

Economic Development in an Assembler Driven Commodity Chain:
Industrial Relations in General Motors' Silao Supply Chain

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In 1994, General Motors opened a new manufacturing facility in Silao, Mexico, a small city with a population of 135,000 roughly 200 miles northwest of Mexico City in the state of Guanajuato. Employing over 3400 assembly workers on two shifts, six days a week, the plant assembles 820 sport utility vehicles a day, nearly all for export to the United States. The production process implements a form of lean production in which supplies arrive on a just-in-time basis to teams of workers who are encouraged to participate in the Japanese system of “kaizen”, or continuous improvement, by offering their recommendations for enhancing productivity or reducing accidents in the plant.

Within six years, five of GM's suppliers built new facilities in Silao, attracted by a desire to be near their customer and a host of incentives offered by state officials aggressively pursuing industrial development in an area previously cultivated for strawberries. The six plants closely coordinate their employment practices to avoid competing for workers or sparking wage inflation. Together, they employ 6,500 production workers earning between seven and twenty dollars a day depending on the product they make and their educational qualifications, which range from completion of sixth grade to full high school or technical training.

The location of GM's plant and its nearby suppliers in Silao, as well as their close coordination, is attributable to changes in industrial and economic policies emblematic of globalization. Since the early 1980s, automakers have responded to competitive pressures by reorganizing production and their corporate structures to reduce the share of production they perform and increasing their reliance on outside suppliers. Over the same period, economic

policy shifts in the U.S. and Mexico encouraging an expansion of trade between the two countries make Silao an ideal assembly location for GM, and the pursuit of an auto plant a viable option for local policymakers.

Yet, this shift in the auto industry and its implications for local development is unaccounted for within the global commodity chains literature, though the approach has become a popular means of analyzing economic development within the context of globalization. By drawing attention to the increasingly complex networks of manufacturers, contractors, and subcontractors involved in global production, and particularly by identifying the nodes of power in a given chain, the global commodity chain approach enhances our understanding of economic development by focusing not on states, but on the transnational flows of goods and services between them. These analyses have helped identify industrial upgrading as a means by which governments promote economic development by encouraging firms to move up commodity chains.

However, the global commodities chains approach is most commonly applied to analyses of “buyer driven” commodity chains, especially those of the garment industry. In comparison, “producer driven” chains, the archetype of which is the auto industry, remain largely unexplored even as processes associated with globalization increasingly spread production in these industries to developing countries. As a result, our model of producer driven chains is outdated and pays little attention to the dynamics by which they touch down in developing countries, how they may be attracted and grown, or what types of job opportunities they represent.

This paper will expand global commodity chain analysis to the producer driven chains and their impact on economic development through an analysis of industrial relations at General

Motors' newest Mexican assembly plant and its five suppliers located in Silao. It demonstrates, first, the viability of economic development strategies targeting the top of producer driven commodity chains and expanding downward, rather than attempting to climb buyer driven chains through industrial upgrading. Second, the analysis focuses on key measures of job quality and human resource policies to understand the effects of local industrialization on workers, documenting that among firms situated at the top of this complex commodity chain, a broad range of industrial jobs have been created. As the global commodity chain approach leads us to expect, General Motors' maintains significant influence over its suppliers, which it leverages to ensure itself a position as the area's prestige employer. However, the quality of jobs created at any particular factory also depends largely on the type of product being produced and the requirement of the production system, with great variation among firms at identical places in the commodity chain, thereby underscoring the value of delving in to the details of local industrialization rather than substituting a firm's or region's movement up a commodity chain as a proxy for economic development.

The paper proceeds as follows. The first section reviews the contributions of the global commodity chain approach to our understanding of economic development in an era of globalization. In the second section, the restructuring of the North American automobile industry is explained from a global commodity chain perspective as shifting the sector from a producer driven to an "assembler driven" commodity, updating and elaborating on the relatively undeveloped vision of the relationship between major automakers and their suppliers. The third section reviews the confluence of public policy strategies in Mexico that integrated the North American auto industry and led GM's commodity chain to touch down in Silao. The fourth section focuses on industrial relations at the six plants to paint a picture depicting the way the

confluence of industrial restructuring and economic policy reforms described in the previous two sections manifest themselves for workers. It highlights the manner in which GM leverages its place at the top of the commodity chain to orchestrate across the firms an industrial relations regime providing the precise mix of labor necessary to guarantee timely delivery of quality products. The paper concludes with some thoughts on the success of policymakers in attracting an auto plant to Silao and its implications for the global commodity chain approach, as well as developments to look for as the local industrial sector grows.

GCC Approach and Economic Development

The global commodity chain approach to studying economic development was proposed by Gereffi and Korzeniewicz (1990) as a method by which researchers might better analyze the semi-periphery, a categorization of states based more on what they are not (not the core and not the periphery) rather than shared characteristics. As a designation, the term “semi-periphery” becomes increasingly problematic as globalization spreads industrial production away from the core and increasing numbers of countries’ economies become a mixture of activities traditionally associated with either the core or the periphery, yet these countries experience industrialization differently. In particular, Gereffi and Korzeniewicz cite the East Asian newly industrialized countries’ far superior performance over their Latin American counterparts in raising living standards as evidence that industrialization should not be conflated with development, and that to understand the latter we must more closely examine the former.

Hopkins and Wallerstein (1986), define a “commodity chain” as the “network of labor and production processes whose end result is a finished commodity” (p. 159) and suggest they be studied beginning with the finished product and working backwards toward the raw materials. Gereffi and Korzeniewicz expand this definition to include the post production marketing and

sale of the product included in what Porter (1990) refers to as a product's "value system". But whereas Porter largely sees firms as nationally bound, and international competition a function of "the ability of a nation's firms to exploit linkages with home-based suppliers and customers" (p. 42), the global commodity chain approach holds firms in the global economy to be stateless. This is not to say that the global commodity chain approach does not see economic development as a state centered activity. Rather, by analyzing a commodity chain, and especially where it touches down in developing countries, the global commodity chain approach provides a means for studying economic development that does not rely on the state as the unit of analysis, but allows us to locate a country's place in an industry to understand its place in the world system.

