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## **Entrepreneurial Supply Chains and Strategic Collaboration: The Case of Bagòss Cheese in Bagolino, Italy**

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### **Abstract**

Many small towns and communities are struggling to sustain their competitiveness in the face of increasing globalization. Yet, through entrepreneurial supply chains, some communities are organizing themselves to forge local solutions to their global challenges. The essence of entrepreneurial supply chains is its ability to facilitate alignment of all participants in the chain, eliminating moral hazard and opportunism risks. It is argued that this governance system and an ability to protect the common assets from infringement by outsiders are necessary for the success of these solutions. The research uses Bagòss cheese, produced in the small Italian village of Bagolino, to illustrate the characteristics of entrepreneurial supply chains and test the effect of the identified necessary conditions for their successful implementation.

**Keywords:** entrepreneurial supply chain, Bagòss cheese, globalization

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## **Introduction**

O'Hara and Stagl (2001) argue that increasing globalization has altered the relationship between economics and society because local alternatives are emerging as strong competitors to imports in local markets. They view the emergence of community supported agriculture as an example of the evidence that certain characteristics of production are becoming more important to consumers in their choice of products, especially food products. Increasingly, consumers are looking at food production, distribution and consumption as political tools in addressing environmental challenges (Theodoropoulou and others 2008), in dealing with conservation and preservation of culture (Leong 1989) and in contributing to economic development (Arce and Marsden 1993) even as they meet their primary economic purpose.

The importance of these issues is being driven by an increasing proportion of consumers who care about where and how their food is produced and are willing to pay premiums for products that meet their ethical sensibilities, including environmental protection, fair trade and social justice and animal welfare programs. Some firms are responding by emphasizing their sustainable production practices and highlighting their social responsibilities efforts, e.g., organic products, small family farms, habitat protection, etc. Others position themselves as distinct based on their appellation d'origin, such as "Champagne" and "Bordeaux" in French wines and "Vidalia onions" in the U.S. Within the context of the resource-based view of the firm, these idiosyncratic characteristics offer uniqueness in resources that are rare and valuable and are inimitable and non-substitutable (Lippman and Rumelt 1982). These firms' ability to successfully sustain their competitive advantage is supported by the credible threat of retaliation they possess against potential competitors (Day and Reibstein 2004).

This paper's purpose is two-fold. First, we evaluate the concept of entrepreneurial supply chains as business and economic development strategies in small communities within an increasingly global marketplace. The second purpose is to apply the outcomes of the evaluation to Bagòss cheese, produced in the small Italian village of Bagolino, which is dealing with globalization challenges. The application involves the simulation of the Bagòss producers' strategic decisions under alternative governance and intellectual property (IP) conditions. The lessons from the simulation provide insights into how local communities may leverage their solutions using appropriate governance systems and IP protection mechanisms to address their global challenges.

## **Entrepreneurial Supply Chains and Strategic Collaboration**

Traditional supply chains have a dominant champion controlling most of the strategic decisions associated with performance. Champions' power emanates from their control over the distribution of value (Amanor-Boadu, Trienekens and Williams, 2002). In exchange for their share of the value they create, participants conform to champions' specifications of types of input to use, the quality standards of outputs, production processes and quantities, delivery locations and times, etc. Because of this uneven power distribution, opportunism (Simon 1991) tends to be prevalent in traditional supply chains and anonymity becomes valuable (Amanor-Boadu and Starbird 2005). This governance mechanism may also foster moral hazard at points along the supply chain where participants perceive themselves to be powerless (Amanor-Boadu, Trienekens, and Williams 2002); (Starbird, Amanor-Boadu, and Roberts 2008). Here,

participants in the supply chain who perceive themselves as powerless will find it advantageous to shirk on the necessary but unobservable effort required to minimize potential risks to the whole supply chain. Although these traditional supply chains' risks may be addressed with oversight protocols that aim to increase transparency and reduce the value of anonymity, they can be expensive and cumbersome to execute if the partners have competing objectives. Entrepreneurial supply chains offer an effective alternative to traditional supply chains when opportunism or moral hazard risks cannot be otherwise effectively controlled.

Entrepreneurial supply chains are inter-firm relationships characterized by a mutual recognition of need for, and dependence on, a valuable asset that is inexhaustible in use but easily depreciated with misuse or abuse. Participants in entrepreneurial supply chains, therefore, recognize a shared responsibility in protecting and enhancing the value embedded in the enabling asset through social ties and networks (Granovetter 2005). The enabling asset's characteristics define the opportunities that may be exploited and the extent of participants' embeddedness in the governing social ties and networks. These characteristics also define the IP protection methods that may be employed to enforce exclusivity and create tangible value for participants. Although they may operate in the same marketplace, participants in entrepreneurial supply chains compete via blue ocean strategies which involve focused development of alternative strategy maps that specifically avoid price competition and focus on market expansion (Kim and Mauborgne 2005).

The collective success of entrepreneurial supply chain participants is driven by their independent ability to meet their customers' idiosyncratic expectations as well as maintain their collective diversity. Recognizing the foregoing, participants in entrepreneurial supply chains organize themselves around their shared assets while consciously taking personal ownership in maximizing the assets' contribution to their individual performance. Because they are non-linear, entrepreneurial supply chains are usually more extensive and complex than traditional supply chains, encompassing government agencies enforcing use rights and exclusivities, and businesses in multiple industries that depend on the shared assets. Thus, changes in the nexus of entrepreneurial supply chains can have significant effects in seemingly unrelated segments of the local economy in which they operate.

