Challenge

THE MAGAZINE OF ECONOMIC AFFAIRS

MAY–JUNE 2005/$9.00

THE UNITED STATES TODAY

ECONOMIC GROWTH

Robert Heilbroner, 1919-2005
by William Milberg and Robert Pollin

05
0 74470 86806 4

How Do We Grow?

Jane Jacobs on Diversification and Specialization

David Ellerman

It is probably the most important issue in economics. How do economies grow? And for a few centuries, one traditional model has prevailed. Economies grow through specializing in industries, through division of labor, and through standardization. But one of the leading thinkers of our time, the urban scholar Jane Jacobs, has long emphasized the important of diversity and variation to growth. The author summarizes her views and the empirical evidence and finds that Jacobs' ideas also have serious policy implications.

JANE JACOBS IS BEST KNOWN FOR HER FIRST BOOK *THE DEATH AND LIFE OF GREAT AMERICAN CITIES* (1961). It established her as a leading critic of modernist city planning and of technocratic social engineering in general. But her later books (1969, 1984, 1992, 2000) on economies[1] and development are not sufficiently known—particularly within the field of economics. Indeed, it is part of my purpose here to argue that she should be seen not simply as a writer about cities but as a remarkably original thinker about economies and development—with cities playing a natural role as the principal sites of development. Her work continues. She has just published a new book, *Dark Age Ahead* (2004), an analysis of the deterioration and breakdown (or perhaps I should say "decline and fall") of various parts of American society. (At age eighty-eight, she has just signed contracts for two more books.)

Why is her work on economies and development so little known and understood? Partly it is her "own fault"; she does not utilize the received presuppositions or concepts of economics. She writes about firms but takes no pains to repackage the ideas for economists who think of firms as being modeled by production functions. She writes about growth and development but does not try to build bridges to economists who think in terms of increases in K and L along with an expanding black box labeled "total factor productivity." But it is not entirely a question of using economists' jargon. There are also basic differences in ideas.

One of the overarching themes in Jane Jacobs' thought is the importance of diversification.[2] This is a leitmotiv in evolutionary biology as emphasized by Stephen Jay Gould.

> Evolutionary biologists (I am one) tend to equate goodness with what we view as the agent and the result of evolutionary change: the correlation between unconstrained smallness and innovation (for new species usually arise in tiny populations separated from larger parental groups), and the sheer exuberant diversity of life. If an evolutionist believes in any *summum bonum,* it can only be diversity itself. (Gould 1987, 204; originally published as Gould 1979)

After quoting Gould, Jacobs notes that this "sort of view has worked a strong influence upon me; it did so long before I was conscious of its source in the thinking of naturalists. . . . Three cheers for the dogged persistence and mysterious vitality of diversity" (Jacobs 1980, 113–15).

But from Adam Smith onward, a leitmotiv of economics has been

DAVID ELLERMAN *is a visiting scholar at the University of California at Riverside.*

Challenge, vol. 48, no. 3, May/June 2005, pp. 50–83

the (static) efficiency returns to specialization in the division of labor in both the small and the large (i.e., the principle of comparative advantage). Efficiency improves by specializing in what one does best, not in diversifying. But, in spite of the weight of that orthodox tradition, the importance of diversity has started to creep into economics through the consideration of knowledge spillover effects. For instance, Robert E. Lucas noted in his work on endogenous growth theory, "I will be following very closely the lead of Jane Jacobs, whose remarkable book *The Economy of Cities* seem to me mainly and convincingly concerned (although she does not use this terminology) with the external effects of human capital" (Lucas 1988, 37).

Edward Glaeser and colleagues (1992) have constructed and tested the following three models of knowledge spillovers in cities. Roughly, the Marshall-Arrow-Romer (MAR) model (Marshall 1920; Arrow 1962; Romer 1986) emphasizes the grouping of firms in the same industry and predicts that local monopoly would outperform local competition due to better internalization of the rewards to innovation. A model associated with Michael Porter (1990) also focused on groupings or clusters of like firms but emphasized local competition. The Jacobs model agrees with Porter on the importance of local competition rather than monopoly but disagrees on the clustering of like firms. As Glaeser writes,

> Jacobs (1969), unlike MAR and Porter, believes that most important knowledge transfers come from outside the core industry. As a result, variety and diversity of geographically proximate industries rather than geographical specialization promote innovation and growth. (Glaeser et al. 1992, 1128)

Glaeser and colleagues use a data set on the growth of large industries in 170 U.S. cities between 1956 and 1987 to test the models and find that the "evidence is . . . negative on MAR, mixed on Porter, and consistent with Jacobs" (Glaeser et al. 1992, 1129). In qualitative terms, they

> find that local competition and urban variety, but not regional specialization, encourage employment growth in industries. The evidence suggests that important knowledge spillovers might occur between rather than within industries, consistent with the theories of Jacobs. (Glaeser et al. 1992, 1126)

Empirical results that favor Jacobs's emphasis on diversity continue to come in. Jean Imbs and Romain Wacziarg (2003) report quite robust findings in a bastion of orthodox thought, the *American Economic Review,* in an article entitled, "Stages of Diversification." They relate sectoral concentration (as a proxy for nondiversification) to per capita income (as a proxy for development) in a variety of settings and find a robust U-shaped relationship. As per capita income increases, sectoral concentration drops over the lower part of the U-shaped curve and then may rise once income reaches a developed country level. Instead of specializing to comparative advantage being the path of development, they find: "Countries diversify over most of their development path" (Imbs and Wacziarg 2003, 64; quoted in Rodrik 2004).

And some theoretical work in growth theory (Weitzman 1992, 1996, 1998) has rediscovered the importance of diversity in growth and has exploited some of the biological metaphors. Similar conclusions have emerged from the recent work on complex adaptive systems (often associated with the Santa Fe Institute). For instance, Stuart Kauffman concludes that "diversity should be a major predictor of economic growth. This is not a new idea. Canadian economist Jane Jacobs advanced the same idea on different grounds two decades ago" (Kauffman 1995, 295).

Indeed, for over a third of a century, Jane Jacobs has not only noted these facts about diversity but has developed a theory of economic development that helps to explain those facts. Reading and re-reading her books to see how she arrives at those conclusions is its own reward. I will only try here to sketch some of the arguments and tease out some of the policy implications.

Development as Growth Through Diversification

The notions of "growth" and "development" are sometimes used almost interchangeably, but it would be useful to our purposes to make a sharp distinction. Jacobs points out that there was a sharp distinc-

tion even in biology. In the history of embryology, there were two schools about the process of change from an embryo to a mature organism. The "preformation" school (e.g., Aristotle) saw the embryo as just a tiny version of the mature organism, so the process of embryonic change was simply one of quantitative growth. The epigenesis school saw the process of change in the embryo as a qualitative process of differentiation and transformation.

Aggregate growth theory in economics does a disservice to the understanding of *development* by abstracting away from the difference between growth and development. The biologist C. H. Waddington described the "epigenetic landscape" of development through diversification as being more like a branched and differentiated river delta than just a wider and deeper river (Waddington 1977, 116). Development involves not just "growth" but diversification and the continuing ramifications of different products and different kinds of work. These might take place, in part, within firms but also through spinoffs, breakaways, split-ups, and the like within a city and its region. A preformation theory of city growth would picture a "city" just as a quantitatively bigger version of a small town, like a number of towns located together in a geographic area. But that is not what vibrant cities are, nor how they grow. According to Jacobs, it is more like the process of epigenetic transformation, not blowing up a small balloon—with more capital and labor—to make a big balloon.

