Pre-empting Public Regulation with Private Food Quality Standards

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Abstract: This paper discusses the recent growth of both public and private food quality standards and the factors driving this growth, including strategic incentives for setting private quality standards. The incentives for firms to set private quality standards before governments or international organizations do so are analyzed with an analytical model. The model explains incentives for private firms to pre-empt public regulation by setting their own private food quality standards in order to choose the form of standards that minimizes their costs.

I. Introduction

Food quality standards and the ability to trace food within the supply chain have become increasingly important, both from the producer and the consumer sides. Historically, public food quality standards were set by the government with the objectives of safety from threats to life and health and prevention of food adulteration and misbranding (Gardner, 2003). However, in recent years, it is the private rather than public standards that are becoming the dominant drivers of the agri-food system (Henson and Hooker, 2001). In this paper, the recent growth of both public and private food quality standards and the factors driving this growth are discussed, including strategic incentives for setting private quality standards. The argument is that a firm restricts itself with private standards in order to choose the form of standards and to affect the total level of quality standards. With wide-ranging possible quality standards, firms choose the private quality standards that minimize their own costs before governments or international organizations do so.

Other researchers have studied incentives for firms to push for stricter public quality regulations or to over-comply with public quality standards. In their seminal paper, Salop and Scheffman (1983) show that a firm might want stricter regulations if

complying with them is relatively costlier for its rivals. Maloney and McCormick (1982) show that an industry might lobby for tighter legal standards if tighter standards are a barrier to entry. However, neither of these articles considers establishing private quality standards or type of standard chosen. Both Arora and Gangopadhyay (1995) and Kirchhoff (2000) analyze voluntary over-compliance with environmental regulations based on an environmental premium in the market.

Self-regulation is a related topic to private quality standards and has been studied in the environmental economics literature (Arora and Cason 1995; Maxwell et al 2000), the agricultural economics literature (Zago 1999) and in the law enforcement literature (Kaplow and Shavell 1994; Innes 1999). Malik (1993) shows that self-regulation can be beneficial to societal welfare if auditing costs and monitoring accuracy are sufficiently high.

The current paper adds to this literature by discussing the firm's incentive to strategically pre-empt government regulations with private quality standards by choosing the form of standards. Lutz, Lyon, and Maxwell (2000) use a duopoly model of vertical product differentiation to show that if a high quality firm can commit to a quality level before public regulations are promulgated, it induces the regulator to weaken standards. The current paper differs because it focuses on the form or type of standards rather than the overall level of strictness.

II. The Recent Growth of Public and Private Food Standards

In general, consumer expectations for food quality and concerns about food risk are both increasing. Both governments and the private sector have responded. This has

resulted in an abundance of food standards and certifications concerning safety, nutrition, characteristics, geographic origin, organic status, and other attributes, as firms try to position their products in the market for high-value foods.

In the public sphere, standards have increased and tightened with a greater emphasis on science as a basis for standards and a systems approach. A key example is the Hazard Analysis and Critical Control Point (HACCP) food safety program. HACCP applies science-based controls to prevent hazards that could introduce food-born illnesses at the point where the hazards initially occur. HACCP was adopted in the United States in the late 1990s and has been recognized internationally by the Codex Alimentarius commission.

Internationally, there is a growing proliferation of food standards and certifications. As Henson and Reardon (2005) discuss, quality meta-systems (such as the ISO 9000 series) are embedded in voluntary public standards at the national and/or international levels. The ISO 9000 series of quality management standards was developed to create a framework of the fundamental generic elements that would form the basis for a series of internationally recognized quality management standards (jobwerx.com, 2006). It is in use in many countries and is increasingly becoming a requirement for food manufacturers in order to sell their products. Other quality meta-systems include good manufacturing practice (GMP) and good agricultural practice (GAP) (Henson and Reardon, 2005).

