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Economic Development without Pre-Requisites: How Bolivian Producers Met Strict Food Safety Standards and Dominated the Global Brazil-Nut Market

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Summary. — Brazilian firms used to dominate the brazil nut (BN) market to such an extent that the product still carries the country's name. In a surprising twist, 77% of all BNs are now processed and exported by Bolivia, a country with far fewer resources than its neighbor. This paper analyzes the impact of EU regulations on the global BN market. It finds that Bolivian producers prevailed because they joined forces to revamp their manufacturing practices and meet EU sanitary standards despite continued mutual mistrust. In contrast, Brazilian producers have been unable to work cooperatively and lost access to the European market entirely.

Key words — food safety, regulatory enforcement, Latin America, Bolivia, Brazil

1. INTRODUCTION

Global trade can be a double-edged sword: while it creates economic opportunities, it also exposes exporters to higher levels of scrutiny concerning labor, environmental, and sanitary standards than they may be able to meet. Food safety hazards are particularly likely to trigger immediate and drastic responses. For instance, in 2008 news emerged that some brands of infant formula produced in China contained melamine, a chemical that increases protein content in milk but can be fatal when ingested (Gao, 2011). Within days, 28 countries had banned all milk imports from China and many of its trading partners. In the ensuing furor, Chinese milk producers posted multibillion dollar losses and at least one large producer went bankrupt. In 2009, *Salmonella* bacteria were found in peanuts sold by the Peanut Corporation of America (Irlbeck, Akers, & Palmer, 2011. Hundreds of people got sick and nine died. Throughout the US, food manufacturers recalled products that contain peanuts, including cookies, crackers, ice cream, trail mixes and pet foods. Sales of peanut related products plunged and the US peanut industry lost an estimated three billion dollars. The public is now so sensitive to food scares that even false alarms can cause significant damage. For example, the inaccurate and temporary labeling of H1N1 influenza as "swine flu" affected the futures market of lean hogs to such an extent that the industry lost US$200 million within four months (Attavanich, McCarl, & Bessler, 2011).

As these real and imagined safety issues are exposed, customers flee and producers struggle to adjust. Eventually, some producers upgrade their practices and facilities and go on to retain or even improve their market position. Other producers fail to adapt, downsize, or leave these demanding markets altogether. What explains this disparity? Scholars of industrial clusters, global commodity chains, and local economic development have identified three agents of change: either (a) global buyers or (b) local governments help producers upgrade or (c) producers act collectively to upgrade on their own. Unfortunately, these change agents seem to require strict prerequisites to deliver results. At the very least, global buyers must be willing to intervene, local governments must have managerial capacity and the political will to act, and producers are more likely to collaborate when they share preexisting social, cultural, or ethnic ties.

To understand how producers can meet stringent food safety standards even when these change-facilitating conditions are not initially present, this study compares the recent evolution of the brazil-nut (BN) industry in both Brazil and Bolivia. The BN is the seed of the *Bertholletia excelsa*, a tree that grows exclusively in the Amazon and that has never been domesticated (Mori & Prance, 1990). To this day, all BNs consumed worldwide come from contiguous areas of native forests in Brazil, Bolivia, and Peru. For centuries, Brazilian producers dominated this sector to such an extent that the product still carries the country's name. And yet, in 2010, 77% (in value) of all BNs consumed worldwide were processed and exported by Bolivia (Food and Agriculture Organization, 2013), a country with far fewer resources and economic capabilities than its larger neighbor to the east.

During my preliminary inquiries, observers of the industry attributed this outcome to Brazilian deforestation, high labor costs, or Bolivia's ability to attract large amounts of foreign

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aid. My research suggests that none of these hypotheses explains the observed outcomes. At present, Brazil retains enough forest cover to export unprocessed BNs to both Bolivia and Peru (Ministério do Desenvolvimento, Indústria e Comércio Exterior, 2013), [1] which process and export the final product to other countries. While the Global Competitiveness Report (World Economic Forum 2012) ranks Brazil's "labor market efficiency" as the 69th worst in the world (out of 144 countries; p. 116), it ranks Bolivia even worst at 132nd (p. 110). Finally, Bolivian BN producers have received significant amounts of foreign aid (Assies, 1997, p. 64; Mangurian, 1998; Chemonics International, 2004) but so did their Brazilian counterparts, who have also benefitted from foreign aid (Standards and Trade Development Facility, 2006), private philanthropic grants (Assies, 1997, p. 38; Welles, 1998) and various forms of public-sector support (Drew & Fujiwara, 2002; SUFRAMA, n.d.; Pagina 20, 2003; Freitas-Silva & Pereira, 2012).

Contrary to these hypotheses, my research reveals that Bolivian BN producers prevailed because their business association helped them upgrade manufacturing practices and facilities despite intense and continued mistrust. Thanks to these improvements, producers have been able to meet strict new EU food quality and safety standards. Conversely, Brazilian producers tried to meet the EU standards individually, failed to do so, and found themselves shut out of that market. This finding challenges the idea that engaged buyers, proactive government agencies, or a foundation of mutual trust are prerequisites for successful upgrading. Bolivian BN producers did not have access to any of these resources at the outset but still developed the required institutional arrangement that helped them succeed.

The remainder of this paper is structured as follows: Section 2 discusses the challenges faced by developing country firms as they try to meet stringent food safety standards and the levers they use to upgrade. Section 3 provides background on the global BN industry. Section 4 describes the methodology employed in this study. Sections 5 and 6 discuss the findings for Bolivia and Brazil respectively, and Section 7 summarizes and concludes.

2. FOOD SAFETY STANDARDS AND LOCAL ECONOMIC DEVELOPMENT

In recent decades, developed country governments and multinational firms have been imposing an ever growing array of food quality and safety standards on imported foodstuffs. Once this trend became apparent, scholars used econometric models to predict a large and negative effect of tightened standards on trade. For instance, Otsuki, Wilson, and Sewadeh (2001) estimated that the EU's 1999 adoption of stricter aflatoxin standards would decrease imports of dried fruits and edible nuts from nine African countries by 47%, or US$220 millions per year as compared to the 1998 baseline (p. 509). Similarly, Gebrehiwet, Ngqangweni, and Kirsten (2007) estimated that South Africa would have increased its food exports by US$69 million per year if five OECD countries had not tightened sanitary standards beyond the level suggested by international conventions (p. 35). Strengthening these predictions, trade representatives from 65 low and middle-income countries surveyed by Henson and Loader (2001) asserted that sanitary and phytosanitary standards constituted "*the most important impediment to agricultural and food exports to the EU*" (p. 99).

Subsequent empirical research challenged these estimates and suggested that the impact of food quality and standards on trade is more diverse than anticipated (Jaffee & Henson, 2004; Jaffee, Henson, & Diaz Rios, 2011). On average, small firms, firms based in less-developed countries, and firms that export perishable or lightly processed commodities tend to suffer large losses (Anders & Caswell, 2009 pp. 317–18; Shepherd & Wilson, 2010, p. 16). Conversely, firms based in richer countries and larger firms from developing countries tend to adapt to the new requirements more easily (Amekawa, 2009). Other variables of import include the share of the target market held by the affected country, the suitability of its legal framework, coordination among private sectoractors, technical capacity, clarity of institutional procedures, and agro-climatic conditions (Henson & Jaffee, 2008, p. 564).

