}_x \\
&= \frac{K^n}{p^n - tx - p} \leq H_x(p) \text{ otherwise.}
\end{aligned}
$$

so that the cumulative $H_x^n(p)$ remains strictly unchanged in the range of middlemen prices $p \leq \hat{p}_x$, but the fraction of producers receiving higher prices in the non-profit range increases with the entry of non-profits. Price distribution schedules H^2, $\bar{H}$ and H^3 in Figure 5 illustrate. Naturally, the entry of non-profits raises the implied average price of export:

$$
\begin{aligned}
E^n p_x &= \int_c^{\hat{p}_x} \frac{p}{1 - H_x^n(c)} d\frac{K}{p^* - tx - p} + \int_{\hat{p}_x}^{p^{n+}} \frac{p}{1 - H_x^n(c)} d\frac{K^n}{p^* + ax - tx - p} \\
&= Ep_x + ax\frac{(1 - (1 + m_x^n/N)e^{-m_x^n/N})}{1 - e^{(m_x^n + M_x^n)/N}} > Ep_x
\end{aligned}
$$

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whenever $m_x^n > 0$. Similarly, the implied average local producer revenue

$$
\begin{aligned}
E^n R_x &= (1 - H_x^n(c))E^n p_x + H_x^n(c)c \\
&= E R_x + ax(1 - (1 + m_x^n/N)e^{-m_x^n/N}) > E R_x
\end{aligned}
$$

also exceeds $E R_x$. By contrast, however, note from (23) that since the equilibrium number of non-profits depends strictly on the price premium ax relative to the increment in entry cost $K^n - K$, it follows that

$$
\frac{\partial E^n R_x}{\partial p^* - tx} = \frac{\partial E R_x}{\partial p^* - tx}
$$

and thus the extent of imperfect pass through remains unchanged despite the entry of non-profits as long as middlemen market power λ_x^n remains unchanged at λ_x.

In summary, Region I in Figure 4 exhibits invariance despite the possibility of non-profit entry. Producers in these locations are too close to the hub and accordingly the price premium is to low to justify the entry of non-profits. Region II presents the intermediate range where middlemen and non-profits co-exist. As discussed, overall producer revenue rises thanks to the entry of non-profits, but the degree of border price pass through remains untouched. The final region III encompasses locations where non-profit completely displace middlemen, and locations where non-profit facilitated export where isolation from world markets was the norm. At these locations, both overall producer revenue, and the extent of border price pass through improve with non-profits. Figure 4 reveals additionally that regions II and III are non-empty as long as the price premium is large enough to guarantee that non-profits are viable at least at x^+ – the least remote distance without competition from middlemen – or $ax^+ \geq (K^n - K)$, equivalently $a \geq t(K^n - K)/(p^* - c - K)$. It follows that

Proposition 2 *At the national level, averaging across all locations $x \in [\underline{x}, \bar{x}]$, the introduction of non-profits with price premium $a \geq t(K^n - K)/(p^* - c - K)$*

1. *gives rise to a first order stochastically dominating shift in the producer price distribution as $H_x^n(p) \leq H_x(p)$ for all x,*

2. *raises the average producer price of exports since $E^n p_x \geq E p_x$ for all x, and*

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3. *improves the responsiveness of average local producer revenue, inclusive of exporting and non-exporting producers, to border price changes since $\partial E^n R_x / \partial(p^* - tx) \geq \partial E R_x / \partial(p^* - tx)$ for all x.*

3.3 Intra- and Inter-regional Poverty Incidence

The poverty implications of non-profits are illustrated in Figure 5, in which a family of producer price distributions is shown going from distances nearest to the hub, to more remote locations deeper into the hinterland. Of particular interest is the cutoff distribution $\bar{H}$. For locations closer to the hub relative to $\bar{H}$, the poor are served by middlemen only, and non-profits offer a price higher than the poverty line $\bar{p}$, or

$$\hat{p} \geq \bar{p} \iff x \leq \frac{p^* - \bar{p}}{t + ak/(1-k)} \equiv \bar{x}^n(a). \tag{33}$$

Since the poor remains untouched by non-profits, the introduction of non-profits at these locations naturally leave poverty unchanged at:

$$P_{x,\alpha}^n = \frac{\alpha}{\bar{p}} \int_c^{\bar{p}} \left(\frac{\bar{p} - p}{\bar{p}}\right)^{\alpha-1} \frac{K}{p^* - tx - p} dp = P_{x,\alpha}.$$

By contrast, for locations further into the hinterland than $\bar{H}$, either some (for $x \in [\bar{x}^n(a), x^2(a))$), or all of the poor ($x \in [x^2(a), x^{n+}(a))$) will be served by non-profits. At all locations where there are at least some non-poor, $\bar{p} \leq p^{n+}$, poverty declines with the entry of non-profits:

$$
\begin{aligned}
P_{x,\alpha}^n &= \frac{\alpha}{\bar{p}} \int_c^{\bar{p}} \left(\frac{\bar{p} - p}{\bar{p}}\right)^{\alpha-1} H_x^n(p) dp \\
&\leq \frac{\alpha}{\bar{p}} \int_c^{\bar{p}} \left(\frac{\bar{p} - p}{\bar{p}}\right)^{\alpha-1} H_x(p) dp. = P_{x,\alpha}
\end{aligned}
$$

which follows since $H_x^n(p)$ first order stochastically dominate $H_x(p)$ from Proposition 1. In the appendix, we discuss all of the remaining cases, depending on (i) whether all producers are poor, and (ii) whether middlemen and non-profits co-exist. But in all:

Proposition 3 *At the national level, averaging across all locations $x \in [\underline{x}, \bar{x}]$, the introduction of non-profits*

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1. *reduces overall average poverty ($P_{x,\alpha}^n \leq P_{x,\alpha}$) for all x if $a \geq t(K^n - K)/(p^* - c - K)$, and remains unchanged otherwise,*