Geographical identifications (GIs) can also be thought of as food quality standards. As specialty, regional, authentic, and local food products have become a more important part of consumer purchases in recent years, firms have responded by marketing

food products that come from specific geographic areas. This trend has led to a greater reliance on GIs. In 1992, the European Union (EU) passed a package of legislation (EC Regulations 2081/92 and 2082/92), which provides protection of food names on a geographical basis. The categories of protected food products recognized in this regulation are protected designation of origin (PDO) and protected geographical indications (PGI), and each protected product has is own standards. These programs promote regional and "traditional" products in unique value-added niche markets and help preserve traditional production that otherwise may disappear in a competitive market. An example of a PGI is "Galician Veal" *(Ternera Gallega)* from Spain. The quality standards for production of this product are quite strict. They include that the feed must be traditional and natural, and it is prohibited to treat the animals with products that speed their growth and development (such as hormones), as well as feed derived from other animals.

As concern about genetically modified (GM) foods has increased, GM labeling standards are receiving more attention. Individual countries or groups of countries have set their own standards or thresholds for GM food products, ranging from the United States, which does not require labeling of GM products, to outright bans in some countries. The disparity in standards can and has resulted in trade disputes. The challenge of Codex will be to find the best possible set of international standards for GM food labeling that still allow fair trade, consumer choice and innovation (Kalaitzandonakes and Phillips 2000).

Two new U.S. laws that are having the greatest and most immediate impact on the food supply chain are the Country of Origin Labeling (COOL) Act and the U.S. Bio-

terrorism and Response Act of 2002. The COOL Act requires labeling for beef, lamb, pork, fish, perishable agricultural commodities and peanuts. The implementation of mandatory COOL for all covered commodities except wild and farm-raised fish and shellfish has been delayed until September 30, 2006. Although many food industry firms were originally positive about COOL owing to the potential to gain from marketing their products as "made in the USA," many lobbied for the delay in implementation because of concern about high costs of compliance. The U.S. Bio-terrorism and Response Act of 2002 requires the establishment and maintenance of records by persons who manufacture, process, pack, transport, distribute, receive, hold, or import food in the United States. Like HACCP, this Act creates standards in documentation and traceability in the production process.

Private standards have been evolving which address quality, environmental, and social concerns. Producer groups market products which explicitly claim that the products were produced with sound environmental, animal welfare, and fair labor practices. The environmentally friendly marketing movement is already successful and growing rapidly. For example, the German eco-label, Blue Angel (*Blauer Engel*), introduced in 1978, has become a successful instrument in environmental protection and marketing. Nearly 4,000 certified products use it. The Euro-ecolabel, launched in 1998, regulates and sets common standards for all eco-labels in the European Union countries. In the United States, eco-labels are proliferating rapidly with programs such as Green Seal, Scientific Certification Systems, and the U.S. Environmental Protection Agency's Energy Star Program. In addition, many regional sustainable agriculture programs set standards to assure acceptance in regional niche markets for "green" products.

Finally, with the expansion of premium food products (often with premium prices) in many categories from coffee to salt, it is an easy argument to make that consumers expect higher quality in their food purchases. It follows that there is a greater focus on private standards and codes of practice, which are becoming a requirement in order to do business. McCluskey and O'Rourke (2000) found an increased emphasis by major food retail buyers on product specifications. This does not necessarily mean that higher quality is being demanded. Rather, the buyers want to pay for exactly what they were receiving, and they want the product much more strictly defined than it was in the past. Further, as will be discussed below, consolidation in the food retail sector has given the major food retailers the bargaining power to define these private standards.

III. Reasons for the Growth in Public Food Standards

New government food regulations are being enacted as consumers are becoming more concerned about health and food safety, resource sustainability, and other environmental issues. Also, as in the case of the U.S. Bio-terrorism and Response Act of 2002, governments respond to an intentional outside threat. Consumers want to know the most basic information about "*what it is, how it was produced, and where it is from,*" throughout the supply chain. They want to know the origin of their food, and they often prefer locally produced products. They are concerned about food safety issues, such as contaminated meat. By setting standards and ensuring accurate provision of information, governments create greater accountability for the food industry by discouraging irresponsible activities and rewarding beneficial and sustainable endeavors.