## **Typology of Entrepreneurial Supply Chains**

Three distinct groups of entrepreneurial supply chains may be delimited based on the types of assets: place assets; place/product assets; and place/product/process assets (Figure 1). Entrepreneurial supply chains based on place assets are organized around the unique characteristics of a location, and are, therefore, commonly found in the tourism industry. Their participants leverage the location's unique characteristics to provide customers with idiosyncratic experiences. Thus, the primary source of the participants' collective competitive advantage is the unique, valuable and unsubstitutable location asset they all share. They incorporate these qualities of the location asset into their individual strategies to achieve their business objective. An example of a place-based entrepreneurial supply chain is the Finger Lakes Wine Trails in upstate New York, which are organized to maximize tourist traffic to the Finger Lakes region of New York by exploiting the location's natural beauty and the diversity of its tourism activities. Included in the Wine Trails are vineyards, wineries, restaurants and bed and breakfast

accommodations as well as event organizers and tour bus operators. Individual participant's sources of competitiveness are in how they organize their own production and utilize the common assets to leverage their ability to delight their customers. It is not uncommon to have a participant in these relationships direct a potential customer to another partner who is deemed to be a better provider of a particular solution or product. This behavior of marketing each other elevates the common asset by first knowing their disparate strengths and then bringing their collective strengths together. A similar governance mechanism is found in the wine and tourism region of Southwestern Ontario region of Niagara-on-the-Lake, on the shores of Lake Ontario. Likewise, the ski resort towns of Whistler, British Columbia and in the Swiss Alps as well as resort locations like Acapulco, Mexico have place-driven entrepreneurial supply chains that leverage the location's assets to enhance participants' competitiveness in their industries. In all these examples, the immobility and inimitability of the common assets are the primary source of IP protection. As such, the participants' ability to establish and secure a first mover advantage is usually critical to their ability to sustain their competitive advantage. A good example of this is how Las Vegas, Nevada has successfully maintained its dominant market share, measured by gross gaming receipts, over Atlantic City, New Jersey despite the latter's efforts over the years (Eadington 1999).

Place/product asset-driven entrepreneurial supply chains are organized around products naturally occurring in a particular location. They also cover entrepreneurial supply chains that are organized around products that, while they may not occur exclusively in a particular location, have been there for such a long time that they have come to be literally associated with the place. They exhibit a natural barrier to competition because of their products' association with a particular location. Therefore, the place name becomes the embedded IP that separates the product from all others.

Italian suits and fashion are good examples of place/product entrepreneurial supply chains. While fine suits may be obtained from many places, being Italian elevates a suit above the others due to the association of quality suits with Italy, allowing industry participants to extract premiums for their products. The participants recognize that their distinguishing factor is quality, and they owe each other the responsibility of maintaining their perceived quality advantage if they are going to succeed individually. The same is true of Cuban cigars or California wines. Another example is Saskatoon berries, which is produced by a shrub that grows throughout the Canadian prairies and the northern plains of the United States (Harris 1972). However, by the fortuitous naming of the fruit, Saskatoon and Saskatchewan have claimed it as their own, marketing it as being authentic only if grown in Saskatchewan. Saskatoon berries' production and marketing have benefited from scientific evidence of its high antioxidant levels (Hosseinian and Beta 2007); (Hellstrom and others 2007) and the increasing appreciation of nutraceuticals' role in health protection and promotion (Morris 2003). The final type of entrepreneurial supply chains is place/product/process entrepreneurial supply chains. These are organized around a product that is produced in a particular place using a specific process, inputs or production technology. The products produced within this type of entrepreneurial supply chains, therefore, tend to have more controls and standards around them than the other two. They have explicit IP protection protocols that serve to exclude non-conforming products and producers from exploiting the value offered by the supply chain. These protocols may also confer legal protection from suppliers who do not meet the place/product/process characteristics that create value in the marketplace.

Roquefort cheese is an example of place/product/process entrepreneurial supply chains. It is a blue cheese made specifically from the milk of Lacaune, Manech and Basco-Béarnaise breeds of sheep and matured in natural caves near the town of Roquefort in France's Aveyron region. A unique fungus, *Penicillium roqueforti*, whose spores are used to infect the maturing cheese to give it its unique characteristics, grows in these caves. Roquefort cheese's IP explicitly dates back to 1411 when the village of Roquefort-sur-Soulzon sought and obtained the rights from King Charles VI to age this particular type of cheese in its caves (Aussibal 1983). There were only seven Roquefort producers as of 2003, and the largest is the Société des Caves de Roquefort (a subsidiary of Lactalis), which accounts for about 60 percent of all production and owns several caves. The entry barrier to the Roquefort cheese production is the cave, the place asset that determines the product and the process.

Another example of place/product/process entrepreneurial supply chains is Vintners' Quality Assurance (VQA) employed by Ontario, Canada wine producers. This is not a product, per se, but a label that allows a chain participant to claim a mark of quality. To qualify for this label, the bottled wine must be produced by a winery located in Ontario and be made with at least 75 percent of grapes grown in Ontario (Wine & Vines 2007). Participating wineries are audited every six months to ensure that they are following VQA regulations and all volumes of VQA wines are substantiated with respect to origin and other requirements. For example, the wineries must provide official Grape Growers of Ontario records including a "weigh slip" with the results of an independent test for brix. Additionally, participating retailers are audited at least annually for their use of the VQA labels as well as their sales of VQA wines for authenticity. This supply chain's governance system, thus, encompasses grape growers, wineries, retailers, the Liquor Control Board of Ontario (LCBO), and the government agencies that audit the industry for compliance.

Another example of place/product/process entrepreneurial supply chains is Vidalia onions, grown since the early 1930s only in Vidalia onion production area—encompassing 20 counties in the state of Georgia, U.S. Vidalia onions are characterized by being unusually sweet, a characteristic emanating from the low soil sulfur content in the production area. The Vidalia Onion Act (1986), passed by Georgia's state legislature, authorized a trademark for "Vidalia Onions" and the Georgia Commissioner of Agriculture was given the authority to promote and protect Vidalia onions by assessing royalties on legitimate users and prosecuting violators with fines and/or imprisonment. The IP protection for Vidalia onions was enhanced when the industry received a Federal Marketing Order No. 955 in 1989 from the U.S. Department of Agriculture (Costa and Epperson 2003; Boyhan and Torrance 2002).

