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Abstract

EXTERNALITIES, THRESHOLDS AND THE MARKETING OF NEW AQUACULTURAL PRODUCTS: THEORY AND EXAMPLES

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Identifies and discusses the type and nature of market externalities or spillovers likely to be experienced by businesses in developing markets for new aquaculture products or in developing previously unexplored markets for existing products. Because development of new markets usually requires a substantial investment on the part of a business or businesses initially embarking on it, inability of market developers to appropriate, as a result of externalities, a substantial share of the economic returns from the successful establishment of a new aquaculture market can result in market failure.

The existence of large thresholds for the minimum level of investment in market development needed to establish a new market successfully creates further barriers for the establishment of new aquaculture markets.

Larger firms compared to smaller ones are better placed to overcome the above barriers. Furthermore, existing aquaculture businesses usually have economic advantages in development of new markets compared to new entrants. The economic establishment of new aquaculture products, and aquaculture development generally, displays a high degree of path dependence. For instance, the prior existence of complementary marketing facilities and activities can be critically important for the successful marketing of a new aquaculture product. Examples are given.

Developers of a new market may generate favourable spillovers for later business entrants because (1) they foster acceptance of the new aquaculture product by distributors, retailers and consumers; (2) they invest in the development of marketing networks, distribution channels and marketing facilities complementary to the sale of the new product, and late-comers have some open access to these 'infrastructures' and (3) developers generate some public information about the market acceptance of the new product and this is of value to late-comers.

Whether or not governments should provide assistance to early developers of markets where development is subject to market failure is discussed. Possible means for providing support are outlined.

Externalities, Thresholds and the Marketing of New Aquacultural Products: Theory and Examples.

1. Introduction

As pointed out by Lazonick (1991), neoclassical economics pays little attention to the economics of developing markets for new products or for substantially altered products. This is a major shortcoming of orthodox economics given that new commodities play a major role in economic development in modern times (cf. Schumpeter, 1942). This general deficiency is mirrored in studies of the economics of aquaculture. James Anderson (1995) points out that " marketing is critical to the seafood and aquaculture sectors, but it is an area that has received little attention to date". This is all the more surprising because "Aquaculture is the fastest growing sector of the animal production industry worldwide" (APHIS, 1999, p.1) and is frequently attempting to market new or substantially modified products. The aquaculture sector generates a high rate of product innovation, particularly in countries, such as Australia, where the development of aquaculture is in its infancy.

Lazonick (1991) has suggested that given the dynamics of development of new markets, large (possibly established) firms are at an advantage compared to small ones because of their greater ability to coordinate all stages involved in the production and marketing processes. They may be more integrated and large firms usually have been established for a longer period than smaller ones. Hence they are likely to have gained greater experience and accumulated more knowledge than small firms; but this point is not specifically mentioned by Lazonick. He mentions (Lazonick, 1991, p.192) that Chandler (1962) seems to have been the first to suggest that large firms (especially multidivisional ones) are likely to be more successful than small firms in marketing new products because of their superior ability to coordinate all stages of production and marketing processes. But the additional point is made here that large firms are in a better position to absorb market start-up costs.

One might expect this point of view to be just as applicable to new aquacultured products as to other products. In fact, Young *et al.* (1999) argue that large firms do have an advantage in marketing aquacultured products compared to small enterprises,

particularly small enterprises exporting from developing countries. They suggest, for example, that large firms may be able to create a clean green image for their product even though their product may in fact be less satisfactory in this respect than supplies from smaller enterprises.

While the coordination element could be one aspect that favours larger firms over smaller ones in marketing new products, such as new aquacultured products, there may also be other factors which favour larger and established firms, in addition to the experience and accumulated knowledge factors already mentioned.

Economic obstacles in marketing new products (such as new aquacultured products) may be classified into those which involve economic thresholds and those involving externalities in market development. The latter results in imperfect appropriation of economic benefits by developers of new markets. In general, larger firms find these obstacles to be less of a hurdle than smaller firms.