2. *pushes back towards the hinterland the threshold location beyond which all producers are poor if in addition $a \geq t(K^n - K)/(p^* - \bar{p} - K)$; otherwise the threshold location remains unchanged.*

To see the second part of the proposition, note that the maximal non-profit price offer $p^* + ax - tx - K^n$ from (27) is below the poverty line

$$x \geq \frac{p^* - \bar{p} - K^n}{t - a} \equiv x^{np}(a) \geq x^p = \frac{p^* - \bar{p} - K}{t} \tag{34}$$

if and only if $a \geq t(K^n - K)/(p^* - \bar{p} - K)$ as stated based on (14). With the help of (33) - (34), Figure 6 illustrates the full array of possibilities in our model of middlemen and non-profits. Depending on the size of the premium a, there are two main classes of outcomes.[19] The first class involves a at relatively low levels, between $t(K^n - K)/(p^* - c - K)$ and $t(K^n - \bar{p} - K)$. In this range of price premia, non-profit can emerge and do so in regions $\text{II}_{m,allpoor}^{n,allpoor}$ where they co-exist with middlemen, and $\text{III}^{n,allpoor}$ where non-profits only serve as producers' link to export markets. Importantly, with price premia this low, in no location are non-profits able to price above the poverty line.

The second class of cases involves relatively high price premia $a \geq t(K^n - K)/(p^* - \bar{p} - K)$. For each a in this range, there are as many as five distinctive equilibrium middlemen-nonprofit configurations, depending on whether middlemen and non-profits coexist (regions I, II or III), and whether at least some of the producers served are non-poor. Interestingly, therefore, at a given price premium, a, the mean poverty of producers served by non-profits across all locations:

$$P_\alpha^n = \frac{\int_{x^1(a)}^{x^2(a)} \int_{\hat{p}_x}^{\min\{\bar{p}, p_x^{n+}\}} [(\bar{p} - p)/\bar{p}]^\alpha dH_x^n(p) dx + \int_{x^2(a)}^{x^{n+}(a)} \int_c^{\min\{\bar{p}, p_x^{n+}\}} [(\bar{p} - p)/\bar{p}]^\alpha dH_x^n(p) dx}{\int_{x^1(a)}^{x^2(a)} 1 - H_x^n(\hat{p}_x) dx + \int_{x^2(a)}^{x^{n+}(a)} 1 - H_x^n(c) dx} \tag{35}$$

may well be *higher* or *lower* than the mean poverty of producers served by middlemen:

$$P_\alpha^m = \frac{\int_{\underline{x}}^{x^1(a)} \int_c^{\min\{\bar{p}, p_x^+\}} [(\bar{p} - p)/\bar{p}]^\alpha dH_x^n(p) dx + \int_{x^1(a)}^{x^2(a)} \int_c^{\min\{\bar{p}, \hat{p}_x\}} [(\bar{p} - p)/\bar{p}]^\alpha dH_x^n(p) dx}{\int_{\underline{x}}^{x^1(a)} 1 - H_x^n(c) dx + \int_{x^1(a)}^{x^2(a)} H_x^n(\hat{p}_x) - H_x^n(c) dx} \tag{36}$$

---

[19]An additional class has a smaller than $t(K^n - K)/(p^* - c - K)$ and as shown in Figure 5, a is too small for non-profit to ever emerge in equilibrium.

since there are regions (say $\text{II}^{n,allpoor}_{m,allpoor}$) where non-profits offer strictly higher prices compared to middlemen in the same location, but there are also locations (say, $\text{III}^{n,allpoor}$) where some non-profits offer strictly lower prices compared to middlemen in other locations (say, region $\text{I}_{n,somepoor}$). These can be contrasted against the average poverty of producers who continue to have no access to export markets,

$$P^c_\alpha = \frac{\int^{\bar{x}}_{\underline{x}} [(\bar{p} - c)/\bar{p}]^\alpha H^n_x(c) dx}{\int^{\bar{x}}_{\underline{x}} H^n_x(c) dx} = \left(\frac{\bar{p} - c}{\bar{p}}\right)^\alpha. \qquad (37)$$

In what follows, we offer an observation comparing the three.

Lemma 1 *For all $a \geq t(K^n - K)/(p^* - c - K)$ where either middlemen, non-profits, or both can emerge in equilibrium depending on location, poverty among non-exporting producers is the greatest but the poverty ranking between producers served by middlemen and non-profits is in general ambiguous:*

$$P^c_\alpha \geq \max\{P^m_\alpha, P^n_\alpha\}.$$

In the special case of poverty head count with $\alpha = 0$, and price premia in the range $a \in [t(K^n - K)/(p^* - c - K), t(K^n - K)/(p^* - \bar{p} - K)]$

$$1 = P^c_0 = P^n_0 > P^m_0$$

all non-exporting producers and all producers served by non-profits are poor, but some producers served by middlemen are not.

There are two opposing forces at work here. With a price premium, non-profits do indeed offer higher prices (Propositions 2 and 3). But with poverty aversion, non-profits tend to work in remote locations where producers are poorer (Proposition 1). Consequently, the relative poverty of producers served by middlemen and non-profits is indeed ambiguous. As we will see, however, this particular ranking turns out to be key in the determination of poverty reducing strategies.

4 Policy for Poverty Reduction

We have by now seen the full range of possibilities in the absence of government interventions, in terms of the equilibrium share of middlemen and non-profits, the impact of non-profits on mark

up and pass through, as well as the equilibrium poverty implication of non-profits. We now address a final set of questions: Should a government interested in poverty reduction subsidize non-profits, or should it perhaps subsidize middlemen? And should consumers interested in poverty reduction pay a premium on purchases from a non-profit, or should they subsidize the fixed costs of the non-profits?