Jacobs' Basic Ecological Analogy: The Tangled Bank Vision

The use of biological metaphors and analogies, both good and bad, is hardly new in economic thought.[3] But Jacobs goes on to use a quite specific set of biological or rather ecological analogies that to my knowledge have not been developed elsewhere in the economics literature. The economic unit of development, for Jacobs, is not a country but a city and its surrounding region. To set up an analogy between a city and an ecological system, she gives a sketch of the energy flows in an ecological system.

Organized energy comes free from the sun, but its trajectory within an ecology will depend on the complexity of the system. The two extremes could be taken as a desert and a rain forest. A rain forest and a desert at the same latitude would have about the same amount of solar energy arriving per unit area. In the case of the desert, it is essentially a sterile conduit; the energy comes in during the day and is dissipated at night. Little is captured; it is a throughput operation. The opposite is the case for the rain forest. Much energy is captured through the photosynthesis of its plants. Then the stored energy is passed around in a complex diversified web of relationships until it is finally dissipated through leakages. Plants die and decay to feed other plants. Plants are eaten by herbivores who are eaten by carnivores. All animals give off waste products and eventually die to feed other organisms directly or through decay.

At first glance, the economic analogue to incoming energy would seem to be incoming money either as payments for exports, as proceeds in a loan, or as remittances from abroad. The funds would then have a multiplier effect on the local economy seemingly similar to the cascades of energy going from one stage to another until finally dissipated. But Jacobs specifically does not use that analogy.

Rather, Jacobs constructs the ecological analogy by taking the *imports* coming into an economic settlement—as incoming bundles of embodied knowledge and know-how—as being analogous to the incoming organized energy. If development is conceptualized as a form of social learning, then it is clearer why it is imports—like new useful books arriving in the mail—that are key to developmental learning, not exports. Lacking the free energy of the sun, there must still be some exports of commodities or services to fund the imports.

It is the way imports are used—as primary, intermediate, final, or producer goods—that separates the economic "deserts" from the "rain forests." A settlement is more like a desert when the imports are dissipated in consumption or are incorporated directly into the (enclave) production of what is exported. The settlement is a rather straightforward economic conduit.

A settlement is more like a rain forest when the imports feed into a diversified web of local value chains—some goods being inputs into

many other products or spawning import replacements. The imports spread out like a river delta to directly and indirectly feed a diverse, weblike "ecology" of economic activities.

Jacobs's vision of a developed economy recalls the famous "tangled bank" (i.e., bank of a stream) passage in the closing paragraph of Darwin's *On the Origin of Species*.

> It is interesting to contemplate a tangled bank, clothed with many plants of many kinds, with birds singing on the bushes, with various insects flitting about, and with worms crawling through the damp earth, and to reflect that these elaborately constructed forms, so different from each other, and dependent upon each other in so complex a manner, have all been produced by laws acting around us. (Darwin 1999)

With the tangled-bank image, Darwin surpasses older imagery to arrive at a modern ecological vision of life that Jacobs has reimported into the study of economies (in considerable contrast to the crude competition-as-survival-of-the-fittest analogies that have appealed to so many economists).

The most sterile or inert desertlike settlements are the settlements based essentially on direct consumption of imports such as communities living off migrant worker remittances, retirement communities living off pensions (and income from capital invested elsewhere), and military bases.[4] Not far behind are the settlements based on one stage of production with little local value-added, such as agricultural or natural resource–based towns, tourist centers, casinos on Indian reservations, company towns, and labor-intensive assembly or processing enclaves. These are more like economic deserts—perhaps with one variety of cactus—than economic rain forests.

Thus we get a clear contrast in definitions of development. By a living-standards or consumption-oriented definition of development (e.g., gross domestic product), an economic settlement made rich by pumping out oil would be "developed." For instance, at the World Bank, the oil-rich Gulf States qualify as Part 1 "developed" countries, not as Part 2 developing countries. But by Jacobs' productivist definition, such an economy is just a big pipe—an economic conduit—not a tangled bank. The oil exports fund imports, which are then consumed, i.e., dissipated, rather than feeding into a web of value-added activities and manufactured products, some of which might be exported for the oil-independent funding of future imports. A city built in the desert just by oil is still a "desert" from Jacobs's productivist or capabilities-based viewpoint.[5]

To become more ramified and complex, an economic settlement should have multiple uses for imports to produce diversified and multi-staged products with a significant part for local use. Each specialization to achieve some static efficiency should be accompanied by the diversification of outputs into various product niches, by backward integration to produce previously imported inputs, and perhaps by unexpected recombinant matings with nearby processes and products to produce novel offspring.[6] These are the innovations from "human capital externalities" that tend to happen when diverse people with various skills and complementary knowledge jostle together in companies, and when sectorally diverse companies in a symbiotic web jostle together in cities.

How Adam Smith Got It Wrong

The jostling together of diverse people and skills spawns the diversifying sideways jumps from specialized old work to new work in a nearby field. "For instance, making forgings for one purpose develops skills and enterprises that can be drawn upon for other purposes. An economy that can produce improved fish-canning machinery can feasibly produce improved furniture-making machinery" (Jacobs 1980, 60). Paul Bairoch supports Jacobs on this point that "the diversity of urban activities quite naturally encourages attempts to apply or adopt in one sector (or in one specific problem area) technological solutions adopted in another sector" (Bairoch 1988, 336).

This connection was key to the contagious innovation that made the industrial revolution. As one of the leading historians of the industrial revolution wrote:

> All these gains, plus the invention of machines to build machines, came together in the last third of the eighteenth century—a period of contagious novelty. Some of this merging stream of innovation may

> have been a lucky harvest. But no. Innovation was catching because the principles that underlay a given technique could take many forms, find many uses. If one could bore cannon, one could bore the cylinders of steam engines. If one could print fabrics by means of cylinders (as against the much slower block printing), one could also print wallpaper that way; or print word text far faster than by the up-and-down strokes of a press and turn out penny tabloids and cheap novels by the tens and hundreds of thousands. Similarly, a modified cotton-spinning machine could spin wool and flax. (Landes 1998, 191–92)

Those who bore cannon may themselves not be interested in steam engines, and those who print fabrics may hardly be interested in printing wallpaper, not to mention penny tabloids and cheap books. But in a diverse environment and with flexible or "fissionable" economic organizations, these spin-offs and recombinations to go from old work to new work might take place (more on this below).

Adam Smith did not get it quite right in *The Wealth of Nations* (1994); it is not a process driven by increasing specialization. Deepening the division of labor increases operating efficiency and thus may expand old work, but it is not the dynamics of development of new work. Jacobs criticizes Smith on seeing the division of labor and increasing specialization as being key to development.

> Dividing existing work into tasks is by no means confined to advancing economies. It is also practiced in the most stagnant economies, where men and women spend their entire working lives at very specialized tasks: tapping rubber trees, or herding goats, or loading bananas, or twisting fibers, or dancing in temples, or mining salt, or crushing ore, or carrying baskets of dirt for public works, or cultivating corn and beans. A stagnant economy may lack almost everything, but not division of labor. (Jacobs 1969, 83)

One key to dynamics is when the process of deepening the division of labor in the old work leads to a new type of work, a new branch on the tree. Jacobs illustrates with Smith's own example of pin-making (Smith 1994, chapter 1). The story of the improvements in pin-making started on an earlier branch of the tree, the making of wire bristles to card wool. Specialization in making carding combs led to people "who bought iron ingots from smiths, drew them into wire, made the wire into bristles and sold the bristles to cardmakers" (Jacobs 1969, 82). But the operations of making the shaft of the wire bristle were the same as those needed to make the shaft of a pin; the carders and pinners were associated guilds. Hence some bristle makers could branch off with the further steps to add heads to the wire bristles to make pins. "They were adding a new complexity, pin making, to an older simplicity, bristle making. From this addition came the rest of the divisions of labor in pin making that Smith describes" (Jacobs 1969, 82).