The role of marketing and distribution in commodity chains has become key to the global commodities chain approach. In explaining the consolidation of clothing retailers in the United States and their resulting power over overseas suppliers in demanding particular products be delivered at a specific price, Gereffi (1994) establishes the importance of locating the node of power within a commodity chain. In particular, he identifies and contrasts two ideal types of commodity chains, the "buyer driven" in which "large retailers, brand-named merchandisers, and trading companies play the pivotal role in setting up decentralized production networks in a variety of exporting countries" and "producer driven" chains "in which transnational corporations (TNCs) or other large integrated industrial enterprises play the central role in controlling the production system" (p. 97).

This dichotomy between the buyer driven and producer driven commodity chains has largely guided the global commodities chains literature, though the idea of "trader driven" chains has been advanced (Gibbon, 2001). However, the global commodity chain approach has been mostly applied to analyses of buyer driven chains, particularly in the footwear, garment, and

agricultural industries. Since by definition the top of these chains are occupied by firms with consumer market access in importing countries, these writers seek to explain the actions of a particular firm, understand the dynamics of an industry, or identify the role a particular country or area plays vis-à-vis marketers or retailers in developed countries where the product is sold, typically the United States.

For instance, Korzeniewicz (1994) focuses on Nike to document what has become the model of the buyer driven chain. He recounts how the founder of Nike, Philip Knight, grew the company from an importer of Japanese athletic footwear to become the power node of a commodity chain in which it specializes in design and marketing, but has never attempted to manufacture its own footwear. Rather, Nike has experimented with various forms of contractor relationships in its drive to find a combination that could reliably deliver quality products inexpensively, leaving to its suppliers the job of managing production.

As the model for the buyer driven commodity chain, the apparel industry has been investigated to understand the relationship between the products and their commodity chains. Appelbaum, Smith, and Christerson (1994) compare the geography of production of men's wool suits and women's blouses. Demonstrating how the qualities sought in the two products require different commodity chains, they show that higher value garments tend to be produced in spatially concentrated areas, among firms with more stable relationships that allow them to shift production to meet changing fashions, whereas low value items are more geographically dispersed to areas of cheap labor. As a result, in 1987 Italy remained a major exporter of wool fabrics and suits. However, production of synthetic blouses was increasingly occurring within low wage East Asian countries.

Similarly, Ian Taplin (1994) analyzes U.S. manufacturing of outerwear to demonstrate that the industry may be thought of as two different commodity chains. The first, a fashion oriented industry operating small shops in New York and Los Angeles survive as highly specialized shops producing women's and girls' outerwear. The second commodity chain of mass produced, standardized products for men and boys is increasingly concentrated in large scale firms. Both found themselves at risk, low wage employers subject to the demands of U.S. retailers and the threat posed by cheaper foreign labor which was being held at bay by U.S. import protections.

Others analyze the role of different commodity chains in local development. Kenney and Florida (1994) examine Japanese owned maquiladoras in Mexico and their place in the commodity chains manufacturing goods, especially electronics, for the U.S. consumer market. They indicate that the factories provide a source of inexpensive labor for non-automated, labor intensive assembly, but that the production systems share little in common with the lean production techniques commonly associated with Japanese management. Instead, the workers appear to assume the role traditionally played by women in the Japanese industrial relations system, that of lower paid temporary workers.

Laura Reynolds (1994) looks at agricultural exports from the Dominican Republic to understand the ownership and trading patterns among the non-traditional agricultural products the country exports in lieu of its traditional agricultural product, sugar, which is unprofitable as an export due to U.S. trade restrictions, falling world prices, and increasing use of sugar substitutes. She discovers that each of pineapples, melons, oriental vegetables, and winter vegetables are produced and sold through different commodity chains based on the demands of their cultivation, processing, packaging, and exportation. Pineapples require heavy capital

investment and over a year to mature, and are typically grown on large plantations owned by transnational corporations. Melons and oriental vegetables are short-cycle crops that must meet demanding quality standards and are labor intensive to cultivate. These are generally grown on contract to exporters who desire the stability of reliable suppliers but transfer the risk and costs associated with cultivation to peasant farmers. Winter vegetables are more likely to be purchased by exporters on the open market because they are more readily available on the Dominican market.

Goldfrank (1994) demonstrates how change in consumer demand for “fresh” fruit, year round, has combined with changing economic policies, and enhanced refrigeration technology to increase Chilean exports of produce to the United States and shape the commodity chain associated with those exports. He notes that the change in the definition of “fresh” to include anything unprocessed, even if it had been picked weeks earlier, and changing dietary fashions, particularly in the West and Northeast has fed demand for Chilean produce. Furthermore, he notes that the bi-coastal demand has made ports in California and Philadelphia the primary destinations for Chilean fruit, with little transported through Houston.

As studies of buyer driven commodity chains have repeatedly demonstrated greater profits and value added to be located incrementally closer to the node of power within the commodity chain, some have sought to demonstrate the capacity of particular regions’ firms to move up the commodity chain as a means of economic development. Gereffi (1999) documents the changing nature of the garment commodity chain in Asia. As retailers, branded marketers, and branded manufacturers have forced the search for ever cheaper sources of labor, countries such as Korea and Hong Kong have not simply fallen out of the commodity chain. Rather, these countries have developed the expertise to coordinate the production and become key agents in

the commodity chain that connects manufacturers to the U.S. market. Similarly, Bair and Gereffi (2000) demonstrate how the blue jean industry in Torreon, Mexico developed between 1993 and 2000 from performing only assembly to become “full package” manufacturers capable of receiving an offer from a customer and delivering a finished product.