4.1 What Should Government Subsidize?

With three groups of producers served respectively by middlemen, non-profits, and no interme-diaries at all, there are three corresponding direct mechanisms of intervention: (i) a subsidy on exports mediated by middlemen s^m; (ii) a subsidy on exports mediated by non-profits s^n, and (iii) a subsidy on products for domestic sales s^c, or equivalently, a price support guarantee for all producers who do not export. The first option effectively raises the border price for mid-dlemen from p^* to $p^* + s^m$. The second option effectively raises the premium adjusted border price facing non-profits from p^n to $p_x^n + s^n$. The final option raises producers' opportunity cost of exports from c to $c + s^c$. The revised expected profits of non-profits and middlemen are:

$$\pi_x^n = \max_p H_x^n(p)(p_x^n + s^n - tx - p) - K^n,$$

$$\Pi_x^n = \max_p H_x^n(p)(p^* + s^m - tx - p) - K.$$

Since the opportunity cost of export facing producers is now $c + s^c$ in the presence of domestic price support, the minimum price offer from any middlemen must now be $c + s^c$. Like before, let $\hat{p}_x$ be the price offer threshold separating non-profits and middlemen, the distribution of middlemen price offers $p \leq \hat{p}_x$, accounting for the three subsidies is:

$$F_x^n(p) = \frac{1}{\lambda_x^n} \ln \left(\frac{p^* + s^m - tx - c - s^c}{p^* + s^m - tx - p} \right). \tag{38}$$

Thus, an increase in s^m shifts the price offer distribution via a first order stochastically dom-inating change, reflecting an on average higher offer from middlemen to producers. Likewise, an increase in s^c has a similar effect, literally since the minimum offer rises in tandem with s^c. Now for non-profit price offers with $p > \hat{p}_x$,

$$F_x^n(p) = F_x^n(\hat{p}_x) + \frac{1}{\lambda_x^n} \ln \left(\frac{p_x^n + s^n - tx - \hat{p}_x}{p_x^n + s^n - tx - p} \right), \tag{39}$$

and as such an increase in the subsidy s^n shifts the price offer distribution again via a first order stochastically dominating change, raising the average non-profit price offer even further. Each of these observations are important from a distributional standpoint, since the poverty head count $H_x^n(\bar{p})$ ultimately depends on the price offer distribution $F_x^n(p)$:

$$H_x^n(p) = e^{-\lambda_x^n(1-F_x^n(p))}.$$

Now, the threshold price offer $\hat{p}_x$ separating middlemen and non-profits is determined once again obtained by observing that with simultaneous and endogenous entry of profit maximizing middlemen and non-profits:

$$e^{-\lambda_x^n}(p^* + s^m - tx - c - s^c) = e^{-\lambda_x^n(1-F_x^n(\hat{p}_x))}(p^* + s^m - tx - \hat{p}_x) = K, \qquad (40)$$

$$e^{-\lambda_x^n(1-F_x^n(\hat{p}_x))}(p_x^n + s^n - tx - \hat{p}_x) = e^{-\lambda_x^n(1-F_x^n(p))}(p_x^n + s^n - tx - p) = K^n \qquad (41)$$

and thus for interior solutions where $F_x^n(\hat{p}_x) \in (0,1)$ where middlemen and non-profits co-exist:

$$\hat{p}_x = p^* - tx - \frac{(ax + s^n)k}{1-k} + \frac{s^m}{1-k}$$

$$\frac{m_x^n}{N} = \lambda_x^n(1 - F_x^n(\hat{p}_x)) = \ln\left(\frac{ax + s^n - s^m}{K^n - K}\right)$$

$$\frac{M_x^n + m_x^n}{N} = \lambda_x^n = \ln\left(\frac{p^* - tx - c + s^m - s^c}{K}\right). \qquad (42)$$

Evidently, any difference in $s^n - s^m > 0$, reflecting policy discrimination favoring non-profits, directly impacts non-profit entry and thus the equilibrium number of non-profits m_x^n. Meanwhile, any difference in $s^m - s^c$, will directly impact middlemen entry, and thus the equilibrium number of middlemen, at constant $s^n - s^m$.

For any given price premium $a > t(K^n - K)/(p^* + s^m - c - s^c - K)$ in Figure 6 so that non-profits emerge in some locations,[20] let β^m, and β^n denote the share of producers served by middlemen and non-profits respectively, across all locations:

$$\beta^m = \frac{\int_{\underline{x}}^{x^1(a)} 1 - H_x^n(c)dx + \int_{x^1(a)}^{x^2(a)} H_x^n(\hat{p}_x) - H_x^n(c)dx}{\bar{x} - \underline{x}},$$

$$\beta^n = \frac{\int_{x^1(a)}^{x^2(a)} 1 - H_x^n(\hat{p}_x)dx + \int_{x^2(a)}^{x^{n+}(a)} 1 - H_x^n(c)dx}{\bar{x} - \underline{x}}.$$

[20]Figure 6 shows equilibrium configuration when all three subsidies are evaluated at zero.

We can now express overall poverty, accounting for all locations, as:

$$P_\alpha = \beta^m P_\alpha^m + \beta^n P_\alpha^n + (1 - \beta^m - \beta^n)P_\alpha^c,$$

and the budget cost $\bar{B}$ of the three subsidies as:

$$\bar{B}^m + \bar{B}^n + \bar{B}^c = [\beta^m s^m + \beta^n s^n + (1 - \beta^m - \beta^n)s^c](\bar{x} - \underline{x})N \tag{43}$$

where $\bar{B}^i = s^i \beta^i (\bar{x} - \underline{x})N$, $i = m, n, c$. Consider therefore a small increase in subsidy budget $\bar{B}^n$ directly towards subsidizing non-profits, $s^n \beta^n (\bar{x} - \underline{x})N$. In the appendix, we show that starting from $s^n = 0$, the marginal impact of a small increase in the non-profit subsidy budget on total poverty P_α:

$$\frac{\partial P_\alpha}{\partial \bar{B}^n} = -\frac{\alpha}{\bar{p}N(\bar{x} - \underline{x})}P_{\alpha-1}^n \tag{44}$$

is proportional to the poverty indicator $P_{\alpha-1}^n$ among producers served by non-profits. This echoes Besley and Kanbur (1988), where the national poverty impact (P_α) of a regional food subsidy is shown to highest by targeting a region with the highest $P_{\alpha-1}$. This very insight continues to hold despite several key difference between setups: the prevalence of both intra- and inter-regional heterogeneity in producer income here, and the fact that middlemen, non-profits, or both, can and do partake in the income gains made possible by the corresponding subsidy program because of imperfect pass through.