Crucially, these correlations between country-wide variables and trade performance conceal enormous variation. While some producers act as if standards were a barrier to trade, others with comparable profiles take standards as a stimulus to invest and upgrade. For instance, groundnut producers in Argentina anticipated the EU's stricter sanitary standards and developed new varietals, enacted plant disease controls, and improved water management and post-harvest practices in ways that allowed them to increase sales and market share (Rios & Jaffee, 2008, pp. 22–23). In Malawi, the US Agency for International Development (USAID) helped small farmers create a network of associations that closely monitors groundnut production and screens shipments for contamination. Thanks to these interventions, local farmers have retained access to the stringent EU market and benefit from fair-trade premiums (p. 27). Conversely, in Senegal, the private company responsible for the national confectionery peanut program has taken a series of steps to increase the output of preferred groundnut varieties but has not been able to improve quality sufficiently to meet EU standards (p. 25). In The Gambia, the multinational corporation responsible for marketing the national groundnut crop has changed payment procedures, rehabilitated the domestic marketing infrastructure, and invested in research but quality remains so low that a large proportion of its groundnut exports end up as bird feed (p. 26).

Given that the returns for compliance are sizeable (Masakure, Spencer, & Cranfield 2009; Henson, Masakure, & Cranfield, 2011), why do some countries (and firms) revamp their practices to comply with strict food quality and safety standards, while others give up, or try to reform but fail? And what is it that successful countries and firms do to succeed? The literature on industrial clusters, global value chains, and local economic development has identified three actors—global buyers, local governments, and business associations—that can potentially help producers in developing countries upgrade their manufacturing practices.

Practically all studies of industrial clusters have found that producers adjust successfully when they establish close ties of collaboration with global buyers. This type of vertical relationship has benefitted a variety of local industries including producers of—surgical instruments in Pakistan (Nadvi, 1999a, 1999b), woolen knitwear in India (Tewari, 1999), footwear items in Mexico, India, and Brazil (Schmitz, 2000), and fresh vegetables in Kenya and Zimbabwe (Dolan & Humphrey, 2000). As highlighted by Locke, Amengual, and Mangla (2009), labor auditors sent by a large US-based apparel company to visit its clothing suppliers around the world often help producers improve their performance on various fronts, including inventory management, turnaround time, defect rates, and labor standards.

Opening a second set of possibilities, studies of local economic development have found that domestic government agencies also can help producers upgrade. Typically, these interventions entail protracted (and sometimes heated) negotiations through which government agents and local

producers identify critical bottlenecks and decide how to proceed (Tendler, 2002). In some of these instances, government authorities agree to provide some sort of service, subsidy or support to help the industry improve, but they then require that firms perform certain tasks or meet specific conditions. For instance, the government of Ceará, a state in Brazil, agreed to buy a large number of school desks from a cluster of small furniture makers in the state. A separate governmental agency agreed to provide these producers with training and technical support but the beneficiary schools maintained the right to refuse those desks that did not meet minimum quality standards, which would be returned to be repaired by the exact workshop that had manufactured them (Tendler & Amorim, 1996). Thanks to this kind of conditional support, the cluster thrived and started selling its products to other clients as well. In other instances, local government agencies orchestrate deliberative processes that help public and private agents converge toward a common goal, as illustrated by McDermott, 2007 study of wine-making in Argentina. More recently, a number of scholars have chronicled innovative forms of regulatory enforcement that reconcile compliance with labor standards with business competitiveness, including those modes of action known as "the Latin model" of labor inspection (Piore & Schrank, 2008) as well as "relational" (Silbey, 2011; Silbey, Huising, & Coslovsky, 2009) and "rewarding" types of regulation (Schrank, 2013; see also Pires, 2008 and Coslovsky, 2011).

In the third set of cases, producers cooperate with their competitors to provide collective goods that help them maintain or even expand access to demanding global markets. In some cases, firms engage in horizontal cooperation enabled by a strong group identity (Cammett, 2005) or pre-existing cultural, social, or ethnic ties (Brautigam, 1997; Farrell, 2005; Kennedy, 1999). In other cases, they cooperate through invigorated industry or business associations. As chronicled by Lund-Thomsen and Nadvi (2010), apparel producers in Cambodia and Bangladesh, growers of cut flowers in Kenya, and producers of soccer balls in Pakistan have all relied on their respective business associations to respond to global demands for improved labor standards in ways that did not compromise local producers' ability to compete.

Unfortunately, global buyers, local governments, and business associations seem to be effective in helping local producers upgrade their practices only when buttressed by pre-requisites that are rare to find and that cannot be wished into existence. More specifically, global buyers must be willing to engage in protracted relationships with suppliers, but more often than not, large firms remain at arms' length and replace suppliers without warning or hesitation. Likewise, local government agencies must possess a modicum of technical capacity and political will, but instead of negotiating strategically they often offer to relieve burdens in ways that dampen economic dynamism rather than enhancing it (Tendler, 2002). Finally, business associations often lack resources or serve a narrow but dominant slice of their membership (Olson, 1965). Some avoid these problems, but they tend to do so when members already share social, cultural, or ethnic ties, or the association possesses high member density, deploys selective incentives (often bequeathed by the government), and mediates internal conflicts effectively (Doner & Schneider, 2000).

3. METHODOLOGY AND RESEARCH ACTIVITIES

The BN industry in Bolivia and Brazil provides an ideal setting in which to examine the importance of pre-requisites for economic development and how developing countries may upgrade their food quality and safety standards. BN trees in both countries belong to the same botanical species (Mori, 1992; Mori & Prance, 1990) and the size distribution of the botanical population is not affected by intra-regional differences in total rainfall, availability of nutrients in the soil, length of dry season, or canopy openness (Peres *et al.*, 2003). Furthermore, producers in both countries utilize similar harvesting techniques, organize production along similar lines, and export their products to the same consumer markets (Assies, 1997; Conservation International, 1998; LaFleur, 1992). Thanks to these similarities, Bolivia and Brazil constitute a matched-pair cohort in which extraneous variables are kept constant and do not affect the analyses or results.

Increasing the analytical power of this comparison further, Bolivia falls behind Brazil in practically all measures of institutional development, state capacity, and physical, human, and social capital. At the national level, Bolivia has a much smaller territory, GDP, and population than Brazil (Table 1). It has lower human development indicators, less infrastructure, more perceived corruption, and worse business climate. Furthermore, Bolivia is landlocked, rife with ethnic rivalry, and beset by political instability (Kaufmann, Mastruzzi, & Zavaleta, 2003). When one restricts the comparison to sub-national units, the disparity between Bolivia and Brazil shrinks but does not disappear. Relevant Brazilian states have larger population, higher human development index, and bigger GDP per capita than their Bolivian counterparts (Table 2). In sum, Bolivia is an unlikely candidate to prevail over Brazil in this industry so the causal mechanisms at play must be quite strong and therefore relatively easy to discern.

(a) *Research activities*

To understand how Bolivia came out ahead in the BN world market, in 2004 I visited some of the most important centers of BN production in the world, namely the municipalities of Cobija and Riberalta in Bolivia, and Belém, Rio Branco, Xapuri, and Brasiléia in Brazil.[2] On that occasion, I toured nine BN processing plants (four plants in Riberalta; two in Belém; and one each in Xapuri, Brasileia, and Cobija) and conducted 45 in-person interviews with individuals relevant to the BN business. I also visited two processing plants under construction in Xapuri and Brasileia and spent four days in the Brazilian forest accompanying a BN collector to observe harvest sites and interview harvest workers.

