Eco-Labeling and the Price Premium

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ABSTRACT

International environmental and government organizations propose eco-labeling as a market incentive to cause industry to operate in an ecologically sustainable and biodiversity-friendly manner. A microeconomic analysis questions whether eco-labeling will cause producer profits in a competitive industry to decline, even under a voluntary system, and whether eco-labeling will necessarily generate different prices for labeled and unlabeled product. Using wood product as an example, results identify conditions that may exist when firms lose profits, even under a voluntary system, and where existing production constraints may lead to a single price, regardless of labeling.

Key Words: eco-labeling; prices; markets

JEL Classification Numbers: D40, L10, L15

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INTRODUCTION

The United Nations Conference on Environment and Development (UNCED), known as the Rio de Janeiro Earth Summit of 1992, identified the conservation and sustainable development of global forest resources as a critical concern for over 100 nations. The crisis of global forest and biodiversity losses has generated dozens of initiatives by governments, industry and nonprofit organizations to create a system whereby consumers could identify whether various wood products are manufactured using environmentally friendly production methods (Upton and Bass 1996; Sedjo et al. 1998). This effort toward "eco-labeling" has been initiated on intuitive grounds, as a leap of faith.

Proponents suggest that voluntary labels will allow consumers to reveal their willingness to pay for ecologically-friendly products, leading more firms to choose production methods that increase the ecological quality of forest land (e.g., Upton and Bass 1996). While the argument is appealing, little economic analysis exists to address the issue, and analysts like Kiker and Putz (1997) focus on practical obstacles in consort with potential environmental advancements. Proponents rely on intuitive persuasion drawn from firms whose experience suggests that choosing environmentally-friendly processes results in benefits such as more enthusiastic (ostensibly more productive) personnel and advantages for retention of market share (e.g., Canadian Chemical Producers Association 1996; Stevens et al. 1998; Upton and Bass 1996). Mattoo and Singh (1994) provide a basic market analysis, but they focus on a partial equilibrium model with production constraints that eliminate firms' ability to choose between traditional and environmentally-friendly technologies. These assumptions limit the insights that industry analysts may draw from their model.

This paper focuses on the market implications of labeling consumer products. Although the example addressed in this paper is wood products, the results apply to other products for which a label provides a "stamp of approval," indicating that the raw material is derived from a source that is managed according to independent standards for environmental or ecological purposes. The present example motivates an eco-label based on concerns for on-the-ground forest management consistent with sustainable forestry and ecosystem quality; producers with an appropriate, "certified" management system would qualify their wood for a certified, eco-label. Other motivations include certification that producers have integrated local communities into their management system, or that producers have addressed equity concerns in developing nations (Upton and Bass 1996; Kiker

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and Putz 1997; Barbier 1998). While our framework may illuminate these other issues, our emphasis concerns whether markets will necessarily generate price signals sufficient to attract firms into certifiable production, whether certification might erode profits of firms choosing non-certifiable production, and whether and under what conditions prices will differ between labeled and unlabeled products.

The main points may be established intuitively, so we place the analytical content in simple graphical tools within a partial equilibrium analysis, assuming producers are price takers.[1] The analysis assumes that the means by which producers qualify for a certified, eco-label will leave unharmed the traditional dimensions of product quality.[2] While we begin without assuming that certification generates a premium "willingness to pay" by consumers, much of the analysis relies on the existence of a group of consumers who are willing to pay a price premium for labeled products. Indeed, many of the alleged benefits from eco-labeling, especially under a voluntary system, could not arise without the existence of a group of eco-consumers,[3] but we shall see that the market may not generate a price differential between labeled and unlabeled wood.[4]

MANDATORY CERTIFICATION WITHOUT ECO-CONSUMERS

An economic assessment of mandatory eco-labeling, even without a group of eco-consumers, reveals many of the underlying issues and establishes a simple foundation for further analysis. Partial equilibrium implications are apparent from Figure 1, which shows the current quantity demanded, $W^D(P_w)$, and quantity supplied, $W(P_w,0)$, of wood products, where P_w is the price of wood products.[5] The second argument in the supply function is C (initially zero), which represents the situation with respect to "certified" eco-labeling.

Presently, one may interpret C either as a discrete "with or without" condition or as a continuous variable measuring the stringency of requirements for a producer to gain certification as a practitioner of ecologically sustainable forestry. In either case, C equals zero to represent the initial conditions existing prior to a certification or eco-labeling program. Henceforth, we will refer to

[1] The price-taking assumption leaves unaddressed the possible implications of eco-labeling under monopolistic competition or some other market structure.