In similar fashion, the marginal impact of a middlemen subsidy, and a domestic price support are respectively given by:

$$\frac{\partial P_\alpha}{\partial \bar{B}^m} = -\frac{\alpha P_{\alpha-1}^m}{\bar{p}N(\bar{x} - \underline{x})} \quad \text{and} \quad \frac{\partial P_\alpha}{\partial \bar{B}^c} = -\frac{\alpha P_{\alpha-1}^c}{\bar{p}N(\bar{x} - \underline{x})}.$$

From Lemma 1, we know that the relative ranking of $P_{\alpha-1}^m$, and $P_{\alpha-1}^n$ is in general ambiguous for any given price premia, and thus the relative ranking of the marginal impacts of a non-profit subsidy and a middlemen subsidy is accordingly ambiguous. But for the special case of $\alpha = 1$, we know from Lemma 1 that in fact $1 = P_0^c = P_0^n > P_0^m$ based on the poverty head count, we have thus:

Proposition 4 *The marginal impacts of respectively a small increase in s^n, s^m, and s^c on the overall poverty gap ratio P_1 can be ranked as follows:*

$$\left|\frac{\partial P_1}{\partial \bar{B}^c}\right| = \left|\frac{\partial P_1}{\partial \bar{B}^n}\right| > \left|\frac{\partial P_1}{\partial \bar{B}^m}\right|$$

25

if the price premium is in the range $a \in [t(K^n - K)/(p^* - c - K), t(K^n - K)/(p^* - \bar{p} - K)]$.

Interestingly, and intuitively, with an objective to minimize overall poverty (P_1) at $\alpha = 1$, one way to maximize the marginal impact of the subsidy program (44) is to target non-profits, if the price premium a is small and in fact all producers served by non-profits are living below the poverty line. Alternatively, the marginal impact of a domestic price support is similar in magnitude, because producers who do not have access to export markets are likewise poor across the board.

4.2 What Should Consumers Subsidize?

In this final section, we investigate whether subsidizing production via a price premium $p_x^n > p$ is a sensible strategy for consumers interested in raising the welfare of producers at large. A natural candidate to compare with is a subsidy on non-profit entry. Thus, let S^a and S^k represent respectively subsidies to supplement the non-profit premium from ax to $ax + S^a$, and subsidized non-profit entry, so that the fixed cost is reduced from K^n to $K^n - S^k$. Denote

$$m^n(a) = \int_{x^1(a)}^{x^2(a)} \lambda_x^n (1 - F_x^n(\hat{p}_x)) N dx + \int_{x^2(a)}^{x^{n+}(a)} \lambda_x^n N dx$$

as the total number of non-profits across all locations at given a. The budget costs of the two subsidies can now be expressed as:

$$\bar{B}^a = N\beta^n(\bar{x} - \underline{x})S^a, \quad \bar{B}^k = m^n(a)S^k.$$

where $N\beta^n(\bar{x} - \underline{x})$ as before gives the total number of producers served by non-profits. Consider therefore a small increase in the direct entry subsidy, starting from $S^k = 0$, the associated impact

$$\frac{\partial P_\alpha}{\partial \bar{B}^k} = -\frac{\beta^m P_\alpha^n}{m^n(a)K^n}$$

whereas the marginal poverty impact of a small increase in $\bar{B}^n$ has already been shown to be

$$\frac{\partial P_\alpha}{\partial \bar{B}^a} = -\frac{\alpha}{\bar{p}N(\bar{x} - \underline{x})}P_{\alpha-1}^n.$$

The relative effectiveness of the two reduces to the sign of the difference

$$\left| \frac{\partial P_\alpha}{\partial \bar{B}^k} \right| - \left| \frac{\partial P_\alpha}{\partial \bar{B}^a} \right| \tag{45}$$

26

which is ambiguous in general. But to gain further intuitive insights, we note that $P_\alpha^n \leq P_{\alpha-1}^n(\bar{p} - c)/\bar{p}$ since $\bar{p} - c$ is the largest possible poverty gap. Now, the inequality in (45) reduces to a simple sufficient condition:

Proposition 5 *The overall poverty impact of a Northern consumer subsidy on the price premium is greater than a direct subsidy on non-profit entry if*

$$\alpha \geq \frac{\beta^m N(\bar{x} - \underline{x})(\bar{p} - c)}{m^n(a)K^n}.$$

Thus, devoting Northern consumer expenditure on the per unit export price premium has a larger overall impact on poverty if the poverty gap $\beta^m N(\bar{x} - \underline{x})(\bar{p} - c)$ is sufficiently greater than the cost of entry $m^n(a)K^n$, and in addition, if poverty aversion α is sufficiently acute.

5   Conclusion

Let us return to the questions posed in the introduction. What does an equilibrium with middlemen and non-profits look like? We have provided a full characterization of when only middlemen will enter, when only non-profits will enter, and when both middlemen and non-profits exist in equilibrium. In the last of these cases, locations closest to the hub, the most advantaged, are served by middlemen; locations farthest away, the least advantaged, are served by non-profits; but in between are locations which are served by both middlemen and non-profits.

How precisely do the price mark up as well as the price pass-through, from market price to producer price, differ in the equilibrium with middlemen and non-profits compared to the equilibrium with only middlemen? The answer depends on the location. Close to the hub, where only middlemen operate even after the entry of non-profits, nothing has been changed by entry of non-profits, including mark up and pass through. Farthest from the hub, where only non-profits operate, we show that both the average price of exports, as well as the responsiveness of producer revenue to border price changes is now greater than if only middlemen had operated. However, we show that in intermediate locations, where middlemen and non-profits co-exist, the average producer price rises with the entry of non-profits, but the pass through remains unchanged.