In the context considered here, a new aquacultured product is assumed to be one that has not been previously available to consumers from aquaculture. Nevertheless, in many cases, a well-established capture fishery for the same product is likely to predate the marketing of the aquacultured product. In this case, the captured product and the aquacultured product may show a high degree of demand substitutability. In such cases, the aquacultured product is not so novel to buyers. However, cases arise in which no or an insignificant or patchy market for a captured product predates the aquaculture of the product. In such cases, the degree of market novelty of the aquacultured product is high. Also, in some cases, a previous market for the captured product may have existed but subsequently collapsed due to over harvesting and/or protection of the species concerned. In such cases also the market for the product based on aquacultured product has to be re-established. If the period of lack of availability of the product from the wild has been lengthy, re-establishment of the market will virtually involve the creation of a new market.

This article analyses these obstacles in turn and some policy implications are then discussed. The discussion is not confined to consideration of the relative prospects of small and large firms in marketing new aquacultured products but takes account of

barriers facing all businesses in undertaking market development. Because there is little settled economic theory in this area, the analysis in this article is to a considerable extent exploratory.

2. Thresholds, Start-up and Overhead Marketing Costs

Ideally market development should be modelled as a dynamic multi-period problem. But here it will be considered as a simple one-period problem because the aim is to identify basic factors which may make for economic success or failure in marketing new (aquacultured) products.

In order not to complicate the analysis and so as to focus on marketing costs, it will be assumed that the new product to be marketed can be produced at constant per-unit cost and that all firms deciding to produce it experience the same per unit production costs. This can be relaxed later.

It is assumed that marketing and distribution costs for a new product can be divided into start-up or overhead costs and variable costs. A very important consideration for a business is the volume of sales or sales revenue needed to break-even. The business risk involved in marketing the new product increases with the size of this threshold.

For simplicity, assume that the total cost function of the firms is linear and can be represented by

$$C = a + bX \tag{1}$$

where C is total cost, X is volume of sales (equals output) and a and b are parameters. Parameter a represents overhead or start-up marketing costs in this case and b is per unit marketing plus production costs. If λ represents per unit production costs, variable marketing costs are $b - \lambda$.

For simplicity, total revenue, R, can also be assumed to be linear. Hence,

$$R = \rho X \tag{2}$$

where ρ is a constant price. However, if the revenue function increases monotonically as a function of the quantity of sales the same general mathematical results are obtained.

In the above case, other things equal, the break-even quantity of sales is higher, the larger is a, marketing start-up, costs or the larger is $(b-\lambda)$, variable marketing costs. Considerable marketing set-up costs and higher variable costs (including distribution costs) of marketing new products increase the riskiness of an enterprise.

This is illustrated in Figure 1 where the line ODG represents total revenue. The total cost line ADF shows lower set-up marketing costs, OA, than the total cost line BGH for which start-up marketing costs are OB. In addition, the slope of ADF is less than for BGH, indicating lower per unit variable marketing costs in the former case. The break-even volume of sales, X_2, is much higher in the case involving high start-up marketing costs than in the other case where the break-even point is a volume of X_1 of sales.

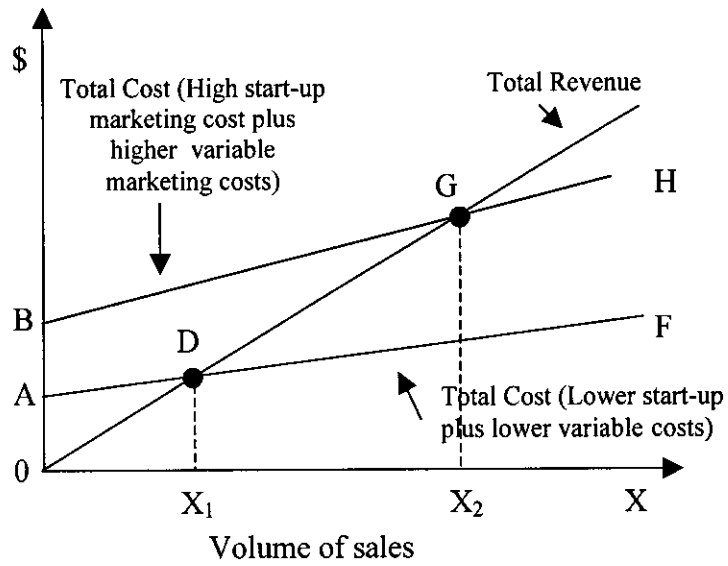

Figure 1 Higher start-up marketing costs plus per unit variable costs increase the riskiness of attempting to introduce new aquacultural products.