The 45 in-person interviews were divided as follows: on the production side, I interviewed 22 individuals who manage BN processing plants, including the owners or senior manager of all visited facilities and technical personnel employed by them. To complement these data, I interviewed 23 representatives from various public, private, and non-profit organizations relevant to the industry in both Bolivia and Brazil, including government officials, union leaders, journalists, accountants, biologists, food scientists, and representatives from local and international nongovernmental agencies (NGOs) resident in either Brazil or Bolivia. In the US, I conducted a phone interview with the designated buyer from a large US-based supermarket chain and attended a health food trade show where I interviewed current and prospective BN buyers from both the US and Europe.

All interviews were conducted in Spanish, Portuguese, or English by the author without the aid of translators.[3] They lasted from 20 min to 3 h each, with a median of 1 h. Some interviews were semi-structured, but most were unstructured and revolved around historical and contemporary aspects of

Table 1. *National comparison*

Indicators	Bolivia	Brazil	Source
GDP per capita (current US$ – 2011)	$2,374	$12,594	World Bank (2013a)
Total population (millions – 2011)	10.1	196.6	World Bank (2013b)
Human Development Ranking (2011)	108th	85th	UNDP, 2013
Corruption Perceptions Ranking (2012)	105th	69th	Transparency International (2013)
Ease of Doing Business Ranking (2012)	155th	130th	IFC and the World Bank (2013)
Lead time to export (days – 2010)	15	2.8	World Bank (2013c)
Electricity consumption (kWh/cap. – 2010)	616	2,384	World Bank (2013d)
Size of Amazon forest ('000 km2)	824	4,982	Goudia and Cuff (2001)

Table 2. *Sub-national comparison – Selected indicators 2000–1*

State/Province	Population	Human Development Index	GDP per capita (US$)
Bolivia (2001)			
Beni	362,521	0.627	$854
Pando	52,525	0.651	$1.447
Sources	INE (2001)	UNDP (2003, p. 52)	INE (2001b)
Brazil (2000)			
Acre	557,526	0.697	$2,114
Amazonas	2,812,557	0.713	$3,259
Pará	6,192,307	0.723	$1,683
Sources	IBGE (2000)	UNDP (2000)	IBGE (2013)[a]

[a] Brazilian GDP per capita values were converted using an exchange rate of US$0.5473/R$.

BN production, including legal, financial, commercial, managerial, and logistical variables. A few interviewees agreed to share internal reports with hard data about their enterprise but others were reluctant to do so, citing confidentiality issues. Qualitative interviewing has advantages and disadvantages. On one side, this paper emerged from an empirical puzzle (how did Bolivia come out ahead?) whose answer required an open-ended exploration of all those variables that could have influenced the result. In this sense, the chosen research method maximized the chances of finding an answer. On the other side, qualitative interviews produce personal accounts rather than undisputable statements of fact. To ensure accuracy, and even if interviewees were selected for their intimate knowledge of the industry and its recent evolution, I cross-checked the data from each interview against other interviews, contemporary press accounts, and additional primary sources such as official reports, minutes of meetings, laws, regulations, border rejections, and trade data published by Bolivia, Brazil, the United States, the European Union, and the Food and Agriculture Organization.

4. THE BASICS OF BN PRODUCTION

BN production takes place in two steps: harvest and processing. The BN harvest is a fairly rudimentary endeavor. Every year after the rainy season, indigenous people, peasants, and seasonal workers move into the forest to find those BN pods that have fallen to the ground, open each one with a machete, and collect the raw nuts in wicker baskets or burlap sacks. Once harvesters have collected enough BNs, they bring the cargo to an intermediary who takes the raw material to a processing plant. These plants sort, clean, dry, and convert the raw BNs into two final products- kernels and in-shells. In-shells are dark, pyramidal nuts that must be peeled by the final consumer. They are sold in bulk bins at supermarkets during the holiday season. Kernels are light brown oblong nuts that are ready to eat. They are sold as snacks, used in confectionary products, or added to mixed-nut packages and trail mixes. In 2010, Brazil, Bolivia, and Peru exported US$123 million worth of brazil nuts (Food & Agriculture Organization, 2013). Kernels brought in approximately 92% of this value, while in-shells brought in the remaining 8%. In that year, the largest BN buyers were the EU27, the US, and Australia, with market shares (in value) of 55%, 25%, and 4%, respectively (Food & Agriculture Organization, 2013).

The history of the BN industry can be divided into three phases. The first phase extends from colonial times to the early 1970s, a period in which Brazil retained the virtual monopoly of BN processing and exports. The second phase goes from the early 1970s to the late 1990s. During that period, the Brazilian and Bolivian BN industries followed opposite trajectories. In Brazil, the national government adopted a number of policies that channeled deforestation into the exact regions that produced BNs in large scale. These policies included the construction of large infrastructure projects such as highways, dams and mining operations; the granting of subsidized credit for cattle ranching; and the expropriation of land for agrarian reform (Bunker, 1982; Bunker, Coelho, & Lopes, 2002; Emmi, 1988). Thanks to these interventions, by the mid 1980s the area formerly known as "the BN polygon" for the richness of its groves had become "the BN graveyard" for the countless charred stumps that littered the landscape (Homma, 2000, 2001). Damaging the industry further, from the early 1980s to the mid 1990s Brazil faced a period of protracted economic stagnation and successive macroeconomic crises that affected all businesses in the country. Brazil achieved economic stability in 1994, but the national currency remained overvalued until January 1999, so exporters endured an additional five years of reduced competitiveness. As a result of all these problems, in 1998 only a handful of Brazilian BN producers remained in business, retaining 42.5% of the combined US and EU markets (US Department of Agriculture, 2013; European Commission, 2013).

In Bolivia, business conditions evolved quite differently. In 1985 the Bolivian government embarked on an ambitious program of economic reforms and liquidated the state-owned *Empresa Nacional de la Castaña* (ENACA), a BN processing enterprise based in the Amazon (Assies, 1997, p. 46; FUNDES, 2003 p. 4). Records concerning this firm are sparse, but interviewees suggested that ENACA had operated at a loss for most of its 20-year existence. Still, this state-led effort to promote the BN industry was not entirely wasted. When ENACA closed down, some of its former employees used the resources and expertise they had gained under its auspices to enter the BN business on their own. Helping its BN industry further, Bolivia achieved macroeconomic stability in 1985 (Sachs, 1987). As a result, Bolivian exporters benefitted from almost 15 years of reduced macroeconomic risk and increased exchange rate competitiveness when compared to Brazil. Finally, in the late 1980s the Bolivian government opened the first highway linking its Ama-

zon region to La Paz (Assies, 1997, p. 47). Thanks to all these interventions, in 1998 Bolivia had approximately 20 BN processors and exporters(Assies, 1997, p. 48; Kaimowitz & Bojanic, 1998, p. 143; FUNDES, 2003, p. 5) that retained 43.8% (about equal to Brazil's aforementioned 42.5% share) of the combined US and EU markets (US Department of Agriculture, 2013; European Commission, 2013a).

