Chapter Four
Back to the Future

Even with the decentralizing potential of electrical power neglected and sidetracked into the paleotechnic framework, and even with the diversion of technical development into the needs of mass-production industry, small-scale production tools were still able to achieve superior productivity—even working with the crumbs and castoffs of Sloanist mass-production, and even at the height of Moloch's glory. Two models of production have arisen within the belly of the Sloanist beast, and between them offer the best hopes for replacing the mass-production model: 1) the informal and household economy; and 2) relocalized industry using general-purpose machinery to produce in small batches for the local market, frequently switching between production runs.

A. Home Manufacture

First, even at the height of mass-productionist triumphalism, the superior productivity of home manufacture was demonstrated in many fields. In the 1920s and 1930s, the zenith of mass production's supposed triumph, Ralph Borsodi showed that with electricity most goods could be produced in small shops and even in the home with an efficiency at least competitive with that of the great factories, once the greatly reduced distribution costs of small-scale production were taken into account. Borsodi's law—the tendency of increased distribution costs to offset reduced unit costs of production at a relatively small scale—applies not only to the relative efficiencies of large versus small factories, but also to the comparative efficiencies of factory versus home production. Borsodi argued that for most light goods like food, textiles, and furniture, the overall costs were actually lower to manufacture them in one's own home. The reason was that the electric motor put small-scale production machinery in the home on the same footing as large machinery in the factory. Although economies of large-scale machine production exist, most economies of machine production are captured with the bare adoption of the machinery itself, even with household electrical machinery. After that, the downward production cost curve is very shallow, while the upward distribution cost curve is steep.

Borsodi's study of the economics of home production began with the home-grown tomatoes his wife canned. Expressing some doubts as to Mrs. Borsodi's confidence that it "paid" to do it, he systematically examined all the costs going into the tomatoes, including the market value of the labor they put into growing them and canning them, the cost of the household electricity used, etc. Even with all these things factored in, Bordodi still found the home product cost 20-30% less than the canned tomatoes at the market. The reason? The home product, produced at the point of consumption, had zero distribution cost. The modest unit cost savings from large-scale machinery were insufficient to offset the enormous cost of distribution and marketing.[1]

Borsodi went on to experiment with home clothing production with loom and sewing machine, and building furniture in the home workshop.

> I discovered that more than two-thirds of the things which the average family now buys could be produced more economically at home than they could be bought factory made;
>
> —that the average man and woman could earn more by producing at home than by working for money

---

1 Ralph Borsodi, *Flight From the City: An Experiment in Creative Living on the Land* (New York, Evanston, San Francisco, London: Harper & Row, 1933, 1972), pp. 10-15.

in an office or factory and that, therefore, the less time they spent working away from home and the more time they spent working at home, the better off they would be;

> —finally, that the home itself was still capable of being made into a productive and creative institution and that an investment in a homestead equipped with efficient domestic machinery would yield larger returns per dollar of investment than investments in insurance, in mortgages, in stocks and bonds....
>
> These discoveries led to our experimenting year after year with domestic appliances and machines. We began to experiment with the problem of bringing back into the house, and thus under our own direct control, the various machines which the textile-mill, the cannery and packing house, the flour-mill, the clothing and garment factory, had taken over from the home during the past two hundred years....
>
> In the main the economies of factory production, which are so obvious and which have led economists so far astray, consist of three things: (1) quantity buying of materials and supplies; (2) the division of labor with each worker in industry confined to the performance of a single operation; and (3) the use of power to eliminate labor and permit the operation of automatic machinery. Of these, the use of power is unquestionably the most important. today, however, power is something which the home can use to reduce costs of production just as well as can the factory. The situation which prevailed in the days when water power and steam-engines furnished the only forms of power is at an end. As long as the only available form of power was centralized power, the transfer of machinery and production from the home and the individual, to the factory and the group, was inevitable. But with the development of the gas-engine and the electric motor, power became available in decentralized forms. The home, so far as power was concerned, had been put in position to compete with the factory.
>
> With this advantage of the factory nullified, its other advantages are in themselves insufficient to offset the burden of distribution costs on most products....
>
> The average factory, no doubt, does produce food and clothing cheaper than we produce them even with our power-driven machinery on the Borsodi homestead. But factory costs, because of the problem of distribution, are only first costs. They cannot, therefore, be compared with home costs, which are final costs.[1]

Even the internal economies of the factory, it should be added, were offset by the overhead costs of administration, and the dividends and interest on capital. Profliferating departmentalization entails

> gang bosses, speed bosses, inspectors, repair bosses, planning department representatives and of course corresponding “office” supervisors: designers, planners, record keepers and cost clerks.... there are office managers, personnel managers, sales managers, advertising managers and traffic managers.... All tend to absorb the reductions in manufacturing costs which are made possible by the factory machinery and factory methods.

These are only the costs within the factory. Above the factory, in a firm of numerous factories and branch offices, comes an additional layer of administrative overhead for the corporate headquarters.

And on top of all that, there are the distribution costs of producing for a large market area: “wholesaling transportation and warehousing costs, wholesaling expenses, wholesaling profits, retailing transportation and warehousing costs, retailing expenses, retailing profits.”[2]

Since Borsodi's time, the variety and sophistication of electrically powered small machinery has increased enormously. As we saw in Chapter One, after the invention of clockwork the design of

---

1 Ibid., pp. 17-19.

2 Borsodi,*This Ugly Civilization* (Philadelphia: Porcupine Press, 1929, 1975), pp. 34-38.

machine processes for every conceivable function was nearly inevitable. Likewise once electrically powered machinery was introduced, the development of small-scale electrical machinery for every purpose followed as a matter of course.

Since first reading Borsodi's account I have encountered arguments that his experience was misleading or atypical, given that he was a natural polymath and therefore perhaps a quicker study than most, and therefore failed to include learning time in his estimate of costs. These objections cannot be entirely dismissed.

One of Borsodi's genuine shortcomings was his treatment of household production in largely autarkic terms. He generally argued that the homestead should produce for itself when it was economical to do so, and buy from the conventional money economy with wages when it was not, with little in between. The homesteader should not produce a surplus for the market, he said, because it could only be sold on disadvantageous terms in the larger capitalist economy and would waste labor that could be more efficiently employed either producing other goods for home consumption or earning wages on the market. He did mention the use of surpluses for gifting and hospitality, but largely ignored the possibility of a thriving informal and barter economy outside the capitalist system.

A relatively modest degree of division of labor in the informal and barter economy would be sufficient to overcome a great deal of the learning curve for craft production. Most neighborhoods probably have a skilled home seamstress, a baker famous for his homemade bread, a good home brewer, someone with a well-equipped woodworking or metal shop, and so forth. Present-day home hobbyists, producing for barter, could make use of their existing skills. What's more, in so doing they would optimize efficiency even over Borsodi's model: they would fully utilize the spare capacity of household equipment that would have been idle much of the time with entirely autarkic production, and spread the costs of such capital equipment over a number of households (rather than, as in Borsodi's model, duplicating it in each household).