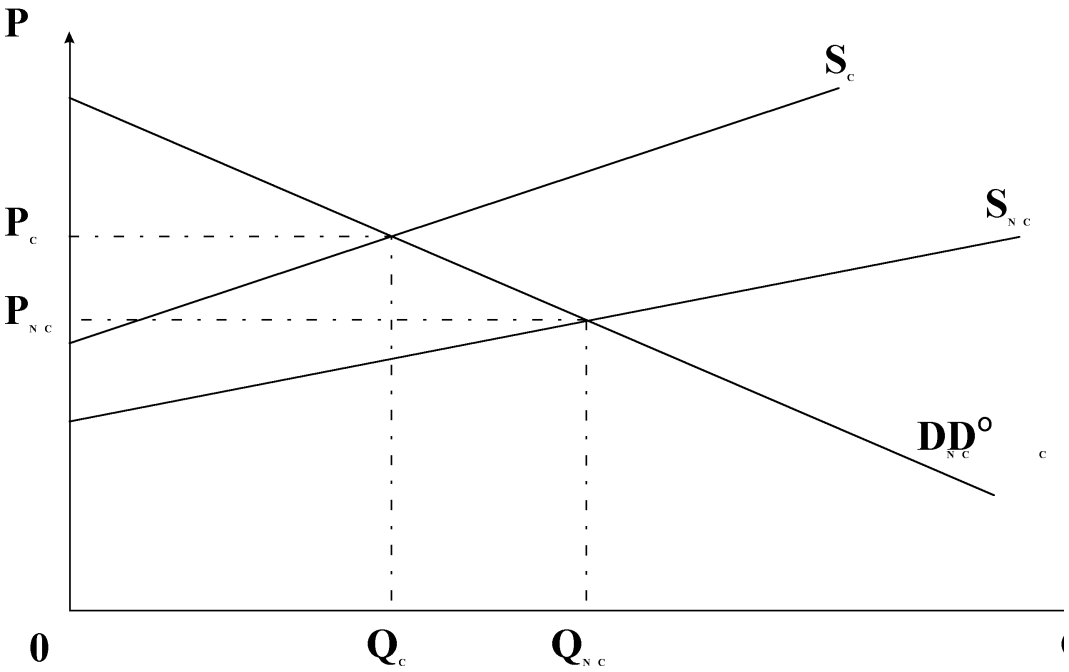
[2] This assumption is not trivial. In addition to concerns that new harvest or management systems may affect fiber quality, informal discussions with producers in Canada, Finland, and the U.S. quickly reveal concerns that many independently developed labeling schemes will destroy consumer confidence and generate a negative backlash on demand (see also Upton and Bass 1996).

[3] Indeed, Upton and Bass (1996) and Mattoo and Singh (1994) cite evidence that 80 percent of consumers in U.K. and Canadian markets are willing to pay more for environmentally friendly commodities, while Stevens et al. (forthcoming) report a substantially smaller share revealed by industry members in the U.S.

[4] Many debaters, e.g. Upton and Bass (1996), debate whether a price premium will arise. However, this dispute between economists and business-industry is partially a jargonistic problem. Frequently, industry representatives cite anecdotal evidence that they will be unable to sell the eco-labeled product for a higher price. In the present context, evidence that labeling protects market share, for example, is accepted as a "mirror image" of a price premium. Businesses that voluntarily label are doing so because "it is good for business;" if no price differential will exist, at least in some form, then these volunteers would be discussing their declining profits since investments needed to obtain certification could not be viewed as good for business. In the present context of economic theory, the idea of a price premium and market share carry some dimensions that may deserve further analysis. Stevens et al. (forthcoming) review some literature on this point and report on the mixed responses from a survey of industry members.

[5] Murray and Casey (1998) and Murray and Abt (1998) use this basic framework to motivate some empirical work and welfare considerations, especially regarding the southern U.S., but they do not address the equilibrium pricing issues under voluntary eco-labeling.

Figure 1. Non-Certified and Certified Wood



conditions where producers do not meet certification requirements to earn an eco-label as the case of "not certified" (nc), while we refer to conditions where producers do meet certification requirements as "certified" (c).[6]

Under a mandatory certification regulation, all producers must be certified and, presumably, costs will increase in most cases. In Figure 1, the supply curve under certification (nonzero C) rises from $W(P_W,0)$ to $W(P_W,C)$. This supply curve shows that some quantity of wood products could be certified under current conditions, since some forests are already managed for ecological concerns, but most units of output would likely require some degree of higher costs.[7] Accordingly, the price of wood rises from the non-certified level P_W^0 to the certified level P_W^1 due to the ordinary equilibrium of initial demand with higher cost supply. While wood prices increase, this situation involves no "price premium" because demand is invariant to the certification program.

Proponents of certification may argue that the decline in the quantity supplied, from Q_0 to Q_1, reflects a less intensive use of existing forest land and thereby an increase in ecosystem qualities. Their argument overlooks whether reduced output reflects a withdrawal of land from forest production. Swallow and Sedjo (1998) address these issues, but we note here that ecological improve-

[6] The emphasis is on certification of standards for ecological sustainability and biodiversity conservation. This context is separate from a process which simply certifies that a producer is delivering on some self-determined goals or advertised claims which may or may not relate to ecological quality. This latter form of certification may prevent fraudulent claims, but it may not promote a "high" ecological standard.