Further, public regulations can correct market failure. For example, before the USDA set its national organic standards, there was no national definition of what constitutes an organic food product. Under the previous system, some organic foods were certified under state and private certification programs, and consumers were often confused about what the term "organic" actually meant, which opens the door for "lemons" and/or fraud. Consumers benefit if standardization and increased consumer confidence in quality cause markets to expand and to become more efficient. Finally, governments have advantages in setting public standards compared with private standards. Regulators can easily establish a single standard such as organic with certainty and prosecute violators under criminal law.

IV. The Reasons for the Growth in Private Food Standards despite the Existence of Public Standards

Flexibility in Response to a Changing Environment

As introduced earlier, the food distribution system continues to change at a rapid rate. New formats continue to evolve, consolidation has increased among major retail food chains, and new technology is constantly being introduced. A drawback of public standards is their lack of flexibility. Public standards do not adjust to changes in consumer preferences or technology. As consumer tastes and preferences continue to change, the private sector has responded to ensure consumer satisfaction. To be successful in this new food distribution system requires retailers to display market

leadership, carry strong brands, establish a good reputation for quality and price, and exhibit flexibility and adaptability.

A number of different forces are at work in the food supply chain. Among these forces are the increased level of mergers and acquisitions between retail grocery store chains, internal growth and expansion into food within both retail grocery store chains and retail discount stores, and technology and innovation. The expansion of Wal-Mart has been a catalyst for many of these changes. Wal-Mart built much of its success on the use of information technology to control costs in every part of its system, thus allowing it to sell at every day low prices (EDLP) which drew in an ever-expanding pool of customers. Wal-Mart brought its purchasing might, logistics expertise and category management skills to the food retailing business.

The Wal-Mart threat forced traditional retailers to rethink their current mode of operation. Traditionally, supermarkets competed for customers by building larger and larger outlets, stocking an ever-increasing array of items and adding many peripheral services. They attempted to buy most items on deal (i.e. when the seller offered a discount for volume purchases) and to have extensive (and costly) inventories in the system. The first major shock to this system was when Procter and Gamble unilaterally in 1992 announced that it was switching to EDLP and would no longer sell on deal.

Traditional players in the food supply chain formed a working group to evaluate the inefficiencies of the supply chain as configured at that time and to develop strategies to improve the system to counter the competition created by the non-traditional food retailers like Wal-Mart. The outcome was the Efficient Consumer Response (ECR)

initiative, which forced suppliers and retailers to work together to reduce costs and enhance profits while better serving consumers.

Vertical alliances in the food distribution system became common. It encouraged the adoption of information technology to better identify inefficiencies. Some of the applications are in category management and activity-based costing, enabling both supplier and retailer to identify opportunities for lowering costs or enhancing value to consumers. In this new food retail environment, there are higher standards by necessity of supply chain traceability.

Strategic Incentives for Private Standards: The Model

In this section, strategic incentives for private standard setting in order to pre-empt public regulations are analyzed. First, we assume that food quality standards are multi-faceted (such as a vector of standards), and that different types of standards within this vector will affect firm revenues differently, depending on the firm's competitive advantage. The initial endowments of a firm will affect how the types of standards impinge on revenues. For example, the choice of standards for a firm located in an industrialized country might be different from the choice of standards for a firm located in a lesser developed country. We also assume the public's perception of desirable food quality standards is a function of its preferred characteristics that affect the product's taste, appearance, odor and texture, the number and severity of food contamination incidents, and the cost of implementing these standards. Specifically,

$S_{public} = f(V, Q, P) + \varepsilon$, where V is the number (weighted by severity) of food contamination incidents, Q is a vector of characteristics, P is a vector of food prices, and

ε is a random variable error term. We assume that the public regulator's objective is to be perceived as fair and competent by the public and the international community. It meets this objective by minimizing the absolute value of the difference between the total standards imposed (the binding self-imposed private quality standards plus the binding public standards) and the public's view of the appropriate standards. If we normalize each standard we can write the public regulator's objective as,

$$(1) \qquad \min_{S_R} \left| \sum_{i=1}^{n} S_{Private,i} + \sum_{i=1}^{n} S_{R,i} - \sum_{i=1}^{n} S_{Public,i} \right|$$

where there are *n* possible types of standards. $S_{private,i}$ is the i^{th} type of private standard that is self-imposed by the firm, and $S_{R,i}$ is the i^{th} type of standard that is imposed by the regulator.