From the foregoing, it is clear that government's role in the place/product/process entrepreneurial supply chains is necessary for providing enforceable intellectual property rights or preventing counterfeits by outsiders and opportunism by participants. The Canadian VQA process, for example, focuses on preventing opportunism among participating firms to ensure that they follow all the necessary protocols. The European Community's Council Regulation 1383/2003 (The Council of the European Union 2003), on the other hand, focuses on customs action and measures that may be taken against goods suspected of infringing certain intellectual property rights that have been granted to specific products. The regulation is an expansion and strengthening of existing national laws, such as France's Appellation d'origine contrôlée (AOC), Italy's Denominazione di origine controllata (DOC), and Spain's Denominación de Origen (DO)

system. Infringements, such as selling products not meeting the location and process qualifications, are treated as counterfeit goods, misleading advertisements, or even a public health risks. The regulation is weighed in favor of those who have been granted the rights, and allows for a “a more flexible procedure allowing goods infringing certain intellectual property rights to be destroyed without there being any obligation to initiate proceedings to establish whether an intellectual property right has been infringed under national law” (Article 9, L 196/7). Similar protection is offered in European Union laws under geographical indications— Protected Designation of Origin (PDO), Protected Geographical Indication (PGI) and Traditional Specialty Guaranteed (TSG) — to protect the names of recognized regional foods and beverages. Examples of these are Italian Limone di Sorrento, Scotch Whiskey and French Coquille Saint-Jacques des Côtes-d’Armor.

The foregoing suggests that entrepreneurial supply chains may be assessed on the basis of the mobility of the assets, the depth of IP protection and the extent to which participants need to be engaged for the governance system to work, i.e., exhibit low risk levels for opportunism and moral hazard. Figure 1 summarizes these characteristics for the three types of entrepreneurial supply chains presented here. For example, the high immobility of place systems implies that participants are more independent of each other and require low degree of engagement for the system to succeed. On the other hand, the low immobility of place/product/process systems makes them easily imitable and hence more prone to counterfeiting. These conditions call for high levels of intellectual property protection and high degrees of participant engagement for the system’s success in creating unique and valuable solutions (Grant 1991).

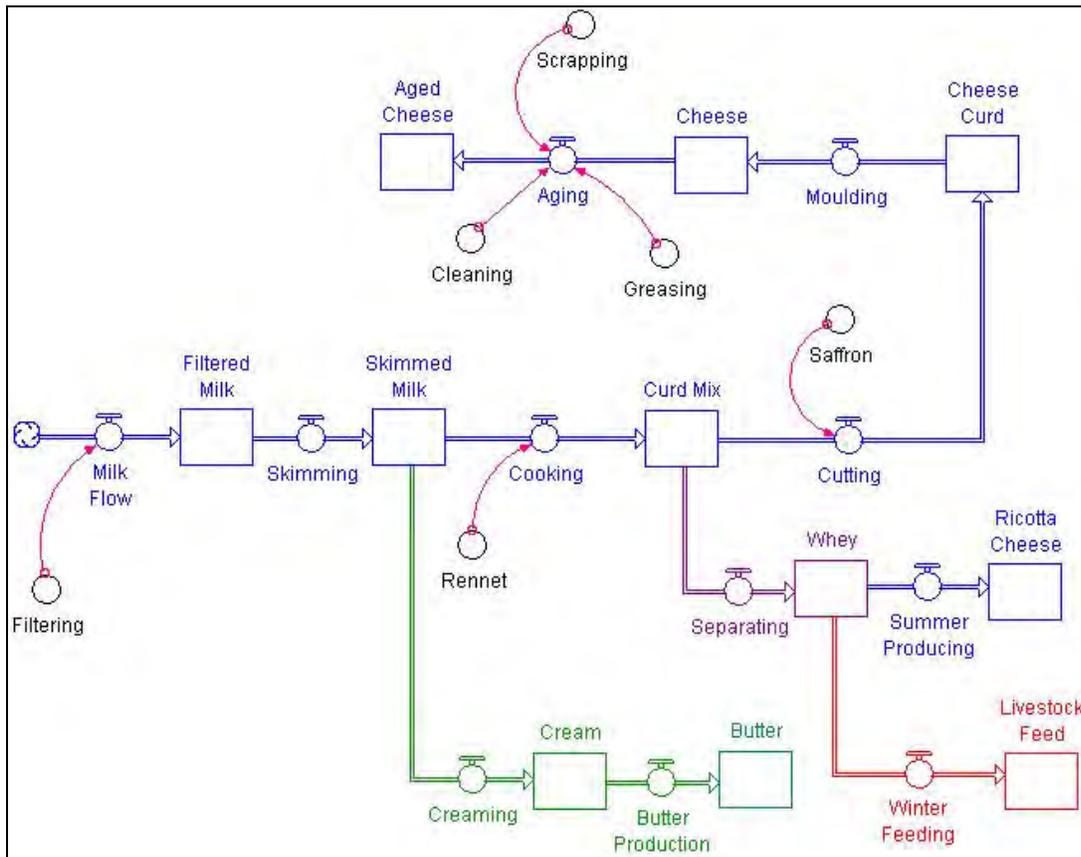
| Type                  | Immobility | IP Protection | Degree of Participant Engagement | Examples                      |
|-----------------------|------------|---------------|----------------------------------|-------------------------------|
| Place                 | High       | Low           | Low                              | Hawaii Surfing, Grand Canyon  |
| Place-Product         | Low        | Medium        | Low                              | Italian Suits, Scotch Whiskey |
| Place-Product-Process | Low        | High          | High                             | Vidalia Onions, VQA Wines     |

**Figure 1.** Typology of entrepreneurial supply chains with characteristic differences

## Bagòss Cheese: An Entrepreneurial Supply Chain

We use the entrepreneurial supply chain for Bagòss cheese in the village of Bagolino, Italy to illustrate the local solution that emerges as a result of participants acting in concert to address their own global challenges. It shows how the purposeful pursuit of individual economic objectives leads to social benefits, such as environmental protection and conservation, community economic development and enhanced cultural education and preservation.

Authentic Bagòss cheese is a semi-cooked cheese produced under strict milk production and cheese processing methods that have been practiced for centuries. It is produced only in Bagolino using the milk of brown cows that live in Bagolino and are fed only feed grown in Bagolino. The process begins with the immediate filtering of the milk after milking using conifer branches placed at the bottom of a bucket with holes in it (Figure 1). The filtered milk is skimmed and poured into 40-liter vats and left for a day. Rennet, dissolved in spring water, is added to the skim milk and poured into a copper vat and warmed on a wood-built fire to a temperature of between 37°C and 39°C for about 20 minutes before adding powder curd to the warm milk. The mixture is then heated to between 48°C and 50°C to produce an appropriate consistency. It is then cut into the size of rice grains. Saffron is added to the mixture and reheated to form curds (although some producers add the saffron when they add rennet to the skim milk). The curds are separated from the whey, wrapped in canvas, and placed into molds



**Figure 2.** Schematic overview of Bagòss production with process by-products

of 40 cm diameter and heights between 12 cm and 15 cm. These are then placed on wooden planks, and stones placed on top to drain any excess water, a procedure that lasts about three days. The cheese is released from its wrappings after this period and brought to the valley, where it is aged from a year to three years. In the first five weeks of the aging process, the cheese is dry salted twice a week by hand, and during the first six months of aging, it is turned periodically, scraped, cleaned and greased with linseed oil. The final head of authentic Bagòss cheese weighs between 16 kg and 18 kg depending on its age and is produced from between 260 kg and 290 kg of milk.