[7] Here it appears that we assume certification costs increase with the existing marginal costs of production. However, one could interpret the certified marginal cost function as based on an ordering of units of output after certification is in place; this ordering may differ from the *ex ante* ordering. The current paper abstracts from the complications of ecological heterogeneity in determining which lands might improve, ecologically, under certification. Swallow (1996) provides a discussion of analogous issues. Also note that some forests are currently certifiable due to decisions of sympathetic owners or imposition of existing environmental regulations. However, we assume that no producer experiences a decrease in costs because such an outcome suggests the producer is not choosing a currently minimum cost production process.

ments on land remaining in forest production may be offset partially or entirely by a reduction in the ecological quality of land reallocated to other uses. For the present purposes, however, the simple case of mandatory certification forecasts an increase in the relative price of wood products generally due to the new equilibrium after the market adjusts to the costs of certification.

REPRESENTING A PREMIUM WILLINGNESS TO PAY FOR CERTIFIED WOOD

Proponents of eco-labeling suggest that some consumers gain more utility from a unit of certified wood than from a unit of non-certified wood. These consumers are unlikely to consume any non-certified wood if certified wood is cheaper.[8] If certified wood is more expensive, eco-consumers may choose a mix of certified and non-certified wood, with that mix weighted toward certified wood as the price differential decreases.

In the eco-labeling context, the value of certified wood reveals itself as a rotation of the demand curve for wood. There are two alternative views. Economists commonly represent rotations of demand curves as a pivot around the price intercept in demand, but this view assumes consumers are willing to pay a per-unit premium that increases as their total consumption increases. This view is consistent with non-convexity in the preferences for environmental goods; following Anderson and Francois (1997), if consumers view the consumption of one unit of certified wood as inconsequential to ecological quality, then they may exhibit a small willingness to pay a premium for the first certified unit, with their willingness to pay on the marginal unit increasing as further consumption increases their ecological impact.

In the second view, certification may be viewed as a "luxury" quality for which consumers' marginal willingness to pay a premium diminishes as total consumption increases. This premium may be modeled as a percentage over the willingness to pay for the base commodity, wood itself. Also, for example, if consumers with lower income enter the market at lower prices, then there may be a tendency for the premium to diminish as the total quantity consumed increases.

Figure 2 illustrates the resulting pivot in the demand curve, assuming that the marginal willingness to pay a premium diminishes. When combined with the certification-induced increase in supply costs (pivot in the supply curve), one observes that a willingness to pay a premium ameliorates the anticipated decline in wood consumption so that, in partial equilibrium, wood output declines from Q_0 to Q_1' rather than the further decline to Q_1. Of course, price also rises from P_0 to above P_1

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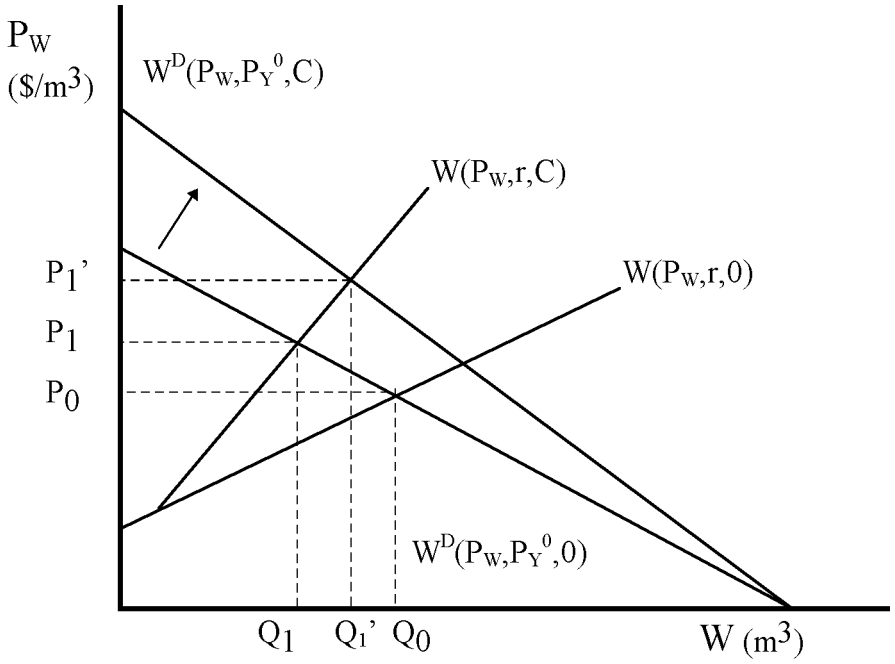
[8] For these consumers, certified and non-certified wood are imperfect substitutes, and the marginal rate of substitution between certified wood and all other goods (Y) at a particular quantity combination (W,Y) exceeds the marginal rate of substitution between non-certified wood and all-other-goods for an equal quantity combination. Our discussion is consistent with the following model of consumer utility. Let $U^c(\ )$ denote the utility of individuals who prefer certified wood, and $U^{nc}(\Diamond)$ denote the utility of consumers who are indifferent between certified and non-certified wood. Define $U^{nc}(W,Y) = U(Y,w_{nc}+w_c)$, so that certified and non-certified wood, w_c and w_{nc} respectively, are perfect substitutes to the consumers who are indifferent to an eco-label; Y is the quantity of "all other goods consumed." Define $U^c(Y,W) = U_1(Y,w_{nc}+w_c) + U_2(w_c,C)$, so that consumers who prefer eco-labeled wood view the certified and non-certified wood as perfect substitutes with respect to their performance for furniture or housing, while, if certification is in place (nonzero C), these consumers gain additional utility from their consumption of w_c. Using Kuhn-Tucker conditions for the maximization of $U^c(\cdot)$, it is easily shown that the consumers who prefer eco-labeled wood will never consume w_{nc} if the price of w_c is lower, but if the price of w_c is higher than the price of w_{nc}, then these consumers will increase their consumption of w_{nc} as the price differential (or "price premium") that they must pay for w_c increases. This utility structure is only adopted for an example discussion. Of course, here, and throughout the paper, prices of the ecologically sensitive product (wood, in this case) are measured relative to the price for a numeraire good, such as Y.