The story of the *dynamics* of development is not the static efficiency of greater specialization but the branching off of new kinds of work. Carrying the pin-making story further, about fifty years after Smith's exposition, the hand-making of pins was rendered obsolete in a stroke by a pin-making machine. That machine, however, did not develop from the specialization of labor in the pin-making business. Rather, it developed from a new branch on another tree, a new application made by a designer of machines for other industries.

Example of "Development in One Company"

Jane Jacobs uses the development of the 3M company as a modern example of how innovation turns mere growth ("expanding old work") into diversified and ramified development ("adding new work") in a process where "one sort of work leads to another" (1969, 53). The Minnesota Mining and Manufacturing Company started with two proprietors and some workers gathering and processing sands used for abrasive purposes. Then they decided to make sandpaper but had trouble with the adhesives to stick the sand to the paper. After experimenting with adhesives, they developed a gummed paper to use as masking tape for painters and eventually a whole line of tapes: "shoe tape, electrical tape, acetate tape, pressure-sensitive adhesive tape (better known as Scotch tape), acetate fiber tape, cellophane tape, printed cellophane tape, plastic tape, filament tape, sound recording magnetic tape, nonwoven synthetic fibers" (1969, 53). Today we could add a host of other spin-off products such as the Post-it notes and magnetic disks for computers.[7]

Other uses of adhesives were not forgotten. The diversification continued with "sandblasting stencils, automotive adhesives, industrial adhesives, marine adhesives, marine calking compounds, tile and construction adhesives, construction compounds" (1969, 53). The original product of sand also sent out its branches on the ramifying tree of products: "coated sand for polishing, then wax and varnish coatings, finely ground paint pigments, roofing granules, nonslip cleats and strips, abrasive cloth, reflective sheeting, reflective compounds, paving materials, and welding fluxes" (ibid.). "This process in which one sort of work leads to another must have happened millions of times in the whole history of human economic development" (ibid.). This is an example of the dynamics of development that goes beyond increases in labor and capital and that goes on inside the expanding black box of "total factor productivity."

Jacobs' Ladder: Climbing Toward Development

In graduate school, it often seems that future economists are trained using modernized Pavlovian methods to intellectually "growl" whenever they hear the phrase "import substitution." Being without the benefit of such professional training, Jacobs rethought the idea of "import substitution" to arrive at an alternative viewpoint. For her own reasons, in fact, she agrees with most of the orthodox critique of state-planned import substitution programs. As she writes:

> The import-substitution programs fixed upon items selected abstractly, from statistics on imports. Factories were located in semi-rural economic deserts because jobs were most needed there. Although labor costs were low, the factories and their imported equipment and imported managers and supervisors were expensive. Markets weren't at hand; co-developments were missing; nothing meshed. When the intended substitutes for imports could actually be produced with reasonable speed and reliability—an expectation seldom realized—the products cost more than equivalent imports. (Jacobs 2000, 81)

But instead of stopping with this critique and urging economies to specialize in their current comparative advantage, Jacobs looked at how city economies that do develop use import replacement as a key part of the process.

Cities can grow through a process of dynamic interaction with each other through direct or indirect rivalry. To play in the "game," a city must produce something it can export—perhaps based on its natural endowment. The export earnings can then buy imports from other cities that were not produced in the given city. In the rivalry between cities, a manufactured import is like a "slap in the face," an "insult," or a challenge; the city has to buy the import because it cannot produce it itself. If the other exporting cities were not too advanced, then the import will present a plausible challenge to be replaced through learning and improvisation (the process of moving beyond old work to new work outlined previously) and perhaps improved upon by the importing city. Since the wealth to buy the imports might have been earned productively (not a gift), the city might already have some productive capacity that could begin to improvise and differentiate to produce and replace the import.

In the meantime, the other cities might be replacing the original exports of the city; its temporary advantage might be competed away. Now the domestic and perhaps improved version of the originally imported products can then be re-exported, perhaps to the original supplier city or more likely to other cities "down the line" that are less developed or have different specializations. The new export earnings will then purchase other, more challenging imports, and the process can repeat itself ratcheted up at a higher level. In this matter, a diversified group of innovative and versatile cities can learn from each other through trade and not only grow but *develop* "on one other's shoulders" (Jacobs 1984, 144)—which we might call climbing "Jacobs' Ladder."

It should be particularly noted that the Jacobs' Ladder mechanism works best between competitors at a roughly comparable level of development.[8] Her theory provides a rationale for regional trading blocs between countries at roughly the same level of development, not for free importing from the most advanced countries. "Science fiction" imports from advanced countries (largely to feed

the conspicuous consumption habits of the elites)[9] would stop the rivalrous process in the same way that allowing a heavyweight to box in a lightweight class would stop the rivalry as well as the associated process of learning and improvement through competition—leaving aside any other damages. Enforcing "level playing field" competition between "heavyweights" and "lightweights"—that is, between advanced and underdeveloped countries—would be tantamount to "kicking away the ladder" (Chang 2002) that the developing countries could climb.

Jacobs' Ladder as a Scheme of Parallel Experimentation for Social Learning

In the presence of genuine uncertainty, innovation and learning is best advanced by conducting diverse concurrent experiments with a common goal—for instance, toward the most economical car or the most effective means of treating AIDS.

> The use of a parallel-path strategy for the solution of difficult development problems is standard practice in several of our outstanding industrial laboratories. It is extremely common in agricultural and medical research. And in the atomic-bomb project, one of the most spectacularly successful military projects the United States has ever undertaken, the parallel-path strategy was employed. (Nelson 1961, 353)

It is the opposite of specializing one's resources in what is currently considered as the One Best Way. As the parallel experiments score successes, there must be some mechanism so that those successes are transmitted to the other experiments and thus the whole group is ratcheted up.

The international community of scientists in any field furnishes an excellent example of such a scheme of discovery and learning through parallel experimentation. Rather than "avoiding duplication" and "increasing efficiency" by putting all resources on what seems the most promising way, a diversity of centers of research ideally is fostered. As Jacobs writes:

> Development work is a messy, time-, and energy-consuming business of trial, error and failure. The only certainties in it are trial and error. . . . Indeed, development work is inherently so chancy that by the law of averages, chances of success are greatly improved if there is much duplication of effort. . . . Just so, when Pasteur, that wise old man, begged for enlarged support of the biological sciences, he begged for multiplication of laboratories. (Jacobs 1969, 90–91)

Evolutionary biology provides a natural example of parallel experimentation. There are two opposing moments in an evolutionary process: variation (exploration or diversification) to expand the range of possibilities, and selection (exploitation or specialization) to whittle down the given possibilities to the best ones. Thus specialization and diversification are seen as two opposing moments in one overall process. Think of a species as trying to climb to a higher level of evolutionary fitness on a "fitness landscape" that has multiple peaks. But the species might be on a low hill. From Darwin up until Sewall Wright's work in the early 1930s, evolutionary theory focused on selection, which by itself is only a hill-climbing mechanism. If the main population is climbing a low "dead-end" hill, then there needs to be some alternative way to go downhill against selective pressures, cross a valley of low fitness, and start climbing a higher hill. Mutation in one large interbreeding population was not enough. Sewall Wright was the first evolutionary thinker to focus on that problem of variation, exploration, and diversification. "The problem of evolution as I see it is that of a mechanism by which the species may continually find its way from lower to higher peaks in such a field" (Wright 1932; reprinted in Wright 1986, 163–64).