On the other hand, Kaplinsky and Morris (1999) find that in the KwaZulu-Natal Province of South Africa firms have not sufficiently upgraded in response to increased international economic competition in the wake of reforms reducing protective trade barriers. Though results differ among the 130 companies surveyed, overall trends show the auto components industry fairing better than clothing or textiles, the former benefiting from pressure and assistance provided by customers such as Toyota.

But even as global commodity chain literature expands our understanding of the nuances inherent in different buyer driven commodity chains, little effort has been made to understand the producer driven chains and their role in economic development, especially with regard to the relationships between the transnational corporations with consumer market access and their suppliers. Lee and Cason (1994) compare the different roles South Korea, Mexico, and Brazil play in global automobile commodity chains by identifying the markets for which they are producing. Kim and Lee (1994) examine the growth of the South Korean auto industry and the forward linkages it developed to market its products in the United States and Europe, with most of companies opting to market their cars under known nameplates and Hyundai adopting the riskier strategy selling them under its own name.

The focus on buyer driven commodity chain may be because producer driven chains “in which transnational corporations (TNCs) or other large integrated industrial enterprises play the central role in controlling the production system” are seen as impenetrable due to the high cost of

entry compared to the buyer driven chains in which “production is generally carried out by independent Third World factories” (Gereffi, 1994, p. 97). Likewise, since economic development through the promotion of capital and technology intensive industries characterized as producer driven chains is commonly associated with out-of-fashion import substituting industrialization schemes, and those industries associated with export oriented industrialization tend to be classified as buyer driven chains, the latter have garnered greater attention.

However, this emphasis on the buyer driven commodity chains leaves global commodity chain literature lagging behind post-fordist literature on the auto industry detailing the manner in which increasing mobility of capital and the widespread industrial restructuring inherent to globalization encourages and facilitates the location of manufacturing facilities in producer driven chains in developing countries. These changes have shifted automobile supply chains from producer driven to “assembler driven” as the large automakers have drastically reduced their role in manufacturing automobiles.

From Producer Driven to Assembler Driven Commodity Chain

The North American auto industry is a good example. Beginning in the post World War II period and continuing in to the early 1980s, automobile manufacturing in the United States and Mexico developed along parallel, nonintegrated tracts. In the United States, the big three automakers (General Motors, Ford, and Chrysler) practiced “fordist” production, building automobiles from the ground up employing the principles of scientific management. Each company owned and operated both a series of auto assembly plants and a vast network of autoparts plants in which workers labored on assembly lines, the control over which had long been ceded by the United Auto Workers to the companies in exchange for salaries, benefits, and

job security affording autoworkers a middle class standard of living matched by few groups of blue collar workers.

Similarly, in Mexico five major automakers (GM, Ford, Chrysler, Nissan, Volkswagon) produced automobiles for the Mexican consumer market which was protected from international competition by economic development policies associated with import substitution industrialization. They manufactured their own parts and assembled automobiles on assembly lines employing workers represented by firm level, national unions that were closely associated with, and a key constituency of, Mexico's ruling Revolutionary Institutional Party (PRI). Like their counterparts in the United States, Mexican autoworkers enjoyed high wages and benefits, the costs of which could be passed on to consumers due to the lack of any import competition. For General Motors, this meant operating separate supply chains and assembly plants in each of the two countries.

From a global commodity chain perspective, the automakers in both Mexico and the United States directed truly producer driven chains, with their suppliers providing mostly raw materials and rudimentary parts. In the early 1980s, this system of fordist production began to unravel as foreign competition in the U.S. automobile market, particularly from Japanese imports offering higher fuel efficiency and quality exposed inefficiencies within the system. Faced with mounting losses, the big three first sought to cut costs through concession bargaining with the UAW, but also by reorganizing production away from the fordist model by adopting elements of "lean" production borrowed from the Japanese, and particularly Toyota. These included shortening production cycles to better respond to market demands, implementing "just-in-time" inventory systems, and liberalizing work rules to allow the automakers to experiment with work teams and other methods of promoting greater productivity and quality on the shop floor.

As large automakers experiment with, and push the boundaries of, lean production, they have sold off or isolated their parts divisions, forcing them to compete internationally for contracts that were once guaranteed. At the same time, the increased technological sophistication of automobiles and the demands of lean production create the need for a select group of first tier “super suppliers” working closely with the automakers engineering and designing new parts and their production processes. Firms at lower tiers are less involved in product design, and at the lowest tiers provide parts meeting guidelines provided by their customers (Helper, 1995, 1999; Helper, MacDuffie, and Sabel, 2000).

As a result, the auto industry, once the archetypal producer driven commodity chain, has been transformed so that the nucleus of power lies with the large auto assemblers with widespread name recognition. They sit in the middle of these assembler driven commodity chains wielding tremendous power both up the chain to the retailers with whom their relationship remains largely unchanged, and down the chain to suppliers. As a result, some of the relationships between the major automakers and their suppliers increasingly resemble those buyer driven commodity chains in which parts manufacturers are dependent on those with consumer market access, but the retailers have come to rely on key suppliers who not only ensure stable flows of supplies, but take responsibility for research and development functions as well.

Geographic Restructuring of the North American Automotive Commodity Chain

Concomitant with the industrial restructuring reshaping the relationship between automakers and their suppliers, the auto industry has experienced a geographic realignment emblematic of, and in response to policies closely associated with, globalization. Whereas economic policies once prevented automobile manufacturers from sourcing parts across the U.S.

– Mexico border, changes in Mexico’s development strategy and the reduction of trade barriers between the countries have encouraged this practice. As a result, over the last two decades, auto plants once producing for strictly domestic markets incorporating domestically produced parts now supply automobiles made with parts and materials from a host of countries to customers on both sides of the border, but with sales much greater north of the border.

