

Decentralised production organisation and institutional transformation: large and small firm networks in Chile and Nicaragua

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This paper analyses changing production organisation and new governance that contribute to productive upgrading in developing economies. It discusses research conducted in Chile and Nicaragua, focused on agroindustrial clusters. Recent analyses of small firms in developing countries highlight the important presence of clusters, and local factors in building global competitiveness. This paper argues for an approach that focuses on the institutional arrangements to coordinate decentralised production networks. It emphasises the role of learning-by-monitoring as the key to successful adjustment in the face of liberalisation and globalisation. It identifies the institutional reshaping of relations between firms, and between the state and the economy.

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JEL classifications: D2, O1, L0

1. Introduction: European districts and clusters in developing countries

In the 1990s, new research on clusters in developing countries emerged, evolving from the studies of industrial districts in Europe. The European districts research showed that from the mid-1970s onwards, agglomerations of small and medium-sized firms, using modern craft methods, could compete successfully in a wide range of industries in world markets (Pyke *et al.*, 1990; Pyke and Sengenberger, 1992). This finding surprised scholars studying developing countries; conventional wisdom was that small firms had limited growth potential. By the late 1980s, a new research agenda on developing countries appeared (Schmitz, 1989) with two main questions: are there industrial districts in developing economies similar to the European versions, and what are the conditions that promote or inhibit growth? This line of inquiry predominated in studies of small firms during the 1990s.¹ With

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¹ See, for example, Rabellotti (1995), Nadvi and Schmitz (1994), Cawthorne (1995), Nadvi (1995).

time, scholars recognised the limits of contrasting developing country clusters to the Italian model, and that a more dynamic framework needed to be developed (Humphrey, 1995; Schmitz and Nadvi, 1999).

Despite a common focus on agglomerations of firms, the current research on clusters in developing countries differs in important ways from the industrial district literature of the 1980s. The latter concentrated on the relative competitiveness in world markets of a very particular form of production organisation: the decentralised and cooperative industrial practices among small, medium-sized and large firms (Brusco, 1982; Piore and Sabel, 1984; Pyke *et al.*, 1990; Sabel, 1989). The findings constituted a critique of large-scale mass production and vertically integrated enterprises. Piore and Sabel (1984), among others, showed that while the centralised Fordist firm was experiencing serious crisis, the smaller scale, flexible, specialised and decentralised, inter-firm networks in regions of Germany, Italy, Denmark were succeeding in world markets. While the analysis of industrial districts in advanced economies focused on decentralised practices, organisation and economic coordination, these issues did not become central themes of the developing cluster research.

Instead, recent research on developing countries is concerned with identifying clusters, that is, the geographic and sectoral concentration of firms. The results demonstrate that clusters are common; they vary widely, from artisan to internationally competitive; and large firms have a stronger presence compared with the Italian experience (Schmitz, 1995B; Schmitz and Nadvi, 1999). The recent literature on clusters in developing countries became more closely associated with research on the relationship between regional clusters and competitiveness in advanced economies. It focuses on the factors contributing to spatial agglomeration and external economies, as well as to cluster competitiveness (Enright, 1999; Porter, 1990; Porter and Solvell, 1999; Scott, 1999). This literature shows there are competitive clusters with little decentralisation. They share a view that emphasises the role of geography and local factors for competing in global markets.

Schmitz (1995A) coined the term 'collective efficiency' to explain the competitive advantage of clusters in developing economies. This concept attempted to capture the localised external economies resulting from agglomeration of firms, and the deliberate joint action and cooperation among firms. The literature on global commodity chains (Gereffi and Korzeniewics, 1990, 1994), however, revealed the limits of a framework that did not adequately account for external/global linkages, for example, the relations with foreign buyers. Recent attempts to improve the 'collective efficiency' framework to explain differences in the performance of clusters emphasises two additional pre-conditions for growth and competitive success: first, the existence of trade networks to connect to distant markets; and second, the existence of trust to sustain inter-firm relations.¹

In this paper, I move beyond the discussion of the relevance of industrial districts for analysing small firms growth in developing countries. Instead, I focus on issues that 'fall through the cracks' in the developing countries cluster literature, which are relevant for discussions of decentralised governance. I take into account new analysis that argues the ways of coordinating decentralisation make a difference for upgrading productive capacity in developing economies, contrary to the oversight in the earlier literature. I focus on the emergence of what Sabel (1996B) calls learning-by-monitoring, as a key principle that guides the relationship between the state and the economy, and inter-firm relations. I discuss these issues from the perspective of improving the capabilities of small producers.

¹ Some examples include Humphrey and Schmitz (1998), Schmitz and Nadvi (1999), Rabellotti (1997) and Weijland (1999).

The literature on learning-by-monitoring suggests that a debate focused on organisational forms or types is self-limiting. Networks, clusters, industrial districts, production chains, whose properties make them particularly adaptive to current competitive environments, are often seen as 'the' new form for the future. Little attention is given to the principles underlying their ability to adapt and adjust. These may vary within the same organisational forms, and make a difference in the ability to compete and continuously to improve performance.