Differences in marketing start-up costs seem to be very important in influencing the break-even point. Higher start-up costs will result in a higher break-even point, even if associated variable per unit marketing costs are the same or somewhat higher than otherwise.

Note that although linearity has been assumed in the above discussion, provided that cost functions and the revenue function increase monotonically, the general results continue to hold.

Market start-up costs for business may consist of one or more of the following components:

1) Costs of establishing a customer network e.g. of retailers.
2) Costs of convincing potential customers to try and accept the new product.
3) If the product requires specialised storage facilities or treatment, then there will be costs in communicating this to potential customers.
4) Sometimes specialised complementary storage or treatment facilities may be needed for a new product e.g. by retailers. These will involve an upfront investment. In some cases, the supplier may have to provide these facilities in order to get a foothold in the market.
5) If a suitable distribution network for the product does not exist, the supplier of a new product may have upfront costs in establishing such a network or modifying an existing network.

Upfront costs will generally be lower for a business attempting to market a new product if it can tap existing customer networks and if the product has substantial similarities with products which are already being marketed. In the latter case, those involved in marketing the product may be able to use facilities already used for storing or treating existing products. Furthermore, it may be possible to tap existing distribution channels in such a case.

Attempts to market aquacultured giant clams, *Tridacna*, provide an example. A market for such clams for the aquarium market developed quickly because specialist distributors, retailers and customers for tropical light-dependent aquaria species already

existed. Existing marketing networks and facilities could easily be tapped (cf. Tisdell *et al.*, Part III).

By contrast, the market for giant clams for fresh food in the restaurant trade, for example, has failed to develop rapidly. In fact, it appears to have developed hardly at all. One reason could be that specialist equipment is needed to transport live clams and to store these in restaurants. To provide such equipment requires a substantial upfront investment. Furthermore, compared to other species often held in tanks at restaurants, additional specialised knowledge is required to care of live *Tridacna*. Furthermore, many potential customers are unaware of the taste of giant clams and chefs may have to learn about suitable gastronomic ways to present these. Clearly the upfront cost of establishing a food market for live giant clams is much greater than that involved in marketing giant clams for the aquarium market. No doubt less difficulty would be experienced from a marketing point of view in selling the frozen adductor muscle or the chilled meat of giant clams for food because this could make use of existing marketing channels. Nevertheless, given the production costs involved, it may not be a profitable activity.

It is worth emphasizing that the cost of establishing a market for a new product tends to be to be lower if the product is as a close substitute for existing products. Both upfront marketing costs plus variable promotion and marketing costs can be expected to be much lower when a new product is a close substitute for an existing one or ones. If it is an aquacultured food product, existing recipes, cooking methods and means of presentation can be used and preparation and storage methods will be much the same as with the existing product or product. The taste, texture and other qualities of the new product are likely to be similar to its existing close substitutes.

For example, Australia has a fledgling industry for eel aquaculture and two endemic species are being cultured on the east coast namely the longfin eel *Anguilla reinhardtii* and shortfin eel *Anguilla australis*. Because the Australian shortfin eel is very similar to the species *Anguilla japonica* favoured in the Japanese market, the potential for marketing *Anguilla australis* in Japan is excellent. However, the Japanese do not favour the longfin eel so there is little prospect for marketing it in Japan. However, it is

preferred by the Chinese. So a potential export market may exist among the Chinese for *Anguilla reinhardtii* (NSW Fisheries, 2000a).

Another example is provided by the evolving Australian freshwater crayfish industry. Whereas freshwater crayfish aquaculture in the rest of the world (southern United States, Spain and other countries) is based on the red swamp crayfish, *Procambarus clarkii*, the Australian industry relies on three native species of the genus *Cherax*. These are the yabbie *Cherax destructor* which occurs naturally over a wide range in eastern Australia, the marron *C. tenuimanus* which is native to southwest Western Australia and the redclaw *C. quadricarinatus* which is naturally distributed throughout northern Queensland and the Northern Territory.