What precisely is the impact of non-profits on poverty when the full round of market repercussions, including entry and exit of middlemen and of non-profits, is taken into account? We show that the introduction of non-profits pushes back the distance from the hub beyond which all producers are poor. Essentially, non-profits serve the distant locations which are not profitable for middlemen to serve. We also show that under certain conditions, which capture whether the concern of the non-profit for poverty is strong enough, the introduction of non-profits reduces national poverty.

Should a government interested in poverty reduction subsidize the entry of non-profits, or should it perhaps subsidize the entry of middlemen? We address this question and add a new possibility, that the government invests to improve the opportunity cost of selling to either middlemen or non-profits (for example through improving local infrastructure). We provide a detailed analytical characterization, and we get sharp results for specific cases. If the government's objective is to minimize the poverty gap measure P_1, we show the conditions under which subsidizing the entry of middlemen is ranked lowest in terms of policy effectiveness. Subsidizing the entry of non-profits and subsidizing the opportunity costs are equal in effectiveness, but both are superior to subsidizing the entry of middlemen.

Finally, should wealthy consumers concerned about poverty pay a premium for fair trade products, or would the same amount of money be better used to subsidize fair trade non-profits directly? Our answer is intuitive – the price premium strategy is superior if the poverty gap is sufficiently large relative to the cost of entry of the non-profit.

We believe that we have just begun the formal analysis of a range of markets that are prevalent in developing countries; where middlemen earn profits that are considered "excessive"; where remoteness exacerbates imperfect pass through; where non-profits come in to help the poor in the face of what they see as exploitation by these middlemen; where governments are faced with a policy problem of whether and how much to help non-profits or sanction middlemen; and where rich country consumers are asked to pay a price premium for products marketed by non-profits on behalf of poor producers, and to support the creation and entry of such non-profits into these markets. The model structure we have developed allows us to ask and answer a number of key questions in the debate on middlemen and non-profits. A rich research agenda awaits.

Appendix

Proof of inequality (30): From (28) and (29), expected producer price of exports with non-profits only (regime III) can be expressed as:

$$E^n p_x = (1 - \gamma_x^n)(p^* + ax - tx) + \gamma_x^n c < p^* - tx.$$

where $\gamma_x \equiv \lambda_x^n e^{-\lambda_x^n}/(1 - e^{-\lambda_x^n})$. In addition,

$$Ep_x = (1 - \gamma_x)(p^* - tx) + \gamma_x c < p^* - tx$$

where $\gamma_x \equiv \lambda_x e^{-\lambda_x}/(1 - e^{-\lambda_x})$. The inequality in (30) follows directly from (28), where λ_x^n is shown to be greater than λ_x, and that γ_x^n is decreasing in λ_x^n.

Proof of Proposition 2: We show that poverty $P_{x,\alpha}^n$ (weakly) declines upon entry of non-profits, in all regions shown in Figure 6 where at least some non-profits emerge in equilibrium. Starting from Region $\text{II}_{m,somepoor}^{n,nonepoor}$,

$$
\begin{aligned}
P_{x,\alpha}^n &= \frac{\alpha}{\bar{p}} \int_c^{\bar{p}} \left(\frac{\bar{p} - p}{\bar{p}}\right)^{\alpha-1} \frac{K}{p^* - tx - p} dp \\
&= \frac{\alpha}{\bar{p}} \int_c^{\bar{p}} \left(\frac{\bar{p} - p}{\bar{p}}\right)^{\alpha-1} H_x(p) dp = P_{x,\alpha}.
\end{aligned}
$$

For Region $\text{II}_{m,allpoor}^{n,somepoor}$,

$$
\begin{aligned}
P_{x,\alpha}^n &= \frac{\alpha}{\bar{p}} \int_c^{\hat{p}_x} \left(\frac{\bar{p} - p}{\bar{p}}\right)^{\alpha-1} \frac{K}{p^* - tx - p} dp + \frac{\alpha}{\bar{p}} \int_{\hat{p}_x}^{\bar{p}} \left(\frac{\bar{p} - p}{\bar{p}}\right)^{\alpha-1} \frac{K^n}{p^* + ax - tx - p} dp \\
&\leq \frac{\alpha}{\bar{p}} \int_c^{\min\{\bar{p}, p_x^+\}} \left(\frac{\bar{p} - p}{\bar{p}}\right)^{\alpha-1} \frac{K}{p^* - tx - p} dp = P_{x,\alpha}.
\end{aligned}
$$

Similarly for Region $\text{III}^{n,somepoor}$,

$$
\begin{aligned}
P_{x,\alpha}^n &= \frac{\alpha}{\bar{p}} \int_c^{\bar{p}} \left(\frac{\bar{p} - p}{\bar{p}}\right)^{\alpha-1} \frac{K^n}{p^* + ax - tx - p} dp \\
&\leq \frac{\alpha}{\bar{p}} \int_c^{\min\{\bar{p}, p_x^+\}} \left(\frac{\bar{p} - p}{\bar{p}}\right)^{\alpha-1} \frac{K}{p^* - tx - p} dp = P_{x,\alpha}.
\end{aligned}
$$

Finally, consider the region $\text{II}_{m,allpoor}^{n,allpoor}$,

$$
\begin{aligned}
P_{x,\alpha}^n &= \int_c^{p_x^{n+}} \left(\frac{\bar{p} - p}{\bar{p}}\right)^{\alpha} dH_x^n(p) \\
P_{x,\alpha} &= \int_c^{p_x^+} \left(\frac{\bar{p} - p}{\bar{p}}\right)^{\alpha} dH_x(p).
\end{aligned}
$$

Integrating by parts and taking difference,

$$P_{x,\alpha} - P_{x,\alpha}^n \;\geq\; \left(\frac{\bar{p} - p_x^+}{\bar{p}}\right)^\alpha \left(1 - H^n(p_x^+)\right) - \int_{p_x^+}^{p^{n+}x} \left(\frac{\bar{p} - p}{\bar{p}}\right)^\alpha dH_x(p) \geq 0$$

since $p_x^+ \leq p_x^{n+}$.