The solution[10] was again diverse, semi-isolated experiments (subpopulations or "demes" in different niches) run in parallel with enough migration of genes between the subpopulations so that successes would ratchet up the whole population. Since there was always a balance to be struck between the semi-isolation of the subpopulations to encourage novelty and communication between the groups to share successes, Wright called it the "shifting balance theory."

As a general scheme of parallel experimentation for learning under

uncertainty (where you really do not know the One Best Way to go), the "Wright stuff" is:

- different experiments running concurrently with some common goal (rather than focusing resources on what currently seems like the best option),
- with some semi-isolation from the pressure of immediate success,
- with benchmarking comparisons made between the experiments, and
- with the "migration" of discoveries between experiments wherever possible to ratchet up the performance of the whole population.[11]

The Jacobs' Ladder mechanism is, of course, an example of a parallel experimentation scheme. The different cities (or countries) within a vibrant trading bloc are each carrying on various experiments and then exporting their successes to others in the group. Each member tries to incorporate and improve upon the "challenging" imports and then to re-export its successes so that they develop "on each other's shoulders," ratcheting up the level of development (knowledge and productive capacity) of the whole group.

Such a scheme of mutual challenges and import replacements ratcheting up and continuously improving the whole trading bloc is in striking contrast to the scheme promoted by comparative advantage theory in which each city, region, or country in the trading bloc specializes in "what it does (relatively) best" and then exports that product (perhaps ever-improving through more specialization) to the other specialized trading partners, who, in turn, supply their ever-improving specialized products as imports to the others in the bloc. Jacobs sees this scheme of specialization as a recipe for long-term stagnation. People with specialties can further dynamic improvements if they jostle together with people of other specialties within a company. Or companies with specialties can promote dynamics if they jostle together with other companies within a versatile city. But when a whole city specializes and trades with other specialized cities, then that locked-in pattern of static efficiency is a recipe for stasis and long-term decline.

Jacobs University: A School for Lifetime Learning

It is not easy to explain Jacobs' theory in terms of conventional economic models. Perhaps one key is to focus on her theory of development as a type of social learning and then to construct a purely educational analogue as an aid to understanding. That is the purpose of this section.

Imagine a school of student-teachers. They earn chits by teaching some topic to their fellow students, and then they can use the chits to pay for courses offered on other topics by their fellow student-teachers. For simplicity, we assume that the student-teachers' other needs are taken care of by other means, e.g., that they are like students living at home. As students learn and can recombine knowledge and innovate, they may offer new courses to their fellows if they can find enough takers. The student-teachers play the role of the cities, with the courses they teach being their "exports," and the courses taken being their "imports." Thus Jacobs University is a simplified educational model of the Jacobs' Ladder mechanism. The student-teachers learn (develop) on each other's shoulders. Many of her basic arguments can be modeled and perhaps clarified within the Jacobs University model. The arguments are developed in parallel in Table 1.

The Jacobs University analogue clarifies some difficult points. Conventionally, the emphasis is on export-driven growth, but Jacobs puts the emphasis more on imports and the process of stretching and replacing them. Seeing an import as a crystallized packet of codified knowledge and tacit production know-how, learning to replace an import is analogous to taking a course and assimilating the knowledge, perhaps improving on it and then being able to teach others (re-exporting the improved product). Thus the exports are basically the means to pay for the imports, and the important thing is what happens in between—learning to replace the imports and developing new exports.

Table 1

An Educational Analogy for Jacobs' Economic Theory

Theme	Economic Model: Jacobs' Ladder Mechanism	Educational Model: Jacobs University for Lifetime Learning
Players	Cities	Student-teachers
Inputs	Imports	Courses taken by students
Outputs	Exports	Teaching fellow students
Means of obtaining inputs	Exports earning imports	Teaching other students to earn chits to pay other student-teachers to teach one a new topic.
Original endowment	Endowment of natural resources to start process (as original unearned resources to buy imports).	Inherited chits to start taking a course.
How success forces players to next level	Exports to a creative city will soon be replaced, forcing a city to generate new exports.	Courses successfully taught will dry up the students willing to take the same course, so teacher has to learn something new to teach.
Desert	Imports (however funded) are just consumed with no attempt to stretch or replace them.	Course taken (however funded) but no learning and no subsequent teaching.
Rain forest	Imports are assimilated, stretched, and modified in a diversity of products. City is in an excellent position to innovate and export goods. This is easier in a diverse city with many entry points to assimilate and creatively use imports.	Course knowledge feeds into a number of "hooks" or "entry points" so student has an in-depth understanding of topic and is in an excellent position to teach—perhaps in new courses. This is easier in a student with more diverse knowledge.
Export processing zone	Imports get a little processing and are then re-exported.	Courses not really learned but mechanically used to teach others, while having little real understanding oneself.
Advanced-backward trade	Science fiction import cannot be stretched or replaced. Not assimilated in that sense. Stops the dynamic.	Course at too advanced level, so little is learned or assimilated. Stops the dynamic.
Supply regions	Regions that produce something, natural resources, agricultural outputs, or a military supplier that is not part of a Jacobs' Ladder dynamic (inert partners with steady demand), so it is lulled into just using its earnings to buy imports and has lost the necessity and capacity to replace the imports. It has stopped learning and becomes specialized.	Finds that teaching in a specific field goes on and on, so one can take other courses, but it is not really necessary to learn them to teach in the new topics. Slides outside the dynamic of teaching, students learning to teach, teacher needing to learn a new topic, and so forth.
Unearned imports	Unearned imports paid for with subsidies given perhaps for charitable or political reasons.	Getting unearned chits to take a course—for charitable or perhaps political reasons.
Transactions of decline	Even though it may be an advanced creative city ultimately providing subsidies (through the government) to backward regions that turn around and give demand for the city's exports, there is no creative partner, so the city gets locked into becoming a supply region for inert subsidized partners. Sustained use of taxes for military expenditures on a city's products is the same type of pattern locking the city into becoming an industrialized supply region.	Good student-teachers provide some scholarship chits for backward students who can thus pay for the better teachers' courses. But the backward students might not learn or progress (since the chits were unearned by their own learning and teaching). One is outside the positive dynamics of teaching students who learn, so teacher uses fees to take another course, which can then be used for teaching, and so forth. Teachers may fall into an inert pattern of teaching to subsidized, unlearning students.
Remittances	Remittances, being unearned where they are spent on imports back home, do not lead to learning, import stretching, or replacement.	Getting chits unearned by teaching (earned in some other way elsewhere), so the student would have little capacity to learn anything to kick off the learning-teaching dynamic.

(*continued*)

Table 1 *continued*

Theme	Economic Model: Jacobs' Ladder Mechanism	Educational Model: Jacobs University for Lifetime Learning
Specialization to comparative advantage	Each city specializes, so it does not learn from imports, and other cities similarly do not learn from its exports. They are in a static "equilibrium" until the products are obsolete and competition from outside the specialized trading group exposes their inertness.	Some students decide to specialize and then take in each other's laundry (each teaching their own specialty to unlearning students). The situation repeats itself. When new knowledge finally comes from outside, neither will be able to learn it.
How transplants can attenuate the dynamics on the importer-student side	Exporters who transplant a factory to the importing city so product will be "produced locally" are in fact attenuating the dynamic, as it forestalls genuine import replacement. Importing cities might compete to get the transplant factories so they could quickly get into the "producing-and-exporting" business without going through the time-consuming process of learning to produce themselves.	If teacher offers to teach (with lower return) "for" the students, then the students get some return (as student-assistants) but don't learn in order to teach the topic themselves. Students might even compete to offer deals to teacher to teach for them so they can quickly get into the "teaching" business without going through the time-consuming process of learning to teach the topic themselves.
How transplants can attenuate the dynamics on the exporter-teacher side.	Since previously exporting city is now benefiting (owners, not workers) from having the product produced locally in the previously importing city, there will be no real import replacement, so the partner has become inert. The exporting city can thus sterilize potentially creative import-replacing partners so that it can continue doing the same thing.	If the teacher can teach "for" the student, the student will not replace the demand for teaching that topic by learning, so the student-partner has become a relatively inert student-assistant. By doing this for the potentially learning students, the teacher can render their learning-to-teach unnecessary so the teacher can continue doing the same thing.