### *Bagolino and the Participants*

Bagolino is a small village with a 2007 population of 3,916 (National Institute of Statistics (ISTAT) 2007) located in the Caffaro Valley of Brescia Province in the Italian alpine region. About a decade ago, the per capita income per taxpayer in Bagolino was lagging significantly behind that of the Brescia province and a much farther behind the Lombardy region. However, unlike many small alpine communities that are losing population and economic activity and their natural resources becoming wasted, Bagolino saw a 16.5 percent increase in income per taxpayer between 1999 and 2007 compared to 2.7 percent for the Province of Brescia, 7.5 percent for the region of Lombardy and 2 percent for all of Italy. Civic leaders in Bagolino attribute this increase to a focused effort to enhance the importance of Bagòss cheese in Bagolino's economy. Bagòss cheese is one of Bagolino's two main historic assets. The other is the Bagòss Carnival, which, with its masks, colorful costumes, dancers and folk music, is described as a unique phenomenon in Italy, with few competitors in Europe (Sordi 1976). While most tourists come to Bagolino for the Carnival, Bagòss cheese remains the one thing they take with them when they leave. For this reason, Bagolino's dairy producers and the community joined forces more than a decade ago to secure a trademark for their cheese to facilitate promotion and marketing as well as acquire the legal support to prevent infringements under European Community laws. This initiative's importance is underscored by the recognition that about twice as much counterfeit as authentic Bagòss cheese is currently on the market.

The village of Bagolino has 130 farmers, 28 of whom are dairy farmers (ISTAT 2007). We interviewed 23 of these dairy farmers for this research. Together, they farm about 3,000 ha, with an average holding of 136 ha, ranging from 12 to 349 ha. Cow numbers and cow productivity range from eight to 42 and 1,300 kg to 4,900 kg per cow per annum respectively, with an average of about 25 cows per farm and 3,133 kg per cow per year. This productivity contrasts with Brescia province average of 6,451 kg in 2007 (ANARB 2008).

Two of the dairy producers interviewed were too small to process their own cheese, selling their milk to the local processor. The larger producers who process their own cheese also sell any excess milk they have—about 16.9 percent of total milk production of nearly 1,798 metric tons—to the local processor. Total annual authentic Bagòss cheese produced for sale was 138.8 metric tons, distributed as follows (Table 1): Direct-to-consumer (45.8 percent); Local retailers (21.9 percent); Wholesalers (12.0 percent); Outside retailers (15.9 percent); Restaurants (3.9 percent); and Agers (0.7 percent). Fifteen of the 23 producers distributed through local retailers, compared to 14 who sold directly to consumers. Eight, nine and ten producers sold to wholesalers, restaurants and outside retailers respectively, and only three producers sold to agers.

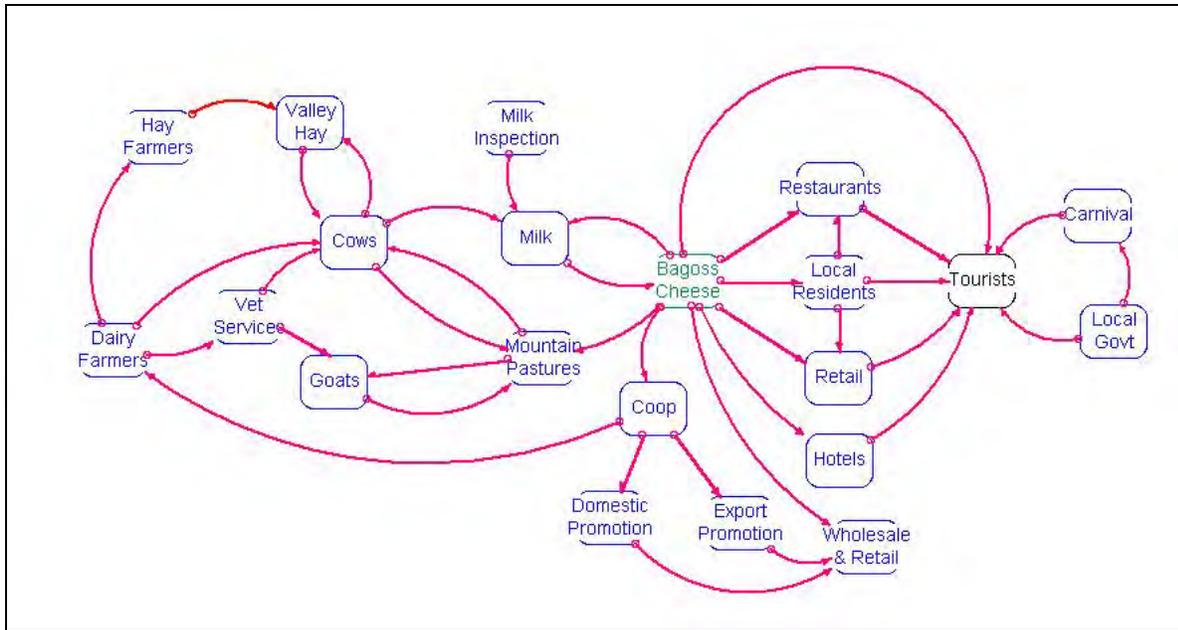
**Table 1.** Prices and quantity of Bagòss Cheese by channel and age