Since the firm knows the public regulator's objective and is able to set the private standard first, the firm is able to minimize its costs. Therefore, if the firm sets its private standard, the public regulator's additional standard is given by,

$$(2) \qquad \sum_{i=1}^{n} S_{Public,i} = \max\left\{ f\left(V,Q,P\right) + \varepsilon - \sum_{i=1}^{n} S_{Private,i}, 0 \right\}.$$

It follows that the final quality standard is given by,

$$(3) \qquad \sum_{i=1}^{n} S_{final,i} = \sum_{i=1}^{n} S_{Private,i} + \sum_{i=1}^{n} S_{Public,i} = \max\left\{ f\left(V,Q,P\right) + \varepsilon, \sum_{i=1}^{n} S_{Private,i} \right\}.$$

Equations (2) and (3) only show the sum of the types of standards and do not distinguish between standard given by the public regulator and private standard that the firm gives itself. However, this is important to the firm, and we will illustrate this with the firm's net revenue function. The revenue function, $R\left(\sum_{i=1}^{n} S_{Private,i}, \sum_{i=1}^{n} S_{Public,i}\right)$, is a decreasing function with respect to both types of standards. The more strict standard the firm receives, the lower revenues its will be. However, since standards are multifaceted, different types of standards will affect revenues differently. Since the firm can choose its private standards, it should choose the standard that marginally decreases revenue the least. It follows that at any given standard level, $\frac{\partial R}{\partial \sum_{i=1}^{n} S_{Public,i}} \leq \frac{\partial R}{\partial \sum_{i=1}^{n} S_{Private,i}} \leq 0$.

In this model, there is an optimal set of private standards for the firm. The firm has an incentive to choose the set of private standards at a level in which the public regulator will accept the standards and not add any additional standards. If the private standards have not yet reached that point, creating additional private standards will increase revenue at a rate of $\frac{\partial R}{\partial \sum_{i=1}^{n} S_{Private,i}} - \frac{\partial R}{\partial \sum_{i=1}^{n} S_{Public,i}}$. However, if the private standards are already stringent enough so that the public regulator will not impose additional standards, adding or increasing private standards will decrease revenue by $-\frac{\partial R}{\partial \sum_{i=1}^{n} S_{Private,i}}$.

Figure 1 shows how the firm's private standard affects the final standard. In Figure 1, we assume that the value of $\frac{\partial^2 R}{\partial \sum_{i=1}^{n} S_{Public,i}{}^2} = 0$. This is defendable, since there is no rationale for this second derivative to have either a positive or negative sign. Without loss of generality, we will also assume that the public regulator will distribute its standards evenly throughout the different standard categories, so

$$P_{Public,i} = \frac{\sum_{j=1}^{N} S_{Public,j}}{N}, \quad \forall i.$$

If $\Pr\left(\sum_{i=1}^{n} S_{Private,i} > f(V) + \varepsilon\right) < 1 - \frac{\partial R / \partial \sum_{i=1}^{n} S_{Private,i}}{\partial R / \partial \sum_{i=1}^{n} S_{Public,i}}$, then a risk neutral firm should increase its private standard until the probability equals $1 - \frac{\partial R / \partial \sum_{i=1}^{n} S_{Private,i}}{\partial R / \partial \sum_{i=1}^{n} S_{Public,i}}$. Therefore, assuming that the error term has a standard normal distribution, then the optimal choice of private standards is equal to,

$$\sum_{i=1}^{n} S^{*}_{Private,i} = f(V,Q,P) + \Phi^{-1}\left(1 - \frac{\partial R / \partial \sum_{i=1}^{n} S_{Private,i}}{\partial R / \partial \sum_{i=1}^{n} S_{Public,i}}\right), \tag{4}$$

where Φ is the cumulative distribution of a standard normally distributed random variable. (The formal details of this derivation are provided in the Appendix.) This rule results in the lowest expected final damages from standard for the firm. Combining