One of the most important effects of licensing, zoning, and assorted “health” and “safety” codes, at the local level, is to prohibit production on a scale intermediate between individual production for home consumption, and production for the market in a conventional business enterprise. Such regulations criminalize the intermediate case of the household microenterprise, producing either for the market or for barter on a significant scale. This essentially mandates the level of autarky that Borsodi envisioned, and enables larger commercial enterprises to take advantage of the rents resulting from individual learning curves. Skilled home producers are prevented from taking advantage of the spare capacity of their capital equipment, and other households are forced either to acquire all the various specialty skills for themselves or to buy from a commercial enterprise.

B. Relocalized Manufacturing

Borsodi's other shortcoming was his inadequate recognition of the possibility of scales of manufacturing below the mass production factory. In *Prosperity and Security*, he identified four scales of production: “(I) family production, (II) custom production, (III) factory production, and (IV) social production.”[1] He confused factory production with mass-production. In fact, custom production fades into factory production, with some forms of small-scale factory production that bear as much (or more) resemblance to custom production than to stereotypically American mass-production. In arguing that

1 Borsodi, *Prosperity and Security: A Study in Realistic Economics* (New York and London: Harper & Brothers Publishers, 1938), p. 172.

large-scale factory production was more economical only for a handful of products—"automobiles, motors, electrical appliances, wire, pipe, and similar goods"—he ignored the possibility that even many of those goods could be produced more economically in a small factory using general-purpose machinery in short production runs.[1]

In making "serial production" the defining feature of the factory, as opposed to the custom shop, he made the gulf between factory production and custom production greater and more fixed than was necessary, and ignored the extent to which the line between them is blurred in reality.

> In the sense in which I use the term factory it applies only to places equipped with tools and machinery to produce "goods, wares or utensils" by a system involving serial production, division of labor, and uniformity of products.
>
> ….A garage doing large quantities of repair work on automobiles is much like a factory in appearance. So is a railroad repair shop. Yet neither of these lineal descendants of the roadside smithy is truly a factory.
>
> The distinctive attribute of the factory itself is the system of serial production. It is not, as might be thought, machine production nor even the application of power to machinery.... Only the establishment in which a product of uniform design is systematically fabricated with more or less subdivision of labor during the process is a factory.[2]
>
> ….But none of the economies of mass production, mass distribution, and mass consumption is possible if the finished product is permitted to vary in this manner. Serial production in the factory is dependent at all stages upon uniformities: uniformities, of design, material and workmanship. Each article exactly duplicates every other....[3]

In arguing that some products ("of which copper wire is one example") could "best be made, or made most economically, by the factory," he neglected the question of whether such things as copper wire could be made more economically in much smaller factories with much less specialized machinery.[4] Elsewhere, citing the superior cost efficiency of milling grain locally or in the home using small electric mills rather than shipping bolted white flour from the mega-mills in Minneapolis, he appealed to the vision of a society of millions of household mills, along with "a few factories making these domestic mills and supplying parts and replacements for them...."[5] This begs the question of whether a large, mass-production factory is best suited to the production of small appliances.

In fact the possibility of an intermediate model of industrial production has been well demonstrated in industrial districts like Emilia-Romagna. As we mentioned in Chapter One, Sabel's and Piore's "path not taken" (integrating flexible, electrically powered machinery into craft production) was in fact taken in a few isolated enclaves. In the late 1890s, for example, even after the tide had turned toward mass-production industry, "the German Franz Ziegler could still point to promising examples of the technological renovation of decentralized production in Remscheid, through the introduction of flexible machine tools, powered by small electric motors."[6]

But with the overall economy structured around mass-production industry, the successful industrial

---

1 Ibid., p. 181.
2 Borsodi, *This Ugly Civilization*, pp. 56-57.
3 Ibid., p. 187.
4 Ibid., p. 78.
5 Ibid., p. 90.
6 Michael J. Piore and Charles F. Sabel, *The Second Industrial Divide: Possibilities for Prosperity* (New York: HarperCollins, 1984), p. 47.

districts were relegated mainly to serving niche markets in the larger Sloanist economy. In some cases, like the Lyon textile district (see below), the state officially promoted the liquidation of the industrial district and its absorption by the mass-production economy. In the majority of cases, with the predominance of large-scale mass-production industry encouraged by the state and an economic environment artificially favorable to such forms of organization, flexible manufacturing firms in the industrial districts were "spontaneously" absorbed into a larger corporate framework. The government having created an economy dominated by large-scale, mass-production industry, the pattern of development of small-scale producers was distorted by the character of the overall system. Two examples of the latter phenomenon were the Sheffield and Birmingham districts, in which flexible manufacturers increasingly took on the role of supplying inputs to large manufacturers (they were drawn "ever more closely into the orbit of mass producers," in Piore's and Sabel's words), and as a result gradually lost their flexibility and their ability to produce anything but inputs for the dominant manufacturer. Their product became increasingly standardized, and their equipment more and more dedicated to the needs of a particular large manufacturer.[1] The small-scale machine tools of Remscheid, a decade after Ziegler wrote, were seen as doomed.[2]

But all this has changed with the decay of Mumford's "cultural pseudomorph," and the adoption of alternatives to mass production (as we saw in Chapter Three) as a response to economic crisis. Today, in both Toyota's "single minute exchange of dies" and in the flexible production in the shops of north-central Italy, factory production takes on many of the characteristics of custom production. With standardized, modular components and the ability to switch quickly between various combinations of features, production approaches a state of affairs in which every individual item coming out of the factory is unique. A small factory or workshop, frequently switching between products, can still obtain most of the advantages of Borsodi's "uniformity" through the simple expedient of modular design. Lean production is a synthesis of the good points of mass production and custom or craft production.

Lean production, broadly speaking, has taken two forms, typified respectively by the Toyota Production System and Emilia-Romagna. Robert Begg et al characterize them, respectively, as two ways of globally organizing flexible specialization: producer-driven commodity chains and consumer-driven commodity chains. The former, exemplified in the TPS and to some extent by most global manufacturing corporations, outsources production to small, networked supplier firms. Such firms usually bear the brunt of economic downturns, and have (because they must compete for corporate patronage) have little bargaining power against the corporate purchasers of their output. The latter, exemplified by Emilia-Romagna, entail cooperative networks of small firms for which a large corporate patron most likely doesn't even exist, and production is driven by demand.[3] (Of course the large manufacturing corporations, in the former model, are far more vulnerable to bypassing by networked suppliers than the authors' description would suggest.)

The interesting thing about the Toyota Production System is that it's closer to custom production than to mass production. In many ways, it's Craft Production 2.0.