2. Decentralised organisation and coordination: beyond industrial districts

The success of industrial districts stemmed from their flexibility in production, and the decentralised authority in the design and production of goods and services.¹ The old Taylorist system had as key principles: economies of scale, centralised authority, and separate conception and execution in production. Hierarchical and vertically integrated organisations separated conception and execution throughout all parts of production and management. For example, it separated those in the factory floor (unskilled and skilled workers) from those with the overview of the production process and design. The same separation applied to relations between large firms and subcontractors: a system of arm's length, lowest-bid prevailed. The costs of design and specialised machines could be amortised as long as the production runs were large. As markets became more competitive, demand level fluctuations increased and technology changes shortened product life cycles, as they did in the 1970s, the costs became too burdensome. Vertical, hierarchical forms of organisation became non-competitive.

In this context of rapid technological and market changes, the new forms of economic organisation, like the industrial districts, lowered the costs of adjustment to volatile market conditions by reintegrating conception and execution in production, and by decentralising authority (Piore and Sabel, 1984; Sabel, 1996B). In particular, decentralised authority distinguished the new forms from the old model. For example, in the Italian industrial districts, relations between end-user firms and suppliers changed constantly, depending on which firm got the contract. Producers also collaborated on the development of the product. In the German districts, the end-user firms cultivated long-term relations with their key suppliers (Herrigel, 1996). The collaboration was intensified through associational affiliations and common local education and service facilities.

The recent difficulties of European industrial districts, and the diffusion of other decentralised practices world-wide, have revealed competitive weaknesses with the district form of organisation. Recent discoveries demonstrate that the ways of coordinating decentralisation matter, and make a difference. These differences in the forms of decentralisation appeared negligible when scholars discovered the industrial districts. Initially, the focus was on their ability to outperform traditional, vertical organisations. Two developments, however, qualified the initial view, and further emphasised the relevance of decentralised practices and their ways of coordinating them. First, industrial districts began to show economic difficulties, and limits to their capacity to coordinate decentralised production (Herrigel, 1997; Sabel, 1995; Sabel and Zeitlin, 1998, Whitford, 2001). These problems included: increased competition from lower-wage countries in mature industries (footwear and garment), an excessively fragmented productive structure, and the inadequacy of

¹ For the original discussion that contrasts the two forms of production organisation, see Piore and Sabel (1984).

existing formal institutions (associations and service centres) to meet new market challenges.

Second, new ways of coordinating decentralised production emerged, as revealed by Japanese experience, and the world-wide restructuring of multinational corporations (MNCs) and large firms (Helper, 1994; Kaplinsky, 1994; Nishiguchi, 1994; Shaiken, 1990; Smitka, 1991). The alternative flexible arrangements, initially discovered in Japanese industry, diffused, transformed and even improved in other contexts. As Sabel (1996) notes, the new decentralised arrangements do not involve specialising in one particular skill, nor one particular form of organisation. Rather, they require the ability to solve problems in production collectively through self-monitored processes.

The discovery of the Japanese principles of just-in-time inventory-less production, work groups, and collaborative end-user firms and suppliers revealed limits to the way decentralisation is organised in industrial districts. Moreover, the different production systems showed that not all forms of flexibility and decentralisation are alike: there are varieties of flexibilities.¹ Industrial districts rely on a permanently fragmented division of labour that reproduces hierarchy and fixed specialised role positions. Craft coordination proves self-limiting because craft skill and the transmission of craft expertise generate hierarchies and jurisdictional distinctions that hamper cooperation among craft workers (Sabel, 1995).

The Japanese experience showed that forms of coordination that encourage deliberate, experimental revision of the definition of goals and tasks outperform those based on notions of craft methods found in industrial districts (*ibid*). This form of organisation is less local-centred because discussions are in relation to continually shifting goals, rather than the experience or knowledge rooted in the historical identity of the locale of production. Indeed, there is a large literature showing that production arrangements initially discovered in Japanese industry have spread, transformed and improved in a wide array of countries and industries (Humphrey, 1994; Kaplinsky, 1994; Liker *et al.*, 1999; Nishiguchi, 1994; Shaiken, 1998).

The widespread restructuring of MNCs also revealed the limits in the industrial district organisation model. During the 1980s and 1990s, large firms showed their ability to organise flexibly, using collaborative self-monitoring (Helper *et al.*, 1998). As MNCs redefine and continuously improve, they are developing an organisation that is more flexible and competitive than the craft-based forms of flexibility that characterise the organisation of production in industrial districts. For example, MNCs and suppliers have been successfully creating problem-solving groups to coordinate their interactions in ways that allow for the rapid absorption of new technology and production arrangements as well as continuous monitoring of the quality of processes and products.

3. New principles: learning-by-monitoring

In the new flexible production, the diffusion of a particular model is not relevant. Rather, it is the emergence of new principles that focus on goal setting, through comparisons that reveal possibilities, and that serve to evaluate progress and to revise goals continually during the process of experimentation (Sabel, 1996B). Multiple actors (large firms, alone or in interaction with the state) are the creators of clusters of firms. The concept of learning-by-monitoring refers to the ability to evaluate current practices and performance to develop

¹ Flexibility in this context refers to the capacity for contending with volatile markets and changing technology through continuous improvement in production processes and products, through low inventories, shorter lead time and without increasing production costs. On the varieties of flexibilities, see Sabel (1996A).

new standards in order to then build a capacity for continuous improvement. This literature sees that the central problem of production organisation is the coordination of decentralisation.