equations (4) and (3), we obtain an expected final standard, where the sum of the final standards are equal to $\sum_{i=1}^{n} S_{Private,i}$ with probability $1-\frac{\partial R \Big/ \partial \sum_{i=1}^{n} S_{Private,i}}{\partial R \Big/ \partial \sum_{i=1}^{n} S_{Public,i}}$, and standard is equal to $f(V)+\varepsilon$ with probability $\frac{\partial R \Big/ \partial \sum_{i=1}^{n} S_{Private,i}}{\partial R \Big/ \partial \sum_{i=1}^{n} S_{Public,i}}$. Using the expectation of a truncated normally distributed variable, the expected final standard is,

(5)

$$\sum_{i=1}^{n} S^{*}_{final,i} = f(V,Q,P) + \Phi^{-1}\left(1-\frac{\partial R \Big/ \partial \sum_{i=1}^{n} S_{Private,i}}{\partial R \Big/ \partial \sum_{i=1}^{n} S_{Public,i}}\right) + \left(\frac{\partial R \Big/ \partial \sum_{i=1}^{n} S_{Private,i}}{\partial R \Big/ \partial \sum_{i=1}^{n} S_{Public,i}}\right)\left(f(V,Q,P) - \sum_{i=1}^{n} S_{Private,i} + \frac{\phi\left(\sum_{i=1}^{N} S_{Private,i} - f(V,Q,P)\right)}{\left(1-\Phi\left(\sum_{i=1}^{N} S_{Private,i} - f(V,Q,P)\right)\right)}\right)$$

where ϕ is the probability density function of a standard normally distributed term. Using Equation (3) we can now find how a private standard affects the final standard. Each element *i* in the final standard vector is given by,

(6)

$$S_{final,i} = S_{Private,i} + \frac{\sum_{i=1}^{n} S_{Public,i}}{N} = S_{Private,i} + \frac{\max\left\{f(V,Q,P) + \varepsilon - \sum_{i=1}^{n} S_{Private,i}, 0\right\}}{N}.$$

In the simple case in which there is no additional standard imposed by the public regulator, the final standard will simply be the private standard. In this case, the increase in one type of standard will have no marginal effect on other types of standards. However, if the private standards are lax enough so that the public regulator imposes additional (more strict) standards, the effects of private standards are clear. In this case, increasing element *i* in the standards vector increases that particular type of standard in the final set of standards:

(7a) $$\frac{\partial S_{final,i}}{\partial S_{Private,i}} = \frac{N-1}{N},$$

but decreases the other types of standards in the following way:

(7b) $$\frac{\partial S_{final,i}}{\partial S_{Private,j}} = \frac{-1}{N},$$

where $i \neq j$. Therefore, since public regulators often imposes additional standards, we expect private standards to increase the type of standard that it gave itself, but decrease other types. In this way, firms will choose the specific standards that minimize the effects on revenues.

An example of strategic private standards from a non-food industry is the Motion Picture Association of America and its international counterpart, the Motion Picture Association, which serve as the voice and advocate of the motion picture industry. This

private association sets its own private standards for film ratings, and public regulators do not rate films.

V. Conclusions and Discussion

In this paper, the recent growth of both public and private food quality standards and the factors driving this growth were discussed, including strategic incentives for setting private quality standards. It is argued that firms may set private quality standards in order to choose the form of quality standards. If firms choose their standards, they can do so in a way that minimizes their costs.

The issue of who defines the standards, of course, has implications for international trade. Unless standards do not impose a binding constraint on producers, meeting them will increase production costs. The cost of meeting the standards will differ depending on a country's comparative advantage. Consequently, firms in one country may push for standards because they would raise its rivals' costs more than its own costs, perhaps to the extent of effectively making a particular country unable to compete.