Another point difficult for those accustomed to "static" models of growth is the inherent dynamism of the Jacobs model. The school analogy captures this nicely since a school that just keeps on repeating the same courses to the same unlearning students is a clear failure even though it might have an increasing volume of repeating students in its circular flow. In the Jacobs University model, imagine two initial sets of "specialized" student-teachers. One set teaches mathematics to the other set, and that other set teaches post-modernism to the math set. Each set finds the other topic totally incomprehensible, so they keep repeating the taking and teaching of the courses in a static equilibrium. Each repeats its comparative advantage. But there might be some unemployed members of each set. The university administrators could have a one-time pump-priming injection of chits into both groups so that the unemployed members could now be employed to teach their topic and thus to pay for being students of the other topic. The system would then have "growth" to a higher-level equilibrium–like giving a one-time push to a frictionless wheel to leave it spinning with increased angular momentum. But such "growth" is only the failure to learn on a broader scale. Now we turn from the macro-model of the Jacobs' Ladder mechanism to Jacobs's micro-level analysis of innovation in the firm.

Some Policy Implications

How New Work Might Be Spawned from Old Work

Jane Jacobs' micro-level analysis of how old work can lead to new work in firms has interesting and powerful implications for economic policy about job and enterprise creation. New work arises out of old work in a variety of ways. One way is simply that old products might be stretched to find new applications; old services might be stretched to find new categories of clients. But a deeper source of innovation lies in the multiple uses and recombinations of a technology. Once a company learns technology W to produce product X, the economically rewarding path and "path of least resistance" is probably to continue in the same groove

(or rut) to produce more and better X instead of using the technology W to produce noncompeting products Y and Z.[12] In a diverse environment, the additional knowledge to use the technology to produce the other products Y and Z might be readily available.

> Picture, for example, a large manufacturer of metal dies whose abrasive-sand department has taken on the work of making sandpaper and masking tape. The personnel department has added the service of supplying part-time office workers to banks and publishers. One group of machinists has added the manufacturing of toy cars. Another group of machinists has added the manufacturing of surgical instruments. Still another group is working on a machine to improve bookbinding. The shipping department has added the manufacturing of crate linings made from foam rubber and is also making shoe inner-soles from the scraps. (Jacobs 1969, 72)

But this filling out of the possibilities of each technology might fail for reasons other than an overly specialized environment. Management would become a nightmare in this "strange hive." Each new kind of work might be in a different sector and would have its own customers, input and space needs, financing and staffing requirements, and growth rate, all not in any coordination with the original work of the company. It probably is not worth the distraction to the original company. Given the limitations on the scope and attention-span of unified management, the company might decide to just "stick to its knitting" with the original products. The new job creation possibilities would be squandered.

Every Company's Two Products

Here Jacobs' thought meets up with some older observations by Cambridge economist Arthur C. Pigou (1877–1959). Every company produces two products. One product is its products. The other product is the organization of people (always with some turnover) trained in the technologies used by the company and trained in the general business capabilities needed to carry on the business. Pigou noted that the businesses in a country provided this *potential* positive externality (meaning their potential social product exceeded their private product) of training people in technologies and business capabilities:

> One very important indirect service is rendered by the general economic organisation of a country in so far as, in addition to fulfilling its function as an instrument of production, it also acts, in greater or lesser degree, as a training ground of business capacities. (Pigou 1960, 204)

What are the policy implications of this fundamental point that existing businesses are major training grounds for entrepreneurial, managerial, and technological capability and potential incubators for new businesses? The extent to which this widespread potential positive externality is exploited to create new jobs—or new work from old work—depends crucially on the form of the business. The additional job creation that could follow from a corporation's "second product" (its training of people in technologies and business capabilities) is typically not a part of the company's goals; that is why it is an externality.

Realizing the Potential for New Job and Enterprise Creation

First we consider the conventional corporate form of business. How might the externality be internalized through private or public action? While unitary corporate management typically tries to maximize the size of its empire, the diseconomies of scale and scope will soon extract their price.[13] One counter-strategy is the multidivisional firm (e.g., Chandler 1990). The example of the 3M company shows that a multidivisional structure (together with a very special corporate culture) can be used to try to fill out the plenum of possibilities offered by each technology mastered by a company. But 3M is more the exception than the rule; larger organizations usually mean deeper ruts to imprison the older work.

Here again, a biological example might be instructive. There are two ways that biomass can be increased: by existing organisms getting bigger (like multidivisional growth in a firm) or by existing or-

ganisms spawning new life by having offspring.[14] Nature gives little choice between these options. There are powerful structural limits to physical growth in each type of organism, and the grim reaper imposes even stricter time limits. Hence the biological "principle of plenitude" (Lovejoy 1960, 52) by which biomass has increased is principally old life spawning new life through fission and reproduction. Incidentally, the orthodox "dream world" of perfectly enforced intellectual property rights would tend to shut off the second option of spawning new economic life—while the "grim reaper" of limited patent life is an attempt to (belatedly) bring the second option back into play.

For an economy to be more like a rain forest than a desert, it must increase its "economic mass." But corporations do not have a limited lifetime, and the diseconomies of scale and scope seem to place little natural limit on the ambitions of management to try to grow directly or to grow indirectly through acquisitions and mergers. Hence conventionally organized companies do not tend to follow an economic principle of plenitude by deliberately spawning new offspring. Indeed, where new life gets going on its own, large corporations try to compensate for their lack of innovation and oncoming senility by gobbling up the previously successful start-ups (reverse spin-offs) in a process of "destructive corporate cannibalism" (Jacobs 2004, 170).

One possibility is realized by franchising. Often a business has natural geographical limits (e.g., a restaurant). But the business's "second product"—its capacity to train people in the specific business—could be used to "replicate the DNA" to other geographical locales. If there are enforceable intellectual property rights to the "concept" and perhaps property rights to some unique inputs, then the positive externality might be internalized as a franchise operation. If successful, then the company's second product becomes the main product—the use of the company's training capacity to replicate the business DNA in the franchisee operations. Even when some of the prerequisites are not present for a full-blown master franchiser operation, each business still has the potential to replicate its successful DNA—it just lacks the means to recoup the benefits (which is why positive externalities tend to be under-realized). For instance, with some temporary doubling up of staff, new people could be trained to replicate the business in a noncompetitive locale.

It is also possible for a company to use spin-offs of partial subsidiaries (rather than new divisions) to develop new products out of the old products and technologies. One interesting example of systematic spin-off promotion is the Thermo-Electron Group in and around Boston.[15] The original company, Thermo-Electron, was started by an MIT physics professor, George Hatsopoulos, in 1956. Once a company has mastered a technology to produce one product, there are often many nearby products that beckon to be produced. Thermo Electron established the principle that new nearby products would be produced in new companies that were "spin-outs" from the original company. The mother company would keep a majority of the shares (to address the incentive problem), but the other shares would be held by the people in the spin-out or would be sold to the public. Operational control would be in the hands of the spun-out company, whose name would always begin with "Thermo" to signify membership in the Thermo group (which now has over sixty companies listed on its Web site). Now the children have begun to have children, since the ramification through spin-outs is a principle for all the companies of any generation.