| Distribution Channel | Price/kg |       |       |           | Age at Sale    |               |              | Total          | Number |
|----------------------|----------|-------|-------|-----------|----------------|---------------|--------------|----------------|--------|
|                      | Min      | Max   | Mean  | Std. Dev. | < 1 Year       | 1 - 2 Years   | 2+ Years     |                |        |
| Consumers            | 9.50     | 22.50 | 15.00 | 4.15      | 44,323         | 18,996        | -            | <b>63,318</b>  | 14     |
| Restaurants          | 11.00    | 25.00 | 17.22 | 4.86      | -              | 286           | 5,070        | <b>5,356</b>   | 9      |
| Local Retailers      | 9.00     | 16.50 | 12.97 | 1.94      | 30,354         | -             | -            | <b>30,354</b>  | 15     |
| Outside Retailers    | 11.50    | 22.00 | 15.10 | 3.04      | 11,434         | 10,972        | -            | <b>22,406</b>  | 10     |
| Wholesalers          | 11.50    | 19.00 | 14.13 | 2.72      | 16,356         | -             | -            | <b>16,356</b>  | 8      |
| Agers                | 12.00    | 13.00 | 12.50 | 0.50      | 999            | -             | -            | <b>999</b>     | 3      |
| <b>Total</b>         |          |       |       |           | <b>103,466</b> | <b>30,254</b> | <b>5,070</b> | <b>138,790</b> |        |

Table 1 also shows that 74.5 percent of total cheese produced is sold within a year of production (i.e., fresh), 21.8 percent is sold between a year and two years, and the remaining 3.7 percent is sold as aged cheese, i.e., two or more years old. Three principal reasons explain the high proportion of fresh sales: labor; cash flow; and aging storage limitations. The farmers note that their most limiting resource is labor and the aging process is labor intensive. By selling a large proportion of their production as fresh cheese, the farmers avoid the labor and space constraints and increase their cash flow. Although they do not make as much money this way, they point out that they avoid shrinkage and other storage risks.

Also presented in Table 1 are the summary price statistics by distribution channel. We found that restaurants, which do not purchase fresh cheese, paid the highest average price, €7.22/kg, a price found to be significantly different from the prices paid by all the other channels at the 10 percent level. Contrarily, agers and local retailers purchase only fresh cheese, paying an average price of €12.50/kg and €12.97/kg respectively. Outside retailers purchase nearly equal proportions of fresh and medium-aged cheese and pay an average price of €15.10/kg, while the direct-to-consumer price ranged from €9.50/kg to €22.50/kg and averaged about €15.00/kg. Bagolino dairy producers depend solely on their own labor and that of their family members, therefore, labor is treated as a residual claimant and cows are treated as capital. Milk production variable costs are defined to include feed purchases, pasture rent, land and building rent, veterinary expenses and fuel and utility expenses while cheese production variable costs include saffron and rennet expenses. Average milk production variable expenses amounted to about €3,113 while cheese production variable expenses (excluding milk) amounted to approximately €2,250 per farm. Feed purchases and pasture rent accounted for almost 75 percent and 8.5 percent of milk production variable expenses respectively while saffron costs accounted for about 79 percent of cheese production variable expenses. Thus, the majority of variable expenses for Bagòss producers is providing food for the cows. This is probably because of the strict production specifications associated with Bagòss production—from rules relating to the breed of cows, housing, and feeding and cheese processing and aging.

Bagolino’s dairy farmers graze 1,100 cows and calves on the 22 pastures they have developed in the mountains around their village during the summer months and feed them hay from the valley during the winter months (Figure 2). Due to labor shortage, it is not uncommon to find farmers collaborating in taking care of their cows in the mountains. Dependence on the mountain pastures as part of their production process has caused the farmers to protect the quality of their mountain environment, using goats instead of pesticides, for example, in weed control (Suttini, October 4, 2008). The dairy farmers supply manure to the crop farmers in the valley from whom they purchase hay in the winter. They receive veterinary services from the government and milk quality inspection services from the provincial milk producer association (Stagnoli, October 4, 2008). Valli di Bagolino cooperative provides domestic and international marketing and promotion support for Bagòss cheese, protects the trademark and enforces production standards. Bagolino’s local government actively promotes Bagòss cheese (as well as the carnival), creating traffic to Bagolino and consumer awareness about its principal assets. The 17 hotels and 12 restaurants in the village showcase Bagòss cheese and actively promote it because of the benefits it brings. The entrepreneurial supply chain offers customers—tourists, retailers, restaurants, etc.—uniqueness because of its artisanal production system, creating a diversity that allows each producer to develop and maintain loyalty among their own customers.



**Figure 3.** Participating organizations, individuals, products and services in Bagòss Cheese entrepreneurial supply chain

### *A Local Solution to a Global Challenge*

We have argued that entrepreneurial supply chains can offer effective local solutions to global challenges, and the effectiveness of these solutions have been implied to increase as one moves from place to place/product/process structures. The problem that many small communities

involved in these relationships face with their solutions is how to sustain their effectiveness given the dynamic environment of globalization. Focusing on place/product/process entrepreneurial supply chains, we hypothesize that the governance system and the IP protocols are necessary conditions for sustainability in the global marketplace. The chain's governance structure determines the alignment of participants' objectives and the potential risks of moral hazard and opportunism (Amanor-Boadu and Starbird, 2005). The artisanal pride that Bagòss producers bring to their production and participation in the Bagòss entrepreneurial supply chain ensures that their individual objectives are aligned with that of the collective objective of protecting the quality and image of Bagòss cheese. The IP protection protocols provided by the EU government for such products offer significant support for prosecuting and preventing counterfeits from entering specific markets. When the Bagòss entrepreneurial supply chain participants can enforce these regulations and protect their loyal customers from counterfeit products through education, then they can improve their product's value position in the global marketplace, ensuring the sustainability of their local solution.

#### *A System Dynamic Model for Bagòss Cheese*

We test the foregoing hypothesis using a system dynamics modeling approach. The approach, grounded in nonlinear dynamics' theory (Lane, 2001), uses well-defined assumptions to describe and analyze complex and dynamic feedback problems (Forrester, 1968; Sterman, 2000). It has been applied extensively in problems with complex inter-relationships: management of complex technology projects (Philbin, 2008); collaboration in supply chains (Pawlak and Malyszek, 2008); the relationship between education and economic growth (Ndiyo, 2007); and assessment of infectious diseases (Pradas-Velasco, Antoñanzas-Villar and Martínez-Zárate, 2008). It is useful in this problem because of its ability to handle the complex feedback relationships among governance, IP protection and dairy producer profitability. The system dynamic models for this research were developed and simulated with iThink®, a simulation software from iseesystems [www.iseesystems.com](http://www.iseesystems.com). The simulation models in iseesystem NetSim format may be requested from the communicating author.