It is often the case that private standards become the industry standard. When one firm implements a voluntary standard, then all other firms may "voluntarily" have to follow in order for supermarkets to carry their products. The end result is the same as if a public regulation had been imposed. For example, "dolphin-safe" tuna is a purely voluntary designation, but tuna without the "dolphin safe" label has disappeared from grocery shelves in the United States. Since the private standards can become *de facto* industry standards, can we trust the market to act in the public interest? Will industry

standards give specific countries advantages in the international market? There are also tradeoffs involved with setting public standards, including the loss of flexibility and lack of incentives for innovation.

Who defines the standards also has implications for economic development because different types of standards will affect firm revenues differently depending on its initial endowments. Since the leading multi-national food retailers are located in industrialized countries, the private standards that become the industry standards will likely be different from the choice of standards for a firm located in a lesser developed country.

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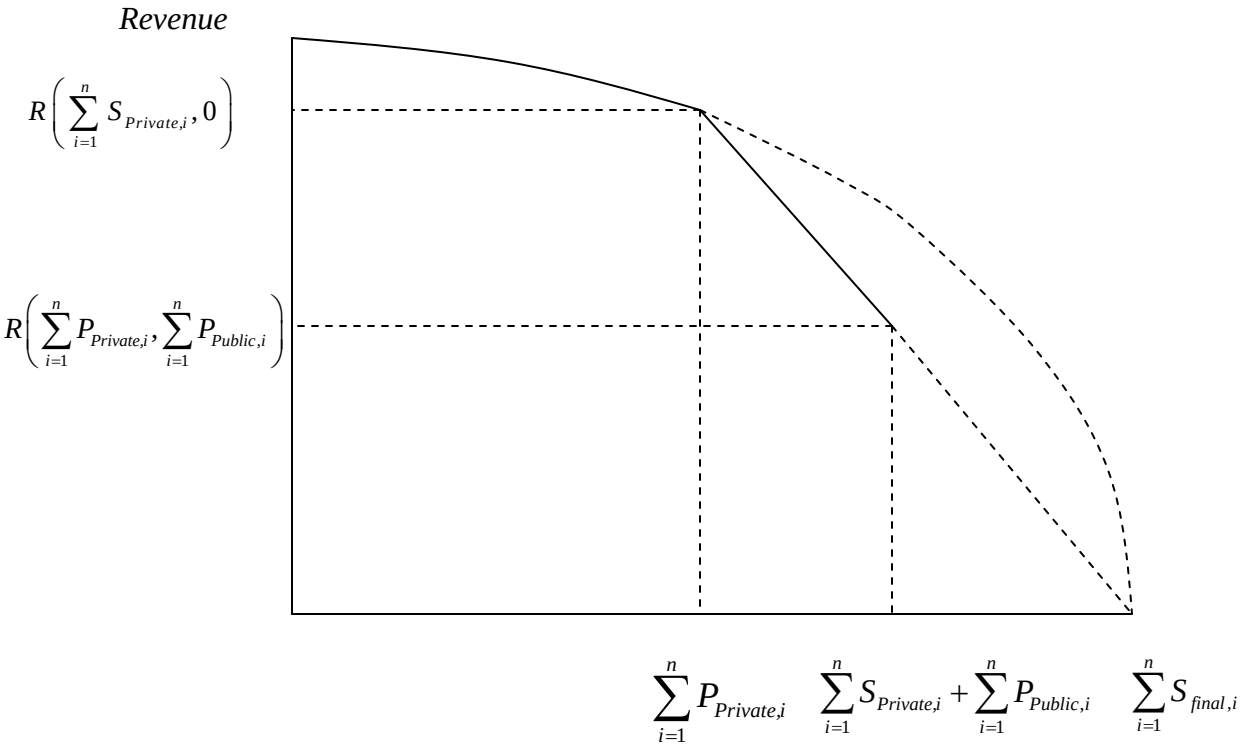
Figure 1


Revenue
$R\left(\sum_{i=1}^{n} S_{Private,i}, 0\right)$
$R\left(\sum_{i=1}^{n} P_{Private,i}, \sum_{i=1}^{n} P_{Public,i}\right)$
$\sum_{i=1}^{n} P_{Private,i}$
$\sum_{i=1}^{n} S_{Private,i} + \sum_{i=1}^{n} P_{Public,i}$
$\sum_{i=1}^{n} S_{final,i}$