The learning-by-monitoring principle operates at multiple levels of the economy, and connects the state (central or local) to the economy, as well as firms or other actors to one another. This process guides the communication between economic actors (firms, associations, the state). The actors set goals and make an effort to reach defined targets through continuous review and monitoring of the partners' performances and capacities to reach those targets. Coordination is effected through disciplined goal setting that links discussion of actual performance by the cooperating actors (monitoring) to discussion of how to improve performance (learning). This process encourages the creation of relations among and within firms, or between the state and the economy, that continually foster flows of knowledge and maximises the possibility of learning (improving production performance). Learning is possible because the disciplined discussions reduce information asymmetries among and within firms, and between firms and the state. Learning-by-monitoring creates the possibility that, instead of pursuing self-interest, rent-seeking and accommodation to protectionism, the actors can redefine objectives and pursue beneficial developmental projects.

Learning-by-monitoring, as a principle for coordinating decentralised organisation, differs with some leading variants of the literature on districts and clusters with their emphasis on pre-existing conditions. Some analysts overemphasise the districts' embeddedness in highly specific sociocultural contexts involving established trust relations among local actors that would limit their transferability or reproduction elsewhere (Becattini, 1990). This idea is also prevalent in the literature on clusters in developing countries that views competitiveness as possible when there is pre-existing trust (Schmitz and Nadvi, 1999). In this traditional view of districts, the accumulation of skill, collaborative practices, institutional supports, and trust among actors result from a long historical and regionally specific process of industrialisation (Sabel and Zeitlin, 1985). The craft-based flexibility of industrial districts depends significantly on the tacit shared forms of knowledge that makes for a common socio-economic culture.

Another variant of the industrial district approach, however, argues that almost any set of shared experiences serves as basis of a common culture of cooperation. Trust relations are more a consequence than a precondition for practical collaboration among local actors, and institutional mechanisms play an increasingly crucial part in coordinating decentralised organisation and promoting productive upgrading within the districts (Zeitlin, 1992; Sabel, 1993). In effect, the diverse histories of industrial districts in Italy, West Germany, Denmark and France indicate long periods of conflict and complex struggles. Parties in conflict engaged in processes of creating 'trust' relations and cooperative institutions, through diverse paths that redefined collective values and distinct interests.

The latter variant of the industrial district concept overlaps with the views elaborated in learning-by-monitoring, which does not have an embedded limit on its transferability. In contrast to stories of industrial districts which emerged over long periods of time, and which had a distinct embeddedness, the new principles of learning-by-monitoring can be introduced into contexts in which previously there had been little cooperation or flexibility (Sabel, 1996B; Helper *et al.*, 2000). For example, flexible systems of group-based collaboration and self-monitoring learning processes have been created in a wide array of countries.¹

¹ See, for example, the works of Carrillo (1996), Helper and McDuffie (1997), Humphrey (1995), Kaplinsky (1994), Perez-Aleman (2000) and Shaiken (1990).

These collaborations do not rely on pre-existing trust, common culture, common heritage, tacit knowledge or extensive sets of extra-firm supporting institutions.

The central feature of learning-by-monitoring is that it constantly brings people and groups together into monitoring discussions, where actors make explicit the problems, what is succeeding, why, and how to improve (Sabel, 1996B). There is no specific form of organisation that is required for learning-by-monitoring to work. It is compatible with a broad array of disparate institutional, cultural and market arrangements. In effect, the diffusion of these practices does not involve convergence of organisations, institutions or culture (Sabel and Zeitlin, 1998). Instead, it is a form of self-organisation that engages the human capacities for self-reflection and deliberation. Learning and monitoring allow partners to cooperate, align their interests and develop trust that was non-existent at the start.

The actors that can introduce learning-by-monitoring vary widely. World-wide, it has been the MNCs in sectors such as automobiles, electronics and machinery that have restructured both internally and their relations with suppliers. But the actors can also be the state (national or subnational), small firms, civic agencies and foreign aid development projects.

In the next section, I discuss cases from Chile and Nicaragua. I attempt to demonstrate that learning-by-monitoring develops through a process of reconstructing existing institutions to meet new demands. The Chilean case shows how learning-by-monitoring emerges through experimentation in the way the state relates to firms, as well as in the relations between enterprises in the production process. In both types of relations, we see that, instead of the bureaucratic hierarchy, coordination is carried out through collaborative self-monitoring to solve collective problems. The Nicaraguan case suggests that learning-by-monitoring is emerging through governance arrangements that include MNCs and local organisations. The interaction between a decentralised project and corporate strategy, rather than national or sectoral policy, has more relevance in the development of asset-augmenting capacity in a remote, poor region of Nicaragua.

4. Building a new agroindustrial cluster in Chile

The emergence and growth of firm networks in the Chilean agroindustry, and their successful export performance, involved a highly interactive process at two levels of the economy: between the state and large Chilean firms, and among local producers. On the one hand, Chilean state action nurtured new connections between firms, fostered new forms of production organisation, and attracted private investment in new industries. On the other, domestic firms formed new local networks, or reorganised existing ones, while upgrading their organisation of production to compete in global markets. Chilean firms also became integrated into international networks through relations with foreign customers. In this process, a new agroindustrial cluster was created. I use the case study of the tomato processing industry to illustrate the process of destroying the old and building new connections at both of these levels at which learning-by-monitoring flourished.