Just as Mexico’s auto industry was born and nurtured under the country’s economic development strategy of import substitution, it remained central as the government’s policy shifted to promote growth through exportation of goods in response to economic crisis. Under the 1983 National Development Plan, automakers were provided incentives to upgrade their technologies and tariffs on capital equipment were cut so that the industry could rapidly upgrade and become internationally competitive. By the 1990s, Mexico’s economic and trade policies had begun to converge with those of the United States, which had been lowering its own tariffs, quotas, and other barriers to trade steadily over the years.

However, trade policy alone did not create a hospitable environment for the production of automobiles in Mexico for export. In addition, automakers argued that the high pay and stringent work rules through which labor was rewarded for their support of Mexico’s ruling Institutional Revolutionary Party (PRI) during the period of import substitution was inconsistent with international economic competitiveness. Exploiting the corporatist industrial relations system through which centralized unions previously wielded their influence within the PRI to force high wages and limit managerial discretion, the government pressured the official unions to renounce these benefits to facilitate future growth. Union leaders consented, signing national agreements limiting pay increases and negotiating collective bargaining agreements allowing greater labor flexibility and management control over production.

Workers in the auto industry who, like much of the country's middle class, had seen the value of their wages and savings plummet due to the devaluation of the peso, were not entirely accepting of the concessions agreed to by unelected leaders. Their status as blue collar elites fading, activists at some plants attempted to democratize their unions, organizing numerous "unofficial" strikes challenging the concessions, the process by which they were negotiated, and demanding reform of the labor movement.

In response, and especially as the automakers have opened new manufacturing facilities in greenfield sites, there has been a gradual shift in the nature of unionism within the auto industry. The system of centralized, firm level unions negotiating at the national level has given way to a decentralization of collective bargaining to the plant level, even as an increasing number of unions at auto plants became affiliates of one union federation, the Confederation of Mexican Workers (CTM). What has emerged is decentralized collective bargaining in the context of a "new union discourse" (Bayon and Bensusan, 1999) based on a "symbolic-ideological identification" (Regini, 1992) with the firm. Union goals are now more closely aligned with those of the firms whose workers they represent, with collective bargaining focusing nearly exclusively on remuneration and ceding the shop floor back to management.

This combination of industrial restructuring and geographic realignment has been largely successful in promoting the growth of an internationally competitive, integrated, North American auto industry in which firms in each country occupy a range of tiers. In fact, by the time the United States, Mexico, and Canada implemented the North American Free Trade Agreement, Mexico's role in auto production for export had grown from a supplier of parts requiring labor intensive production, to a reliable engine manufacturer, and ultimately to an assembler of automobiles whose productivity rivaled that of the United States (Carrillo, Shaiken, etc.).

GM's Silao Commodity Chain

In the early 1990s, the trends in automotive industrial and geographic restructuring provided an opportunity for economic development policymakers in the state of Guanajuato when General Motors announced it was investigating possible locations for a new assembly plant to replace their Toluca facility which was outdated and had been among those mired in industrial disputes for a decade as workers continued to demand democratic representation. By offering GM a combination of incentives including free land and assistance in paying municipal taxes, as well as by conducting a feasibility study analyzing the available labor force within thirty kilometers of Silao, state officials successfully courted the company which selected the site over another in the state of Durango.

According to state officials, their efforts reflected a belief that attracting an auto assembler to the area would pay immediate dividends and encourage additional industrialization over the long term. Following a strategy designed as a hybrid between export oriented and import substitution industrialization, state officials determined to first attract an auto assembler producing for export and to then begin substituting parts the plant would import with those produced locally by encouraging first, second, and third tier suppliers to open local facilities. Immediately after GM finalized its decision to locate in Silao, an area was set aside for an industrial park, FIPASI, to house GM suppliers that the automaker indicated they would want located “in their backyard”. Nine factories are now located in FIPASI, four of which are first tier suppliers to General Motors local plant.

For GM, selection of a greenfield site offered the opportunity to create a local automotive sector from scratch, unburdened by memories of the tumultuous industrial transition that characterized the 1980s. Today, in Silao General Motors sits on top of a local commodity chain

created to serve its production of sport utility vehicles for the U.S. market. All of the workers at the six factories discussed below are represented by one of two CTM affiliated unions recognized by the companies before any workers were hired, and the structure of the union and the extent of its involvement in the plants varies according to the industrial relations strategies of the firm. Each of the collective bargaining agreements focuses nearly exclusively on pay and benefits which are negotiated annually, with no provisions relating to the organization of production or even establishing a grievance procedure.

Below, each of the corporations' production processes will be briefly described to the extent necessary to understand why particular industrial relations policies are practiced. The data for this project was collected over a two month period in the beginning of 2002. At each plant, the production process was examined through a shop floor tour lasting anywhere from twenty minutes to two and a half hours. Information regarding industrial relations practices was collected through interviews with at least one plant representative, usually the human resources director, and from various contacts within the unions. Table one compares key employment statistics between the plants.

Whereas fordist production dictated manufacturers own the entire production process and employ a large workforce under broad collective bargaining agreements, the combination of industrial restructuring through which GM has shed much of its responsibility for production to focus on design, marketing, and final assembly and economic policy reforms in Mexico have facilitated creation of a unique multi-employer industrial relations regime among GM and its five first tier suppliers in Silao. Under this form of lean production, industrial relations policies are tailored to guarantee reliable delivery of a particular part at minimum cost. Human resource managers meet regularly to share information on successful recruitment and training techniques,

assure they are maintaining their designated position in the regimes pay scale and to update their list of recent terminations and quits that prevent them from hiring each others' former workers. Through this coordination, GM simultaneously preserves its place as the status employer in the area and stifles wage inflation by preventing suppliers from competing for employees while economically rationalizing the labor costs associated with production by allowing each firm to establish industrial relations policies that will attract workers with only those skills necessary to manufacture a particular part. What results is a range of jobs in which workers with an assortment of educational qualifications experience very different career trajectories and wide variations in pay depending on the product they make.

