Physical economy: comparing Taiwan and the P.R.C.

by Kathy S. Wolfe and Cho Wen-pin

The figures for this article are on pages 24–35.

The call by Chinese Vice Minister Hui Yongzhen for a "new Silk Route" high-speed rail bridge from Europe to China in *EIR* of May 27, 1994 is one of several signs that the People's Republic of China has begun to seek an alternative to the "free-trade" policy of the 1980s which has brought its economy close to disaster. Under pressure from the British System economists of the World Bank, the P.R.C. for the last decade has diverted credit from internal infrastructure and agricultural development, to speculative Special Economic Zones (SEZ) on the coast, where foreigners could make quick money in low-wage assembly of cheap goods for export.

This so-called Chinese miracle created a "blind flow" of millions of peasants who, because the agricultural interior can no longer support them, seek work whatever the wages, on the coast. It was also used by the World Bank and the International Monetary Fund (IMF) to demand that other underdeveloped nations follow the "China model." It has brought China to the edge of social explosion.

Simply backing away from British "free enterprise," however, will not avert a breakdown in China. Economic thinkers in China and across Asia must now ask themselves: What is it in the British *method* which produced this crisis? Is there a superior method, a philosophy of economic science, which could save China, and develop the rest of the world?

Lyndon H. LaRouche, Jr. has commissioned this study of the Republic of China on Taiwan (R.O.C.) and of Mainland China, to demonstrate the scientific method of *physical economy,* the method which industrialized the United States itself. The R.O.C. on Taiwan, with its emphasis on basic infrastructure, water projects, labor development, directed credit, and other programs proceeding from Dr. Sun Yat-sen's "Three Principles of the People," has also proven the superiority of the *physical economy* method.[1]

Taiwan's economy is not of interest because of its commercial success, but rather for the intense development of its *infrastructure,* the very sector of the

Dongfeng trucks manufactured in the People's Republic of China. Drawing on the methodology that was so successful in Taiwan, the P.R.C. can achieve similar breakthroughs in economic output and standard of living; but following the British free-trade model is a recipe for disaster.

P.R.C. economy, and of the current U.S. and European economies, which is falling apart due to neglect. Taiwan's infrastructure began with construction of water projects needed for highly irrigated agriculture in a monsoon climate, and a high level of health and education infrastructure, later extended to power and transportation grids. As LaRouche pointed out in a recent interview, "Taiwan's infrastructure development approach is actually qualified to provide an even more developed industrial base" than Taiwan's industrial sector today.

The statistics of physical economy show that, starting from the identical cultural base, the Chinese citizen on Taiwan has been able to create a higher economic output and standard of living, precisely because of the higher value given each individual's labor power. This theory is the exact opposite of the World Bank's demand for a "free-trade," cheap-labor approach. In fact, what Chinese in Taiwan can do, so can Chinese on the Mainland. They are the same people, who speak the same language, and have the same heritage.

For example, all the propaganda from the IMF that China is "overpopulated" and China's unfortunate one-child-per-family policy notwithstanding, the fact is that Taiwan's infrastructure has allowed a population density far greater than that on the Mainland (**Figure 1**).

Yet many Taiwanese leaders today have forgotten the *method* of physical economy and, brainwashed by Anglo-American universities, have begun to adopt "free marketization," "deregulation," and other forms of "financial AIDS," a disease caught in London and on Wall Street. The same is happening in Japan, South Korea, and the other "Asian miracles": All of these nations are about to be in big trouble in the coming world financial crash, because their current leaders are without any competent economic theory or science.

We do not propose, that is, to substitute a "Taiwan model" for a "China model." Rather, this study will use the physical evidence in Taiwan's economy, compared to that of the P.R.C., to demonstrate the traces of an economic method whose roots are much older and more scientific.

What is physical economy?

"The true measure of the value of human productive activity is the increase of the economy of labor, through aid of technological progress," as LaRouche defined it in his economics textbook, *So, You Wish to Learn All About Economics?*[2]

Physical economy began, LaRouche notes there, in the Golden Renaissance, with Gemisthos Plethon of Greece, who presented a report on national economy to Cosimo de Medici in fifteenth-century Florence. Leonardo da Vinci's subsequent work on theory of machine design reflected Plethon's effort to develop a way to multiply the power of each man's labor. Based on this method, economics as a science was established by Gottfried Leibniz in his 1670s studies of the principles of heat-powered machinery and their effects on increasing productivity of labor. He showed that industrialization requires rising real wages and family living standards to produce an ever-more highly educated workforce.