The third phase of BN production started on July 16, 1998, when European authorities decided that starting on January 1, 1999, they would enforce tighter sanitary standards on a range of imported foodstuffs, including permissible levels of aflatoxins in BNs. [4] Aflatoxins are a carcinogenic substance produced by certain types of mold that live on edible nuts and other protein-rich food products such as corn and milk. For many years, sanitary authorities in both the US and the EU had enforced a limit of 20 parts per billion (ppb) for total aflatoxins. However, from 1999 onward, the EU would lower the limit for total aflatoxins in BNs to four ppb. [5] Shipments that did not meet the new specification would be destroyed or returned at the exporter's expense.

(a) *Food quality and safety challenges in BN production*

To retain access to the EU market, BN producers would have to upgrade their practices but this would be neither simple nor easy. First, the tropical forest provides almost ideal temperature and humidity levels for the proliferation of aflatoxins (FUNDES, 2003, p. 54). [6] Second, in theory, harvest workers can provide the first line of defense against contamination. In practice, they have limited or no formal education, work on their own, and spend weeks or even months in the forest at a time so it is difficult to train them or monitor their performance. Third, owners and managers of BN processing plants in both Bolivia and Brazil had never given much thought to product quality or safety standards. Some BN processors adopted a "putting-out" system, in which truck drivers dropped bags of raw BNs at workers' homes and returned later to collect the kernels (IPHAE, 1994; Anderson, 2002; Assies, 1997). Others maintained a central plant, but they neglected the facilities, paid workers on a piece-rate that favored expediency over vigilance, and generally allowed laborers to manage their own affairs. According to several interviewees, plant buildings had leaks, missing roof tiles, no bathrooms, limited potable water and unprotected windows so that birds, insects, and other pests entered at will. In an infringement of basic food manufacturing practices, workers wore their regular clothes and ate, drank, and smoked on the factory floor. Fourth, even if managers had wanted to prevent or eliminate aflatoxins and other contaminants, they did not have the necessary tools or knowledge to be effective (Conservation International, 1998; Santos, Menezes, Souza, & Figueiredo 2001, p. 14). As described by the owner-manager of a fairly modern new plant:

> "*I looked into the literature and could not find anything of practical concern about BNs: humidity, temperature, shelf life, rancidity, how to preserve it, how to identify a bad nut, anything. Buyers did not know anything about these nuts either, how much time the product could be stored, what made them go bad, and so on. The only tool we had was a humidity gauge that costs US$250 and has some prongs that you stick into the mound of nuts.*"

Lacking other tools, some producers tried to eradicate rodents from their plants but at least one firm (in Bolivia) did it by deploying a jaguar and anacondas as pest control. As explained by the worker in charge, "*I bought four anacondas from some guy for US$10 a piece. They are fifteen feet long and the rats and mice are gone.*" The sorry state of the industry was summarized by an international trader who described a Brazilian plant as a "*sociologically sensitive, ecologically sympathetic pig-sty*" (Holt, 2002, p. 13).

Given this mismatch between stringent market demands and inadequate business capabilities, many observers predicted that the industry would collapse (Bolivia, 1998, p. 7). As will be discussed below, Brazilian producers did indeed suffer sizeable losses, but their Bolivian competitors carried out the enhancements necessary for competitive success.

5. BOLIVIA: TEMPERING COMPETITION WITH COOPERATION

Approximately 90% of Bolivian BN production takes place in or around Riberalta (data in tons for 2009; Instituto Nacional de Estadistica de Bolivia, 2013), a municipality of 100,000 inhabitants that hosts more than 15 BN processing plants. These businesses are of sufficiently varying sizes and work arrangements that their interests rarely coalesce. [7] Not only are they direct competitors, but ethnic issues also intercede; some BN processing plants are owned by Bolivians of European descent while others are owned by Bolivians of Amazonian or Andean ancestry and there is strong animosity and even overt racism among them. Since the early 1990's, local exporters of forest products have been represented by the "*Camara de Exportadores del Norte*" (CADEXNOR). Technically, BN producers were also represented by the "*Asociacion Boliviana de Almendras del Noroeste*" (ABAN) but until the late 1990's ABAN remained dormant, without a mandate, budget, or staff (Assies, 1997, p. 82 ft 44; Kaimowitz & Bojanic, 1998, p. 147). As stated by a European buyer, "*[. . .] organizing any joint activity is difficult because of jealousies and competitiveness*" (Conservation International, 1998).

Despite this unpromising start, ABAN eventually became a politically inclusive, financially autonomous, and technically savvy organization that helped Bolivian firms upgrade their practices and retain access to the EU market. This transformation can be traced back to 1998, when the EU originally announced its intention to tighten sanitary standards concerning aflatoxins in BNs. Upon learning of this new requirement, leading Bolivian exporters and local government authorities traveled to Europe to try to reverse the decision. As stated by a local leader, "*[Bolivian BN producers] predicted economic ruin for the region, and the Bolivian government feared not only the economic crisis but the potential social turmoil that would follow*". As part of this effort, Bolivian representatives to the WTO contested the scientific basis of the demand and argued that the measure constituted an unjustified barrier to trade (Newing & Harrop 2000, p. 9). Furthermore, Bolivian authorities considered requesting "special and differential treatment" (WTO, 2011, p. 31), a set of trade provisions that exempts developing countries from certain trade requirements, and enlisted members of the EU parliament to plead for leniency on its behalf (Evans, 1999; Jackson, 1999). None of these efforts yielded results. The EU placed Bolivia on a high priority list for foreign aid, but did not budge: if Bolivian producers were to sell BNs in the EU, they would have to meet the new EU standards.

During this initial exchange, leading Bolivian producers and government authorities learned that the EU would provide the same treatment to all the exporters from a given country. This arrangement is more significant than it may sound. While

WTO rules outlaw arbitrary or unjustified discrimination among foreign sources of supply, they allow importing countries to impose their own standards concerning food quality and safety standards (WTO, 2010, p. 18). For instance, import authorities may authorize individual producers from a given country that have instituted process controls to export their goods unimpeded while otherwise identical producers from the same country face higher hurdles. Likewise, import authorities may recognize certain zones within a country as disease-free and thus free to export while other zones are subjected to export constraints. In the case of BNs, EU authorities decided against any kind of sub-national discrimination. As explained by ABAN's general manager, "*the Europeans said that the new standards and procedures concerned the Bolivian product as a whole. If they detected too many contaminated shipments originating from Bolivia, they would get tough with everyone in the country.*"

This decision bundled up the Bolivian BN exporters and created a condition in which inept BN exporters sending contaminated shipments to Europe would trigger restrictions that harmed all. In effect, and similarly to the US nuclear power industry after the Three Mile Island accident, Bolivian BN producers became "hostages of each other" (Rees, 1994). Confronted with this challenge, the Bolivian government immediately mandated that all outgoing BN shipments be tested for aflatoxin to obtain an export license (*Decreto Supremo n'25.200 de 16 de Octubre 1998*). This measure buffered high-performing Bolivian exporters from the risk posed by their unskilled competitors but it did not determine outcomes. At this juncture, it was still unclear whether any Bolivian producer would marshal the resources to upgrade and especially whether the smaller producers could retain access to the EU market at all.