Proof of (44): We consider here the case of $a \in [t(K^n - K)/(p^* - c - K), t(K^n - K)/(p^* - \bar{p} - K)]$. The proofs involving the rest of the possibilities, with $a > t(K^n - K)/(p^* - \bar{p} - K)$, are analogous. Overall poverty P_α is equal to the sum of

$$\frac{1}{\bar{x} - \underline{x}} \int_{\underline{x}}^{x^p} \frac{\alpha}{\bar{p}} \int_{c+s^c}^{\bar{p}} \left(\frac{\bar{p} - p}{\bar{p}}\right)^{\alpha-1} \frac{K}{p^* + s^m - tx - p} dp\, dx$$

associated with region $I_{m,somepoor}$, plus

$$\frac{1}{\bar{x} - \underline{x}} \int_{x^p}^{x^1(a)} \left[\frac{\alpha}{\bar{p}} \int_{c+s^c}^{p_x^+} \left(\frac{\bar{p} - p}{\bar{p}}\right)^{\alpha-1} \frac{K}{p^* + s^m - tx - p} dp + \left(\frac{\bar{p} - p_x^+}{\bar{p}}\right)^\alpha\right] dx$$

associated with region $I_{m,allpoor}$, plus

$$\frac{1}{\bar{x} - \underline{x}} \int_{x^1(a)}^{x^2(a)} \left[\frac{\alpha}{\bar{p}} \int_{c+s^c}^{\hat{p}_x} \left(\frac{\bar{p} - p}{\bar{p}}\right)^{\alpha-1} \frac{K}{p^* + s^m - tx - p} dp \right.$$
$$+ \frac{\alpha}{\bar{p}} \int_{\hat{p}_x}^{p_x^{n+}} \left(\frac{\bar{p} - p}{\bar{p}}\right)^{\alpha-1} \frac{K^n}{p^* + ax + s^n - tx - p} dp)$$
$$\left. + \left(\frac{\bar{p} - p_x^{n+}}{\bar{p}}\right)^\alpha\right] dx$$

associated with region $II_{m,allpoor}^{n,allpoor}$, plus

$$\frac{1}{\bar{x} - \underline{x}} \int_{x^2(a)}^{x^{n+}(a)} \left[\frac{\alpha}{\bar{p}} \int_{c+s^c}^{p_x^{n+}} \left(\frac{\bar{p} - p}{\bar{p}}\right)^{\alpha-1} \frac{K^n}{p^* + ax + s^n - tx - p} dp + \left(\frac{\bar{p} - p_x^{n+}}{\bar{p}}\right)^\alpha\right] dx.$$

associated with region $III^{n,allpoor}$.

Since $\bar{B}^n = s^n N \beta^n (\bar{x} - \underline{x})$, and $d\bar{B}^n = N\beta^n(\bar{x} - \underline{x})ds^n$ evaluated at $s^n = 0$, we have

$$N\beta^n(\bar{x} - \underline{x})\frac{\partial P_\alpha}{\partial \bar{B}^n} = -\frac{1}{\bar{x} - \underline{x}} \int_{x^1(a)}^{x^2(a)} \left[\frac{\alpha}{\bar{p}} \int_{\hat{p}_x}^{p_x^{n+}} \left(\frac{\bar{p} - p}{\bar{p}}\right)^{\alpha-1} \frac{K^n}{(p^* + ax + s^n - tx - p)^2} dp\right] dx$$
$$- \frac{1}{\bar{x} - \underline{x}} \int_{x^2(a)}^{x^{n+}(a)} \left[\frac{\alpha}{\bar{p}} \int_{c+s^c}^{p_x^{n+}} \left(\frac{\bar{p} - p}{\bar{p}}\right)^{\alpha-1} \frac{K^n}{(p^* + ax + s^n - tx - p)^2} dp\right] dx.$$

Rearranging terms, and using (35), we have

$$\frac{\partial P_\alpha}{\partial \bar{B}^n} = -\frac{\alpha P_{\alpha-1}^n}{\bar{p} N(\bar{x} - \underline{x})}.$$

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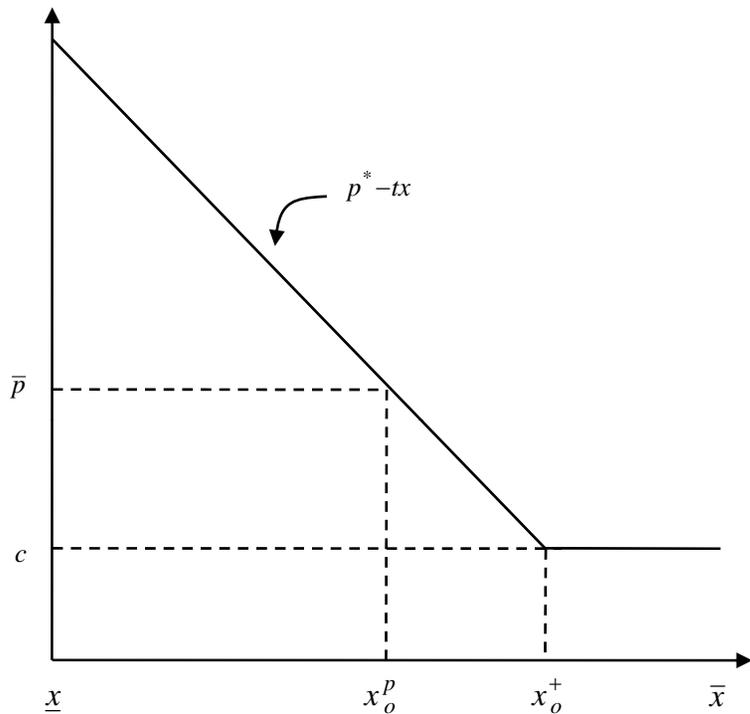
Figure 1
Producer Price and Location
with Bertrand Competition