In fact, a key bifurcation between the plants can be seen in their policies with regard to turnover and whether or not workers are encouraged to view their employment as a long term commitment. A point of unanimity among all the union and company officials is that workers in Silao are unaccustomed to the riggers and daily grind of industrial work. Unless specifically addressed through recruitment strategies, training programs, pay scales, as well as the role of the union in the plant, absenteeism and turnover become the norm. For GM and three of its suppliers producing axles, doors and hoods, and uniformly cut sheets of steel, maintaining low turnover and a stable workforce is a preoccupation. The other two suppliers, one a parts handler and the other a provider of electrical harnesses, operate effectively in spite of constant turnover of their employees.

For General Motors, maintaining its low turnover rate of 1.5% annually is fundamental to an assembly process designed around stable work teams comprising roughly seven workers. The plant assembles Chevy Suburbans, Cadillac Esplanades and Chevy Avalanches (the latter two being four door models with a pickup truck bed) of various colors and combinations employing a

variation of the Japanese kaizen system in which teams of workers at each station along the assembly line, referred to as a “zone”, perform a specific task or small set of tasks contributing to the production process. Aside from working on the line, each team member is responsible for a specific administrative task by which the team keeps track of, and self reports, its productivity, training progress, use of parts, scrap produced, etc. These tasks are coordinated by the team leader and the records kept at each work station for easy access.

While work on the assembly line is meant to be standardized, GM expects their employees to participate in establishing and improving these standards based on what they learn through their own administrative monitoring and experience on the line. Adopted improvements are then documented in a large display in the center of the plant with the title “Kaizen”. Each of the previous month’s changes (32 in the month of December, 2001), ranging from simple ideas to move a stock of parts to reduce bending to alterations in parts that require they be reengineered and their installation process rethought, are reported in full, including the original submission and the names of the workers who made it, a description of the outcome, and before and after photos. The remainder of the display is dedicated to graphs of the work teams’ performance along various productivity measures. Through a program known as “Ideas and Improvements”, workers may be rewarded with a percentage of cost savings that result from their suggestions.

Augmenting these systems of soliciting worker ideas are team based processes for problem solving. For immediate problems in the assembly process, an Andon system allows workers to halt the assembly line in their zone and alert workers who may be away from the line by triggering the repeated broadcasting of team specific jingles as well as the blinking of teams code on overhead lighted signs. Longer term problem solving on the assembly line is

administered through the “process of the seven diamonds” which guides teams through a series of steps to determine if solutions lie in their implementation of the work process, use of appropriate tools and parts, or if they require the intervention of an engineer.

The low turnover required to maintain the production process is exacerbated by the training needed to prepare new employees to join the line. New hires receive three months of classroom and on-the-job training to educate them about the various components of the kaizen system they are expected to participate in, give them an overview of the production process, and socialize them in to the plant. Only then do they join a work team and train in the specific job that they have been hired to perform. Even with a pay scale that limits remuneration during training by paying workers less than seven dollars a day at hire but incrementally doubling it over the first four months of employment, high turnover would escalate training costs.

Similarly, Aventec, GM’s supplier of fenders, roofs, hoods, and doors strives, to maintain low turnover in order to implement its version of kaizen which differs dramatically from that of General Motors. Doing so, however, has been a learning process during which the plant’s original human resource manager was replaced in the face of 30-40% monthly turnover rates that nearly crippled productions after the plant opened in 2000. These have been brought down to two percent monthly as recruitment has become more selective.

Aventec, is joint venture between the Budd Company of the United States and two Japanese firms, Hirotec and Sumitomo. Their desire for low turnover stems from Sumitomo’s management and production system, the “6s” system, which is pitched to workers as a “lifestyle” and permeates the entire facility’s operations. Each “s” refers to a Japanese word (which when translated do not begin with “s” in either Spanish or English) that when taken as a whole reflect a philosophy. Workers should always “select” the appropriate tool or material for the job, and

maintain a logical “order” of materials according to their usage. “Cleanliness” of one’s work environment should be maintained at all times, as should personal “hygiene”. “Discipline” should be shown in adhering to all rules and regulations, with an emphasis on the “maintenance” of the previous five “s”. Through the 6s system, Aventec employees contribute to the firm’s stated goals of “safety”, “quality”, “cost”, and “perfection”. Though workers labor in teams of eight with a leader, the 6s system is designed to cultivate among the workers an image of the entire plant as one big team.

In fact, the work at Aventec is fairly unskilled, and workers require only a week of training. The shop floor is divided in two areas, stamping and assembly. The stamping room’s two press lines are heavily automated, with robots moving the parts among the five presses in each line. Most of the workers stack the stamped parts as they come off the press lines to be sent to the assembly room’s five assembly lines where the inner and outer panels are “married”. Here, where the majority of Aventec’s 400 employees work, spot welding machines are used to reinforce the inner panels, a series of robots apply adhesives and anti-vibration sealers and a series of hemming dies performs the final hemming process.

Whereas low turnover is seen as fundamental to successful implementation of kaizen at GM and Aventec, it is necessary to facilitate the ongoing training at Oxford Automotriz and American Axle & Manufacturing’s - Guanajuato Gear and Axle (AAM). The former is a small operation opened in 1998 employing seventy men on two shifts, each of which is expected to eventually be trained to operate all the plant’s equipment. The latter opened in 2000 and employs 640 production workers with capacity to hire more.

Oxford Automotriz cuts coils of steel in to pieces that can then be fed in to General Motors’ stamping machines. The process of cutting the steel is highly automated. After being

fed a coil of steel by an overhead crane, a single machine uncoils the steel, cleans and dries it, and cuts it with a dye moving up and down like a piston. The uniform pieces exit the other end and are stacked.