This Renaissance economic science allowed the total population of the human race—which took 24 centuries, from 1000 B.C. to A.D. 1400, just to double, reaching 400 million—to more than triple, in the five centuries between 1400 and 1900, to 1.5 billion (**Figure 2**).

Physical economy thus rejects the lie later made famous by Britain's Thomas Malthus (plagiarized from the Venetian slave trade economist Giammaria Ortes) that humans breed like rabbits in a geometric function which has fixed limits, past which the rabbits must die en masse, when their food runs out.

Physical economy instead demonstrates that whenever man has created renaissances in technology, in the power of machinery to multiply the work of every man, this enables such an increased rate of production of physical goods, that humanity is able to supersede any limits imposed by older technologies, and grow at non-linear rates.[3]

This method became known as the American System, as applied by Alexander Hamilton, first U.S. Treasury secretary, in his 1791 reports on Manufactures, Credit, and a National Bank. These reports demonstrated the right of each *sovereign nation-state* to a sovereign system of credit, manufacturing, and infrastructure technology. Hamilton's *Report on Manufactures* refutes, line by line, the British System of Adam Smith, under which the British Empire refused these rights to colonies and insisted upon the British fleet's right to "free trade."

Hamilton's method industrialized the United States; the works of his student Friedrich List industrialized Germany. Based on Hamilton and List, the economists of the Meiji Restoration industrialzed Japan. It was the enormous industrial, scientific, educational, and artistic output of this American System worldwide, which allowed for the very sharp upturn of global population from 700 million in 1800 to 1.5 billion by 1900 (Figure 2).[4]

The fight between the American System of physical economy and the British System of free trade defines all subsequent world history. Communism itself and the works of Karl Marx were nothing but a British attack on the American System, turning the state against the individual citizen. Having funded and helped establish Soviet and Chinese communism, the British used communism as a threat, to demand that all nations turn to free trade as the only alternative.

Lyndon LaRouche has become famous in recent years for insisting that there is a "third way." LaRouche has been the only economist in this century to revive the physical economy of the American System, and to take it further, putting it on a rigorous scientific basis.

LaRouche's method of physical economy ignores, as useless, all paper monetary measures such as Gross National Product and balance of payments, which equate the value of machinery with the value of marijuana.

To demonstrate which kinds of productive activity create increased technological power of each member of the workforce over nature, this method measures the physical production and infrastructure for transportation of food, energy, water supplies, and useful industrial and household goods. These are measured on a per capita, per household, and per square kilometer of land area-development basis.

No monetary figures whatsoever are used in any way. Instead, the standard of living and productivity of the human being are studied. For example, even using the known fraudulent statistics provided by the Mainland's communist regime, life expectancy in the P.R.C. to this day has not approached that on Taiwan (**Figure 3**).

'Looking behind the data'

Instead, as LaRouche wrote recently: "The description begins with a simple requirement that the rate of increase of potential population-density be greater than zero. This requires technological progress, which requires increases of production per capita and per square kilometer, and of labor productivity per capita and per household. Those conditions are expressed as improvements in the area used, per square kilometer and per capita, and improvements in the tools and materials of production. . . . .

"The characteristic of the recent 600-odd years of European Renaissance culture is the increase in the rate of urbanization. The reason is the requirement of increasing emphasis upon improvements in land-area use and in tools, and also the cultural requirement of an increase in the physical standard of household consumption and in life expectancies. To accomplish certain productivities, more people must simply be located more closely together—at higher living standards. Such changes imply already an increase in urbanization relative to the percentage of the labor force required for rural occupations.

"Urbanization signifies more; new categories of change emerge lawfully from out of the belly of the old."[5]

Make a cut in time through the process of economic production. to sustain the households of the productive workforce and its skills, and to maintain the industry and agriculture to employ them, there is a social cost of a consumers' "market basket"—so much consumption of food and other consumer goods per household and per area, and of a producers' "market basket"—so much consumption of producers' raw materials and industrial goods per capita and per area.

Call the rate of flow of this cost at the moment before the cut, is called "input," or "energy of the system." The rate of the economy's useful physical output at the moment after the cut, is called "output of the system." The "free energy" of the system is then approximated as that amount by which more output is produced than was needed for input (output−input), as a ratio over input.

$$\text{Free energy} \approx \frac{\text{Output} - \text{input}}{\text{Input}} = \frac{\text{Free energy}}{\text{Energy of system}}$$

A properly growing physical economy must meet these four criteria:

Criterion 1. The workforce's per-capita and per-household consumption must increase in terms of comparative quality and quantity of the contents of its total market basket. Yet, the time required to produce that enhanced market basket must be less than that required to produce the earlier, poorer quality market basket.