Craft production, as described by James Womack et al in *The Machine That Changed the World*, was characterized by

---

1 Ibid., p. 37.
2 Ibid., p. 47.
3 Robert Begg, Poli Roukova, John Pickles, and Adrian Smith, "Industrial Districts and Commodity Chains: The Garage Firms of Emilia-Romagna (Italy) and Haskovo (Bulgaria)," *Problems of Geography* (Sofia, Bulgarian Academy of Sciences), 1-2 (2005), p. 162.

- A workforce that was highly skilled in design, machine operation, and fitting....

- Organizations that were extremely decentralized, although concentrated within a single city. Most parts and much of the vehicle's design came from small machine shops. The system was coordinated by an owner/entrepreneur in direct contact with everyone involved—customers, employers, and suppliers.

- The use of general-purpose machine tools to perform drilling, grinding, and other operations on metal and wood.

- A very low production volume....[1]

The last characteristic, low volume (Panhard et Levassor's custom automobile operation produced a thousand or fewer vehicles a year) resulted from the inability to standardize parts, which in turn resulted from the inability of machine tools to cut hardened steel. Before this capability was achieved, it would have been a waste of time to try producing to gauge; steel parts had to be cut and then hardened, which distorted them so that they had to be custom-fitted. The overwhelming majority of production time was taken up by filing and fitting each individual part to the other parts on (say) a car.

Most of the economies of speed achieved by Ford resulted, not from the assembly line (although as a secondary matter it may be useful for maintaining production flow), but from precision and interchangeability. Ford was the first to take advantage of recent advances in machine tools which enabled them to work on prehardened metal. As a result, he was able to produce parts to a standardized gauging system that remained constant throughout the manufacturing process.[2] In so doing, he eliminated the old job of fitter, which was the primary source of cost and delay in custom production.

But this most important innovation of Ford's—interchangeable parts produced to gauge—could have been introduced just as well into craft production, radically increasing the output and reducing the cost of craft industry. Ford managed to reduce task cycle time for assemblers from 514 minutes to 2.3 minutes by August 1913, before he ever introduced the moving assembly line. The assembly line itself reduced cycle time only from 2.3 to 1.19 minutes.[3]

With this innovation, a craft producer might still have used general-purpose machinery and switched frequently between products, while using precision machining techniques to produce identical parts for a set of standardized modular designs. By radically reducing setup times and removing the main cost of fitting from craft production ("all filing and adjusting of parts had... been eliminated"), craft producers would have achieved many of the efficiencies of mass production with none of the centralization costs we saw in Chapter Two.

In a brilliant illustration of history's tendency to reappear as farce, by the way, GM's batch-and-queue production resurrected the old job of fitter, supposedly eliminated forever by production to gauge, to deal with the enormous output of defective parts. At GM's Framingham plant, besides the weeks' worth of inventory piled among the work stations, Waddell and his co-authors found workers "struggling to attach poorly fitting parts to the Oldsmobile Ciera models they were building."[4]

1 James P. Womack, Daniel T. Jones, and Daniel Roos, *The Machine That Changed the World* (New York, Toronto, London, Sydney: The Free Press, 1990 and 2007), p. 22.
2 Ibid., pp. 24-25.
3 Ibid., pp. 25-26.
4 Ibid., p. 78.

The other cost of craft production was setup time: the cost and time entailed in skilled machinists readjusting machine tools for different products. Ford reduced setup time through the use of product-specific machinery, foolproofed with simple jigs and gauges to ensure they worked to standard.[1] The problem was that this required batch production, the source of all the inefficiencies we saw in Chapter Two.

This second cost was overcome in the Toyota Production System by Taichi Ohno's "single-minute exchange of dies" (SMED), which reduced the changeover time between products by several orders of magnitude. By the time of World War II, in American-style mass production, manufacturers were dedicating a set of presses to specific parts for months or even years at a time in order to minimize the unit costs from a day or more of downtime to change dies.[2] Ohno, beginning in the late 1940s to experiment with used American machinery, by the late 1950s managed to reduce die-change time to three minutes. In so doing, he discovered that (thanks to the elimination of in-process inventories, and thanks to the fact that defects showed up immediately at the source) "it actually cost less per part to make small batches of stampings than to run off enormous lots."[3] In effect, he turned mass-production machinery into general-purpose machinery.

In industrial districts like Emilia-Romagna, the problem of setup and changeover time was overcome by the development of flexible general purpose machine tools, particularly the small numerically controlled machine tools which the microprocessor revolution permitted in the 1970s. Ford's innovations in precision cutting of pre-hardened metal to gauge, and the elimination of setup time with small CNC tools in the 1970s, between them made it possible for craft production to capture all the efficiencies of mass production.

Ohno's system was essentially a return to craft production methods, but with the speed of Ford's mass production assembly line. With the single-minute exchange of dies, factory machinery bore more of a functional resemblance to general-purpose machinery than to the dedicated and inflexible machinery of GM. But with precision cutting capabilities and a few standardized, modular designs, it achieved nearly the same economies of speed as mass production.

We already described, in Chapter Two, how Sloanism's "economies of speed" differ from those of the Toyota Production System. The irony, according to Waddell and Bodek, is that Toyota and other lean manufacturers reduce direct labor costs (supposedly the raison d'etre of Sloanism) "at rates that leave Sloan companies in the dust."

> The critical technology to cutting direct labor hours by fifty percent or more is better than sixty years old. Electric motors small enough and powerful enough to drive a machine tool had a negligible impact on productivity in America, but a huge impact in Japan.
>
> When belt drives came off of machines, and each machine was powered by its own electric motor the door opened up to a productivity improvement equal to that realized by Henry Ford with the advent of the assembly line....
>
> ...[T]he day came in the evolution of electrical technology that each machine could be equipped with its own motor. Motors were powerful enough, small enough and cheap enough for the belts and shafts to go by the wayside....

1 Ibid., p. 33.
2 Ibid., p. 51.
3 Ibid., p. 52.

> To American thinking, this was not much of an event. Sloan's system was firmly entrenched by the time the shafts and belts were eliminated. Economy was perceived to result exclusively from running machines as fast as possible, making big batches at a time. There was still one man to one machine, for the most part, and maximizing the output from that man's labor cost was the objective. Whether machines were lined up in rows, or scattered at random around the factory did not make much difference to the results of that equation.
>
> Shigeo Shingo presented a paper at a technical conference conducted by the Japan Management Association in 1946 entitled "Production Mechanism of Process and Operation." It was based on the principle that optimizing the overall production process... is the key to manufacturing. To quote Shingo, "Improvement of process must be accomplished prior to improvement of operation." While the Americans saw manufacturing as a set of isolated operations, all linked by sizeable inventories, the Japanese saw manufacturing as a flow. Where the machines are is a big deal to people concerned about flow while it matters little to people concerned only with isolated operations. To Shingo, the flexibility to put machines anywhere he wanted opened the door to fantastic productivity improvements.[1]

In other words, lean manufacturing—as Sabel and Piore put it—amounts to the discovery, after a century-long dead end, of how to integrate electrical power into manufacturing.