To meet this challenge, Bolivian BN producers revived their dormant business association and gradually converted it into an effective engine for industrial change.[8] This achievement traces its roots to the domestic requirement that all outgoing shipments be tested for contamination. At that time, the only lab in Bolivia testing BNs for aflatoxins was located in La Paz, 570 difficult miles from Riberalta. Its services were expensive, slow, and inconvenient. As explained by a leading Bolivian producer, "*the lab charged US$380 per test and it took 15 to 20 days [to get the results]. By then, the whole shipment was already in La Paz. If the sample turned out positive for aflatoxins, the costs [of bringing the container back to Riberalta] were enormous*". To avoid these costs and delays, in 2001 one of the larger BN firms from Riberalta obtained federal financing to build a lab on its own premises. However, this firm allowed the facilities to fall into disrepair. As stated by the head of the local business association, "*they had an embryo of a lab, they had the equipment and the facility, but they were not testing samples. Everyone wanted them to get the lab going, but they were happy to brag about having a lab and to pretend they were investing in quality. To them, image was more important than reality.*" Other BN firms insisted that the lab be moved to a neutral place such as a local university so it could be a resource to all firms in the cluster. However, this concept did not evolve to fruition. As stated by a party to the negotiations, "*local universities are too politicized and unstable, they go on strike all the time*". Ultimately, the lab's hosts agreed to place it under the auspices of ABAN in exchange for past dues, and this proved to be a pivotal change on three grounds.

First, the lab helped ABAN become a politically-inclusive organization, with high member density. As the association grappled with the sector's problems, it hired a food engineer as its general manager and this manager soon learned that the newly acquiredlab entailed high fixed costs. To help defray these costs,[9] the association actively pursued new members among BN producers in the Riberalta region. To entice members to join, ABAN instituted a fairly large board of directors, which included a president, vice-president, treasurer, and two additional board members known as "*vocales*," elected from among roughly 15 firms and who serve two-year terms. In practice, this means that within any five-year period practically all producers get to help lead the organization. As a result, only broad-based policies gather enough support to be enacted and implemented.

Second, the lab helped the association become financially autonomous. As ABAN started operating the lab, it learned that aflatoxin tests, when conducted at the proper scale and thanks also to government subsidies, cost US$105 per sample. In an ingenious move, the lab chose to charge US$300 per test, a price that was US$80 cheaper than charged by the commercial lab in La Paz but still sufficiently high to generate a surplus of US$195 per test to help finance the association. Further increasing its financial autonomy, ABAN convinced the Bolivian government to institute a "one-stop-shop" for export licenses in Riberalta ("*ventanilla unica de exportaciones*"). To closely monitor the performance of the two civil servants in charge of licensing, ABAN offered to host them in the association's own facility. Emulating its approach to lab charges, the association charged US$150 for each export license on top of government fees and used the proceeds to further finance its operations.[10] Both the lab and the export-licensing services provided by the association were faster, cheaper, and/or more convenient than the existing alternatives in La Paz so producers readily adopted them. And by using these services, producers contributed to the coffers of the association according to their output and independent of whether others contributed or not. This arrangement did not eliminate the unfortunate animosity among producers, who continued to offer disparaging, even racist, remarks about each other.[11] Nevertheless, this well designed system of incentives overrode these petty considerations, eliminated the temptation to free-ride, provided the association with a reliable source of revenue, and empowered its manager to pursue collective goals.

Finally, the association acquired the technical capacity it needed to act. More specifically, ABAN's manager relied on a technical report financed by the US Agency for International Development (USAID) that had been written by a peanut expert and a plant pathologist from the University of Georgia (Williams & Wilson, 1999). This report provided three pragmatic insights. First, and as stated by ABAN's manager, "*contamination by aflatoxins is a crapshoot. It is not like contamination by E. coli or other bacteria that you can avoid*". In other words, remediation is more effective than prevention. Second, "*a nut that is contaminated with aflatoxin contains a lot of the toxin but the other nuts are mostly clean*," so that firms ought to build redundancy into their quality control systems. And third, contamination is visible to the naked eye so well-trained workers can identify and eliminate bad kernels before they reach the consumer, a belief that was confirmed by subsequent research (Marklinder, Lindblad, Gidlund, & Olsen, 2005). Together, these insights suggested a simple but effective course of action: "*find and eliminate all nuts that look suspect. This is our rule-of-thumb, eliminate the suspect*."[12]

To implement this strategy, ABAN's manager and his staff used their newly gained political legitimacy and financial autonomy to visit firms, identify vulnerabilities in their manufacturing practices, suggest new pieces of equipment, and teach producers how to implement proper sampling and testing procedures. They also contacted international donors and NGOs to request additional technical support, brought

commercial bankers from La Paz to discuss credit options, organized training sessions for managers and workers, and collected and published industry statistics. In an impressive feat, ABAN helped organize tours of member factories so competitors could learn from each other.[13] As described by ABAN's manager:

> "*It was great fun. People would see procedures that they thought nobody else knew how to do, equipments they thought nobody else owned. They learned new techniques, gave advice, met former employees. One guy thought his firm was the only one that had a mechanical sorter to separate BNs by size and during the tours he discovered that everyone had that equipment already.*"

Thanks to these efforts, Bolivian BN producers improved their lighting fixtures, replaced contamination-prone wooden benches with plastic and metal counters; taught employees to keep production logs; hired full-time quality experts; built additional toilets, sinks, and dressing rooms; and provided workers with uniforms, facemasks, and hairnets.

All these initiatives increased the dynamism and resilience of the Bolivian BN sector. First, the Riberalta cluster remained vibrant and retained remarkable diversity[14] so all its firms benefit from agglomeration effects including a larger local market for labor, professional services, and inputs; the sharing of data and technology that takes place when employees move across firms; and deeper commercial ties among producers, who regularly rent production time and equipment to and from each other. And second, by the time of my visit ABAN had a full time staff of 10 people, its own office space, and a schedule of sector-wide activities. Moving forward, the association had started building a large office complex tellingly called *Centro de Calidad* ("quality center") and was enlarging its mandate to support other sectors of relevance to the region such as timber and agriculture.[15]

Trade data further confirm that Bolivia has cornered the global BN market. On average, between 1998 and 2012 less than one Bolivian BN shipment was rejected by EU authorities per year, with a maximum of three rejections in 2009 (European Commission, 2013b), and the remarkable quality of the Bolivian product quickly translated into market success. In 2011, Bolivian BN producers supplied 93% (in value) of the BNs imported by the EU while Brazil supplied only 2% (European Commission, 2013a- see Chart 1). The US has not tightened its sanitary standards so rejections there remained low.[16] Nonetheless, Bolivian producers parlayed their increased competitiveness into a 61% US market share while Brazil clung to a paltry 8% (data for 2012; in value; US Department of Agriculture, 2013- see Chart 2). Finally, Bolivian producers dominate smaller markets as well, with market shares in Australia, Canada, and Russia that range from 63% to 80% (data for 2010; in value; Food & Agriculture Organization, 2013).

6. BRAZIL: ATOMIZED COMPETITION AND DECLINE

In Brazil, the most important centers of BN production are Belém and Xapuri-Brasiléia. Belém is the capital of the state of Pará and one of the most important metropolises in the Amazon. It has 1.4 million inhabitants, 20 universities (Ministério da Educação, 2013) and a fairly diverse economic base, including three large BN processors and exporters whose owners belong to the regional economic elite (Emmi, 1988). Conversely, Xapuri (16,000 inhabitants) and Brasiléia (22,000 inhabitants) are secondary municipalities in Acre, a small state on the border of Peru and Bolivia[17] and known for the strength of its social and environmental movements (Hochstettler & Keck, 2007; Keck, 1995). Since 1990 forest workers in these areas have been processing and exporting BNs themselves through cooperative arrangements (Assies, 1997 p. 38).