Figure 2. Eco-Consumers' Higher Willingness to Pay for Certified Wood



up to $P_1´$. The willingness to pay a premium encourages producers to increase their output a bit above the post-certification level observed without a premium willingness to pay.

The form of the demand shift carries policy implications. If eco-consumers' marginal willingness to pay diminishes, as in Figure 2, then as certification increases the costs of supply, there is a tendency for the market to provide an increasing level of compensation for producers. Otherwise, if marginal willingness to pay increases with consumption of certified wood (unlike Figure 2), then the market is less willing to compensate producers for certification costs which reduce supply.[9]

Surprisingly, diminishing marginal willingness to pay for certification tends to sustain forest production by providing a greater potential for compensation to producers who invest in certification. Also, while not illustrated here, a sufficiently large willingness to pay for certification could increase demand enough so that the equilibrium quantity of wood products actually increases after certification.

When our analysis considers eco-consumers' willingness to pay a premium, we assume diminishing marginal willingness to pay by eco-consumers. However, our qualitative results depend primarily on the existence of eco-consumers, not on the form of their willingness to pay a premium. Accordingly, one may segregate aggregate demand into the demand from eco-consumers, W_D^C, and the demand from consumers who are indifferent between certified and non-certified wood, W_D^{NC}.

WILL VOLUNTARY CERTIFICATION GENERATE A PRICE DIFFERENTIAL?

We now turn to our primary question of whether markets will generate different prices for certified and non-certified wood when producers can choose whether to participate in certification. We do find conditions under which the market generates a price differential between certified and non-certified wood, but we also find a realistic condition under which no price differential exists. The

[9] If the demand curve pivots around the initial price intercept, unlike Figure 2, then $Q_1´$ and $P_1´$ would be closer to Q_1 and P_1.

simple analysis of mandatory certification above generates an expectation that general wood prices will increase under certification. However, we find that producers who choose a non-certified process may still lose under a voluntary system, although average price for timber will not decrease.

This analysis suggests demand between eco-consumers (W_D^C) and non eco-consumers (W_D^{NC}), but normalizes the analysis against the aggregate demand existing prior to certification (W_D^0). At first we assume eco-consumers simply refuse to purchase a non-certified product, once suppliers exist, and later we extend our analysis to allow certification to induce a premium willingness to pay by eco-consumers. Of course, without eco-consumers showing some inflexibility in their preference, either by refusal to purchase non-certified products or by a premium in their willingness to pay for each certified unit, a voluntary certification system could not exist because competitive producers would always volunteer to use the least-cost technology, which is presumably the technology chosen prior to certification.

At least three possible price outcomes are possible, and are listed below, where P^C refers to the price of certified product, P^{NC} corresponds to the price of non-certified product, and P^0 represents the equilibrium price prior to (pre-) certification:

$$P^C > P^{NC} > P^0$$

$$P^C > P^0 > P^{NC}$$

$$P^C = P^{NC} > P^0$$

The first outcome is generally expected by labeling advocates who note consumer surveys suggesting eco-consumers are willing to pay a percentage above pre-certification prices. This result provides a market incentive in the form of a price premium to produce certified wood. Additionally, the higher non-certified price, compared to the pre-certification price, discourages consumption of non-certified wood. The second outcome also yields a premium for certified products over non-certified products. However, the price of non-certified wood is below the pre-certification equilibrium. The third outcome is the most counterintuitive, with no differential between the price of certified and non-certified products, even while eco-consumers are willing to pay a premium. In this case the common price is above the pre-certification price. These three outcomes are examined in some detail presently.