Emilia-Romagna is part of a larger phenomenon, the so-called "Third Italy" (as distinguished from the old industrial triangle of Milan-Turin-Genoa, and the cash crop plantation agriculture of the South):

> a vast network of very small enterprises spread through the villages and small cities of central and Northeast Italy, in and around Bologna, Florence, Ancona, and Venice.... These little shops range across the entire sprectrum of the modern industrial structure, from shoes, ceramics, textiles, and garments on one side to motorcycles, agricultural equipment, automotive parts, and machine tools on the other.[2]

Although these small shops (quite small on average, with ten workers or fewer not unusual) "perform an enormous variety of the operations associated with mass production," they do so using "artisans' methods rather than industrial techniques of production."[3]

A typical factory is housed on the ground floor of a building, with two or three floors of apartments above for the several extended families that own it.

> The workrooms are clean and spacious. A number of hand operations are interspersed with the mechanized ones. The machinery, however, is fully modern technology and design; sometimes it is exactly the same as that found in a modern factory, sometimes a reduced version of a smaller machine. The work is laid out rationally: the workpieces flow along miniature conveyors, whose twists and turns create the impression of a factory in a doll house.[4]

At the smaller end of the scale, "production is still centered in the garage..."

Despite high productivity, the pace of work is typically relaxed, with production stopping daily for workers to retreat to their upstairs apartments for an extended lunch or siesta.[5]

---

1 Waddell and Bodek, pp. 119-122.
2 Piore and Sabel, "Italian Small Business Development: Lessons for U.S. Industrial Policy," in John Zysman and Laura Tyson, eds., *American Industry in International Competition: Governnment Policies and Corporate Strategies* (Ithaca and London: Cornell University Press, 1983).
3 Ibid, pp. 392-393.
4 Ibid., p. 394.
5 Ibid., p. 394.

> Some [factories] recall turn-of-the century sweatshops.... But many of the others are spotless; the workers extremely skilled and the distinction between them and their supervisors almost imperceptible; the tools the most advanced numerically controlled equipment of its type; the products, designed in the shop, sophisticated and distinctive enough to capture monopolies in world markets. If you had thought so long about Rousseau's artisan clockmakers at Neuchatel or Marx's idea of labor as joyful, self-creative association that you had begun to doubt their possibility, then you might, watching these craftsmen at work, forgive yourself the sudden conviction that something more utopian than the present factory system is practical after all.[1]

Production on the Emilia-Romagna model is regulated on a demand-pull basis: general-purpose machinery makes it possible to produce in small batches and switch frequently and quickly from one product line to another, as orders come in. Further, with the separate stages of production broken down in a networked relationship between producers, constant shifts in contractual relationships between suppliers and outlets are feasible at relatively low cost.[2]

While the small subcontractors in a sector are zealous of their autonomy and often vigorously competitive, they are also quite likely to collaborate as they become increasingly specialized, "subcontracting to each other or sharing the cost of an innovation in machine design that would be too expensive for one producer to order by himself." There is a tendency toward cooperation, especially, because the network relationships betgween specialized firms may shift rapidly with changes in demand, with the same firms alternately subcontracting to one another.[3] Piore and Sabel describe the fluidity of supply chains in an industrial district:

> The variability of demand meant that patterns of subcontracting were constantly rearranged. Firms that had underestimated a year's demand would subcontract the overflow to less well situated competitors scrambling to adapt to the market. But the next year the situation might be reversed, with winners in the previous round forced to sell off equipment to last year's losers. Under these circumstances, every employee could become a subcontractor, every subcontractor a manufacturer, every manufacturer an employee.[4]

The Chinese *shanzhai* phenomenon bears a striking resemblance to the Third Italy. The literal meaning of *shanzhai* is "mountain fortress," but it carries the connotation of a redoubt or stronghold outside the state's control, or a place of refuge for bandits or rebels (much like the Cossack communities on the fringes of the Russian Empire, or the Merry Men in Sherwood Forest). Andrew "Bunnie" Huang writes:

> The contemporary shanzhai are rebellious, individualistic, underground, and self-empowered innovators. They are rebellious in the sense that the shanzhai are celebrated for their copycat products; they are the producers of the notorious knock-offs of the iPhone and so forth. They individualistic in the sense that they have a visceral dislike for the large companies; many of the shanzhai themselves used to be employees of large companies (both US and Asian) who departed because they were frustrated at the inefficiency of their former employers. They are underground in the sense that once a shanzhai "goes legit" and starts doing business through traditional retail channels, they are no longer considered to be in the fraternity of the shanzai. They are self-empowered in the sense that they are universally tiny operations, bootstrapped on minimal capital, and they run with the attitude of "if you can do it, then I can as well".
>
> An estimate I heard places 300 shanzhai organizations operating in Shenzhen. These shanzai consist of shops ranging from just a couple folks to a few hundred employees; some just specialize in things like

---

1 Piore and Sabel, "Italy's High-Technology Cottage Industry," *Transatlantic Perspectives* 7 (December 1982), p. 6.
2 Piore and Sabel, *Second Industrial Divide*, pp. 29-30.
3 Piore and Sabel, "Italian Small Business Development," pp. 400-401.
4 Piore and Sabel, *Second Industrial Divide*, p. 32.

> tooling, PCB design, PCB assembly, cell phone skinning, while others are a little bit broader in capability. The shanzai are efficient: one shop of under 250 employees churns out over 200,000 mobile phones per month with a high mix of products (runs as short as a few hundred units is possible); collectively an estimate I heard places shanzhai in the Shenzhen area producing around 20 million phones per month. That's an economy approaching a billion dollars a month. Most of these phones sell into third-world and emerging markets: India, Africa, Russia, and southeast Asia; I imagine if this model were extended to the PC space the shanzhai would easily accomplish what the OLPC failed to do. Significantly, the shanzai are almost universally bootstrapped on minimal capital with almost no additional financing — I heard that typical startup costs are under a few hundred thousand for an operation that may eventually scale to over 50 million revenue per year within a couple years.
>
> Significantly, they do not just produce copycat phones. They make original design phones as well.... These original phones integrate wacky features like 7.1 stereo sound, dual SIM cards, a functional cigarette holder, a high-zoom lens, or a built-in UV LED for counterfeit money detection. Their ability to not just copy, but to innovate and riff off of designs is very significant. They are doing to hardware what the web did for rip/mix/burn or mashup compilations.... Interestingly, the shanzhai employ a concept called the "open BOM" — they share their bill of materials and other design materials with each other, and they share any improvements made; these rules are policed by community word-of-mouth, to the extent that if someone is found cheating they are ostracized by the shanzhai ecosystem.
>
> To give a flavor of how this is viewed in China, I heard a local comment about how great it was that the shanzhai could not only make an iPhone clone, they could improve it by giving the clone a user-replaceable battery. US law would come down on the side of this activity being illegal and infringing, but given the fecundity of mashup on the web, I can't help but wonder out loud if mashup in hardware is all that bad....
>
> In a sense, I feel like the shanzhai are brethren of the classic western notion of hacker-entrepreneurs, but with a distinctly Chinese twist to them. My personal favorite shanzhai story is of the chap who owns a house that I'm extraordinarily envious of. His house has three floors: on the top, is his bedroom; on the middle floor is a complete SMT manufacturing line; on the bottom floor is a retail outlet, selling the products produced a floor above and designed two floors above. How cool would it be to have your very own SMT line right in your home! It would certainly be a disruptive change to the way I innovate to own infrastructure like that — not only would I save on production costs, reduce my prototyping time, and turn inventory aggressively (thereby reducing inventory capital requirements), I would be able to cut out the 20-50% minimum retail margin typically required by US retailers, assuming my retail store is in a high-traffic urban location.
>
> ....I always had a theory that at some point, the amount of knowledge and the scale of the markets in the area would reach a critical mass where the Chinese would stop being simply workers or copiers, and would take control of their own destiny and become creators and ultimately innovation leaders. I think it has begun — these stories I'm hearing of the shanzhai and the mashup they produce are just the beginning of a hockey stick that has the potential to change the way business is done, perhaps not in the US, but certainly in that massive, untapped market often referred to as the "rest of the world".[1]