But here again, the Thermo Group is more the exception than the rule (see Peters 1992 for more exceptions). When asked why others have not copied his ideas, Hatsopoulos said: "People who head large companies are not venturesome enough. The CEOs of established companies are afraid to lose control because we are turning a lot of decision-making over to the individual manager" (quoted in Bailey and Syre 1996, 45).

The example of the Thermo group is quite instructive on several counts. It shows one way that the externality problem can be addressed by fostering partially owned spin-offs (or "spin-outs").[16] But it also shows the severity of the incentive problem, since the Thermo example has not been imitated. Corporate management wants to expand the empire directly under its thumb; spin-outs to an associated group do not seem to fit the bill. There is one (multidivisional)

Microsoft company, not fifty or a hundred firms in a Microsoft group.

Yet another possibility arises when most of the technology is embodied in highly mobile "human capital," where independent venture capital is available, and where the economic environment has reached a certain critical mass of diversity. Then, as in California's Silicon Valley, Boston's Route 128, or Taiwan's Silicon Gulch[17] (not to mention the fervent period of the industrial revolution in England), many of the technological possibilities can be fulfilled by breakaways and spin-offs that cannot be prevented by empire-building management in the original company—management that sees "big things turning into smaller things" as "decay and disintegration" rather than "birth and renewal of vigor" (Jacobs 1980, 68).

And finally there are many service-sector enterprises with small capital requirements where management cannot stop spin-offs and breakaways. In these last two cases, spin-offs are possible not because they are compatible with the legal form of the enterprise but because much of the business is embodied in the human knowledge and skills of the staff who walk out the door at the end of each working day and have the choice of not coming back.

The Difference Democracy Makes

The enemies of diversification are not just one-sided economic theories that emphasize the deepening of old work rather than the creation of new work (to put it in Jacobs's terms). Empire-building proclivities also thwart diversity, and those tendencies are evident both politically and economically. But the political grip of those proclivities will depend on the form of government. In an autocracy where power comes from above, the sovereign will seek to maintain and perhaps even expand the realm.[18] But if power comes from below as in a political democracy (leaving aside the half-free and half-slave antebellum America), there are few grounds to deny the expressed wish of the bulk of the population in a part of a country to become autonomous or to secede. Jacobs cites the early-twentieth-century peaceful secession of Norway from Sweden as an example (the separation of Singapore from Malaysia might also be mentioned), and she viewed the possible secession of Quebec with equanimity if not support.[19]

The same dynamics of power and legitimacy are at work in an economic polity. In a conventional company, where power comes from above, management has little reason to sponsor spin-offs and would have little cause to accede to any expressed desires coming from below to use the firm's technological and business capabilities for new enterprise creation through spin-offs and breakaways. When the preconditions of a Silicon Valley are present or in labor-intensive service sectors, then it may happen anyway—not because of the form of business but in spite of it.

In a democratic company (e.g., an industrial cooperative) where power comes from below, then management has less of a leg to stand on to oppose new enterprise creation through spin-offs and breakaways.[20] Pigou specifically mentioned that "associations of workers combined together in small co-partnership workshops" would constitute the "first school in which this capacity can be developed" and thus such companies would contribute to the community not just "boots and shoes" but the second product of "well-trained competent" people (Pigou 1960, 205–6).

That has certainly been the experience of today's best example of cooperative development, the Mondragon group of cooperatives in the Basque region of Spain.[21] The companies known collectively as "Mondragon Cooperative Corporation" produce a rather full variety of high-value-added consumer products, intermediate goods, and capital goods, including the first robots and computer numerically controlled (CNC) machinery designed and built in Spain. Since the firms are all cooperatives, it was all done with no foreign ownership. The group started with a single company in the mid-1950s producing a kerosene heater. Then it systematically implemented the economic principle of plenitude by filling out the backward linkages, producing the machines to make the heaters and then the machines to make those machines. Through multiproduct diversification, it started producing other consumer durables (stoves, refrigerators, and washing machines) and all the things to produce those things. Each bottleneck called forth new

energies to solve problems, e.g., a bank to help finance new enterprises, an applied technological research institute to systematically learn new technologies and turn them into new products, a consulting company to help new firms start (a "factory factory"), an insurance company for members, and a polytechnic university.

Since the firms were cooperatives and, as a group, had the express goal of developing good jobs in the Basque country, the positive externality of fostering spin-offs and breakaways was "socialized" or internalized within the group (see Ellerman 1984a, 1984b). The original company did not have the option of "owning" a spin-off or preventing the spin-off if the mother company could not capture all the benefits. The new company would also be a cooperative that would have to "rest on its own bottom" or "walk on its own two feet"—within the group.[22] Thus the headquarters of the whole group encouraged groups within existing firms to coalesce around ideas to produce adjacent products in a spin-off. The potential managers and workers might be from a village or small region without much industrial development, so by doing the spin-off near their homes, they satisfied both economic and social goals. In a similar context, Jacobs noted that such "division would be a normal, untraumatic accompaniment of economic development itself, and of the increasing complexity of economic and social life" (Jacobs 1984, 215). Since the spin-off process was carried out in an organized and socially approved way, precautions could be taken so that it did not disrupt the original mother firm. It became part of how the group evolved.

Conclusion

Our overall goal is to call attention to Jane Jacobs's ongoing work not only as a writer about cities but as a writer about economies and development where cities have the central role as the main sites of development. Her emphasis on diversification is particularly relevant to today's debates about globalization. She is almost a one-person antithesis to orthodox economics, which is professionally enamored with the logic of specialization, increased division of labor, and the theory that each country (or city region) should specialize in its comparative advantage.

According to comparative advantage theory, the North (industrialized countries) clearly has the comparative advantage in modern science, technology, and industrial production. The South (developing countries) should not indulge in the wasteful duplication of producing on its own (initially) crummy imitations of the industrial products produced so well in the North. The South should specialize in its comparative advantage, which is natural resources, agricultural products (which the North should buy more from the South to lock in that sterile pattern), and unskilled labor. Indeed, the South can function in part as a "bedroom community" for unskilled labor that becomes "transnational"—migrating back and forth to the North to take the jobs that northerners don't want.[23] Insofar as industrial products need to be produced in the South, this should be done by factories owned and operated by the multinational companies from the North, which already have the comparative advantage in that sort of thing (and which will tend to crowd out the development of that local capacity in a familiar colonial fashion). But it is "win-win" since the factories will use the cheaper local labor, one of the South's specialties. By thus urging the North and South to each exploit their own comparative advantage, the development institutions that operate according to the "science" of economics—such as the World Bank (see Ellerman 2005) and the International Monetary Fund—promote the goal of worldwide efficiency.[24]

But Jane Jacobs, being without the blessing of an intellectual formation in economics, has spent a lifetime studying economies rather than economics, and she has arrived at a rather different viewpoint. Her perspective is productivist (or capabilities-based) rather than consumptionist. Rather than starting with an artificial static conception of the economy and then perhaps later discovering that some cherished notions (e.g., static efficiency) might even cut against evolutionary dynamics,[25] she begins with a description of actual economies that is dynamic and evolutionary. In her ecological vision of economic life, she is a "diversitarian" in contrast to the "uniformi-

tarian" tendencies of high modernism.[26] She did not stop with the orthodox critique of import substitution programs and endorse comparative advantage theory to lock in the current international division of labor. Instead she has rethought the process of import replacement at the macro-, meso-, and micro-levels to arrive at a model of how cities (or countries) at roughly the same level of development can use volatile trade with one another to develop on each other's shoulder—which might be called the "Jacobs' Ladder" mechanism.