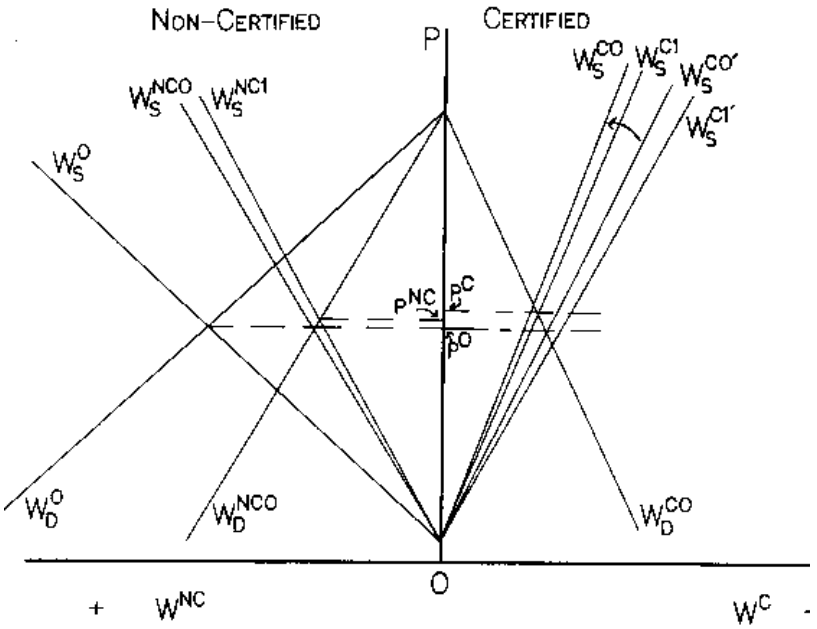
Case 1a: Certified Price Higher than Non-certified Price, and All Gain

Consider Figure 3 which divides demand and supply into two segments, non-certified on the left and certified on the right, with quantities increasing from zero along the horizontal axis and beginning at the intersection with the price axis. The initial demand and supply curves

are depicted on the left, respectively labeled W_D^0 and W_S^0, representing conditions prior to the certification program. After a certification system is in place, demand divides into segments labeled W_D^{NC0} and W_D^{C0} (Figure 3). As an expositional convenience, we temporarily assume eco-consumers do not exhibit a willingness to pay a premium, but that eco-consumers are unwilling to consume non-certified wood below the quantities represented along W_D^{C0}. Then Figure 3 represents that the horizontal sum of W_D^{NC0} and W_D^{C0} just equals the initial aggregate demand W_D^0.

Likewise, we divide aggregate supply by arbitrarily taking the share of supply that was just sufficient to satisfy W_D^{C0} prior to certification and allocating that share to the certified market; $W_S^{C0'}$ represents this portion of supply. This allocation leaves supply W_S^{NC0} that was just sufficient to sat-

Figure 3. Partial Equilibrium Implications of Voluntary Certification: Case 1a, with Distinct Prices for Certified (P^C) and Non-Certified (P^{NC}) Wood and All Producers Gain



isfy W_D^{NCO} at the initial price P^0 (Figure 3). The question hinges on whether the producers comprising these two segments of supply will voluntarily remain in that segment after certification begins.

First, consider the cost of certification. If certification is costly, then the supply curve $W_S^{CO'}$ for certified wood must pivot upward, as represented by the higher curve W_S^{C0}. These cost increases generate a new price for certified wood, as represented by the intersection of W_D^{C0} and W_S^{C0} (above price-line P^C), but the question becomes whether this price increase is sufficient to encourage all producers represented in supply curve W_S^{C0} to remain in the certified market. The outcome could be that even more producers choose to enter the certified market, and this case is represented by Figure 3.

Producers make their choice based on their surplus calculations in comparing the two options. If the higher price in the certified market generates sufficient revenues to cover the higher costs, then producers "exist" from the non-certified market and "enter" the certified market. This reallocation of suppliers establishes an equilibrium where non-certified supply has decreased to W_S^{NC1} and certified supply has increased to W_S^{C1}. Stated in terms of the marginal tradeoff that producers make, this equilibrium requires the following: a marginal increase in the share of suppliers in the certified market leads to an increase in certified producers' surplus that just offsets the decrease in non-certified producers' surplus that occurs when the share of producers in the non-certified market decreases, at the margin. [10]

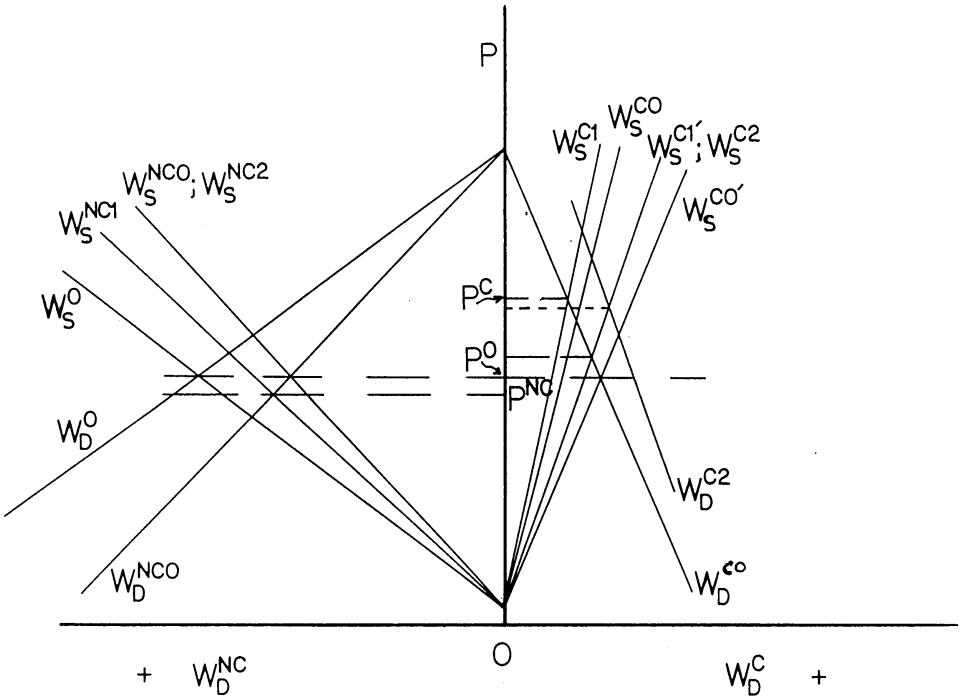
[10] Barbier (1998) rightly points out that, in an international trade setting, exporting countries may respond to eco-consumer countries by shifting their exports toward countries generating demand for non-certified products. While the scope of this paper omits the explicit application of our model to international trade issues, the roots of the model in international trade are obvious and one may modify the discussion of suppliers to tailor the analysis for north-south trade. In addition, we note that the partial equilibrium framework here is not sensitive to whether the particular good (wood, in our example) is directed at a specialty or "niche" market.