It seems that he Australian species can be easily substituted for European species. NSW Fisheries (2000b, p.3) reports:

"The size of any export market is impossible to evaluate until supply can be maintained. There is certainly a market for crayfish in Europe, as crayfish are regarded as a delicacy and local stocks have been largely wiped out by the "crayfish plague". However, the markets in some European countries (for example, Sweden) are highly seasonal. Trial shipments have suggested that the *Cherax* species would be accepted in the market place. Some products have also been exported and well received in Asia, so there is also potential there. The success of further export trade will be largely dependent on volume and continuity of supply".

Given modern marketing methods and outlets, adequate volume and continuity of supply as well as its standardisation are often important for establishing new markets. Usually larger firms are in a better position to fulfil these requirements than smaller ones.

A multi-product established business (these are usually larger sized businesses) is likely to be at an economic advantage in marketing a new aquacultural product compared to a new entrant, especially if the new entrant supplies a single product. Economies of scope (Baumol *et al.*, 1984) are likely to be quite substantial in marketing. Overheads involved in marketing can often be shared between a number of products so reducing the upfront costs for marketing a new product. Furthermore, multi-product firms are

diversified and this reduces their economic risks. Also, larger firms are more likely to be multi-product ones than small firms. In these circumstances, larger firms experience lower upfront costs for marketing new products and face lower risks than smaller businesses.

In general, the view that large multi-product firms are likely to have a competitive advantage in marketing new products is consistent with that of Chandler (1962, 1977, 1990; cf. Lazonick, 1991). However this view does not solely depend on the coordination argument of Chandler.

Small new businesses selling a single new product appear to be in the most vulnerable position because they usually lack experience in marketing, do not have developed marketing networks to tap and cannot spread their marketing costs across several products marketed jointly. The latter two factors imply that their overhead costs represented say in Figure 1 by OB tend to be higher than for larger multi-product firms who may have lower overhead costs for launch of a new product such as indicated by OA in Figure 1. Furthermore, a smaller firm compared to larger one may not be able to obtain discounts or to achieve as low a variable cost in marketing and distribution of its product because of its overall smaller volume of transactions. So its cost curve (as shown in Figure 1 by line BGH) will tend to rise more quickly than that for a larger multi-product firm, which may have a cost curve with a lower slope like that shown by line ADF. This is not to say that a small one-product firm will necessarily fail to establish a new market, but suggests that the risk of its failure is high compared to a large, established multi-product firm.

A large established company is likely to have an additional advantage in marketing a new aquacultured product compared to a small newcomer – it is likely to have considerable market goodwill. Therefore, if the name of a large established company is associated with a new product, its supplies of the new product are more likely to be tried and accepted by potential buyers. The company's name can be used as a favourable signal. Consequently such a company, other things equal, is likely to have lower upfront market costs and variable marketing cots in establishing a market for a new aquacultured product than is the case for a small firm just entering the industry. Naturally, if the large firms reputation is already established for aquacultured products

this will be an advantage to it in marketing. However, even if it has not previously been producing in aquaculture but its name is well known for other products, this can also be favourable to its new market development.

A small firm or set of small firms may be at a disadvantage in establishing a new market for another reason. A significantly large investment may be required in establishing some markets and a considerable lapse of time may occur before the market is established on any significant scale. A small new product firm or such a set of small firms may not be able to raise the funds to overcome this threshold and finance the waiting time required for a return on this investment. This may be partially due to capital market failure, but probably also reflects the high risks involved in making finance available to a smaller specialised firm in such circumstances.

Nevertheless, a set of small firms can sometimes successfully overcome the type of thresholds indicated by Figure 2. It sometimes happens that a significant group of small firms attempts simultaneously and independently to establish the market for a new aquaculture product, and their combined effort may exceed the critical mass needed to establish the market. In such a case, their massed, but uncoordinated efforts, bring benefits to all suppliers of the new product.