Compare, for example, the consumption of electrical energy per household, for the advanced industrial nations of the United States, West Germany, and Japan, with the underdeveloped economies of India, the P.R.C., and Taiwan. We deliberately take data for 1970, when the United States, West Germany, and Japan were at their postwar industrial peak, before the 1971 collapse of the gold standard, the 1974-78 oil shocks, and the 1979 Federal Reserve interest rate shock. The three industrial nations' household consumption was two orders of magnitude higher than that of India and the P.R.C., while Taiwan's was ten times that of the P.R.C. and half that of West Germany. By 1990, Taiwan had surpassed Japan's 1970 level (**Figure 4**).[6]

Criterion 2. Urban physical-productive employment and market baskets' output must increase relatively over rural, up to an asymptotic limit of feasible reduction in percentage of rural.

The industrial nations all had over 70% of their workforce in urban areas, whereas India and the P.R.C. had under 20%. Again, Taiwan was approaching the industrial level in 1970 at 60.5% and surpassed it by 1990 (**Figure 5**).

Criterion 3. Producers' goods market baskets must increase relative to households' goods market baskets, both in percent of the time of the production process devoted to them, and in quality and quantity of per-capita and per-area composition.

For the United States, Japan, and West Germany (**Figure 6**), the productivity of industrial output, even simply in gross tons of industrial goods produced annually per manufacturing worker, is an order of magnitude higher than that of the underdeveloped countries. This is a coarse estimate that at least the quantity of industrial goods which would be available to producers is increasing per capita of industrial workforce and by extension per time required to produce them.

In West Germany and Japan, where the land is the most heavily improved by intensive infrastructure, fertilizer, and other inputs per square kilometer for farming, the productivity of agricultural land (**Figure 7**) far outstrips even that of the United States. The relative cost to the economy of producing food as a consumers' market basket input need is falling even faster, per ton, than the cost of producing industrial goods. On this measure, Taiwan ranks as one of the most productive agricultural areas in the world.

Criterion 4. Thus, the input or "energy of the system," per capita, per household, and per square kilometer, must increase absolutely. In addition, however, the ratio of "free energy" to "energy of the system" must also increase. That is, as the graphs begin to show, it is possible, by using technology, to increase the productivity of each worker and each area of land, to have an economy which requires ever higher producer and consumer inputs, but yet the output of which is so much larger, that the excess of output versus input grows more.

This can only be done within the human mind, through new scientific inventions which are so revolutionary as to *change the matrix* of the entire input-output system, as LaRouche proposed in a recent document on economic modeling:

"Looking at this input-output system, we then change the matrix to be used for future intervals fundamentally, by introducing one or a combination of changes in technology:

"1) Introduce an existing, but presently unused technology.

"2) Develop a new technology, based on a feasible discovery which has not yet been made. Extend the physical requirements for the new technology, and define the output, also in physical terms, as input to the economy.

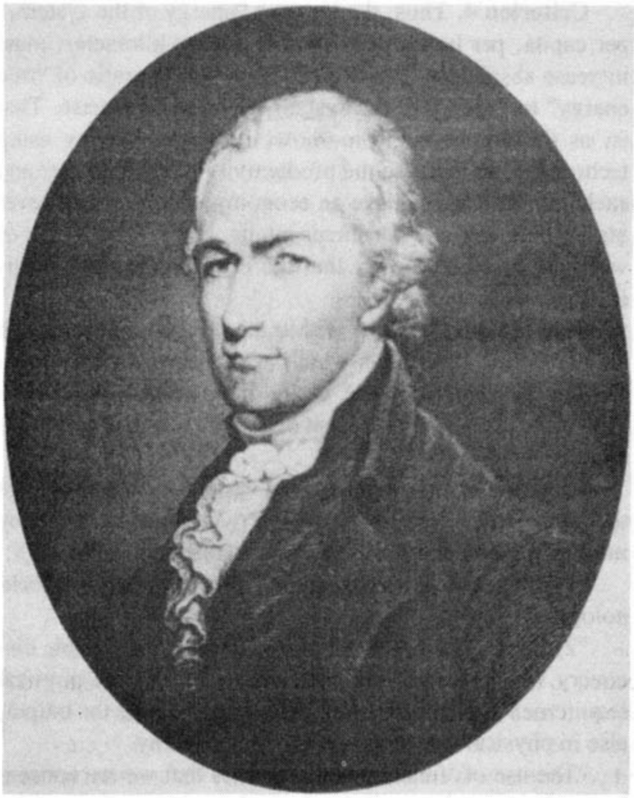
"The use of 'fundamental' signifies that we are concentrating here only upon technological transformations of the physical-economic process, rather than readjusting the division of labor within the bounds of technologies presently in use.