As illustrated in Figure 3, this marginal decision process equilibrates where the certified price, P^C, exceeds the non-certified price, P^{NC}, and both exceed the initial price, P^0. These conditions show that certification may attract a substantial share of production into a sustainable production system. This outcome, of course, captures the intuition of eco-labeling proponents. Moreover, and somewhat unexpectedly, even those producers who choose to remain non-certified will gain from the certification program. The non-certified firms gain because the certification costs have induced an effective supply restriction that raises average price, while non-certified production costs *of the individual suppliers* have remained unchanged.

Case 1b: Certified Price Higher than Non-certified Price, and Some Lose

Figure 3, however, does not represent the only possible outcome of the marginal conditions for allocating producers between the market segments. Figure 4 represents an alternative case where all the notation is as defined for Figure 3. We again begin after the initial division of aggregate supply W_S^0 between non-certified supply W_S^{NCO} and certified supply W_S^{CO}, which accounts for certification costs. Yet, the scenario in Figure 4 represents a case where the price increase is insufficient to compensate the marginal producer of certified wood. This case, then, represents a case where certification induces some of the producers to "return" to non-certified production, so that certified supply decreases to W_S^{C1} and non-certified supply increases to W_S^{NC1}, as compared to the initial (arbitrary) division of supply. These equilibrium supplies satisfy the eco-consumers' demand W_D^{C0}, establishing a certified price of $P^C > P^0$, and satisfy the non eco-consumers' demand W_D^{NC0}, establishing a non-certified price of $P^{NC} < P^0$.

Figure 4. Partial Equilibrium Implications of Voluntary Certification: Case 1b, with Distinct Prices for Certified and Non Certified Wood, but Non Certified Producers Lose.



The case verifies that voluntary certification may yield conditions under which non-certified producers lose, despite their opportunity to avoid certification costs. Their loss arises because demand and supply conditions in the certified market lead to a supply of non-certified product that is large relative to the demand of non eco-consumers remaining in equilibrium,

thereby generating a price decrease for non-certified suppliers. While this case leads to two prices in the wood market's (partial) equilibrium, as proponents often argue, it also may lead non-certified producers to lobby against a strong certification program.

Case 1b with eco-consumers willing to pay a premium

So far, we have assumed that voluntary certification only induces eco-consumers to establish a separate market share without increasing overall aggregate demand. If eco-consumers are also willing to pay a premium, then their initial demand W_D^{C0} is replaced by the higher demand W_D^{C2}. This certification-induced increase in demand by eco-consumers raises the incentive for producers to become certified. To avoid cluttering Figure 4, we illustrate the implications of the willingness-to-pay premium by assuming that the new equilibrium allocation of suppliers is established by a certified supply curve, W_S^{C2}, that just happens to coincide with curve $W_S^{C1'}$ (which, of course, is coincidence and an illustrative convenience). This implies that the corresponding supply of non-certified wood, W_S^{NC2}, happens to coincide with W_S^{NC0}.

Despite this restrictive assumption, Figure 4 now offers two additional insights. First, and somewhat surprisingly, Figure 4 shows that the premium willingness to pay can contribute to a *narrowing* of the price difference between certified and non-certified wood. In this illustration, the equilibrium prices are closer together because non-certified price increases as more suppliers move into (or as more stay in) the certified market and because the relative increase in certified supply causes the certified price to decrease. [11] Secondly, the premium willingness to pay reduces the chance that voluntary certification imposes losses on producers who choose a non-certified process. In the example illustrated, the equilibrium non-certified price would now occur at the intersection of W_S^{NC2} and W_D^{NC0} which is, by coincidence, the initial price. While this case (1b) is still favorable to eco-labeling proponents, there is no guarantee that eco-consumers will prevent the market from imposing a loss ($P^{NC} < P^0$) for non-certified suppliers.