And like the flexible manufacturing networks in the Third Italy, Huang says, the density and economic diversity of the environment in which shanzhai enterprises function promotes flow and adaptability.

> ...[T]he retail shop on the bottom floor in these electronic market districts of China enables goods to actually flow; your neighbor is selling parts to you, the guy across the street sells your production tools, and the entire block is focused on electronics production, consumption or distribution in some way. The turnover

1 Bunnie Huang, "Tech Trend: Shanzhai," *Bunnie's Blog*, February 26, 2009 <http://www.bunniestudios.com/blog/?p=284>.

> of goods is high so that your SMT and design shop on the floors above can turn a profit.[1]

The success of shanzhai enterprises results not only from their technical innovativeness, according to Vassar professor Yu Zhou, but from "how they form supply chains and how rapidly they react to new trends."[2]

C. New Possibilities for Flexible Manufacturing

Considerable possibilities existed for increasing the efficiency of craft production through the use of flexible machinery, even in the age of steam and water power. The Jacquard loom, for example, used in the Lyon silk industry, was a much lower-tech precursor of Ohno's Single Minute Exchange of Dies (SMED). With the loom controlled by perforated cards, the setup time for switching to a new pattern was reduced substantially. In so doing, it made small-batch production profitable that would have been out of the question with costly, dedicated mass-production machinery.[3] Lyon persisted as a thriving industrial district, by the way, until the French government killed it off in the 1960s: official policy being to encourage conversion to a more "progressive," mass-production model through state-sponsored mergers and acquisitions, the local networked firms became subsidiaries of French-based transnational corporations.[4]

Such industrial districts, according to Piore and Sabel, demonstrated considerable "technological vitality" in the "speed and sophistication with which they adapted power sources to their needs."

> The large Alsatian textile firms not only made early use of steam power but also became—through their sponsorship of research institutes—the nucleus of a major theoretical school of thermodynamics. Small firms in Saint-Etienne experimented with compressed air in the middle of the nineteenth century, before turning, along with Remscheid and Solingen, to the careful study of small steam and gasoline engines. After 1890, when the long-distance transmission of electric power was demontrated at Frankfurt, these three regions were among the first industrial users of small electric motors.[5]

With the introduction of electric motors, the downscaling of power machinery to virtually any kind of small-scale production was no longer a matter of technological possibilities. It was only a question of institutional will, in deciding whether to allocate research and development resources into large- or small-scale production. As we saw in Chapter One, the state tipped the balance toward large-scale mass-production industry, and production with small-scale power machinery was relegated to a few isolated industrial districts. Nevertheless, as we saw in earlier chapters, Borsodi demonstrated that small-scale production—even starved for developmental resources and with one hand tied behind its back—was able to surpass mass-production industry in efficiency.

For the decades of Sloanist dominance, local industrial districts were islands in a hostile sea.

But with the decay of the first stage of the paleotechnic pseudomorph, flexible manufacturing has become the wave of the future—albeit still imprisoned within a centralized corporate framework. And better yet, networked, flexible manufacturing shows great promise for breaking through the walls of the

---

1 Comment under ibid. <http://www.bunniestudios.com/blog/?p=284#comment-415355>.
2 David Barboza, "In China, Knockoff Cellphones are a Hit," *New York Times*, April 28, 2009 <http://www.nytimes.com/2009/04/28/technology/28cell.html>.
3 Piore and Sabel, p. 30.
4 Ibid., p. 36.
5 Ibid., p. 31.

old corporate system and becoming the basis of a fundamentally different kind of society.

By the 1970s, anarchist Murray Bookchin was proposing small general-purpose machinery as the foundation of a decentralized successor to the mass-production economy.

In a 1970s interview with *Mother Earth News*, Borsodi repeated his general theme: that when distribution costs were taken into account, home and small shop manufacture were the most efficient way to produce some two-thirds of what we consume. But he conceded that some goods, like “electric wire or light bulbs,” could not be produced “very satisfactorily on a limited scale.”[1]

But as Bookchin and Kirkpatrick Sale pointed out, developments in production technology since Borsodi's experiments had narrowed considerably the range of goods for which genuine economies of scale existed. Bookchin proposed the adoption of multiple-purpose production machinery for frequent switching from one short production run to another.

> The new technology has produced not only miniaturized electronic components and smaller production facilities but also highly versatile, multi-purpose machines. For more than a century, the trend in machine design moved increasingly toward technological specialization and single purpose devices, underpinning the intensive division of labor required by the new factory system. Industrial operations were subordinated entirely to the product. In time, this narrow pragmatic approach has "led industry far from the rational line of development in production machinery," observe Eric W. Leaver and John J. Brown. "It has led to increasingly uneconomic specialization.... Specialization of machines in terms of end product requires that the machine be thrown away when the product is no longer needed. Yet the work the production machine does can be reduced to a set of basic functions--forming, holding, cutting, and so on--and these functions, if correctly analyzed, can be packaged and applied to operate on a part as needed."
>
> Ideally, a drilling machine of the kind envisioned by Leaver and Brown would be able to produce a hole small enough to hold a thin wire or large enough to admit a pipe....
>
> The importance of machines with this kind of operational range can hardly be overestimated. They make it possible to produce a large variety of products in a single plant. A small or moderate-sized community using multi-purpose machines could satisfy many of its limited industrial needs without being burdened with underused industrial facilities. There would be less loss in scrapping tools and less need for single-purpose plants. The community's economy would be more compact and versatile, more rounded and self-contained, than anything we find in the communities of industrially advanced countries. The effort that goes into retooling machines for new products would be enormously reduced. Retooling would generally consist of changes in dimensioning rather than in design.[2]

And Sale, commenting on this passage, observed that many of Borsodi's stipulated exceptions could in fact now be produced most efficiently in a small community factory. The same plant could (say) finish a production run of 30,000 light bulbs, and then switch to wiring or other electrical products—thus "in effect becoming a succession of electrical factories." A machine shop making electric vehicles could switch from tractors to reapers to bicycles.[3]

Eric Husman, commenting on Bookchin's and Sale's treatment of multiple-purpose production technology, points out that they were 1) to a large extent reinventing the wheel, and 2) incorporating a large element of Sloanism into their model:

---

1 “Plowboy Interview” (Ralph Borsodi), *Mother Earth News*, March-April 1974 <http://www.soilandhealth.org/03sov/0303critic/Brsdi.intrvw/The%20Plowboy-Borsodi%20Interview.htm>.