$p^* - tx$

$\bar{p}$

c

$\underline{x}$ x_o^p x_o^+ $\bar{x}$
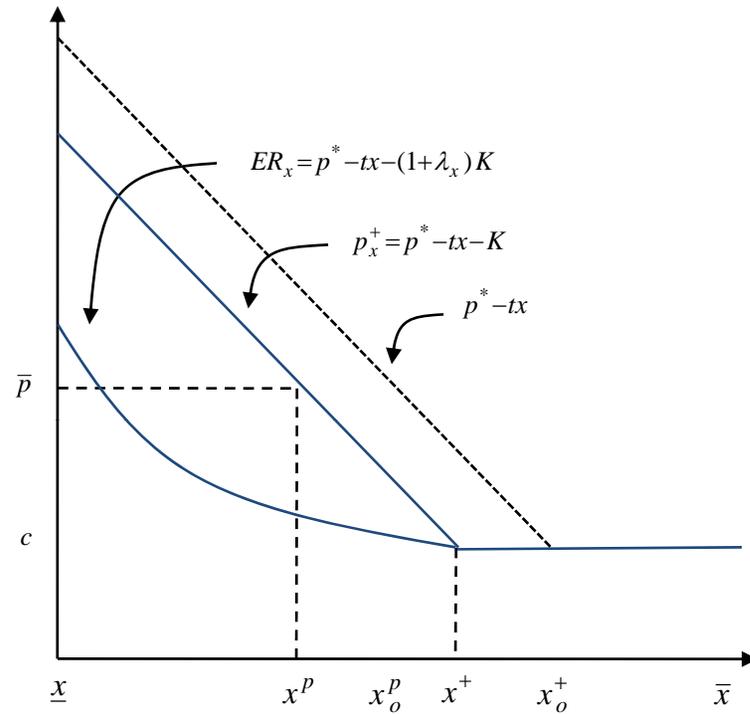
Figure 2
Average Producer Revenue
with Endogenous Middlemen Market Power

$ER_x = p^* - tx - (1 + \lambda_x)K$

$p_x^+ = p^* - tx - K$

$p^* - tx$

$\bar{p}$

c

$\underline{x}$ x^p x_o^p x^+ x_o^+ $\bar{x}$
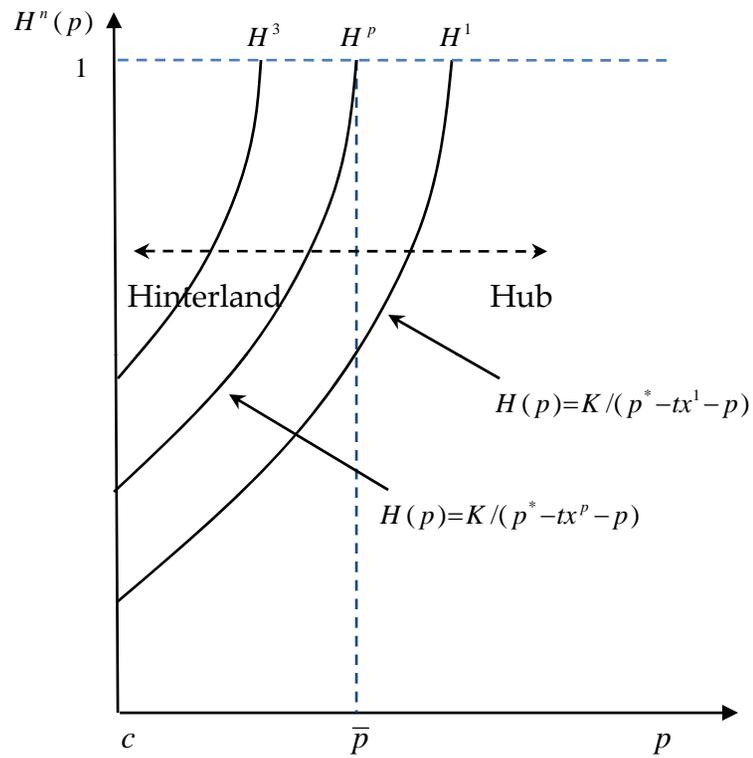
Figure 3
Producer Price Distribution
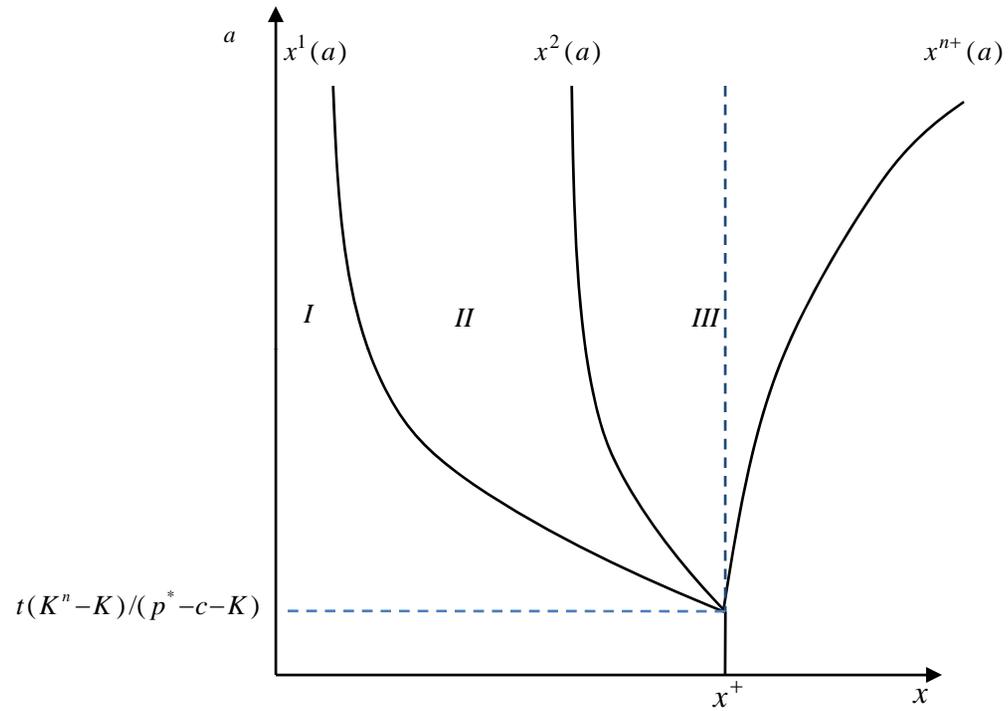
Figure 4
Middlemen and Nonprofits
I : Middlemen Only
II: Coexistence
III: Nonprofits Only