In testing the hypothesis, we develop two alternative scenarios relating to the governance and IP protection respectively and compare them to the base scenario which describes the current Bagòss cheese entrepreneurial supply chain. The focus of the analysis is limited to dairy producers since they are considered the nexus of the Bagòss entrepreneurial supply chain. Thus, it is assumed that the success of dairy producers creates positive externalities in the whole community and vice versa. Under the base scenario, producers are in charge of all three principal stages in the chain—milk production, cheese processing and cheese marketing and distribution and, thus, transfer their milk internally for cheese processing and marketing (Table 2). The average milk to cheese conversion rate is 13.31 kg in the base scenario.

The governance scenario assumes a traditional supply chain which is 'owned' by a processor who purchases all the milk produced by Bagolino's dairy producers. Because producers know their milk is co-mingled at the processing plant, they have an incentive to avoid all costs they can avoid and escape any associated direct penalties. Thus, they may cows save on labor by putting on cheaper commercial feed, which also increases cow productivity. This is a direct result of the divergence in chain participants' objectives emanating from the change in governance. As

farmers focus on maximizing profit from milk production and loss focus on maximizing the value of the Bagòss brand, the product loses its advantage in the market as counterfeits compete effectively with the declining distinguishing characteristics. Declining prices may force the

**Table 2.** Critical Assumptions Defining Alternative Scenarios

| Critical Variables                | Base                              | Traditional Supply Chain                    | Intellectual Property             |
|-----------------------------------|-----------------------------------|---|-----------------------------------|
| Milk Production                   | Producer                          | Producer                                    | Producer                          |
| Local Feed and Pasture            | Voluntary                         | Not necessarily                             | Compulsory                        |
| Milk Price                        | Transferred Internally at €0.0/kg | Sold to Processor at €0.35/kg               | Transferred Internally at €0.0/kg |
| Cheese Processing                 | Producer                          | Processor                                   | Producer                          |
| Communal Aging Storage            | No                                | No  | Yes                               |
| Marketing & Distribution          | Producer                          | Processor                                   | Producer                          |
| Own-Price Elasticity              | -0.6                              | -0.6  | -0.6                              |
| Counterfeit Cheese Control        | No                                | No  | Yes                               |
| Farmers' Cheese Processing Assets | Fully utilized                    | Mothballed because of zero opportunity cost | Fully utilized                    |

processor to expand production, which exacerbates price declines. This classic negative feedback effect, if left unchecked, causes a bullwhip effect in other segments of the community: tourism declines, hotels and restaurants lose customers; mountain pastures are left unkempt; sales tax revenue declines; property tax increases; and so on.

The IP scenario assumes the producers invest in enhancing their IP enforcement protocols, prosecuting counterfeit Bagòss sellers. It is also assumed that all other production activities are similar to those under the base scenario except that the producers implement a check-off system to fund their cooperative's efforts to enhance their IP protection policies as well as educate their loyal customers about the differentiating characteristics of authentic Bagòss cheese. By successfully making it difficult for counterfeits to enter the market and helping customers appreciate authentic Bagòss' uniqueness, Bagolino's dairy producers are able to sustain their competitiveness in the artisanal cheese market and engender positive externalities throughout the community's economy.

### Simulation Results

We simulated the Bagòss cheese system dynamic model under the specified assumptions for the three scenarios over 20 years. Cow productivity was assumed to be stochastic because of uncertainties in weather, pasture and feed quality and availability but cow numbers were kept unchanged due to EU production controls. Distribution channel allocations were maintained for both the base scenario and the intellectual property enhancement scenario. Because dairy producers are assumed to be the nexus of the system, cheese processing and distribution are ignored in the analysis under the governance scenario. The growth in cheese prices were based on projected increases in cheese consumption of between 0.8 percent (Consortium INRA-

Wageningen, 2002) and 1.6 percent per annum (OECD-FAO, 2007) in the EU-25, and an average own-price demand elasticity of -0.6, after Bouamra-Mechemache, et al. (2008) and Soregaroli and Trévisiol (2005).

The entrepreneurial supply chain currently governing Bagolino's dairy producers involves all but two producers engaged in milk production, cheese processing and marketing of the Bagòss cheese. We modeled the producers' activities as a single firm, working with 574 milking cows which produced an average of 3,113 kg of milk per year which was converted into cheese at rates between 9.6 kg and 16.9 kg per kilogram of cheese. (See Appendix 1 for model equations). Based on these assumptions, the average quantity of authentic Bagòss cheese produced over the 20 years was approximately 141 metric tons, with Bagolino dairy producers accounting for about 76.3 percent.

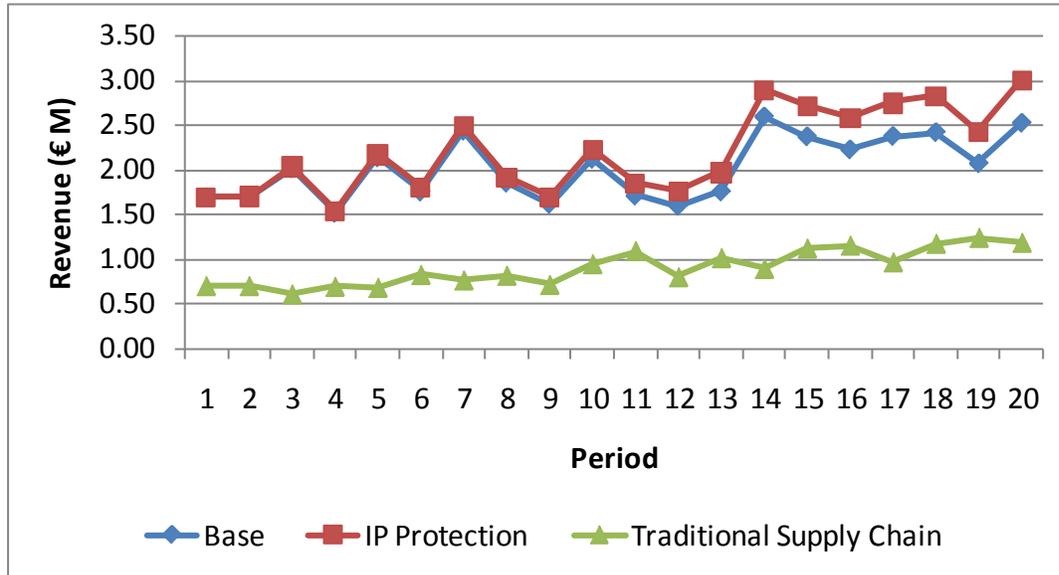
Average producer revenue from all the channels, including sale of excess milk to the local processor, was about €2.02 million per year under the base scenario simulation while average annual variable cost was approximately €51,945 per year. The average annual gross margin under the base scenario was, therefore, estimated at a little under €1.07 million. The net present value of the gross margin over the 20 years was about €10.74 million, using a discount rate of 7.5 percent.