Once the EU announced its intention to tighten sanitary standards for BNs, Brazilian producers from Belém and Xapuri-Brasiléia searched for ways to maintain access to this market. Similar to their Bolivian counterparts, the affluent producers from Belém used their connections to Brazilian trade and diplomatic authorities to contest the change proposed by the EU in various multilateral settings (Brazil, 2008; Newing & Harrop, 2000, pp. 9–10). In particular, they opposed EU's sampling and testing procedures. As explained by the owner of a BN firm, "*the EU takes a sample of in-shells and puts the whole thing into a food processor, the kernel, the shell, good ones and those that are obviously rotten, so aflatoxin levels go through the roof. But these tests are not real indication of risk because the consumer does not eat the shells, and discards those kernels that are obviously rotten*." This argument did not produce the desired results: The EU asserted its authority to set its own sanitary standards and did not compromise.

At the same time, producers from Acre and their technical advisers relied on their strong connections to BN harvesters to try to prevent contamination at the point of collection. As explained by a researcher from EMBRAPA, the federal agricultural research agency, "*Acre has advantages because its social organization allows for better supervision of production in the forest*". In particular, agricultural researchers noticed that most raw BNs are infested with the aflatoxin-producing fungus but only a few actually produce aflatoxins so they hypothesized that environmental factors such as humidity and heat might be at play (Cartaxo, Souza, Corrêa, Costa, & Freitas-Silva 2003). To meet EU standards, they instructed harvesters on better methods to clean, dry, and store the raw BNs in the field. However, to train dispersed and mostly illiterate forest workers on how to sanitize the forest will always be an uphill battle and this effort did not yield noticeable results.[18]

Given the importance of the EU market and the failure of their initial entreaties, Brazilian producers could have pooled their resources and searched for a joint-solution to their problem. The three BN processors from Belém seemed particularly well poised to collaborate. They are located in the same municipality, have similar business models,[19] and are owned and operated by cousins of the same family. In fact, inter-firm cooperation seemed so promising that these firms had tried to cooperate in the past but they did it through purchasing and selling cartels that artificially deflate the price of inputs and inflate the price of outputs. Yet, these arrangements are not only possibly illegal but also very difficult to maintain because of free-riding. Expectedly, all these efforts broke down after a month or so and these failures convinced BN producers from Belém that inter-firm cooperation was beyond their reach. As stated by the owner of one of these firms, "*the families fight a lot,disagreement is in our blood.*" The owner of another firm agreed: "*we barely talk to each other*."

Decreasing the likelihood of broad-based collaboration further, BN producers from Xapuri and Brasiléia were not inclined to join forces with processors from out of state. For many decades, harvesters from Acre had sold raw BNs to processors in Belém but resented what they considered exploitatively low prices. Relations became particularly strained after 1999, when the government of Acre encouraged local cooperatives to process their own BNs or sell the raw material to

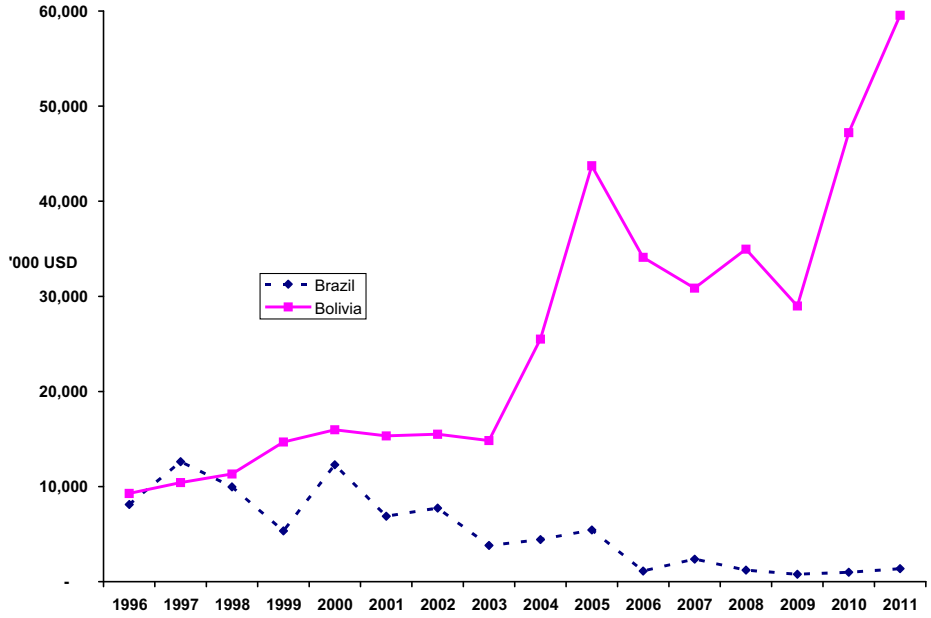

Chart 1. *BN exports to EU. European Commission (2013)*

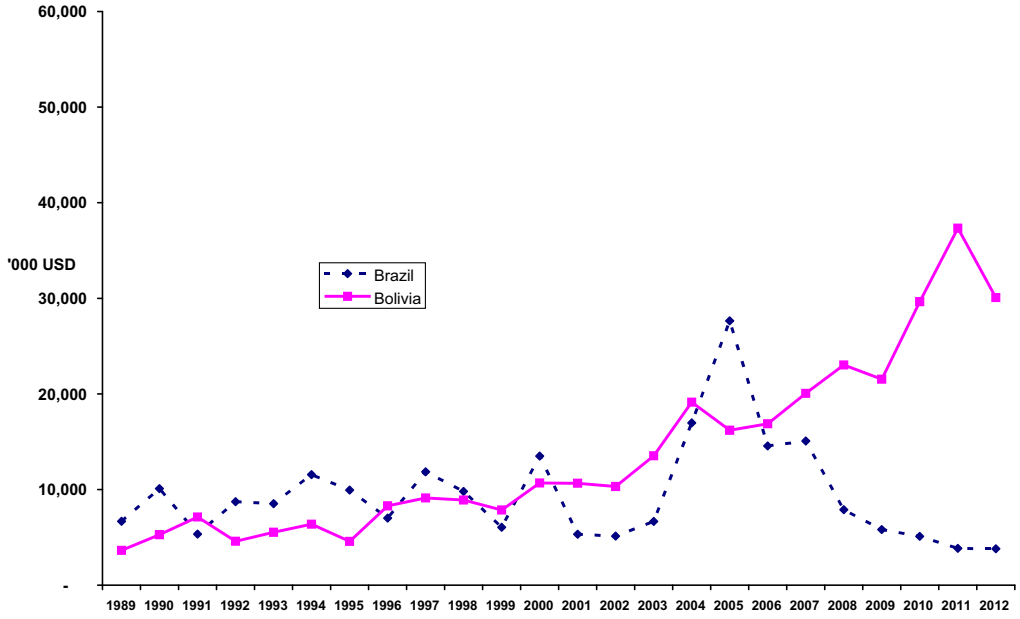

Chart 2. *BN Exports to the US. US Department of Agriculture (2013)*

Bolivian buyers. BN processors from Belém accused harvesters from Acre of being smugglers who undermined the national interest (Aquino, 2004). Various local newspapers picked up the story and a congresswoman from Pará delivered a fiery speech denouncing the practice (Pontes, 2004). The government of Acre responded forcefully. Among other measures, it raised state taxes on the domestic sales of raw BNs by 150% (Martins, 2004); persuaded CONAB, a federal agency linked to the Ministry of Agriculture, to buy the BNs produced by local cooperatives in advance, at an assured minimum price and low interest rates (CONAB, 2004); and continued to finance and manage the construction of two new BN plants that would eventually be transferred to the harvesters' cooperatives.