$H^n(p)$

H^4 H^3 $\overline{H}$ H^2 H^1

1

$H^n(p)=K^n/(p^*+ax^2-tx^2-p)$

$H^n(p)=K^n/(p^*+ax^p-tx^p-p)$

$H^n(p)=K/(p^*-tx^p-p)$

$H^n(p)=K/(p^*-tx^1-p)$

c $\overline{p}$ p
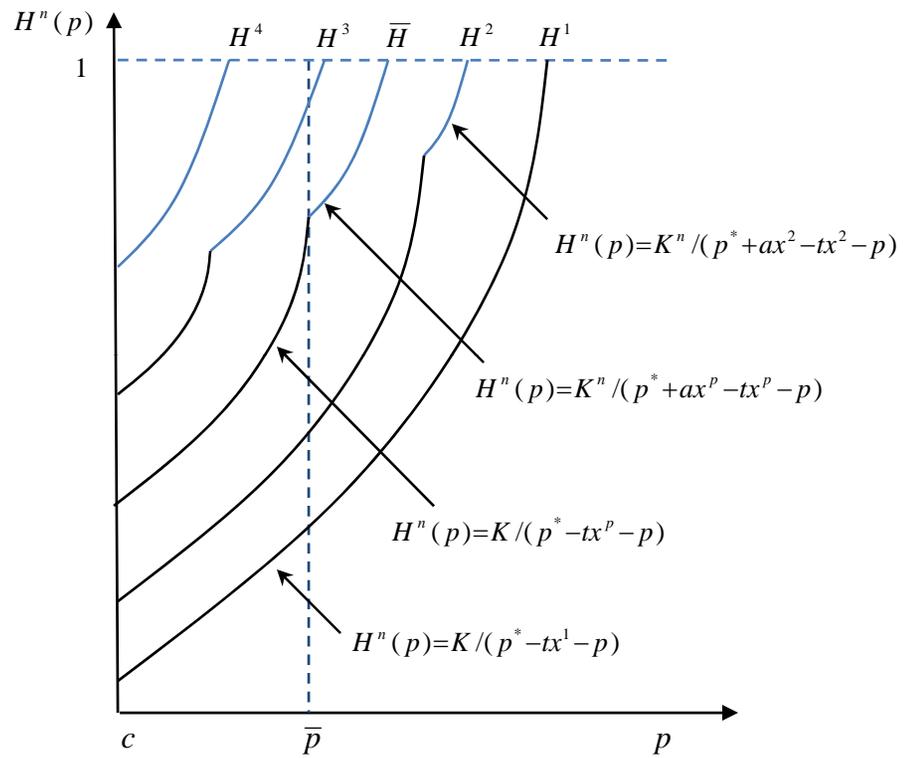
Figure 5
Producer Price Distribution
With Nonprofits and Middlemen
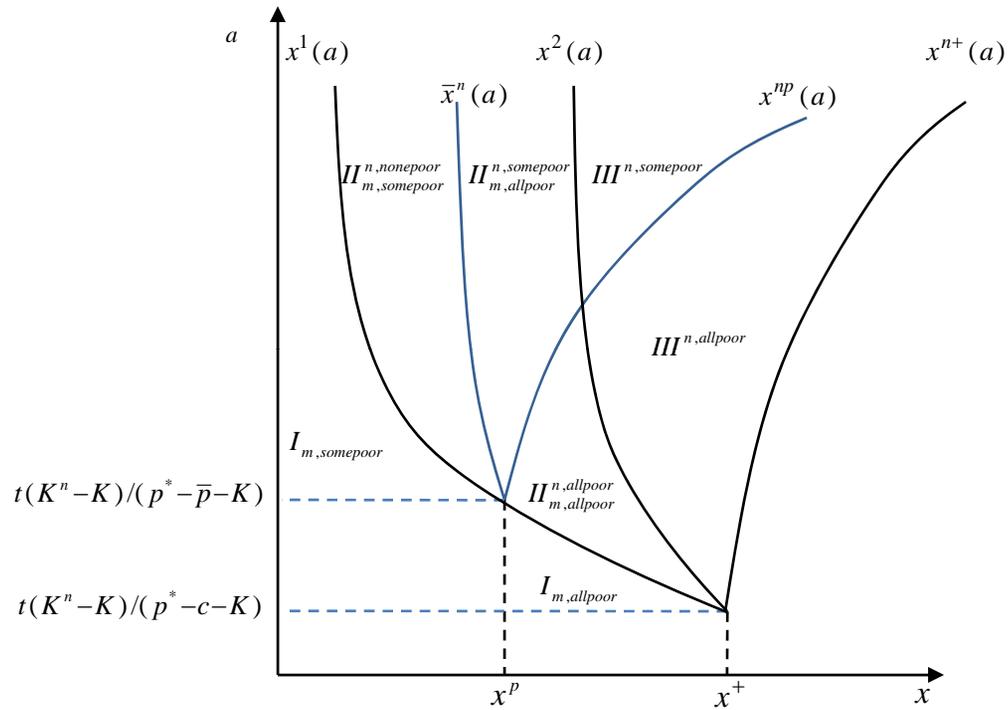
Figure 6
Intra- and Inter-regional Poverty
I: Middlemen Only
II: Coexistence
III: Nonproftis Only