Case 2: Certified Wood and Non-certified Wood at One Price

If the certified production process adds some cost to all producers who choose to comply with certification, then the foregoing results show that the market *may* generate a price differential between the certified and non-certified products. However, intuitive consideration can convince us that, if certification is always costly to producers, then the market *will* generate a price differential.

This outcome is easily established by consideration of the decision facing the marginal producer of certified wood. For example, suppose initial division of supply and demand establishes that the certified price equals the non-certified price (initial $P^C = P^{NC}$, and both markets clear). This situation cannot represent an equilibrium, because the marginal certified supplier would *refuse to stay* in the certified market. By exiting, this marginal supplier can jettison certification costs and receive the same price from the non-certified market. Of course, as the marginal supplier exits the certified market and enters the non-certified market, that entry-exit decision places an upward pressure on

[11] We note that it is possible that the equilibrium certified-supply, W_S^{C2}, could have ended up intersecting W_D^{C2} at a price *above* P^C. In such a case, which we do not illustrate, the price gap between certified and non-certified may not become narrower, although it is clear that the non-certified price when eco-consumers exhibit a premium willingness to pay will exceed P^{NC} in Figure 4. We do not illustrate this additional subcase here.

certified price and a downward pressure on non-certified price. Therefore, if certification is always costly to individual producers, the market will *always* produce a price differential with the certified price remaining higher ($P^C > P^{NC}$).

However, certification may *not* always be costly. Some segments of industry argue that they already produce a certifiable product either as a result of ownership philosophy, such as may prevail among some non-industrial forest landowners who compromise timber profits for aesthetic benefits, or as a result of existing government regulations that cause producers to follow strict environmental guidelines, as suggested for example by firms who win timber contracts on Canada's crown lands. If such landowner choices or environmental regulations impose production constraints on enough producers, such that their supply is sufficiently large relative to demand of eco-consumers, then certification may fail to generate a price differential. However, in our example, certification may generate an increase in the price of all wood, in which case both certified wood and non-certified wood will sell at the same, higher price.

This case is illustrated in Figure 5, where notation is again as defined above. However, in this case, the initial allocation of supply between the market segments is not arbitrary; the allocation is driven by placing all firms that currently supply by certifiable methods within the supply segment captured by W_S^{C0}. In this case, the demand W_D^{C0} of eco-consumers intersects supply W_S^{C0} at a point below the initial (pre-certification) price P^0, while the intersection of non-certified demand, W_D^{NC0}, and non-certified supply, W_S^{NC0}, occurs above P^0. Since non eco-consumers are indifferent between certified and non-certified wood, these consumers generate a demand for the excess supply of certified producers, beginning at supply price P_S^1. Defining this excess supply as the horizontal difference between W_S^{C0} and W_D^{C0}, this excess supply is added to the non-certified supply to obtain an aggregate supply available to non eco-consumers, W_S^{NC1}. Under these conditions, W_S^{NC1} constitutes a supply of both certified and non-certified product that is being sold to non eco-consumers.

So far, however, we are assuming that certification generates a market separation, but W_D^{C0} assumes eco-consumers reveal no increased willingness to pay for certified wood. This process yields an equilibrium at the initial price P^0 where eco-consumers consume Q_D^{C1} from the larger certified quantity Q_S^{C1} and where non eco-consumers consume Q_D^{NC1} which is supplied by non-certified production Q_S^{NC1} and excess certified-supply given by the difference Q_S^{C1}-Q_D^{C1} (which equals $Q_D^{NC1} – Q_S^{NC1}$ in Figure 5).

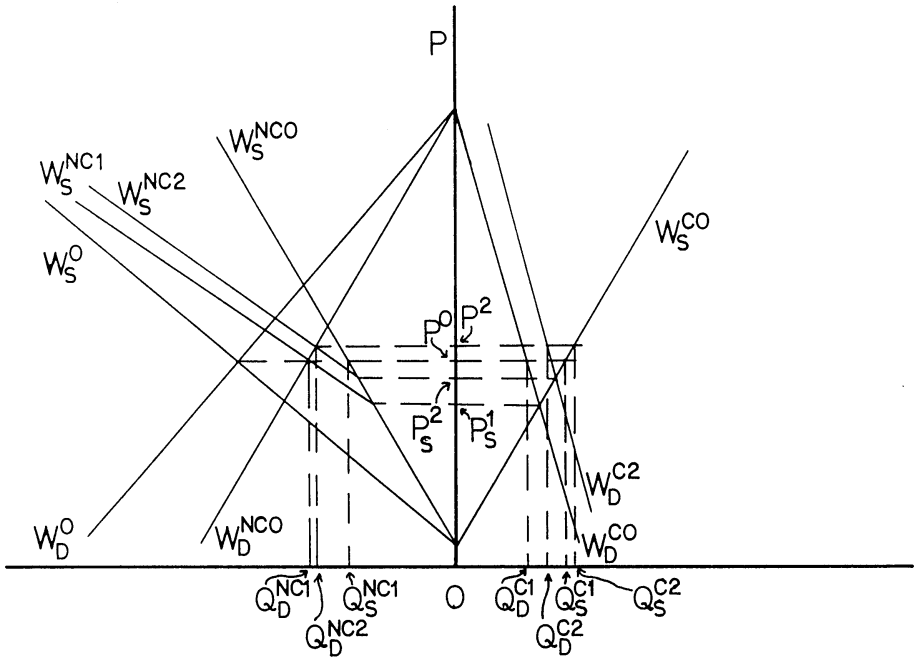
If eco-consumers do reveal a willingness to pay a premium, then their demand curve shifts to W_D^{C2} after certification is institutionalized. In this case, the excess supply of certified product available for consumption by non-certified producers would be given by W_S^{NC2}. Accordingly, the common price would become $P^2 > P^0$, with eco-consumers consuming Q_D^{C2} and non eco-consumers consuming Q_D^{NC2}, including an excess of certified product given by the difference $Q_S^{C2} – Q_D^{C2}$. The implication, under partial equilibrium for this case, is a gain for all producers, since no costs have increased but the price received in both markets increases due to the higher demand of eco-consumers.