Given the above mentioned market thresholds, firms are likely to experience significant synergies in establishing the market for a new product, even if each wishes to carve out a submarket for itself. On the other hand, once the market is established this synergistic marketing effect between firms (a positive spillover elements) can be expected to become weaker. This phenomenon involves both thresholds and marketing externalities but has been given little attention in traditional economics, presumably because of its preoccupation of traditional economics with situations involving comparative statics (Kornai, 1971).

There is, however, no guarantee that those who successfully establish the market for a new aquacultural product will be able to appropriate all or most of producers' benefits from doing this. Latecomers may obtain positive market spillovers from early developers of a market. Consider this matter.

A simple heuristic illustration of this situation is given in Figure 2. In this figure, the curve 0ABC shows the size of the market created (e.g. in terms of an index of height and slope of the product's demand curve) for a new aquacultured product as a function of upfront investment in establishing it. Unless at least X_1 is invested upfront to establish the market considered in Figure 2, it fails to eventuate. Further investment expands the size of the market first at an increasing rate than at a decreasing rate after market upfront investment exceeds X_2. For an investment of X_3 in upfront establishment of the market, the size of the market per unit of upfront investment is at a maximum.

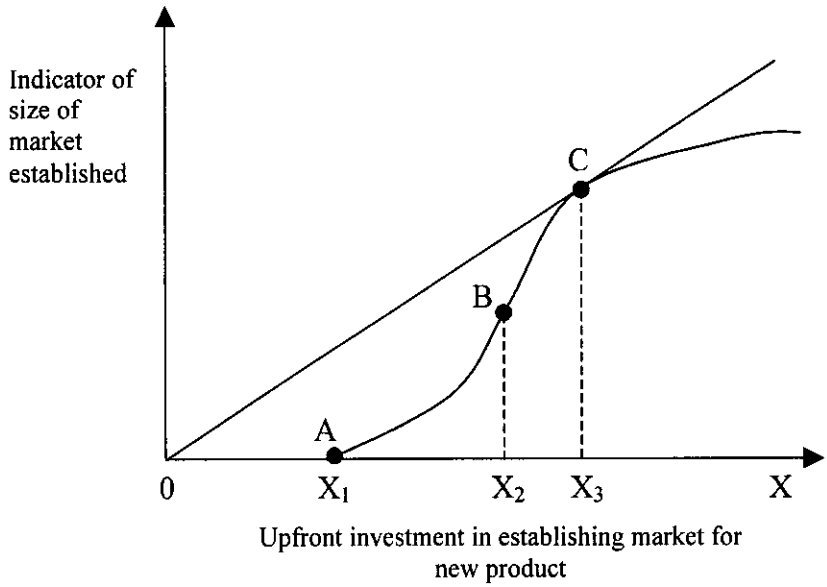

Figure 2 Threshold followed by initial scale economies in upfront investment in establishing a new market

3. Externalities – Lack of Appropriation of Economic Benefits from Marketing Effort

The above discussion implicitly assumes that firms establishing a market for a new product can appropriate all (or at least most) of the economic benefits (for suppliers) from doing this. But in most cases, this is an unrealistic assumption. It is only likely to be satisfied if there are substantial barriers of entry to the new market once it is established.

Strong protection by patents could constitute such a barrier. But many new aquacultural products are unable to benefit from patent or similar protection. Small new firms in comparison to larger established ones are likely to find it more difficult to take advantage of patent protection, if it is in fact available, and will usually find it more difficult to establish a brand name and brand loyalty. Small new firms have quite limited ability to protect their investment in developing a new market from the entry of subsequent rivals. Clearly industry dynamics or evolution needs to be considered.

Subsequent entrants to a newly developed market obtain several types of positive economic spillovers from those who initially develop new markets. These spillovers include:

1) Generation of knowledge about the market. Information becomes available to later market entrants or potential entrants about the size and nature of the market and this information is generated by those who undertake the effort of establishing the market initially.
2) Initial market developers may have to overcome the upfront market investment threshold discussed in relation to Figure 2, and subsequent market entrants may free-ride on these efforts of earlier entrants.
3) In general, early developers of a market through their efforts and market investment, increase awareness of and potential acceptance of new product by potential buyers or actually introduce new buyers to a product. Subsequent entrants to the newly established market often free-ride on these actions by early developers of a market.
4) Suppliers who are late-comers to a new market are often able to tap marketing networks established by market developers, and in general take advantage of market infrastructure established by developers of a market. Note that this infrastructure may include an institutional or social component. For instance, if marketing must meet various (sometimes new) government requirements, developers of a market may have to invest considerable resources to ensure that the regulatory mechanisms are economically workable.