Appendix

Given the properties of a truncated normal distribution, the expected revenue is given by the following,

$$E\left[R\left(\sum_{i=1}^{N} S_{Private,i}, \sum_{i=1}^{N} S_{Public,i}\right)\right] = \Phi\left(\sum_{i=1}^{N} S_{Private,i} - f(\cdot)\right) R\left(\sum_{i=1}^{N} S_{Private,i}, 0\right) +$$
$$\left[1-\Phi\left(\sum_{i=1}^{N} S_{Private,i} - f(\cdot)\right)\right]\left[R\left(\sum_{i=1}^{N} S_{Private,i}, f(\cdot) - \sum_{i=1}^{N} S_{Private,i} + \frac{\phi\left(\sum_{i=1}^{N} S_{Private,i} - f(\cdot)\right)}{\left(1-\Phi\left(\sum_{i=1}^{N} S_{Private,i} - f(\cdot)\right)\right)}\right)\right]$$

Therefore, the first-order condition is given by,

$$\frac{dE\left[R\left(\sum_{i=1}^{N} S_{Private,i}, \sum_{i=1}^{N} S_{Public,i}\right)\right]}{d\sum_{i=1}^{N} S_{Private,i}} = \frac{\partial R}{\partial \sum_{i=1}^{N} S_{Private,i}} + \phi\left(\sum_{i=1}^{N} S_{Private,i} - f(\cdot)\right)\left[R\left(\sum_{i=1}^{N} S_{Private,i}, 0\right) - R\left(\sum_{i=1}^{N} S_{Private,i}, \sum_{i=1}^{N} S_{Public,i}\right)\right] +$$
$$\frac{\partial R}{\partial \sum_{i=1}^{N} S_{Public,i}}\left[\phi'\left(\sum_{i=1}^{N} S_{Private,i} - f(\cdot)\right) + \frac{\phi\left(\sum_{i=1}^{N} S_{Private,i} - f(\cdot)\right)^2}{\left(1-\Phi\left(\sum_{i=1}^{N} S_{Private,i} - f(\cdot)\right)\right)} - \left(1-\Phi\left(\sum_{i=1}^{N} S_{Private,i} - f(\cdot)\right)\right)\right]$$

However since $\phi'\left(\sum_{i=1}^{N} S_{Private,i} - f(\cdot)\right) = -\left(\sum_{i=1}^{N} S_{Private,i} - f(\cdot)\right)\phi\left(\sum_{i=1}^{N} S_{Private,i} - f(\cdot)\right)$ because of the properties of a normal distribution and

$$R\left(\sum_{i=1}^{N} S_{Private,i}, 0\right) - R\left(\sum_{i=1}^{N} S_{Private,i}, \sum_{i=1}^{N} S_{Public,i}\right) = -\frac{\partial R}{\partial \sum_{i=1}^{N} S_{Public,i}}\left(f(\cdot) - \sum_{i=1}^{N} S_{Private,i} + \frac{\phi\left(\sum_{i=1}^{N} S_{Private,i} - f(\cdot)\right)}{\left(1-\Phi\left(\sum_{i=1}^{N} S_{Private,i} - f(\cdot)\right)\right)}\right)$$

because of the assumption that $\frac{\partial^2 R}{\partial \sum_{i=1}^{n} S_{Public,i}^2} = 0$, we can now collapse the derivative.

The first-order condition now gives us,

$$\frac{dE\left[R\left(\sum_{i=1}^{N} S_{Private,i}, \sum_{i=1}^{N} S_{Public,i}\right)\right]}{d\sum_{i=1}^{N} S_{Private,i}} = \frac{\partial R}{\partial \sum_{i=1}^{N} S_{Private,i}} - \frac{\partial R}{\partial \sum_{i=1}^{N} S_{Public,i}}\left[1-\Phi\left(\sum_{i=1}^{N} S_{Private,i} - f(\cdot)\right)\right].$$ By

setting this equation to zero and solving for $\sum_{i=1}^{N} S_{Private,i}$, it give us equation (4).