The condition leading to a single price for the two products require that supply conditions already lead to a significant certifiable supply at no increase in marginal cost for those units; these conditions represent a type of production constraint. If this supply is insufficient to satisfy eco-consumers' demand at a price below the pre-certification price, then the production constraint would be non-binding on the equilibrium process, and a version of Case 1 becomes relevant.

Comparing the Cases to Conditions before Voluntary Certification

These market results raise concerns that eco-labeling may reduce the profits of firms that choose to serve the non-certified market. Yet, if eco-consumers comprise a large enough share of the mar-

Figure 5. Partial Equilibrium Implications of Voluntary Certification: Case 2, without Distinct Prices for Certified and Non-Certified Wood, and No Producers Lose.



ket relative to certification-induced increases in marginal production costs, then, under a voluntary system, the model indicates that even non-certified suppliers may gain. This outcome for producers is even more likely if current regulations have already created a significant supply of certifiable forest land.

CONCLUDING DISCUSSION

The implications of this analysis are significant. For a voluntary system, if demand for certified wood is small relative to overall demand, if the costs of certification are significant, and if the amount of new demand created by certification is modest, then the market is less likely to generate a price premium for the certified product, even if there are substantial numbers of consumers "willing to pay" a premium. However, to the extent that the costs of certification are small and certification with labeling creates significant new demand, the two-price alternative is increasingly likely to be generated by voluntary market activities.

Additionally, the success of eco-labeling depends upon the motivation of forest landowners to favor or oppose eco-labeling. Under a mandatory system of eco-labeling, this issue hinges on whether the net increase in costs due to certification criteria may be offset by an increase in the equilibrium price for producers who retain land in forestry. The chance that producers gain, on net, is certainly greater when some consumers are willing to pay a price premium, especially if eco-consumer's willingness to pay a premium diminishes with the consumption of certified wood (cf. Figures 1 and 2). However, nothing in our analysis indicates that a favorable outcome is certain for producers.

Many proponents have opted to favor a voluntary system of certification, believing that producers who choose not to certify will experience no net loss. However, the outcome of a voluntary sys-

tem is not unambiguous. The simple existence of a cadre of consumers with a "willingness to pay" for certified products does not guarantee that producers will receive price premiums for these products. Moreover, even in a partial equilibrium analysis, producers who (voluntarily) avoid the certification process can still lose if eco-consumers fail to generate a sufficient incentive to attract a large enough portion of suppliers to volunteer for certified production; the result could be a relative oversupply of non-certified production, leading to a loss for those producers. [12]

These results need not imply that the environmental community should abandon eco-labeling. Rather, the results suggest the need for a thorough empirical analysis of a proposed labeling system. Moreover, the results raise the stakes for finding a pragmatic balance between the costs that a labeling system imposes on producers, even if voluntary, and the benefits that consumers feel they obtain from purchasing certified products.

Finally, our presentation above treats certification as an all-or-nothing proposition, but proponents may evaluate the likely outcome of market feedbacks under various certification standards, each of which would improve ecological conditions "at the forest" to different degrees. These market feedbacks may affect not only producer costs but also both the demand for certified products by bringing in new consumers and the consumer's willingness to pay. These concepts suggest a need for research on consumers' preferences for certification standards and the consequent effects on eco-consumer's willingness to pay.[13] In short, attention to market feedback may clearly affect the degree to which promising, market-oriented tools successfully generate incentives for the conservation objectives of environmental organizations.

[12] A less dramatic outcome could be that market equilibrium generates a price premium that is less than the percentage forecast by simple consumer surveys.

[13] Examples for the analogous issues surrounding food safety labels include Wessells and Anderson (1995), Wessels et al. (1996), Holland and Wessells (1998). Note that while the present analysis focuses on the existence of a price premium for labeled products in partial equilibrium, we acknowledge also that to the extent that the outcome alters the profitability of timber production relative to other goods, the general equilibrium concerns of Swallow and Sedjo (1998) may lead to changes in the allocation and relative intensity of use of key ecological resources, such as forest land.

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