The system's boundary under the governance scenario was limited to the farm gate because farmers do not process or market cheese under traditional supply chain governance. The producers' physical and labor resources used in processing milk into cheese are assumed to exhibit high asset specificity, leading to a plausible zero opportunity cost assumption for both. For example, the cheese processing equipment cannot be repurposed in Bagolino for anything else, especially given the assumption that cheese is processed by the processor. Additionally, Bagòss producers' skills and competences are not transferable to any other activity because of their specificity. A zero opportunity cost is also assumed for the farmers' cheese processing and marketing time because of Bagolino's remoteness and lack of alternative local employment. Based on the foregoing, then, it is reasonable to argue that these assets, while productive when the farmers are processing Bagòss cheese, have no contributory value under the governance scenario.

Based on the preceding arguments, the average annual milk production under the governance scenario was estimated at about 1,887 metric tons, generating average annual revenue of €48,339. The average annual variable cost under this scenario was estimated to be €14,711, with a gross margin of €33,628. The net present value of the cash flow under the governance scenario for the 20-year simulation was a little over €2.87 million, about 77 percent less than the base scenario's net present value. These values will change if the processing assets could be sold or repurposed in alternative enterprises.

The IP scenario focused on Valli di Bagolino aggressively prosecuting counterfeit Bagòss cheese suppliers and educating consumer to strengthen the Bagòss brand. The effort was funded with a five percent assessment on Bagòss cheese revenues. It was assumed that the ratio of counterfeit to authentic Bagòss declined from the current 2:1 to 0.13:1 over the 20-year simulation period. It was also assumed that for every 12.9 percent decline in the ratio, authentic Bagòss price increased by 1 percent (Freccia, Jacobsen and Kilby, 2003; Rosa, 2006). All other production levels were assumed to be unchanged from the base scenario. The simulation results showed that

average annual revenue was about €2.21 million and average annual variable costs of about €1.02 million, generating a gross margin of €1.9 million. The net present value of this cash flow at 7.5 percent discount rate was about €1.46 million. This was 6.7 percent higher than under the base scenario. The revenue and cost trend profiles for the three scenarios are presented in Figure 4 and Figure 5.



**Figure 4.** Bagolino dairy producers' revenue under alternative scenarios

While the base scenario and the IP scenario are directly comparable, it is impossible to compare them with the governance scenario at the aggregate level because of the different system boundaries. Therefore, we conducted the comparison of the three scenarios on a per cow basis since the number of cows was kept constant across all scenarios. The gross margin per cow averaged €1,856 under the base scenario compared to €498.11 under the governance scenario and €2,073 under the IP scenario. The net present value of the gross margins per cow over the simulation period for the three scenarios were respectively €8,709, €4,305 and €19,963. We investigated the trends in the gross margin per cow under the alternative scenarios relative to the base scenario in order to assess the effect of the strategy changes underlying the scenarios on producers. The trends in cumulative difference in gross margins of the governance and IP scenarios relative to the base scenario are presented in Figure 6. They show that traditional supply chain is an inferior governance system to entrepreneurial supply chain governance system because of the nature of the assets supporting the Bagòss solution. Because it is difficult for anyone to provide the requisite incentives to elicit the right behavior about these assets, it is important not to replace individual self-interest with a hierarchical governance structure that does not support alignment of participants' objectives. When individual objectives are all aligned in protecting and expanding the value of the assets upon which they make their living, their individual actions do support the community objective of sustaining the solution's effectiveness in the face of global competition. The cumulative difference between the traditional supply chain governance system and the base scenario entrepreneurial supply chain governance system increases from about negative €1,703 per cow in the first year to about negative €27,160 per cow by the end of the 20 years (Figure 6).