On the negative side, the Jacobs' Ladder theory provides a critique of the South's science-fiction imports from the North that serve mainly to titillate the local elites and to forestall the slower development of those industrial capabilities in the South. Domestically, the Jacobs' Ladder theory shows the very minimal development impact ("sterility") of the one-way traffic of products and investments ("political factories") imported into poor regions, company towns, military bases, and other "mono-crop" enclaves that cannot "answer the challenge" by replacing and re-exporting the imports in a self-sustaining process.

Finally, at the micro-level of the firm, her analysis of old work spawning new work revives an older theme of Pigou that each firm embodies a positive externality in the firm's "second product"—its organizational capacity to train people in technological and business capabilities. In the conventional firm where power comes from above, this potential for new job and enterprise creation goes largely untapped. What "king" ever voluntarily gave up his grip on part of the "kingdom" in the interests of diversified niche-filling development? The legal form of production serves as a constraint or fetter on economic development. There are two policy implications. One is that there may be policies that would help conventional firms to internalize the positive externality and thus to be less of a fetter on development (e.g., the examples of 3M and the Thermo Group). The other implication is that if firms are organized more with power coming from below, then the organizations will be more able to spawn new and diverse economic life. Rather than just specialize and expand old life with its attendant diseconomies of scale and scope, economic life would then better approximate the biological principle of plenitude that works to increase the mass and complexity of life primarily by spawning new life.

Notes

1. Unlike so many professional economists, she is always careful to write about economies, not about "economics."

2. In popular terms, she might be called the "diva of diversity."

3. See Hodgson (1993) for a rather comprehensive survey (which, however, misses Jane Jacobs' work).

4. See Ellerman (2004a) for Jacobs's treatment of migration issues.

5. See Sen (1999) for a recent capabilities-based notion of development, and see List (1885) for an older productivist viewpoint.

6. "In economic life the amoebas do not always divide into more amoebas. Sometimes the people who manage to split off new organizations from an old one do not duplicate the older company where they got their start; instead, they combine their experience with a new idea. An example would be a purchasing agent for a restaurant chain who becomes dissatisfied with the scales he buys, has a better idea for their design and teams up with a machinist from a tool-and-die company and a designer of microprocessor controls to start a new enterprise manufacturing food wholesalers' scales. The new enterprise would be not a reproduction of the parent enterprise, but a mutant" (Jacobs 1980, 68).

7. See Peters and Waterman (1982) as well as Collins and Porras (1994) to update the story of 3M as the "Mutation Machine from Minnesota."

8. See "Why Backward Cities Need One Another" (Jacobs 1984, chapter 10).

9. Even imported "factories" such as the BMW and Mercedes assembly plants in South Africa will largely serve only the purpose of gratifying the elites. Moreover, by soaking up much of the local demand for cars by those who can afford them, such plants will crowd out and foreclose on the possibility of there being a genuinely African car with all the technological ramifications that would follow from it.

10. Like Darwin, Wright thought it relevant to carefully observe artificial selection. Wright found that breeders do not keep all their animals together in one large interbreeding herd. They deliberately break the herd up into subherds, subpopulations, "races," or "demes" (as in demography). It is a question of balance. The subherds should be small enough so that the variety found in the subherd (through sampling error) or created through mutation, sexual reproduction, and genetic drift will be emphasized through inbreeding. But the subherd should not be so small that inbreeding leads to the quick fixation of ill-adapted genes and the deterioration or demise of the subherd. When a clearly superior example is produced in a subherd, then the seed is crossbred into the other subherds to give them the benefit of the innovation. But seeds could not be constantly crossbred between the subherds, as that would defeat the benefits of their semi-isolation. Shifting balances were involved.

11. See Provine (1986) for more on Wright's work. On parallel experimentation schemes, see Ellerman (2004b) and the work of Charles Sabel and colleagues (such as William H. Simon and Michael Dorf), e.g., Dorf and Sabel (1998), in what might

be called the Columbia school of legal pragmatism—itself the fruit of the joining across sectors of a politico-economic sociologist (Sabel) and legal scholars.

12. The problem of using new knowledge (either an innovation or new imported knowledge) to produce other products off the main line of business is related to what Norbert Wiener called the "inverse process of invention." Ordinarily we think of starting with a problem and then making an innovation or invention to solve the problem. But with the new "solution" in hand, we might then search for what other problems it might be able to solve. "It is just as truly a work of invention or discovery to find out what we are able to accomplish by the use of these new tools as it is to search for the tools which will make possible a specific new device or method" (Wiener 1993, 91).

13. Or, as Marx would put it, the mode of production puts fetters on the forces of production. And, as recent history has confirmed, real, existing socialism put even greater fetters on the forces of production.

14. Jacobs gives an example from a service sector. "For one thing, restaurant chains keep splitting off new restaurants. Indeed, that is how they become chains in the first place—not by merely trying to add more tables, customers, cooks and cashiers into an ever bigger and bigger restaurant, but by multiplying into more restaurants. Besides that, restaurants give birth to independent progeny which are not branches or subsidiaries, but genuinely new enterprises" (Jacobs 1980, 67).

15. See www.thermo.com; Peters (1992); and Bailey and Syre (1996).

16. There is no intrinsic reason that spin-offs should be restricted to new products. Even routine parts of the operation, such as copying (and printing), trucking, food preparation, secretarial services, cleaning services, and the like, could be spun out with long-term contracts to keep the original business with the mother firm (so the jobs are not "put to competition" for the old business). Then the spin-outs could fill many niches for similar work in the business environment, which would expand the old work and perhaps diversify into new work—all of which would not happen while it remained a sterile captive of the internal division of labor in the mother firm.

17. In Taiwan, the spin-off entrepreneurs are said to prefer being the "head of a chicken than the tail of a horse." See Jacobs (1984, 99–102) on the Taiwanese experience.

18. Jacobs has noted the connection between top-down power and empire-building: "The biggest and most thoroughly centralized governments have always, finally, required the special environment of oppression to continue to maintain themselves. And some could never have attained their great size at all had they not grown in that environment" (Jacobs 1980, 77).

19. See Jacobs (1980). Why did she write a book on this "Canadian problem"? In protest against the Vietnam War, she moved to Toronto in the late 1960s and later became a citizen of Canada, where she has been just as involved in public life as she was in the United States. When asked when she is moving back to America "where things happen," she replied that she was not and that "Things happen (in Canada) too! Just as real!" She went on to observe: "It's very hard to get this across to Americans and I don't think Americans can appreciate this until they've lived outside the country for a little while" (quoted in Pruzan 2004, W3).

20. In biological terms, the more that power is bottom-up in a firm, the more it is like an organism with reproductive cells under decentralized control throughout the organism rather than under central control in one specialized part.

21. See www.mondragon.mcc.es/ingles/menu_ing.html. For details, see the account by a preeminent American organizational theorist and his wife (Whyte and Whyte 1991).

22. In a democratic firm, where "corporate governance" is more than an oxymoronic phrase, the quality of the self-governance deteriorates as the firm gets larger, so firms will naturally tend to subdivide anyway to keep the membership at workable levels. The upper limit might be between several hundred and a thousand members, depending on the technologies involved.

23. See Ellerman (2003) for more on this remarkable theory about migration. By this theory, just as a suburban bedroom community would not be considered "undeveloped" because the jobs were in a nearby city, so in today's globalized world, a country that accepted the "international division of labor" as a supplier of transnational labor would not be "undeveloped"—it is only a "bedroom community" vis-à-vis the developed world.