The tomato processing industry, concentrated in the south-central valley of Chile, achieved substantial competitiveness in the 1990s, and accounts for an important share of processed exports.¹ By 1994, Chile occupied fifth place among the world's tomato paste producers, after the USA, Italy, Turkey, Greece, and tied with Spain. Not only did Chile

¹ Export sales of processed tomato products grew from merely two million dollars in 1981, to more than 100 million dollars in 1995, a 50-fold increase (FEPACH, 1996). During this period, the total volume of processed tomato production increased eight times, from 14,420 metric tons per year to 113,650 metric tons.

increase its share of the world market, but it penetrated very demanding ones.¹ Production networks grew substantially; in 1995, nine large firms worked with nearly 5,000 raw material suppliers in the south-central valley of Chile. A decade earlier, only two companies existed and contracted 210 suppliers.² The emergence of this cluster did not depend on a pre-existing tradition or craft knowledge or skill. In fact, the existing agroindustrial cluster of processed tomato products developed in regions where there was no prior experience with the industrial tomato crops.

Just two decades ago, Chile lagged far behind other producing nations. None of the indigenous firms had the capacity to export. Their processing plants used small-scale, reconditioned second-hand equipment; and discard-quality raw material bought on the spot market. Becoming exporters presented at least four technological challenges. First, producers used local fruit varieties and species inappropriate for industrial purposes. Second, the volumes produced at the time were insufficient to achieve a relevant presence in foreign markets. Third, the existing local plants had outdated equipment compared with that used by the established competitors (California, Italy, Portugal). And fourth, the firms could not meet the quality standards required for exportation.

The movement of the agroindustry from low-quality and inefficient production, to being world competitive entailed a process of destroying old practices and forms of organisation, and constructing new alternative ones. The state contributed to the improvement of technological capacity as well as facilitating politically the firms' reorganisation, before and after the drastic 1970s market reforms. First, the government nurtured the emergence and upgrading of local production networks, attracting national and international private investment in new industries that became connected to global markets. It contributed to shape the capabilities of firms, not by leading with a 'strong hand', but by encouraging firms to compete in the global economy and to upgrade their organisational and technical capabilities to that end. It accomplished this in two ways. The government managed public debate, generating collective learning processes among firms, bringing new information, and illuminating possible strategies. At the same time, it facilitated the shift from an old pattern of production to another, export-oriented one, catalysing the emergence of new private organisations and the diffusion of improved technology, coordinating the general direction of a move over time.

For example, decentralised state-initiated projects to build an internationally competitive agroindustry initiated a movement towards new production practices and organisation during the late 1960s and 1970s. One example is the effort of CORFO (Production Development Corporation), a decentralised and autonomous state agency.³ CORFO set new goals to upgrade production in agroindustry. Through state-financed projects, CORFO helped to introduce new business practices to replace the old model of relying on cheap, discard-quality raw material to produce processed products that could never meet the requirements of foreign clients. CORFO projects facilitated the transfer of foreign know-how, introducing

¹ For example, in 1980, Chile exported little to Japan, accounting only for a 65% share of their total tomato paste imports. By 1985, Chile's share had increased to 4.46%; by 1990, it had risen to 12.52%; and by 1992, it had reached 16.86%. By comparison, China's share in Japan's total tomato paste imports only increased from 6.63% in 1980 to 9.05 in 1990, and decreased to 8.07% in 1992. By 1992, Chile accounted for a larger share of Japan's tomato paste imports than Taiwan, which until 1990 had been the major exporter to Japan (CORFO, 1995).

² Most suppliers are full-time farmers, cultivating around ten to twelve hectares. They do not specialise in just one crop, rather a typical supplier might have three or four hectares of industrial tomato, combined with another crop to supply a different contract, or for home consumption, or for direct sale in the market.

³ For a discussion of the decentralised nature of the Chilean central government see Marcel (1997).

new plant varieties, cultivation techniques, industrial processing technologies and a procurement system.¹ At the time, the existing domestic producers considered the new organising principles a threat to their survival, and even resisted. Given the difficulty that domestic firms face in learning new organising practices across borders, the state played an important role in transferring and diffusing best practices to Chile. Furthermore, state investments in new processing plants and in technology transfer proved that an agroprocessing industry for export was a viable project, which attracted private firms to invest in this new industry.

In the 1970s and 1980s, the Chilean government's macroeconomic reforms drastically cut its previous relations with firms, and put them under pressure to shift to an alternative system. As Velasco (1994) discusses, policy-making and state–economy relations changed. The uniform tariff limited the scope of private sector lobbying for import protection; the privatisation of social security and changes in budgeting procedures limited the amount of lobbying on fiscal matters; and the independence of the Central Bank ended the partial control that private sector interests had on credit policies.

At the same time, the government encouraged firms to engage in collaborative processes for designing and improving production processes and products for exports. Specifically, the state used funding to pressure firms into upgrading their capabilities. It provided funding grants through the state agency PROCHILE, created in 1975. In stark contrast to the popular free market ideology of the Pinochet government, PROCHILE promoted the formation of alliances between agroindustrial firms to assist their explorations into unknown foreign markets. The collapse of Chile's economy in 1981–82 prompted a revision of the policies of the first decade of the Pinochet government, further changing the government's relationship with private firms.² The goal of increasing exports in the post-1982 period led the government to form groups of firms to promote the upgrading of production methods and products.³ PROCHILE contacted and recruited firms directly, one by one, to bring together firms that were both members and non-members of existing trade associations to form new export committees.⁴ The central focus of these state-promoted, but self-coordinated groups was to help firms to learn how to improve the product quality to meet international standards, as well as to examine production practices and explore what to produce for world markets.