2 Murray Bookchin, *Post-Scarcity Anarchism* (Berkeley, Ca.: The Ramparts Press, 1971), pp. 110-111.

3 Kirkpatrick Sale, *Human Scale* (New York: Coward, McCann, & Geoghegan, 1980), pp. 409-410.

> *Human Scale* (1980) was written without reference to how badly the Japanese production methods... were beating American mass production methods at the time.... What Sale failed to appreciate is that the Japanese method (...almost diametrically opposed to the Sloan method that Sale is almost certainly thinking of as "mass production") allows the production of *higher* quality articles at *lower* prices....
>
> ....Taichi Ohno would laugh himself silly at the thought of someone toying with the idea [of replacing large-batch production on specialized machinery with shorter runs on general-purpose machinery] 20 years after he had perfected it. Ohno's development of Toyota's Just-In-Time method was born exactly out of such circumstances, when Toyota was a small, intimate factory in a beaten country and could not afford the variety and number of machines used in such places as Ford and GM. Ohno pushed, and Shingo later perfected, the idea of Just-In-Time by using Single Minute Exchange of Dies (SMED), making a mockery of a month-long changeover. The idea is to use general machines (e.g. presses) in specialized ways (different dies for each stamping) and to vary the product mix on the assembly line so that you make some of every product every day.
>
> The Sale method (the slightly modified Sloan/GM method) would require extensive warehouses to store the mass-produced production runs (since you run a year's worth of production for those two months and have to store it for the remaining 10 months). If problems were discovered months later, the only recourse would be to wait for the next production run (months later). If too many light bulbs were made, or designs were changed, all those bulbs would be waste. And of course you can forget about producing perishables this way. The JIT method would be to run a few lightbulbs, a couple of irons, a stove, and a refrigerator every hour, switching between them as customer demand dictated. No warehouse needed, just take it straight to the customer. If problems are discovered, the next batch can be held until the problems are solved, and a new batch will be forthcoming later in the shift or during a later shift. If designs or tastes change, there is no waste because you only produce as customers demand.[1]

Since Bookchin wrote *Post-Scarcity Anarchism*, incidentally, Japanese technical innovations blurred even further the line between the production model he proposed above and the Japanese model of lean manufacturing. The numerically controlled machine tools of American mass-production industry, scaled down thanks to the microprocessor revolution, became suitable as a form of general-purpose machinery for the small shop. As developed by the Japanese, it was

> a new kind of machine tool: numerically controlled general-purpose equipment that is easily programmed and suited for the thousands of small and medium-sized job shops that do much of the batch production in metalworking. Until the mid-1970s, U.S. practice suggested that computer-controlled machine tools could be economically deployed only in large firms (typically in the aerospace industry); in these firms such tools were programmed, by mathematically sophisticated technicians, to manufacture complex components. But advances in the 1970s in semiconductor and computer technology made it possible to build a new generation of machine tools: numerically controlled (NC) or computer-numerical-control (CNC) equipment. NC equipment could easily be programmed to perform the wide range of simple tasks that make up the majority of machining jobs. The equipment's built-in microcomputers allowed a skilled metalworker to teach the machine a sequence of cuts simply by performing them once, or by translating his or her knowledge into a program through straightforward commands entered via a keyboard located on the shop floor.[2]

According to Piore and Sabel, CNC machinery offers the same advantages over traditional craft production—i.e., flexibility with reduced setup cost—that craft production offered over mass production.

---

1 Eric Husman, "Human Scale Part II--Mass Production," *Grim Reader* blog, September 26, 2006 <http://www.zianet.com/ehusman/weblog/2006/09/human-scale-part-ii-mass-production.html>.
2 Piore and Sabel, p. 218.

> Efficiency in production results from adapting the equipment to the task at hand: the specialization of the equipment to the operation. With conventional technology, this adaptation is done by physical adjustments in the equipment; whenever the product is changed, the specialized machine must be rebuilt. In craft production, this means changing tools and the fixtures that position the workpiece during machining. In mass production, it means scrapping and replacing the machinery. With computer technology, the equipment (the hardware) is adapted to the operation by the computer program (the software); therefore, the equipment can be put to new uses without physical adjustments—simply by reprogramming.[1]

The more setup time and cost are reduced, and the lower the cost of redeploying resources, the less significant both economies of scale and economies of specialization become. Hence, the wider the range of products it is feasible to produce for the local or regional market.[2]

Interestingly, as recounted by David Noble, numeric control was first introduced for large-batch production with expensive machinery in heavy industry, and because of its many inefficiencies was profitable only with massive government subsidies. But the small-scale numerically controlled machine tools, made possible by the invention of the microprocessor, were ideally suited to small-batch production by small local shops.

This is a perennial phenomenon, which we will examine at length in Chapter Seven: even when the state capitalist system heavily subsidizes the development of technologies specifically suited to large-scale, centralized production, decentralized industry takes the crumbs from under the table and uses them more efficiently than state capitalist industry. Consider, also, the role of the state in creating the technical prerequisites for the desktop and Internet revolutions, which are destroying the proprietary culture industries and proprietary industrial design. State capitalism subsidizes its gravediggers.

If Husman compared the Bookchin-Sale method to the Toyota Production System, and found it wanting, H. Thomas Johnson in turn has subjected the Toyota Production System to his own critique. As amazing as Ohno's achievements were at Toyota, introducing his lean production methods within the framework of a transnational corporation amounted to putting new wine in old bottles. Ohno's lean production methods, Johnson argued, are ideally suited to a relocalized manufacturing economy. (This is another example of the decay of the cultural pseudomorph discussed in the previous chapter—the temporary imprisonment of lean manufacturing techniques in the old centralized corporate cocoon.)