Oxford operates two production shifts. Supervision on the shop-floor is light, and the company's intent is for a stable workforce to learn to use the firm's full array of machinery. Training at Oxford occurs in three stages, the first of which is a one week induction during which the workers are educated about Oxford, its products and clients, QS 9000, safety, teamwork, and the different areas of the plant. The second stage is a week of shop floor training in the new hire's specific job assignment. The final stage of training is to learn to use new machinery, which is a process that can continue for a full five years and through which incrementally increase a worker's worker may incrementally increase their salary from nine to twenty-two dollars a day. The human resource manager estimates that it would take a worker five years to become fully qualified throughout the plant, and a large board on the shop floor charts each worker's progress. Turnover is 2.5% a year and considered too high to achieve this goal.

Opened in 2000, AAM is unique among the local auto sector plants for a couple of reasons. First, AAM hires the most highly educated workforce which receives ongoing training that allows them to eventually join the ranks of management and reach a salary levels exceeding those of GM's assembly. Second, with a workforce 20% female, AAM offers the only production work for women with more than a basic sixth grade education. Finally, with parts shipped to a GM plant in Pontiac, Michigan and 25% of production supplying Daimler-Chrysler in Mexico, AAM is the only one of GM's local suppliers with significant alternative customers.

Though the plant's production culminates in a short assembly line on which roughly twenty workers assemble axles for GM's SUVs, most of the production involves forging those

parts. This is performed by workers at computer operated machines arranged in a circle so that more than one machine may be monitored at a time. Operating the machinery at AAM requires thorough training, and over a their first two years of employment technicians receive sixty hours of training annually until they are capable of training others in the use of all the machinery within their area.

Once workers complete two years training, they may continue to train in areas beyond the technical level, with the intent of moving in to a supervisory role. Because at the time this research was conducted the plant had only been open for a year and a half, no one had actually begun such training. But the training coordinator had mapped out an additional two years of training. Fulfilling this vision requires low turnover, currently considered too high and 2.9% annually.

As workers pass through the various training modules, their salaries rise in a manner skewed to reward longevity and minimize the costs of early training and turnover. Upon entering the plant, workers earn a little less than eight dollars a day. This rises incrementally so that after roughly three months they are earning more than eleven dollars a day, and salaries for technicians peak at a little over sixteen dollars a day after eighteen months. Upon beginning post-technical training, AAM plans for pay to jump to twenty dollars a day, equaling the maximum for a GM assembly worker, and to peak at over thirty-six dollars after two years.

These four factories pursue their goal of low employee turnover through a combination of recruitment strategies designed to screen out applicants not considered likely to adapt to the daily grind of industrial work. In addition, the companies use a variety of salary and promotion structures, union involvement schemes, and other incentives to maintain stable workforces.

All the plants have developed recruitment policies designed to screen workers. With an average wage of \$20 a day and reputation the premier employer in the area, GM must sort through an abundance of applicants. But those hired must fit a particular profile. First, they must have a ninth grade education, but no more. Second, they must be inclined toward stable employment due to financial obligations, the details of which are requested on the job application, and by temperament as determined through a psychological exam. Third, workers are given a capability test examining their dexterity, capacity to perform work repeatedly with high levels of quality, and whether they have an eye for detail.

Both Oxford Automotriz and Aventec work maintain low turnover while employing workers with equal educational qualifications as those at GM, at salaries one-third lower. Both employ exclusively men and begin their hiring process by reviewing unsolicited applications deposited at the plant. Due to the inconvenience and expense associated with travelling to the industrial park, which is not included on public transportation routes, these applicants are considered especially motivated to work. Each then screens applicants through a series of interviews with the human resource manager and supervisors, a check of references from previous employers, and a personality and capabilities test.

The most trying screening process among the plants is at AAM. AAM's recruitment process simultaneously tests job applicants' dedication to employment with the company, minimizes initial training costs, and provides the company significant time to judge the candidates. Job applicants responding to the company's newspaper solicitations or at the State of Guanajuato Institute of Training for Work (ICATEG by its Spanish acronym) must have a full high school education or a technical school degree. Accepted applicants then begin three months of training at ICATEG, during which time they get a "scholarship" amounting to the local

minimum wage, currently between three and four dollars a day. Trainees receive 480 hours of training in a diversity of areas including the “vision of the future”, manufacturing processes, machining, computers, heat treatment, and maintenance. Only if they pass a written exam, physical, and drug test are they offered employment. Management concedes this system results in the loss of quality applicants who cannot afford three months of nearly unpaid training, but consider it necessary to prevent costs associated with higher turnover rates. By the time applicants become employees they require only three additional days training in industrial safety, plant and company objectives and policies, quality system, teamwork, and specific machinery and equipment operation before beginning work.

While each of the companies’ workers are union members, General Motors and Aventec incorporate the union in to the plant to help workers adapt to industrial life and reinforce the companies’ philosophies. At each plant, the union, a section of the CTM affiliated Metal-Mechanical, Automotive, Similar and Related Industry Workers’ Union (SITIMM) has an office staffed by union representative who draw their salaries from the firm. At GM, their office is directly off the shop floor. At Aventec, it sits in a small building next to the plant that includes the training classrooms.

These union representatives are available to assist workers with problems or issues that may arise, whether work related or not. Often, they involve supporting workers with problems outside the plant that otherwise could compromise their job performance, as well as providing information and advice on taking advantage of opportunities newly available to workers with steady incomes.

For instance, at General Motors, the union’s sixteen member governing board includes secretaries of agriculture, youth, and social provisions whose attentions are directed at causes in

the community that affect their members either directly or indirectly. In addition, the union addresses workers' personal crises. Union officials keep track of illnesses within workers' families, make hospital visits, and are available to assist them in making arrangements without which they might have to take time off work. Similarly, rather than pay a simple death benefit, union officials coordinate funerals for the relatives of union members, if need be showing up at a local hospital on a moment's notice. According to the union representatives, without support these types of events could lead to worker absenteeism or even loss of employment.