Through the Export Promotion Fund, PROCHILE co-financed export projects proposed by these groups of firms in the same sector. Only firms in a group could receive financing, not firms individually; and the government financed 50% of the project, with private firms financing the balance. PROCHILE organised the association of firms into sector-specific export committees that would then define a project.⁵ The PROCHILE groups allowed firms jointly to discover new sources of vitality that could serve as models and goals for

¹ For an elaboration see Perez-Aleman (1997, 2000).

² For more on the reformulation of the Pinochet government's economic policies, see Meller (1995), and Stallings and Brock (1993). On the multiple political coalitions formed between the Pinochet government and economic groups to pursue market reforms see Silva (1993).

³ After 1982, the government also implemented export promotion measures, including subsidies to exporters, such as value added tax and import tariff reimbursement (Meller, 1995).

⁴ Early committees represented the following sectors: processed fruits and vegetables, salmon and other processed seafood, fresh fruit, furniture, textiles, wine and paper products. In all, some 65 committees consisting of six to fourteen enterprises each, and integrating over 700 firms were in place by 1988 (Pietrobelli, 1993).

⁵ Projects fell into two categories: (1) improving quality to meet international standards; and/or (2) developing new products. Once PROCHILE approved a project, it supported the export committees by providing all the specialised services that firms needed to develop their exports: acquiring information on foreign standards; organising trips abroad to visit the factories of foreign competitors, as well as product discovery missions; providing information on market trends.

reorganisation. These committees provided a base from which firms, with government assistance, could discuss the building of new local production standards, and define their needs.

This state programme contributed to the creation of new networks between firms, between professionals and government officials who together discovered new ways to face the competitive challenges. The network of agroindustry associations that emerged now provides an infrastructure for information sharing, cooperation and innovation. In the case of the agroindustrial firms, the PROCHILE committees sparked the reorganisation of the existing association ASFACO, as firms recreated it to move away from its traditional state lobbying focus to an organisation that would serve to improve the competitiveness of their industry. This process gave birth to the Federation of Processing Firms, FEPACH, which promotes quality control and independent certification among its members.

Equally important, the state's efforts interacted with private firms' own strategies for ways to improve products and organisation, together forming crucial inputs to the adjustment process. Firms adopted a new organisation of production that connected them to local supplier networks, developing relations along group-based learning-by-monitoring that enhanced their productive capacities and their competitiveness. In the 1970s and 1980s, after the adoption of market reforms, and after substantial investments in state-of-the-art processing plants, multiple attempts to export processed tomato failed. Large processing firms encountered many coordination problems in the process of production, resulting in many deficiencies in the quality of their product and the performance of their production process.¹ For a decade, grave problems plagued the industry: low yields; bad quality and rotting of highly perishable raw material; irregular flow and untimely supply; lack of synchronisation between the suppliers and the processing plant; and low volumes of product.

On the supplier's side, the highly perishable crop combined with inefficient reception at the industrial plant often led to reductions in the price received for the product, owing to a higher rejection rate, and subsequent penalties. Suppliers often bore the burden of a coupon rationing system that the customer firms established to avoid frequent raw material overloads. The supplier could harvest and deliver to the plant only a pre-approved amount of raw material, irrespective of the amount ready for delivery. Disagreements on the timing of harvest, quality and weight, and therefore on final price received, left many suppliers with a feeling of being deceived. In addition, suppliers found it difficult to achieve good yields and quality, as they had never worked with this particular crop that required special cultivation practices (i.e., spacing, timing of planting, sowing, irrigation, use of specific fertilisers and pesticides). Finally, firms had to learn to adopt, adapt and diffuse widely new agricultural technology, specifically hybrids.²

Ensuring consistent volumes of high-quality product to meet the stringent international food standards involved constructing new relations, along learning-by-monitoring

¹ Author's personal interviews with Chilean managers, engineers and suppliers at the firms Nieto, Malloa, Isasa, Iansa and Agrozzi, particularly helped to unpack these coordination problems.

² Until the early 1980s, only open-pollinated seeds had been used. Reaching the potentials that hybrids offered was not easy. First, the hybrid seeds are more costly (80 times higher per kilo) than open-pollinated seeds. Second, hybrid seeds are useful for only one growing cycle, given their peculiarity that only the first generation following the cross is useful, requiring that new seed be obtained each year. The small suppliers of these companies could not afford hybrid seeds, nor could they easily access information on this new technology. Third, hybrid seeds suffer frequent maladaptation to local conditions as their performance changes when removed from the original breeding ground (due to differences with soils, pests, climate, fertilisation), often resulting in inferior performance.

principles that contributed to the enhancement of their productive capabilities and competitiveness. Large processing firms had to leave behind old practices and develop the capability to coordinate their suppliers. Initially, processing firms relied on arm's-length relations with their suppliers, in a production system that generated excess raw material supply, used quality control only at the post-harvest reception at the processing plant, and then applied penalties for bad produce. As firms adopted expensive hybrid technology, the old system (that is, acceptance or rejection upon receipt) proved very costly, vulnerable to failure and non-competitive. Moreover, demand for raw material and, thus, demand for suppliers increased as more firms entered the agroindustry.¹ Firms came under pressure to keep the suppliers with whom they had established contracts. The firms defended themselves against local competitors by reducing the likelihood of supplier defection or of their failure to meet the buyer firms' raw material standards. Gradually, competition among processing firms evolved away from a focus on bidding higher prices paid for raw material towards an interest in cooperating across firm boundaries to solve common problems with suppliers.