Observe that while it may frequently be the case that later arrivals in a new market take market share away from market developers, this is not always so. In some markets, cost conditions may be such that no supplier would find it economical to satisfy a substantial fraction of market demand for a new product. The possibility exists for some markets that up to a point synergy or complementarity in market development exists between early entrants. Where natural economic conditions are such that a new industry would be supplied by many small firms, the simultaneous attempted establishment of the new industry by a critical minimum mass of small firms may be necessary for its successful establishment. A critical mass of early market developers may be needed to ensure that the type of market threshold indicated in Figure 2 is overcome and that the upfront costs in developing market infrastructure and for acceptance of a new product are shared. However, there appears to be no 'natural' mechanism to ensure or coordinate the massing of those prepared to develop a new market. Nevertheless, it can occur as a result of a wave of business optimism, encouraged, for example, by media reports.

Market development spillovers constitute a serious barrier to the establishment of markets for new products which are generic in nature, as is frequently the case for new aquacultural products. Large, established, multi-product firms are probably in the best position to develop such markets successfully. Furthermore, if they enter an emerging market pioneered by small firm after a slight lag, these large firms may be in a superior position to capture substantial market shares and capitalize on the investment and efforts of small firms in developing the market initially.

The costs of complying with government regulations should not be underestimated as impediment to the establishment of markets for new aquacultured products or to the successful economic establishment of new aquacultural industries. Often there is inflexibility in adjusting existing regulations to meet the needs of new industries and the brunt of obtaining adjustments generally falls on those who first enter the industry. In an industry survey, Bush and Anderson (1993) "found that regulatory issues, including access to lease sites, predator control, disease management, water access, water discharge and others, are the number one constraint to aquaculture in the United States. Such regulations have essentially shut down aquaculture in some states. Alaska presently has a permanent moratorium on private, for-profit finfish aquaculture. In

other states, such as Maine, the substantial cost of regulation has contributed to increased [business] concentration" (Anderson, 1995). In Australia, marine prawn (shrimp) aquaculture has become increasingly concentrated (NSW Fisheries, 2000c, p.1). This may also be partly a response to government regulation (larger firms might have greater ability to cope with such regulations) as well as other advantages, such as marketing advantages, of large firms.

Many large firms are also in an excellent position to act as middlemen in developing markets for new products, that is as processors, distributors and marketers. As a result, they may also capture most of the rents to be earned from the introduction of a new product.

The speed of entry of suppliers of a new market is an important dimension to consider. In some cases, rapid entry of those who enter a new market with a lag will lower the economic benefits of initial market developers, although it should result in a greater gain for consumers. However, this is not universally the situation. As pointed out earlier, clustering or massing of early entrants resulting in a critical minimum collective effort can sometimes benefit all. This possibility does not appear to have been previously recognised in the literature.

4. Policy Considerations

The above analysis demonstrates that market failures can arise in the development of markets for new products because of marketing effort thresholds and the presence of market development spillovers. When market failures occur, there may be a case for government intervention to improve the operation of markets.

In relation to established products examples exist of government intervention to strengthen mechanisms for their market promotion. For example, in relation to wool in the past a compulsory levy was imposed on wool-growers in several countries to provide funds for the collective promotion of the use of wool as a generic product through the International Wool Secretariat. The rationale for this is that few or no wool-growers would be prepared to promote wool because of market spillovers but all wool suppliers would benefit in economic terms from promotion.

Marketing effort took the form of 'brand' identification of wool as a fibre e.g. by use of the 'Woolmark' (Tisdell and McDonald, 1979). The Australian Government also subsidised the promotion efforts of producers. Similarly California orange-growers have had a collective scheme to promote their product.