Both groups of union representatives consider a primary function to be assisting their members in taking advantage of, and managing, the financial benefits to which they have new access. Many new hires require assistance in opening bank accounts and managing a weekly income stream. Among the union's major tasks in this area is assisting workers in taking advantage of the government program, known as INFONAVIT, that assists workers in obtaining home ownership. SITIMM actively promotes the program, assists their members in filling out the paperwork, and maintains all the workers' files associated with the program for them.

While these four plants employ training and production schemes that cause them to strive for low turnover, the two remaining first tier suppliers simply work around high turnover rates. Both plants are owned by the Mexican conglomerate Condumex, and are among the first of GM's local suppliers to have started operations in Silao. The first, Arneses Eléctricas Automotrices (Arela), produces wire harnesses, the bundles of electrical wiring that run throughout an auto. The other, Automoviles Assembles y Logísticas (Autolog), is a parts handler that ensures GM receives the parts it needs on a just-in-time basis.

Arela employs 1440 women who stand at assembly lines called carousels. Plywood planks sitting upright as though on an easel move past the women who decipher the code that

tells them which harness they are making, and grab wires from behind them to weave through the maze of pegs that protrude from the wood. As the harness proceeds around the carousel, the wires are wrapped in electrical tape to hold them together so that by the end the collection of individual wires is bound in to a single snake of wires that can be plugged into a car. At the end of the carousel, it is checked by computer to be sure it is functional.

Arela produces all the wire harnesses for General Motors' Silao plant. An auto generally has five major harnesses, one for each of the chassis, motor, instrument panel, body, and the lights, in addition to a few simpler harnesses. But because the precise contents of a harness differs depending on an auto's model and options, GM requires an array of different harnesses to produce three different SUVs, each with a range of available combinations of options.

Depending on the harness being produced, a carousel may have as few as fifteen or as many as 150 women working at it.

Though Arela produces parts of vital importance to GM requiring complex engineering in conjunction with the automaker, the actual process by which the harnesses are assembled is low skilled, manually intensive work. Though Arela operates with a 6% monthly turnover rate that the human resources directory cites as a major problem, in fact, the company's policies are clearly geared toward operating with such turnover, not reducing it. Arela's pay is not only low, but the collective bargaining agreement contains four pay categories based on time of service, so that workers earn half the average wage at hire and receive three incremental raises over a period of a few months. This mediates losses associated with rapid turnover among new hires, which drops to 2% monthly for workers with more than three months seniority.

Arela's pay scale is complemented by a scattershot approach to recruitment that does little to screen out applicants unlikely to stay long. Recruitment largely consists of driving

around the countryside near Silao in a car with a megaphone on the roof repeatedly broadcasting the availability of jobs for young women. Though the company insists the production process dictates the hiring of women due to their small, nimble fingers and greater attention to detail than men, that they specifically target young women ages sixteen to twenty without children and only a sixth grade education makes it clear that they are looking for the cheapest labor available.

All workers receive two weeks training before actually starting work. Training is done in an area designated specifically for that purpose which has a mock carousel on which workers practice. There is also “classroom” training where they learn the “theory” behind what they’re doing and the various codes they will need to know to work on the line. At the end of the two weeks, workers must score at least 80% on a competency exam to join the line. If not, their employment is terminated. There is no on the job training. Workers must be competent when they join the line.

Unlike Arela, Autolog produces very little. But the plant serves a crucial function for General Motors as a processing center and subassembler of autoparts with the responsibility of reorganizing parts manufactured elsewhere by other companies and shipped to Silao so that they are received by General Motors on a just-in-time basis.

Hooked up by computer to General Motor’s plant, Autolog’s 480 workers know what models and colors of cars, and with what features, GM is producing in which order. Their job is to make sure that the correct combination of parts arrive to match the models being built. Specifically, they deal with the air conditioners and radiators (which are also assembled) as well as the grills, fenders, carpets, gas tanks, and tires, each of which differs according to model and features.

The shop floor is essentially a warehouse with a series of loading docks on each end. On one side the products come in and are unloaded. They are then reorganized in the order they are needed. Trucks arrive with parts produced outside Silao, are unloaded, and the parts reloaded in to trucks as needed by GM. This ongoing process means that a tire, for example, spends about 6 hours at Autolog from the time it arrives until it is sent to GM. In addition, two small assembly lines assemble the air conditioning units and the radiators before sending them to GM.

Like Arela, the Autolog plant is vital to GM's production, but the work itself is low skilled and poorly compensated. This is reflected in the firm's pay of less than seven dollars a day, and its high turnover rate of 140% annually. The average tenure of the employees is two years, indicating that, like at Arela, turnover is normally early in a worker's tenure. Autolog's human resources director is unfazed by the turnover because workers are easily recruited through advertisements and the union and require less than a week of training to understand the system of simple codes telling them what parts to load on a truck. While applicants are required to have six years of education, they are eliminated from the applicant pool if they have more than nine since such workers would easily qualify for other jobs and would be more likely to quit after a short while. Unlike at the Arela plant, much of the work at Autolog requires lifting and physical exertion. As a result, the workforce is 80% male.

The different strategies that these six firms pursue has also resulted in a stark gendering of the workforce. Though a quarter of the workforce in Silao are women, they are overwhelmingly employed in the firms with the lowest pay and highest turnover, with American Axle as the exception for its hiring of those with above average education. But there are virtually no employment opportunities for women with a ninth grade education.

The role women play in this industrial relations scheme results from business strategies reinforced by local cultural stereotypes and particulars of Mexican labor law, which simultaneously permits discrimination in hiring based on gender and requires employers pay maternity leave benefits. By not hiring young women, firms simultaneously avoid the disruption to their drive to maintain a stable workforce and paying maternity leave.