In his Foreword to Waddell's and Bodek's *The Rebirth of American Industry* (something of a bible for American devotees of the Toyota Production System), Johnson writes:

> Some people, I am afraid, see lean as a pathway to restoring the large manufacturing giants the United States economy has been famous for in the past half century.
>
> ...The cheap fossil fuel energy sources that have always supported such production operations cannot be taken for granted any longer. One proposal that has great merit is that of rebuilding our economy around smaller scale, locally-focused organizations that provide just as high a standard living [sic] as people now enjoy, but with far less energy and resource consumption. Helping to create the sustainable local living economy may be the most exciting frontier yet for architects of lean operations. Time will tell.[3]

The “warehouses on wheels” (or “container ships”) distribution model used by centralized

1 Ibid., p. 260.
2 Ibid., p. 277.
3 H. Thomas Johnson, "Foreword," William H. Waddell and Norman Bodek, *Rebirth of American Industry: A Study of Lean Management* (Vancouver, WA: PCS Press, 2005), p. xxi.

manufacturing corporations, even “lean” ones like Toyota, is fundamentally at odds with the principles of lean production. Lean production calls for eliminating inventory by gearing production to orders on a demand-pull basis. But long distribution chains simply sweep the huge factory inventories of Sloanism under the rug, and shift them to trucks and ships. There's still an enormous inventory of finished goods at any given time—it's just in motion.

Husman, whom we have already seen is an enthusiastic advocate for lean production, has himself pointed to “warehouses on wheels” as just an outsourced version of Sloanist inventories:

> For another view of self-sufficiency—and I hate to beat this dead horse, but the parallel seems so striking—we have the lean literature on local production. In *Lean Thinking*, Womack et al discuss the travails of the simple aluminum soda can. From the mine to the smelter to the rolling mill to the can maker alone takes several months of storage and shipment time, yet there is only about 3 hours worth of processing time. A good deal of aluminum smelting is done in Norway and/or Sweden, where widely available hydroelectric power makes aluminum production from alumina very cheap and relatively clean. From there, the cans are shipped to bottlers where they sit for a few more days before being filled, shipped, stored, bought, stored, and drank. All told, it takes 319 days to go from the mine to your lips, where you spend a few minutes actually using the can. The process also produces about 24% scrap (most of which is recycled at the source) because the cans are made at one location and shipped empty to the bottler and they get damaged in transit. It's an astounding tale of how wasteful the whole process is, yet still results in a product that—externalities aside—costs very little to the end user. Could this type of thing be done locally? After all, every town is awash in a sea of used aluminum cans, and the reprocessing cost is much lower than the original processing cost (which is why Reynolds and ALCOA buy scrap aluminum).
>
> Taking this problem to the obvious conclusion, Bill Waddell and other lean consultants have been trying to convince manufacturers that if they would only fire the MBAs and actually learn to manufacture, they could do so much more cheaply locally than they can by offshoring their production. Labor costs simply aren't the deciding factor, no matter what the local Sloan school is teaching: American labor may be more expensive then [sic] foreign labor, but it is also more productive. Further, all of the (chimerical) gains to be made from going to cheaper labor are likely to be lost in shipping costs. Think of that flotilla of shipping containers on cargo ships between here and Asia as a huge warehouse on the ocean, warehouses that not only charge rent, but also for fuel.[1]

Regarding the specific example of aluminum cans, Womack et al speculate that the slow acceptance of recycling results from evaluating its efficiencies as a discrete step, rather than in terms of its effects on the entire production stream. If the rate of recycling approached 100%,

> interesting possibilities would emerge for the entire value stream. Mini-smelters with integrated mini-rolling mills might be located near the can makers in England, eliminating in a flash most of the time, storage, and distances involved today in the steps above the can maker.[2]

A similar dynamic might result from the proliferation of mini-mills scaled to local needs, with most of the steel inputs for small-scale industry supplied from recycled local scrap.

---

1 Husman, "Human Scale Part III—Self-Sufficiency," *GrimReader* blog, October 2, 2006 <http://www.zianet.com/ehusman/weblog/2006/10/human-scale-part-iii-self-sufficiency.html>.

2 James P. Womack and Daniel T. Jones, *Lean Thinking: Banish Waste and Create Wealth in Your Corporation* (Simon & Schuster, 1996), p. 43. In addition, recycling's slow takeoff may reflect a cost structure determined by the kind of standard, high-overhead bureaucratic organization which we saw dissected by Paul Goodman in Chapter Two. As recounted by Karl Hess and David Morris in *Neighborhood Power*, a neighborhood church group which set up a recycling center operated by local residents found they could sort out trash themselves and receive $20-50 a ton (this was in the mid-70s). Karl Hess and David Morris, *Neighborhood Power: The New Localism* (Boston: Beacon Press, 1975), p. 139.

As Womack et al point out, lean production—properly understood—requires not only the scaling of machinery to production flow within the factory. It also requires scaling the factory to local demand, and siting it as close as possible to the point of consumption, in order to eliminate as much as possible of the "inventory" in trucks and ships. It is necessary "to locate both design and physical production in the appropriate place to serve the customer."

> Just as many manufacturers have concentrated on installing larger and faster machines to eliminate the direct labor, they've also gone toward massive centralized facilities for product families... while outsourcing more and more of the actual component part making to other centralized factories serving many final assemblers. To make matters worse, these are often located on the wrong side of the world from both their engineering operations and their customers... to reduce the cost per hour of labor.
>
> The production process in these remotely located, high-scale facilities may even be in some form of flow, but... the flow of the product stops at the end of the plant. In the case of bikes, it's a matter of letting the finished product sit while a whole sea container for a given final assembler's warehouse in North America is filled, then sending the filled containers to the port, where they sit some more while waiting for a giant container ship. After a few weeks on the ocean, the containers go by truck to one of the bike firm's regional warehouses, where the bikes wait until a specific customer order needs filling often followed by shipment to the customer's warehouse for more waiting. In other words, there's no flow except along a tiny stretch of the total value stream inside one isolated plant.
>
> The result is high logistics costs and massive finished unit inventories in transit and at retailer warehouses.... When carefully analyzed, these costs and revenue losses are often found to more than offset the savings in production costs from low wages, savings which can be obtained in any case by locating smaller flow facilities incorporating more of the total production steps much closer to the customer.[1]
>
> To achieve the scale needed to justify this degree of automation it will often be necessary to serve the entire world from a single facility, yet customers want to get exactly the product they want exactly when they want it.... It follows that oceans and lean production are not compatible. We believe that, in almost every case, locating smaller and less-automated production systems within the market of sale will yield lower total costs (counting logistics and the cost of scrapped goods no one wants by the time they arrive) and higher customer satisfaction.[2]

Husman, incidentally, describes a localized "open-source production" model, with numerous small local machine shops networked to manufacture a product according to open-source design specifications and then to manufacture replacement parts and do repairs on an as-needed basis, as "almost an ideally Lean manufacturing process. Dozens of small shops located near their customers, each building one at a time."[3]

The authors of *Natural Capitalism* devote a separate chapter to lean production. And perhaps not surprisingly, their description of the lean approach seems almost tailor-made for relocalized manufacturing on the Emilia-Romagna model:

> The essence of the lean approach is that in almost all modern manufacturing, the combined and often synergistic benefits of the lower capital investment, greater flexibility, often higher reliability, lower inventory cost, and lower shipping cost of much smaller and more localized production equipment will far outweigh any modest decreases in its narrowly defined "efficiency" per process step. It's more efficient

---

1 Womack, *Lean Thinking*, p. 64.
2 Ibid., p. 244.
3 Husman, "Open Source Automobile," *GrimReader*, March 3, 2005 <http://www.zianet.com/ehusman/weblog/2005/03/open-source-automobile.html>.