However, promoting the market for an existing product is rather different from market development for a new product. For an existing product, a substantial population of suppliers who may benefit from this promotion already exists and can be identified. This provides a base for collective enforced contributions to a product market development fund. Also, in such case, suppliers may constitute a significant political interest group and be able to exert pressure on government to subsidise the promotion of their generic product.

By contrast, in a newly emerging market or a potentially new one, the population of eventual beneficiaries is unclear and they are unlikely to have formed a significant political interest group. In such cases, collective action in promoting the market for a new product is unlikely and government support or a subsidy to establish such a market is unlikely. An exception could, however, occur where the new product would be a sideline for many producers already established in the same industry. These producers may form a special interest political pressure group.

On the whole, market failure in developing markets for new products is likely to be more widespread and persistent than such failure in relation to the marketing of established products, even when these products are of a generic nature. Government support or intervention appears to be least likely in the former case.

In some cases, governments provide support for research and development designed to produce or improve new products. This is common both for primary agricultural and aquacultural production. But the ability to supply physically a new product which has the potential to be a market success does not ensure this success. Failures in the processes involved in marketing can result in markets not being established for new products even when their establishment would confer a social economic gain. No perfect solution to this economic conundrum seems to exist.

Nevertheless, governments can play a positive (even if somewhat limited role) in supporting the emergence of markets for new aquaculture products. While research and development (R&D) does not in itself create new markets, government assistance within R&D can reduce the initial total cost burden of businesses developing a new aquacultural industry and can make for a more marketable product. In some cases, the government may also be able to provide assistance with generic promotion of a new product.

While, as mentioned earlier, an emerging industry may usually not be able to form an effective political lobby group, there can be special circumstances where it might do so at an early date. One such situation is where the emerging aquaculture product could constitute an important side-line to existing aquaculture production. In such cases, producers of existing aquaculture products may form an effective lobby group.

Secondly, if the new aquaculture promises to stimulate employment and economic growth in a lagging region(s), regional pressure groups may press the government to support it. Thus regional development imperatives may sometimes ensure early government support for an emerging industry.

Government bodies can also play an important role in prescribing standards for products of a new aquaculture industry. While excessive government regulation can stifle the development of a new aquacultural product, regulation in some cases can ensure the sustainable development of the market for a new aquacultural product.

Where quality of the product is not easily detectable by inspection, regulation of quality or appropriate identification of quality may be needed to ensure that the market for a new aquaculture product develops and survives. Otherwise, as pointed out in the economic literature (Akerlof, 1970; Varian, 1996, Ch.35), poor quality products may drive out superior quality products or the market for the product may collapse completely. Suppliers of superior products experience an adverse market externality or spillover from suppliers of unidentified poor quality products. This adverse externality, arising from asymmetry in the information of sellers and buyers of a product, may be a serious impediment to the emergence of a new market, in which most buyers are learning about the characteristics of the new product for the first time.

In such circumstances, there can be a case for the government to regulate the quality of a new aquacultural product. The regulation may extend beyond health considerations to include measures to ensure that marketed aquacultured products do not have off-flavours, as discussed below. It may be that in the longer term industry Codes of Conduct, or brand names or other means can be found to address this issue.

An example is the recent aquaculture in Australia of the silver perch *Bidyanus bidyanus*, a species naturally distributed throughout the Murray-Darling Basin. It is being increasingly cultivated in farm dams. NSW Fisheries (2000d, p.3) states

"Like most freshwater fish, silver perch has a tendency to develop a muddy flavour. This occurs as a result of fatty tissues in the fish absorbing compounds released by blue green algae in the culture ponds. The only way to remove the off-flavour is by purging in clean water for 3-21 days, depending on the extent of tainting. Purging the fish in clean water expels the compounds that cause off-taste, and the fish is then ready for market".