In addition, the gender homogeneity at Arela is widely attributed to physical and mental skills more commonly associated with women than men. In particular, women's hands are considered softer and more dexterous than men's and their dispositions more suited to the attention span needed to concentrate on weaving wire harnesses for eight hours. And even though it is recognized that some men could perform this work, there is general apprehension that increasing male recruitment would lead to an exodus of the young female employees who have only been granted permission to work from male family members because the factory is overwhelmingly female.

Conclusion

The global commodity chain approach to economic development has mostly focused on buyer driven commodity chains, particularly within the garment industry. Due to the high barriers of entry associated with the marketing of these products, especially for firms in developing countries, development is limited to moving up the commodity to establish close relationships with the firms at the top of the chain. Firms may gain a greater share of the value added in the commodity chain by developing the expertise to manage production chains for firms like Nike that have no expertise in manufacturing (Korzeniewicz), or they may absorb a greater percentage of manufacturing chores and stabilize production by becoming full package assemblers, as have the jeans manufacturers in Torreon.

However, automatically associating industrial upgrading with economic development ignores important measures of development. In fact, it returns the debate to its origin and Gereffi and Korzeniewicz' contention that industrialization should not be conflated with development, requiring more intensive study of the type of industrializing occurring and its affects on workers in the area. For instance, though Torreon's jeans producers have overseen a five fold expansion of jobs in the industry from 12,000 in 1993 to 75,000 by 2000, it "is characterized by very uneven development of the labor force" (Bair & Gereffi, p. 1897) and turnover in the sewing factories as high as 10% per week. The new capacity "has resulted in some upgrading of the local skills base" required by jobs in cutting rooms and laundries, but these higher paying jobs are not normally available to women.

Guanajuato state policymakers looking to promote development in the Silao area took the opposite approach. Faced with a situation in which there was little industry to upgrade, they determined to first lure a major auto assembly plant and to then attract its suppliers, essentially starting at the top of the commodity chain and working backwards. In so doing, they have not only overseen the creation of the 6,500 jobs at the six factories discussed above, but thousands more as other multinational industrial employers such as Case, Weyerhauser, and Continental invested in new plants after the establishment of the region as a viable location for advanced production.

For General Motors, establishing an assembly plant in a greenfield site presented the company an opportunity to take advantage of trends within the auto industry, as well as Mexican public policy promoting development through trade, to implement a form of lean production that coordinates industrial relations between firms. Leveraging its role at the top of this assembler driven commodity chain and engaging a local labor union eager to gain representation of the

workers at new work sites, GM created an industrial relations regime in which it coordinates policies between the firms to maintain a hierarchy of jobs with General Motors the prestige employer.

On the one hand, the six factories in this study underscore the importance of finding the node of power within a commodity chain to understanding how the chain operates. In the two plants hiring workers with equal education, Oxford Automotriz and Aventec, workers earn less than their counterparts at GM. Even at American Axle, which hires workers with higher qualifications than at GM, those employees must work years before their pay equals that of a GM line worker, though they may eventually exceed it.

On the other hand, this research indicates that simply determining the firms' place in the commodity chain is not sufficient to assessing the quality of economic development efforts. Among GM's five first tier suppliers in Silao are a range of jobs of varying quality offering very different futures. At the one extreme, American Axle's educated workforce is carefully selected and continuously trained toward gaining the skills necessary to join the ranks of management. On the other side of the spectrum are the poorly educated women who rotate in and out of employment at Arela without the prospect of earning more than seven dollars a day. Yet these firms are both among GM's first tier suppliers.

Clearly, as the commodity chain approach suggests, it is advantageous to be at the top of a commodity chains where greater benefits accrue. But which commodity chain a community engages may be at least as important as where on the chain it is located. In short, product matters. As globalization spreads production of the producer driven chains to developing regions, global commodity chain analysts will need to more accurately describe the dynamics of these chains to understand their place in economic development. General Motors reorganized its

commodity chain toward a model better characterized as assembler driven than producer driven, over a period of years performing less of the manufacturing of the cars it markets.

Though state officials in Guanajuato would like to attract another auto assembler to the state, they understand that for the most part economic development means attracting additional firms down the chain, not up. What types of jobs might be provided as a result will likely be mixed and dependent on the specifications of the part and the production process. For instance, one of AAM's suppliers, a second tier supplier to GM in Michigan, opened a factory in FIPASI paying workers with a ninth grade education less than any such workers among GM's first tier suppliers, but significantly more than those less educated workers at Autolog and Arela.

Finally, a word of caution. All the factories in General Motors' Silao supply chain are young, have not yet experienced production downturns and layoffs, and for the most part are still dependent on GM as their sole customer. Their workforces have not aged beyond their twenties and the unions are yet to face militancy among disgruntled workers. In short all the firms are still enjoying a honeymoon phase in their relationships with GM, their workers, and with each other. But as the firms expand their customer base, GM's influence over them to maintain the wage hierarchy may weaken. Similarly, women in the area with a ninth grade education will likely demand greater access to the higher wage jobs, forcing the firms to integrate the plants. And the women at Arela could challenge their union to demand higher wages, which would not only upset the inter-firm wage scale but force the union to address the inherent conflicts between the interests of their members and management which their current ideology ignores.

While time alone will bring challenges to the current industrial relations regime, the state policymaker's economic development plans are likely to introduce others. Already, several other autoparts firms have opened factories in Silao. For the most part, they coordinate their human

resource policies with the other factories in the industrial park and their wages fit within the parameters established by General Motors supply chain. However, as more firms are attracted to the area, and especially if the state is successful in attracting another auto assembler, the tightly controlled industrial relations regime currently in place will become unwieldy and quite possibly deteriorate altogether if the firms find themselves in competition for workers. These dynamics will require further study as the greenfield site matures.