> overall, in resources and time and money, to scale production properly, using flexible machines that can quickly shift between products. By doing so, all the different processing steps can be carried out immediately adjacent to one another with the product kept in continuous flow. The goal is to have no stops, no delays, no backflows, no inventories, no expediting, no bottlenecks, no buffer stocks, and no *muda* [i.e., waste or superfluity].[1]

Decentralizing technologies undermined the rationale for large scale not only in mass-production industries, but in continuous-processing industries. In steel, for example, the introduction of the minimill with electric-arc furnace eliminated the need for operating on a large enough scale to keep a blast furnace in continuous operation. Not only did the minimill make it possible to scale steel production to the local industrial economy, but it processed scrap metal considerably more cheaply than conventional blast furnaces processed iron ore.[2]

Sidebar on Marxist Objections to Non-Capitalist Markets: The Relevance of the Decentralized Industrial Model

In opposing a form of socialism centered on cooperatives and non-capitalist markets, a standard argument of Marxists and other non-market socialists is that it would be unsustainable and degenerate into full-blown capitalism: "What happens to the losers?" Non-capitalist markets would eventually become capitalistic, through the normal operation of the laws of the market. Here's the argument as stated by Christian Siefkes, a German Marxist active in the P2P movement, on the Peer to Peer Research List:

> Yes, they would trade, and initially their trading wouldn't be capitalistic, since labor is not available for hire. But assuming that trade/exchange is their primary way of organizing production, capitalism would ultimately result, since some of the producers would go bankrupt, they would lose their direct access to the means of production and be forced to sell their labor power. If none of the other producers is rich enough to hire them, they would be unlucky and starve (or be forced to turn to other ways of survival such as robbery/thievery, prostitutioing—which is what we also saw as a large-scale phenomenon with the emergence of capitalism, and which we still see in so-called developing countries where there is not enough capital to hire all or most of the available labor power). But if there are other producers/people would *can* hire them, the seed of capitalism with it's capitalist/worker divide is laid.
>
> Of course, the emerging class of capitalists won't be just passive bystanders watching this process happen. Since they need a sufficiently large labor force, and since independent producers are unwanted competition for them, they'll actively try to turn the latter into the former. Means for doing so are enclosure/privatization laws that deprive the independent producers of their means of productions, technical progress that makes it harder for them to compete (esp. if expensive machines are required which they simple lack the money to buy), other laws that increase the overhead for independent producers (e.g. high bookkeeping requirements), creation of big sales points that non-capitalist producers don't have access to (department stores etc.), simple overproduction that drives small-scale producers (who can't stand huge losses) out of the market, etc. But even if they were passive bystanders (which is an unrealistic assumption), the conversion of independent producers into workers forced to sell their labor power would still take place through the simple laws of the market, which cause some producers to fail and go bankrupt.
>
> So whenever you start with trade as the primary way of production, you'll sooner or later end up with

---

1 Paul Hawken, Amory Lovins, and L. Hunter Lovins, *Natural Capitalism: Creating the Next Industrial Revolution* (Boston, New York, London: Little, Brown and Company, 1999), pp. 129-130.

2 Piore and Sabel, p. 209.

capitalism. It's not a contradiction, it's a process.[1]

One answer, in the flexible production model, is that there's no reason to have any permanent losers. First of all, the overhead costs are so low that it's possible to ride out a slow period indefinitely. Second, in low-overhead flexible production, in which the basic machinery for production is widely affordable and can be easily reallocated to new products, there's really no such thing as a "business" to go out of. The lower the capitalization required for entering the market, and the lower the overhead to be borne in periods of slow business, the more the labor market takes on a networked, project-oriented character—like, e.g., peer production of software. In free software, and in any other industry where the average producer owns a full set of tools and production centers mainly on self-managed projects, the situation is likely to be characterized not so much by the entrance and exit of discrete "firms" as by a constantly shifting balance of projects, merging and forking, and with free agents constantly shifting from one to another. The same fluidity prevails, according to Piore and Sabel, in the building trades and the garment industry.[2]

Another point: in a society where most people own the roofs over their heads and can meet a major part of their subsistence needs through home production, workers who own the tools of their trade can afford to ride out periods of slow business, and to be somewhat choosy in waiting to contract out to the projects most suited to their preference. It's quite likely that, to the extent some form of wage employment still existed in a free economy, it would take up a much smaller share of the total economy, wage labor would be harder to find, and attracting it would require considerably higher wages; as a result, self-employment and cooperative ownership would be much more prevalent, and wage employment would be much more marginal. To the extent that wage employment continued, it would be the province of a class of itinerant laborers taking jobs of work when they needed a bit of supplementary income or to build up some savings, and then periodically retiring for long periods to a comfortable life living off their own homesteads. This pattern—living off the common and accepting wage labor only when it was convenient—was precisely what the Enclosures were intended to stamp out.

For the same reason, the standard model of "unemployment" in American-style mass-production industry is in fact quite place-bound, and largely irrelevant to flexible manufacture in European-style industrial districts. In such districts, and to a considerable extent in the American garment industry, work-sharing with reduced hours is chosen in preference to layoffs, so the dislocations from an economic downturn are far less severe. Unlike the American presumption of a fixed and permanent "shop" as the central focus of the labor movement, the industrial district assumes the solidaristic craft community as the primary long-term attachment for the individual worker, and the job site at any given time as a passing state of affairs.[3]

And finally, in a relocalized economy of small-scale production for local markets, where most money is circulated locally, there is apt to be far less of a tendency toward boom-bust cycles or wild fluctuations in commodity prices. Rather, there is likely to be a fairly stable long-term matching of supply to demand.

In short, the Marxist objection assumes the high-overhead industrial production model as "normal,"

---

1 Christian Siefkes, "[p2p-research] Fwd: Launch of Abundance: The Journal of Post-Scarcity Studies, preliminary plans," Peer to Peer Research List, February 25, 2009 <http://listcultures.org/pipermail/p2presearch_listcultures.org/2009-February/001555.html>.
2 Piore and Sabel, *The Second Industrial Divide*, pp. 117-118.
3 Ibid., pp. 120-121.

and judges cooperative and peer production by their ability to adapt to circumstances that almost certainly wouldn't exist.