Issue of permits to growers of silver perch in NSW is subject to growers providing facilities for purging silver perch before sale. This, however does not ensure that the process will be carried out or that purging occurs for a sufficiently long period. However, where growers directly supply live perch to restaurants, restaurant-owners would be able to detect poor quality due to inadequate purging and identify the grower responsible, albeit after the event. Thus the buyer can impose a penalty on the grower. But as the market expands and identification of suppliers becomes more difficult, and if impersonal sales develop through markets, quality control remains a serious problem. Industry self-regulation, especially in the early stages of market development, may be unable to address the issue effectively, and government regulation may be desirable. It can be required and be economically justified in many cases.

Purging often results in much better quality freshwater cultured species for food. Another example is Australian crayfish. For instance, "yabbies feed on detritus (decaying matter) often resulting in the flavour of their flesh being tainted with an off-flavour. Yabbies are much tastier if their gut has been emptied after harvesting and prior to sale in order to improve the flavour" (NSW Fisheries, 2000e, p.1). Market

acceptance of this product will be higher if purging is regularly and adequately carried out prior to sale.

The subject of standards for aquacultural products, especially new aquacultural products, is a complex one. But governments can play a valuable role in helping to regulate such standards or in requiring the appropriate identification of the standard of an aquacultured product. This can be especially important in emerging markets which may be highly sensitive to variations in standards, especially to the undisclosed sale of poor quality product. While private warranties, trade marks and private brands (as well as possibly industry Codes of Conduct) may provide some market protection, these private responses may be weak in an emerging market and also limit sales of generic product. Despite the limitations of government regulation, there is a case for government regulation of quality standards in many emerging markets for aquaculture products.

5. Discussion and Concluding Comments

Industries such as aquaculture and agriculture seem especially prone to failures in the development of markets for new products. This is because of the presence in most cases of small firms in these industries and because of the generic nature of much of their production. This article identifies market thresholds and spillovers in promotion of new products as potentially very important sources of market failure in such cases. While governments might help moderate these failures, it has been argued that they are less likely to do so than in the case of established generic products. However, important roles exist for public intervention in the development of aquaculture markets.

The degree of market novelty of an aquacultured product depends on the availability of close market substitutes. In many cases, wild-caught products provide close substitutes for aquacultured ones e.g. Atlantic salmon. In such cases, marketing thresholds and market externalities involved in introducing the aquacultured product to the market may be slight. Hence, small-sized firms may not be at a substantial disadvantage in entering such a market selling aquacultured products compared to large firms. Nevertheless, marketing thresholds and externalities may not be completely absent. For example, the aquacultured product may require the use or establishment of new

existence for the captured product and no very close substitutes in existence, marketing threshold and externality constraints on the development of the new product are likely to be high, and the market failures outlined above of substantial importance.

It might be noted also that this article highlights both market barriers on the demand side, as indicated by the degree of substitutability of an aquacultured product with other products, as well as marketing supply constraints such as the absence or otherwise of available marketing networks, market distribution and storage technologies. While demand substitutability is often given considerable attention by economists, supply-side marketing constraints have been relatively neglected.

The analysis given here is purely exploratory and now needs to be developed with greater precision and linked to empirical studies of the development of markets for particular aquacultured products.

As shown by Aarset (1999), there are many factors (both supply-side and demand-side factors) that influence the evolution of a new aquaculture industry. Even though the development of Atlantic salmon farming in Norway could be pioneered by small farms and benefited from a number of favourable conditions, such as a pre-existing market for salmon, its evolution was by no means straightforward or easy (Aarset, 1999, pp.179-182). Nevertheless, the development of an Arctic char farming industry has proven to be more difficult for reasons outlined by Aarset (1999). Those reasons include early opposition to development of this industry by the salmon industry because of its perceived market threats to Atlantic salmon.

Economists have given little attention to the processes of market development. Neoclassical economics has concentrated on static analysis but this cannot be used for analysing the emergence of markets for new products. While many members of the Austrian School of Economics (e.g. Hayek, 1948) have emphasised the importance of studying economic processes, their emphasis has mostly been on economic processes underlying established markets. At least, this has been true for Hayek (1948). On the other hand, Schumpeter (1942), also Austrian-trained, has emphasised the importance of studying processes involved in market innovation, processes not captured by

traditional economic approaches. As a growing and developing sector of the global economy, aquaculture provides excellent opportunities to study such processes.

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