The Brazilian BN Exporters' Association ("*Associação de Exportadores de Castanha do Brasil—AECB*") could have risen above this fray, engaged with the relevant government authorities, and helped BN producers upgrade their practices and facilities. However, the association remained stunted and unrepresentative. By the time of my visit, it did not have by-laws, dues-paying members, a physical office, staff, or a budget. A multiyear search for this association utilizing government directories, official gazettes, and a newspaper's archives produced almost no hits, which further suggests that

the association does not really exist as such. According to my interviews, the owners of the large Belém firms alternate at the association presidency according to an unscripted schedule and invoke its name to advance the immediate interests of his or her own firm.

Thanks to these irreconcilable divisions, the Brazilian government did not invest in industrial development and BN producers did not acquire access to important collective resources. For years, the only two aflatoxin labs in the country were located in Belo Horizonte and São Paulo, thousands of miles away from BN processors and exporters (Commission of the European Communities, 2003, p. 7). Aflatoxin tests took from 15 days to a month and were not conducted according to international standards (pp. 17–20). Making matter worse, Brazilian customs' authorities did not communicate with agricultural or sanitary authorities and did not verify whether outgoing shipments had tested negative for aflatoxins (p. 25). In at least one occasion, a container that had been tested positive for aflatoxin in Brazil was shipped to the EU anyway (p. 21). Not surprisingly, rejection rates at the EU kept rising (see Chart 3). In July 2003, EU authorities were so alarmed by the low quality of the Brazilian product and lack of domestic controls that they tightened requirements for in-shells from Brazil further (Commission Decision 2004/493/EC) and effectively shut down this market.

In May 2004 the Brazilian Ministry of Agriculture finally conditioned export licenses to a negative test for aflatoxin (Ministério da Agricultura, Pecuária e Abastecimento, 2004) but it was too little too late. By then, Brazilian producers had given up exporting BNs to the EU altogether. As stated by the manager of a large firm in Belém, "*for us, it is not worth selling BNs to Europe anymore. The risks are too high.*[20]" Instead, Brazilian producers increased their exports to Bolivia (see Chart 4), which does not impose onerous regulations but pays US$0.51 for each kg of in-shells, roughly one third of the price paid by the EU (US$1.43/kg) for the same product (10 year averages; Ministério do Desenvolvimento, Indústria e Comércio Exterior, 2013).[21]

7. CONCLUSIONS

This paper employs a case study approach to understand how Bolivian BN producers upgraded their manufacturing practices and facilities to meet increasingly stringent EU food safety standards while their Brazilian competitors fell behind. Simply put, the Bolivians succeeded because they took a series of right decisions at the right time. Their upward trajectory started with Bolivian producers and government realizing early on that EU's import restrictions would apply to all exporters in the country and not to specific firms, independent of their individual records or proven capacity. Responding to this constraint, Bolivian authorities immediately mandated that all outgoing shipments be tested for aflatoxin, lest inept exporters trigger tighter import requirements that harmed them all. As a next step, Bolivian BN producers acquired a lab so they could fulfill the testing requirement. After some back and forth, producers placed the lab under the purview of their embryonic business association. The lab entailed high fixed costs and the dilution of these costs pushed the association toward expanding its membership and becoming a politically-inclusive organization. When operating at proper scale, the lab was not only convenient but also affordable so producers used its services out of their own self-interest. The lab also generated a surplus so the association became financially autonomous and impervious to free-riding. Thanks to its political inclusiveness and financial autonomy, the association was able to disseminate the technical knowledge it acquired from foreign consultants and help producers upgrade their manufacturing practices. Taken together, these decisions allowed Bolivian BN producers to retain and even improve their access to the all-important EU market.

Conversely, Brazilian producers did not realize that inept exporters could harm all producers. Furthermore, the Brazilian government did not require that outgoing shipments be tested for aflatoxin. Further cementing their fate, Brazilian BN producers did not acquire the collective resources or technical knowledge they needed to thrive. In fact, they seemed more interested in fighting with each other than collaborating for the common good. Adding to the sector's prob-

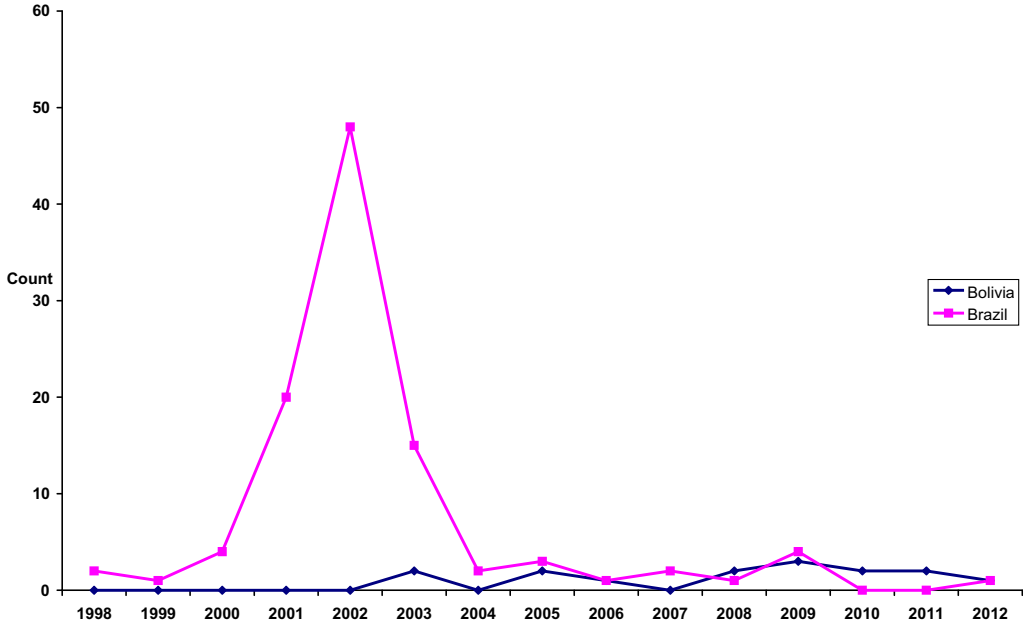

Chart 3. *Border Rejections at the EU—BNs from Brazil & Bolivia. European Commission (2013b)*

Chart 4. *Brazilian Exports of unshelled BNs to EU and Bolivia (kg).* Ministério do Desenvolvimento, Indústria e Comércio Exterior (2013)

lems, Brazilian government authorities did not adopt a value chain perspective. Instead of engaging with BN processors, some authorities lobbied for relief abroad while others adopted a livelihood's focus and engaged with BN harvesters. None of these efforts yielded results. Brazilian producers kept on sending contaminated shipments to the EU and by 2003 they were shut out of that market altogether.