Over the last decade, large firms developed a new form of coordination by constructing cooperative monitoring, rather than arm's length or hierarchy. The interactions with suppliers became focused on joint problem-solving. These practices included: price stability; the introduction of quality control to monitor every step of the production process, not just the final product; the provision of a package of services; and the building of close ties between technical plant personnel and suppliers.² Contracts established in advance the prices that customer firms would pay suppliers upon delivery of raw material, to reduce the incentive for suppliers to jump ship and sell to other firms. Large firms could then invest in suppliers with the assurance of consistently improving future deliveries. Simultaneously, price stability reduced the financial risk for suppliers, as they knew in advance the price they would receive at the end of the production season. In addition, suppliers knew in advance the yield performance target that would bring a profit.

Agroindustry firms organised their interactions along learning-by-monitoring lines, using technical assistance and quality control to identify production problems, exchange critical information and monitor performance. Technical assistance went beyond the mere function of transferring know-how; it became part of an arrangement designed to reduce the likelihood of small producer failures. Quality control and technical assistance allowed a constant evaluation of actual performance against a target performance, at every step of raw material production in order to improve production practice. Frequent field visits by the plant's technical personnel (at least once a week) to suppliers allowed for timely corrective responses to deficiencies in meeting the buyer firms' quality standards. Furthermore, the structure of technical assistance built-in the evaluation and comparison of the performance of the technical advisors at the buyer firm. Weekly meetings served to evaluate the field problems across various geographical zones, and created pressures on the technical advisors to work closely with suppliers to ensure the best possible production in their zone of responsibility.

This example illustrates briefly the way in which the institutions and governance structures in the Chilean agroindustry have evolved over the past three decades. Collaborative agroindustrial practices emerged between large firms and their suppliers, and among large processing enterprises, replacing the old, traditional production organisation and practices.

¹ In addition to more tomato processing plants, there are agroindustrial plants in other products, so producers do not face only one crop market, or few firms per crop, but many firms in the industry with demands for many different crops.

² For more on how inter-firm practices and arrangements evolved see Perez-Aleman (1997, pp. 75–126).

The relationships in the inter-firm network changed as the institutional arrangements coordinating production reconfigured in the context of increasing competitive pressures. The formation of these local firm networks that became connected to global markets would have been unlikely without the state's efforts.

5. Building a dairy cluster in Nicaragua

The movement to upgrade a cluster of dairy producers in Nueva Guinea, a poor, remote rural region of Nicaragua, began in the 1990s.¹ The upgrading process involves destroying old embedded practices, in the relations between local producers, their trading networks and large firms. The producers are revamping both their product and their production organisation by reconstructing existing institutions in the cluster, and adopting new practices that make self-monitoring possible. All producers are currently under market pressure to shift to the alternative system.

Three developments are changing radically the organisation of the cluster: changing regional trade patterns, new styles of foreign investment and the benefits of a local development project.

Ironically, the small, artisan dairy producers in the Nueva Guinea cluster, as well as those in clusters in other adjacent dairy producing regions such as Boaco and Chontales, have competed successfully in regional international markets for the past decade. In particular, their cheese products enjoy high demand, and sell through well-developed ties to markets in the Central American region (particularly, El Salvador, Honduras and Guatemala). For example, in 1999, exports of artisan-produced cheese to El Salvador amounted to 25 million dollars annually.² By international standards, however, the traditional traded product is of low quality, as it does not meet minimum sanitation requirements. Pasteurisation to produce zero levels of infectious bacteria (i.e., *E. coli*) in the products, and the absence of pathogens such as tuberculosis (TB) and brucellosis in the supply herds, standard nowadays, had not been accomplished by local dairy producers.

A recent unexpected trade regulation by El Salvador halted the sales of Nicaraguan artisanal products to their traditional foreign clients. Traditionally, craft cheese producers used unpasteurised milk from cattle that were not certified free of TB and brucellosis. In 1998, El Salvador passed a new consumer protection law which established that all its imported dairy products must be pasteurised. As the majority of Nicaraguan artisan cheese producers and processing plants did not follow hygienic milk collection procedures, nor pasteurise their raw material, they were prohibited from selling to El Salvador.

In previous years, given the high demand in foreign and local markets for these artisan dairy products, there was no interest on the part of producers in upgrading and modernising. In the past decade, for example, various national and regional projects that attempted to eradicate TB and brucellosis failed, as few producers wanted to change their embedded practices, and did not want to engage in the monitoring required for continual certification of infectious-disease-free cattle.