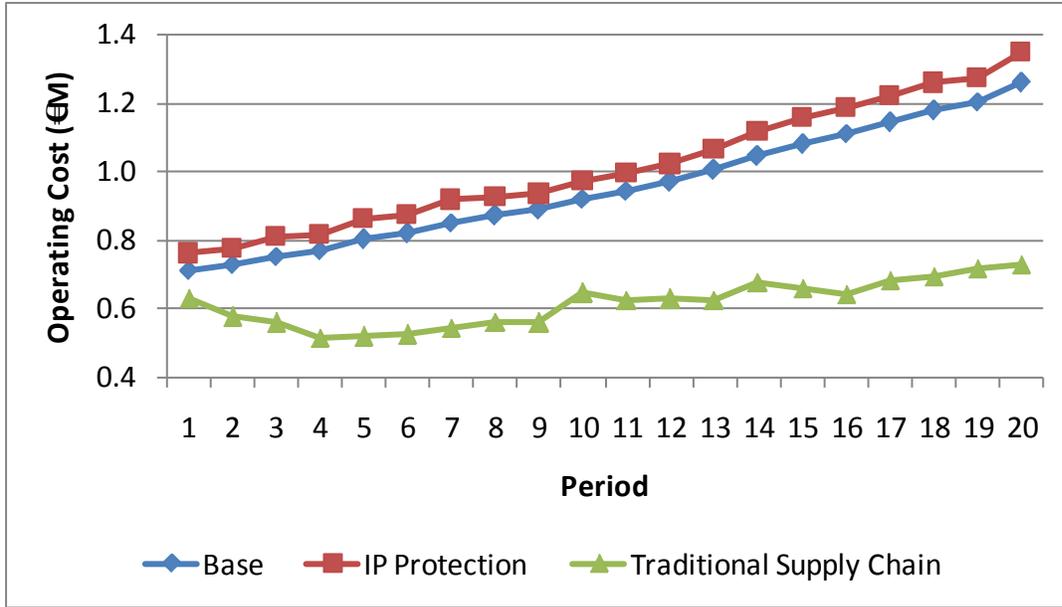


Figure 5. Bagolino dairy producers' operating costs under alternative scenarios

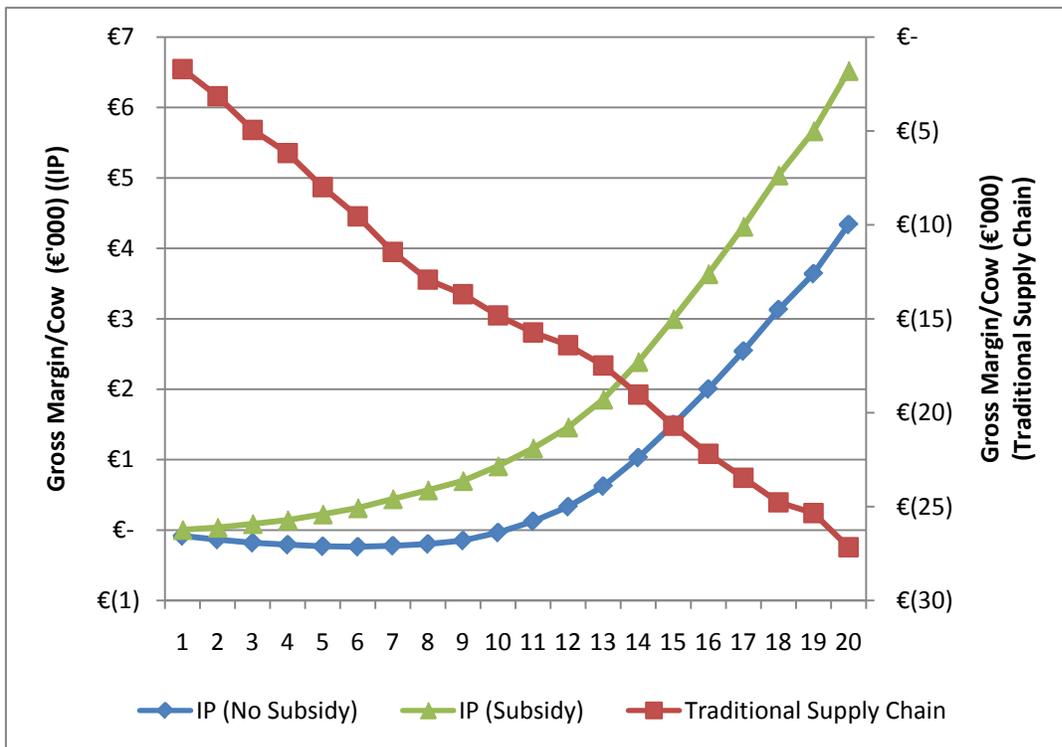


Figure 6. Gross margin per cow: Intellectual property and traditional supply chain relative to base scenario

We had assumed prior that the farmers fund the IP enhancement initiative by themselves. In Figure 6, we investigate another scenario where that initiative is funded fully by the government

because of the positive externalities that a successful Bagòss industry creates in the community. The results show that the producer-funded IP scenario was inferior to the base scenario in the first ten years. However, over the duration of the simulation and as more counterfeit Bagòss is removed from the market, this strategy offered a superior outcome to the base scenario, reaching a cumulative difference value of about €4,339 per cow at the end of 20 years. If the IP enhancement initiative is fully funded by the government, then the IP scenario is superior to the base scenario throughout the whole period, accumulating a difference of about €6,521 per cow by the end of 20 years. This suggests an opportunity for focusing on an IP enhancement strategy to protect the Bagòss brand.

## **Conclusion and Further Research**

This research was motivated by the need to improve our understanding of the emerging inter-organizational relationships that are connecting seemingly unrelated organizations around natural assets such as places and linking those to products and production processes. We noted that the principal characteristic of these relationships is that, unlike traditional supply chains, they do not have a champion or an “owner.” As a result, all participants in these relationships recognize their need and dependence on the identified assets for their success, and work to protect, conserve and promote them through nurtured trust and trustworthiness. We called this relationship entrepreneurial supply chains, and defined them as characterized by a mutual recognition of need for and dependence on valuable assets that are inexhaustible in use but easily depreciated with misuse or abuse.

We identified three types of entrepreneurial supply chains based on the depth and characteristics of the assets involved: place; place/product; and place/product/process entrepreneurial supply chains. Participants’ commitment level and their responsibilities to the governance system increases as one moves from a place entrepreneurial supply chain to a place/product/process entrepreneurial supply chain.

Using the case of Bagòss cheese in Bagolino, Italy, we illustrated the superiority of entrepreneurial supply chains to traditional supply chains for such assets that are inexhaustible in use but easily depreciated with abuse or misuse. We argued that this superiority emanates from the congruence of individual participants’ objectives, such that their selfish pursuit of these objectives contributed to the creation of collective value. Also because of this alignment of participants’ objectives, classic problems in traditional supply chains, such as opportunism and moral hazard, are nonexistent.

We also showed that the value created by entrepreneurial supply chains is enhanced when the participants pursue effective IP protection initiatives. In our case, by implementing policies that made it difficult for counterfeit Bagòss to enter the market, they were able to extract a higher price for the authentic product. The value of this IP protection effort was estimated in our model at about 12.3 percent above the scenario where the underlying asset’s intellectual property was unprotected.

This research offers significant opportunities for businesses in small communities to work together and with their communities to identify unique products with place and process

idiosyncrasies that can contribute to solutions that help them deal with globalization challenges. It allows for the construction of specific governance systems to match the structural characteristics of the assets that can be brought to support these local solutions.

The foregoing results may be unique to Bagòss because of the short length of the supply chain and the presence of strong regulatory support along the chain. Governments mandate production quotas and milk prices and provide strong IP protection regulation. What changes are necessary for an entrepreneurial supply chain to be effective when the supply chain is long and IP systems expensive to implement? This may be the case in such non-food industries as the fashion industry, which can draw on place/product/process controls to create a differentiated solution. Thus, there is a need for further research to compare the effectiveness of entrepreneurial supply chains in different industries in order to discover the necessary and sufficient conditions for their effectiveness in offering local solutions in the face of global challenges.

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