24. "Possibly because so many ambitious and expensive attempts to force or coax economic expansion have failed during the second half of the twentieth century, it has finally become permissible to say that the emperor has no clothes—that economic theory can't explain economic expansion" (Jacobs 2000, 158).

25. "A system—any system, economic or other—that at *every* point of time fully utilizes its possibilities to the best advantage may yet in the long run be inferior to a system that does so at *no* given point of time, because the latter's failure to do so may be a condition for the level or speed of long-run performance" (Schumpeter, 1962, 83).

26. See Lovejoy (1960, 293–94) on "diversity itself as the essence of excellence" (quoted in Jacobs 1980, 114), and see Scott (1998) on the high modernist mentality of "Why not do everything in the One Best Way?"

For Further Reading

Arrow, Kenneth J. 1962. "The Economic Implications of Learning by Doing." *Review of Economic Studies* 29 (June): 155–73.

Bailey, Steve, and Steven Syre. 1996. "And Thermo Begat . . . : Thermo Electron Keeps Spinning Out Offspring." *Boston Globe,* March 19, 41, 45.

Bairoch, Paul. 1988. *Cities and Economic Development.* Chicago: University of Chicago Press.

Chandler, Alfred. 1990. *Scale and Scope: The Dynamics of Industrial Capitalism.* Cambridge: Harvard University Press.

Chang, Ha-Joon. 2002. *Kicking Away the Ladder.* London: Anthem Press.

Collins, James C., and Jerry I. Porras. 1994. *Built to Last.* New York: HarperBusiness.

Darwin, Charles. 1999. *On the Origin of Species.* 6th ed. Available at www.ibiblio.org/gutenberg/etext99/otoos610.txt.

Dorf, Michael, and Charles Sabel. 1998. "A Constitution of Democratic Experimentalism." *Columbia Law Review* 98: 267.

Ellerman, David. 1984a. "Entrepreneurship in the Mondragon Cooperatives." *Review of Social Economy* 42 (December): 272–94.
——. 1984b. "The Mondragon Cooperative Movement." Case No. 1–384–270. Boston: Harvard Business School.
——. 2003. "Policy Research on Migration and Development." *World Bank Policy Research Working Papers,* no. 3117. Available at http://econ.worldbank.org/files/29100_wps_3117.pdf.
——. 2004a. "Jane Jacobs on Development." *Oxford Development Studies* 32, no. 4 (December): 507–21.
——. 2004b. "Parallel Experimentation and the Problem of Variation." *Knowledge, Technology & Policy* 16, no. 4 (Winter): 77–90.
——. 2005. *Helping People Help Themselves: From the World Bank to an Alternative Philosophy of Development Assistance.* Ann Arbor: University of Michigan Press.
Glaeser, Edward, Hedi Kallal, Jose Scheinkman, and Andrei Shleifer. 1992. "Growth in Cities." *Journal of Political Economy* 100: 1126–52.
Gould, Stephen Jay. 1979. "Dreamer" (a review of *Disturbing the Universe,* by Freeman Dyson). *New York Review of Books* 26, no. 15 (October 11).
——. 1987. *An Urchin in the Storm: Essays About Books and Ideas.* New York: Norton.
Hodgson, Geoffrey M. 1993. *Economics and Evolution: Bringing Life Back into Economics.* Ann Arbor: University of Michigan.
Imbs, Jean, and Romain Wacziarg. 2003. "Stages of Diversification." *American Economic Review* 93, no. 1 (March): 63–86.
Jacobs, Jane 1961. *The Death and Life of Great American Cities.* New York: Vintage.
——. 1969. *The Economy of Cities.* New York: Random House.
——. 1980. *The Question of Separatism: Quebec and the Struggle over Sovereignty.* New York: Random House.
——. 1984. *Cities and the Wealth of Nations: Principles of Economic Life.* New York: Random House.
——. 1992. *Systems of Survival: A Dialogue on the Moral Foundations of Commerce and Politics.* New York: Vintage Books.
——. 2000. *The Nature of Economies.* New York: Modern Library.
——. 2004. *Dark Age Ahead.* New York: Random House.
Kauffman, Stuart. 1995. *At Home in the Universe.* New York: Oxford University Press.
Landes, David S. 1998. *The Wealth and Poverty of Nations: Why Some Are So Rich and Some So Poor.* New York: W.W. Norton.
List, Friedrich. 1885 (1841). *The National System of Political Economy.* Trans. Sampson Lloyd. London: Longmans, Green. Available at www.economics.mcmaster.ca/ugcm/3113/.
Lovejoy, Arthur O. 1960. *The Great Chain of Being: A Study of the History of an Idea.* New York: Harper Torchbooks.
Lucas, Robert E. 1988. "On the Mechanics of Economic Development." *Journal of Monetary Economics* 22, no. 1 (July): 3–42.
Marshall, Alfred. 1920. *Principles of Economics.* New York: Macmillan.
Nelson, Richard R. 1961. "Uncertainty, Learning and the Economics of Parallel Research and Development Efforts." *Review of Economics and Statistics* 43(November): 351–64.
Peters, Thomas J. 1992. *Liberation Management.* New York: Knopf.
Peters, Thomas J., and Robert H. Waterman. 1982. *In Search of Excellence.* New York: Warner.
Pigou, Arthur C. 1960. *The Economics of Welfare.* 4th ed. London: Macmillan.
Porter, Michael E. 1990. *The Competitive Advantage of Nations.* New York: Free Press.
Provine, W. B. 1986. *Sewall Wright and Evolutionary Biology.* Chicago: University of Chicago Press.
Pruzan, Jeff. 2004. "Street Activist's Saving Grace." *Financial Times,* July 24–25, W3.
Rodrik, Dani. 2004. "Industrial Policy for the Twenty-First Century." Working paper prepared for UNIDO. Available at http://ksghome.harvard.edu/~drodrik/papers.html.
Romer, Paul. 1986. "Increasing Returns and Long-Run Growth." *Journal of Political Economy* 94, no. 5 (October): 1002–37.
Sahu, Sunil K. 1998. *Technology Transfer, Dependence, and Self-Reliant Development in the Third World: The Pharmaceutical and Machine Tool Industries in India.* Westport, CT: Praeger.
Schumpeter, Joseph A. 1962. *Capitalism, Socialism and Democracy.* New York: Harper Torchbooks.
Scott, James C. 1998. *Seeing Like a State: How Certain Schemes to Improve the Human Condition Have Failed.* New Haven: Yale.
Sen, Amartya. 1999. *Development as Freedom.* Oxford: Oxford University Press.
Smith, Adam. 1994 [1776]. *The Wealth of Nations.* New York: Modern Library.
Waddington, C.H. 1977. *Tools for Thought.* New York: Basic Books.
Wiener, Norbert. 1993. *Invention: The Care and Feeding of Ideas.* Cambridge: MIT Press.
Weitzman, Martin. 1992. "On Diversity." *Quarterly Journal of Economics* 107, no. 2 (May): 363–405.
——. 1996. "Hybridizing Growth Theory." *American Economic Review* 86, no. 2 (May): 207–12.
——. 1998. "Recombinant Growth." *Quarterly Journal of Economics* 113, no. 2 (May): 331–358.
Whyte, William Foote, and Kathleen King Whyte. 1991. *Making Mondragon.* 2d ed. rev. Ithaca: ILR Press.
Wright, Sewall. 1932. "The Roles of Mutation, Inbreeding, Crossbreeding, and Selection in Evolution." In *Proceedings of the Sixth International Congress of Genetics* 1, 356–66. Reprinted in Wright 1986, 161–71.
——. 1986. *Evolution: Selected Papers.* Chicago: University of Chicago Press.