The traditional trading network involved arm's-length relations in a production system that had low quality and sanitation requirements. Suppliers were played off against one

¹ This section discusses findings from field research in Nicaragua. The discussion is based on author's interviews with individual small dairy producers, cooperatives, dairy associations, local project managers, and the Italian MNC PARMALAT managers in Nicaragua, during the years 2000 and 2001.

² In absolute terms, this amount may seem small. In relative terms, it is equivalent to 20% of coffee sales (135 million per year), Nicaragua's most important agricultural export, and to 7.5% of total agricultural products exports (332 million in 1999).

another in price competition, and were vulnerable to highly variable product prices throughout the year. In these highly price-competitive relations between suppliers and Central American customers, the Central American firms bought from whichever producer gave the lowest price. This dynamic hindered producers from upgrading their techniques and equipment, from improving their products, from making long-range investment and plans to improve their production process. This situation also made it difficult for small producers to develop other markets in Mexico, the USA and elsewhere that would have helped to finance new investments to improve processes and products. The price competition in the production network fed a vicious circle that undermined the upgrading of the entire dairy cluster.

In 1998, an Italian multinational in food-related industries bought the Nicaraguan-owned dairy firm La Perfecta (the largest in Nicaragua). The Italian MNC's strategy in recent years has been to capture shares of the Latin American market. In 1998, South American countries accounted for 38% of the Italian MNC's six billion dollar sales worldwide. Its decision to locate in Nicaragua follows a strategy to enter and capture the regional Central American market. In contrast to the previous Nicaraguan-owned firm that geared its production to the local market, the Italian MNC produces with a global orientation, and has a wide diversity of products manufactured both locally and abroad.

With the entrance of the Italian MNC, the quality of milk became the priority, rather than the lowest price sought by the 'old' regional trade network. Achieving higher quality, however, is not a simple process. Simply pasteurising raw milk is insufficient; higher levels of bacterial contamination require a longer pasteurisation process, which in turn lowers milk quality. This makes the milk less useful for producing high-quality products, such as variants of Italian and French cheeses and long-life milk (UVH milk in boxes) that the MNC sells in global markets. Therefore, producers needed to reduce milk contamination prior to the pasteurisation process, following sanitary and hygienic norms during the collection phase. This required radical modernisation in the milk production process and constant monitoring, which is very different from the traditional embedded rural practices in Nicaragua.

Some would argue that enforcing high-quality milk production would be simple in the Nicaragua case, because the power balance between the MNC and local dairy producers is so unequal that the latter would be forced 'to go along' at the peril of survival. In this view, the ability of producers to improve performance would be pure luck, and the emergence of learning-by-monitoring would be unlikely. In this Nicaraguan case, however, the MNC is not a monopoly buyer in the domestic market for raw milk. Currently, the Italian MNC only buys 10% of the milk produced in Nicaragua. The Nueva Guinea dairy producers account for 20% of the milk the MNC buys.¹ High-quality milk is scarce in the local market, and the MNC itself faces extreme undersupply for its current production capacity, and for its plans to develop new products (i.e., long-life milk and high-quality cheese). In the words of an Italian project manager: 'the (Italian) firm is starving for milk'.

Moreover, improving existing practices embedded at the farm level and in the local economy is not a simple process. On the one hand, the MNC itself does not always have the internal capability to diffuse new practices directly. MNCs often face difficulties in transferring knowledge internationally.² In the local Nicaraguan context, the Italian subsidiary

¹ Interviews with Nueva Guinea Dairy Project managers, July 2001.

² Solvell and Zander (1999) argue that multinationals are not particularly well equipped to continuously transfer technological knowledge across national borders. Subsidiaries develop their own unique resources and capabilities, and become integrated into local innovation systems, isolated from headquarters.

specialises in final industrial processing and marketing of dairy products, and does not engage in raw milk production. It has commercial and financial expertise, rather than farm production-related ones. Producers, on the other hand, learn what they can know in the context of their network relations in an underdeveloped and isolated setting. Their production and trading relations condition their access to new knowledge. On its own, spatial clustering is not contributing to the increase of new knowledge flows to upgrade production.

Furthermore, small producers were already facing highly vulnerable economic conditions prior to the MNC entry to Nicaragua. Because the producers' traditional market demands low quality, they are more vulnerable to seasonal price fluctuations, exploitative purchases, and unreliable payments from foreign and local traders. As low-quality raw milk abounds, they have no 'power' in a product market characterised by low prices, high instability and extremely uncertain payment arrangements.

In contrast, there are important differences in the relations between the MNC and the dairy producers when compared with their traditional trading network. The Italian MNC is changing incentives and expectations that are helping to augment the capabilities and competitive assets in the Nueva Guinea cluster. For example, the company offers yearly contracts with stable prices, in marked contrast to the previous system that had extreme price variability throughout the year. This new arrangement is highly valued by the producers. In addition to yearly stability, the foreign firm offers higher prices, reliable payments and increased access to foreign markets.

The entrance of the MNC contributed in two ways to providing the developmental conditions for the dairy cluster. It created local market demand and market incentives for adopting and investing in better practices at the farm level. The better prices and assured market reduce the risks for those producers who decide to make and invest in changes. In some cases, the MNC helps producers' cooperatives to finance the cost of new investment in their farms and facilities. Equally important, it is nurturing a dynamic which led to the development of new relations among networks of producers, associations and local government officials, who are jointly discovering ways of upgrading their organisational and technical capabilities. With the new connections, producers are able to 'study' alternative ways of organising and restructuring dairy production under less vulnerable market conditions. The MNC plays a subordinate role in the transfer of knowledge, but the reshaping of existing networks would have been unlikely without the conditions the foreign firm provides.