This abbreviated account suggests that the EU 1998 decision to tighten food safety standards acted as a "critical juncture," which Collier and Collier (1991) define as "*a period of significant change, which typically occurs in distinct ways in different countries (or other units of analysis) and which is hypothesized to produce distinct legacies*" (p. 29). Naturally, the juncture itself does not determine outcomes. Given that failure can be over-determined, we turn our attention to the Bolivian success. On one side of the analytic spectrum, there is no evidence that Bolivian agents acted purposefully or had a well-thought out plan drafted in advance. In other words, they did not seem to thrive thanks to unrestrained agency guided by foresight. On the other side, there is no evidence that the Bolivian trajectory was pre-determined or inevitable given initial conditions. In other words, the observed outcome was not impervious to blunders. Rather, the data suggest that the Bolivian success wasproduced by a series of narrow but open-ended decisions that guided the industry toward better managerial practices and improved food quality and safety standards. To some extent, each decision was constrained by the decisions that preceded it but not determined by them. In this sense, the Bolivian trajectory illustrates Albert O. Hirschman's argument concerning unbalanced growth (1958). According to Hirschman, developing countries may lack physical, human, and social capital, but their most critical bottleneck emerges from their inability to engage in effective decision-making (p. 25). Fortunately, this bottleneck can be overcome through "pressure mechanisms" and "pacing devices" that elicit the necessary decisions. Seen under this light, the EU's decision to give unified treatment to all exporters from a given country, the Bolivian requirement that all outgoing shipments be tested for aflatoxin, and the creation of the local lab acted as pressure mechanisms and pacing devices that helped Bolivian producers, government authorities, and the managers of the association make the right decisions at the right time. In contrast, Brazilian producers used their agency to squander the opportunity.

On a more contemporary note, this paper represents a case-based challenge to the now-prevalent idea that historical legacies determine development outcomes. It shows that inflexible and cumbersome laws, weaker national-level institutions, corruption, lack of infrastructure, and low levels of interpersonal trust may not always be insurmountable obstacles for industrial transformation. Even if Bolivian producers and authorities stumbled onto their winning streak, their success shows that an underprivileged industry may be able to create developmental institutions where these social structures do not previously exist, and these institutions may enable the industry's continued growth. In the spirit of Hirschman's "possibilism," this paper does not aspire to offer a set of lessons, recipes, or best-practices that can be reproduced, but to provide a source of inspiration for policy-makers who face analogous constraints.

NOTES

1. In 2012, Brazil exported 3,729 tons (valued at US$2.3 million) of unshelled BNs to Bolivia and 1,476 tons (valued at US$ 1.01 million) to Peru.

2. The Brazilian Statistics Office (IBGE) collects data on the extraction but not the processing of BNs by state. In 2011, 33% (in tones) of BNs harvested in Brazil originated in Acre; 17% in Pará; 35% in Amazonas, and 15% in other northern states (IBGE, 2011). According to interviews, a large proportion of the BNs harvested in Amazonas are sold to processors in Pará.

3. All quotes presented in the paper were translated by the author.

4. This decision was formalized through Regulation 1525-98 EC reducing maximum residue limits and Commission Directive 98/53/EC concerning sampling and testing procedures.

5. There are many types of aflatoxins and the most common are B1, B2, G1, and G2. To be admissible into the EU, a product cannot contain more than 2 ppb of aflatoxin B1 (the most toxic) or 4 ppb of total aflatoxins, which corresponds to the sum of the four compounds.

6. According to laboratory analyses, aflatoxin contamination peaks when BNs are stored at 25–30 °C and 97% of relative humidity (Arrus, Blank, Abramson, Clear, & Holley, 2005). In nature, BN trees grow in areas with an annual mean temperature between 24.3 and 27.2 °C and relative humidity between 79% and 86% (Mori and Prance, 1990, p. 136).

7. These firms vary in their ownership of forest land, production technology (manual versus mechanized shelling), and managerial structure (some are run directly by the owners, others are part of diversified business groups, and others are workers' cooperatives). For these reasons, they favor different land-use, forest conservation, labor, and business promotion policies.

8. Legally, CADEXNOR, and ABAN are separate entities. In practice, they have overlapping memberships and share an office and staff. At the time of my visit, the general manager's business card had ABAN printed on one side and CADEXNOR on the other. For this reason, I treat them as fungible.

9. Tendler (1983, p. 61) identified the need to dilute fixed costs as a driver of inclusiveness in services rendered by coops in Bolivia. Attwood and Baviskar, (1987, pp. A46–47) reached a similar conclusion regarding the relatively high quality of service rendered to small farmers by the leadership of certain sugar producing coops in India.

10. It is not clear where the idea behind these two initiatives came from, but the fact that Riberalta had already experimented with collective solutions in the past may have served as a source of inspiration. Historically, citizens from Riberalta tended to be unhappy with their inability to get the Bolivian government to invest in local infra-structure. In the mid-1970s, they decided to take matters on their own hands. Members of the local elite created the "Fundacion para el Desarollo de la Provincia Vaca Diez" which was financed through a surcharge on fuel sold at the only gas station in town. For approximately 25 years the proceeds paid for secondary roads, street paving, a bus terminal, city lights, and other improvements, but the scheme eventually fell apart under political squabbles and legal challenges (Kaimowitz and Bojanic, 1998). Even so, this experience remains very well regarded in the region and it may have inspired the collective efforts that followed.

11. Time and again during interviews, business owners and top managers of various Bolivian BN firms accused other BN processors of benefiting from the largesse of corrupt politicians, evading taxes, cheating on their creditors, and moonlighting as drug dealers ("pichicateros"). Interviewees of European, Andean, and indigenous (Amazonian) descent often disparaged each other using racial epithets.

12. This principle stands in sharp contrast with previous practice in the industry, which I still observed in Brazil, in which firms went to great lengths to recover even minor fragments of kernels that could be commercialized.

13. This type of initiative is not as improbable or unusual as it may sound. Researchers have identified numerous instances of collaboration among rivals in diverse industries and historical periods (Allen, 1983; Von Hippel, 1987; Meyer, 2003; Osterloh and Rota, 2007; Coslovsky, 2013).

14. The Bolivian Government (Promueve Bolivia, 2013) indicates that 24 Bolivian firms export BN kernels, and 23 of them list EU countries among their clients.

15. Despite its commercial success, the Bolivian BN sector still faced plenty of problems. Labor conditions remained subpar, land-owners ("*barraqueros*") fought with indigenous communities over land rights, and some BN entrepreneurs were accused of corruption, political violence, and other criminal acts (Montero and Poveda, 2003).

16. Between 2002 and 2011, only six BN shipments were refused entry to the US, including one each from Brazil and Bolivia (US Food and Drug Administration, 2013).

17. Acre used to belong to Bolivia but was annexed by Brazil in 1903 (Tambs, 1966).

18. In 2003, EU inspectors visited Brazil and interviewed a small sample of forest workers. According to this report, harvesters were not aware of the issue of aflatoxin contamination and had not changed their working practices (Commission of the European Communities, 2003, p. 15).

19. These firms do not own forest land and acquire their raw material in the open market; they deploy labor-intensive manual shelling techniques; and they sell their products to many of the same clients.

20. In recent years, a group of researchers from the Department of Food Sciences and Technology at the Federal University of Santa Catarina has been studying aflatoxin contamination in in-shells, but it is not clear whether they have longstanding links to producers in the Brazilian Amazon, and whether their findings will help reverse the decline in this market segment (de Mello and Scussel, 2009; Giordano, Simao, Manfio, Galvao, Scussel, & Scussel, 2010).

21. There is a substantial difference between in-shells and raw BNs, but the Harmonized Commodity Description and Coding System (HS) does not have a code for raw BNs. I suspect that raw BNs are being coded as in-shells, hence the magnitude of the price difference.

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