Producers have been rebuilding their existing network, from one that was less conducive to learning and kept standards low, to one that sets new goals and presents learning-by-monitoring institutions that foster the diffusion of better production practices in the local economy. The combined actions of the MNC and a local development project are contributing to the reconstruction of the organisation of the cluster, in ways that use collaboration and self-monitoring to foster upgrading and organisational redefinition. Essential to the emerging alternative system is the organisation of producers into decentralised groups (based on '*comarcas*', the smallest spatial division in a municipality). These groups are responsible for coordinating efforts to eradicate disease at the farm level, for diffusing new technology and production practices among producers, and for monitoring the quality at local milk reception plants.

A local government project established a new milk reception plant for the region, combined with the most modern quality test laboratory in the country. In addition, there are 14 peripheral reception plants throughout the region. Ten producer associations

collaborate and participate in the management of the reception plants and quality control. The plant and the laboratory are locally managed; they are not owned by the MNC. Moreover, the coordination of the clusters' production process is not done by the foreign firm, but through cooperative self-monitoring, rather than bureaucratic hierarchy. The monitoring of raw milk quality, and procurement coordination are done through local groups, who have a joint committee, across groups, overseeing the main reception plant. Producers have been able to improve the quality of milk. Currently, 95% of the raw milk collected by the MNC in the Nueva Guinea region achieves quality category A (the highest), a remarkable performance that no other region achieves.¹

In contrast to the Chilean experience, where national policies to boost exports opened new forms of collaboration between the state and private firms, and among large firms, the Nicaraguan governance institutions that contribute to upgrading are being provided by multinationals and local organisations (municipal governments and local development projects). The upgrading of the Nicaraguan dairy cluster is occurring in a national context where traditional large agroindustry (soybean oil, tobacco, meat) is in crisis, as evidenced by statistics on the widespread economic difficulties and bankruptcy of industrial firms. At the same time, there is a widely recognised weak government administrative capacity, as well as an absence of sectoral and national policies, or serious programmes that address key issues for improving the productive capabilities of Nicaraguan firms (small and large). In this context, local projects in alliance with an MNC are taking on the responsibility for upgrading small producers, as well as augmenting the regional assets (infrastructure development). This is contributing to the development of new institutions for local economic governance in which producers' associations, municipal government, MNCs and autonomous state agencies play a key role.

6. Conclusions

I have focused on what could be considered 'successful' attempts to create new production systems that are better able to meet current economic challenges. These two cases show that actors, at various levels, can reconstruct 'old' or existing institutions, and develop new ones using learning-by-monitoring. No single actor, whether the state, multinational or local firm, has the superior knowledge or capacity to direct economic reorganisation. Rather, learning-by-monitoring institutions emerge from the interactions between public (local and national) and private (indigenous and international) actors that become constituents of network reorganisation through deliberation and goal setting.

The Nicaraguan and Chilean cases also show the possibilities for combining small enterprise development and multinational investment. These are not exclusive choices. They point out that focusing the debate on issues of size (large *versus* small) is a limiting perspective. Similarly, the split in the literature on developing economies, between an emphasis on the dominance of global production and attention to localised industrial districts, does not capture the interaction between these two modes in current development strategies. The reality today is showing more combinations and interpenetration of both large and small, artisan and internationally competitive, local and multinational. Foreign investment plays a positive developmental role for local economies when local firm networks are built and act as agents of their upgrading, drawing on the new resources and incentives the global customer provides. The MNCs' main role, however, is not necessarily

¹ Interview with Agriconsulting manager, July 2001.

nor exclusively in knowledge transfer, but in creating local conditions that support the emergence of new institutional mechanisms that promote productive upgrading within the local economy.

This discussion also supports the view that the current focus on the presence or absence of foreign trade networks and pre-existing trust as necessary conditions for cluster competitiveness in developing economies is a self-limiting debate. Trust relations are more a consequence of collaboration among local and international actors. And foreign trade networks do not always play a positive catalytic role for local economies. They contribute to the building of local firm competitiveness when they support learning, efficiency and innovation. A more central issue is how the organisation of production is coordinated, and whether it builds institutional mechanisms for continuous learning and upgrading.

From a policy perspective, particularly in relation to issues of decentralisation, learning-by-monitoring principles promote the emergence of local partnerships that widen participation in the processes of economic change, and upgrading. Furthermore, the analysis presented here supports the view that networks, not individual firms, constitute the key unit for economic restructuring. The responsibility for carrying out the reorganisation rests on firm networks, assisted by local and national public agencies. The challenge is how to diffuse and expand the potential of these new systems to other regions and sectors, as well as to government administration at the local and national level.

Finally, the transferability of learning-by-monitoring for improving the conditions of small firms implies that producers and regions do not embrace a particular organisational form. They adopt common sets of principles that by their very nature involve organisational variety and which are compatible with a broad array of local circumstances. Those who embrace new principles never do so from within unitary systems. They adapt the new principles to the possibilities of their own situation.

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