"Let the matrix corresponding to the state of the economic process prior to the 'fundamental' change be designated by 'A,' and the first matrix to correspond to the state of the economy following that change as 'B.' Both states A and B can be described statistically, and derived statistical values provided for the relative entropy or not-entropy of the transformation which has occurred. *However, relative to any possible formal mathematical schema, the transition between the two states, A and B, is an absolute mathematical discontinuity which cannot be represented with the terms of A and its predecessors.*

"Backwards, however, we can proceed. We can comprehend all states antecedent to B from the vantage-point of B's technology.

"Thus, the statistical study of physical economy is apportioned into two departments: 1) study of past transitions, not trends; and 2) construction of synthetic states based upon the arbitrary introduction of unapplied and unexisting advances in technology. The science of physical economy is a study, not of trends, but of *revolutions* of that sort which cannot be forecast as trends from current and prior states of the economic process."[7]

For example, Taiwan's energy consumption in heat terms (kiloliters of oil equivalent) is over 40% from electricity, of which 37% is generated by nuclear reactors. Compare this,



Masters of the method of physical economy, Alexander Hamilton (left, in an engraving by John F.E. Prud'homme) and Dr. Sun Yat-sen. Hamilton's American System was the basis for the rapid industrialization of the United States. Sun's Principle of People's Livelihood merged Confucian moral teachings with Hamilton's concept of national, government-funded infrastructure and other projects.

over time, to the energy technologies in the P.R.C., only 5% of whose energy consumption is in the form of electricity (**Figure 8**). The vast change induced into an entire economy by the technological leap from Matrix A—a wood-, coal-, and oil-burning economy such as the P.R.C.—to Matrix B, not only an electrically driven, but a nuclear electrical economy, such as Taiwan's, will shift all the factors of production in an economy.

The *change* induced by the new technology itself, however, *cannot be described using classroom mathematics,* it must be emphasized. The physical economic statistics may be arrayed in mathematical ratios and so on, on *either side* of the change, as Matrix A and Matrix B, but the *change itself* occurs only in the human mind, in the process of the discovery. To the statistically fixated computer hack, this new creative fundamental scientific invention looks like a nonexistent "hole" in the mathematical world. Yet what goes on within such virtually nonexistent holes in physical-economic time is the basis for all human progress.

"We are concerned to understand better the nature of the relationship between a *type* of scientific technological discovery, and a *type* of economic transformation derived from the application of such a species of discovery," wrote LaRouche. "For that reason, good economists would spend much of their lives like prospectors, digging around in virtually nonexistent holes within the physical-economic space-time fabric.

"We are not seeking a mathematical result. We are seeking something far more important, vastly more useful. We are uncovering the principles which we must master, in aggregate, to define those species of discovery needed to master the new problems now before us. We do mathematical work, and so forth, because we must have an orderly arrangement of the data. Nonetheless, we are not looking into those data; we are looking behind them."[8]

Taiwan: 'out-Japaning' Japan

The Cold War made the postwar "Taiwan economic miracle" and its comparison to Mainland China one of the most-studied subjects in international economics. While none of these studies incorporates the concept of physical economy, Taiwan's economic policy is clear to those who do. Taiwan out-Japaned Japan in dirigistic programs, such as those used by Alexander Hamilton and Friedrich List, for directed credit, production, tariffs, and trade. Taiwan's postwar economic planners were all production men, engineers and physicists. They were also close students of Japan's 1868 Meiji Restoration, whose leaders rejected the British free-trade system and

TABLE 1
Taiwan: land cultivation and population growth

	Cultivated area (km²)	Total population (millions)	Population density per km² cultivated area
1895 (start of Japan occupation)	6,000	2.3	383
1945 (end of Japan occupation)	8,600	6.0	698
1960	8,700	10.8	1,241
1990	8,900	20.4	2,292

based themselves entirely upon Alexander Hamilton.[9]

"Taiwan did in 25 years (1950-75) what took Japan 50 years (1870-1920)," is the commonly repeated quote.

Taiwan, 14,000 square miles in area (slightly smaller than Holland), was ceded to Japan by the Ching Dynasty in 1895. Under its imperial plan, Japan had sought Taiwan as a food supplier for Japan, which meant Japan had to upgrade Taiwan's agricultural productivity.

In 1895, Taiwan was an island of subtropical rice paddies planted by sixteenth-century methods, beset by swamps, flooding, plague, cholera, and malaria. It could barely feed its 2 million inhabitants. During the Occupation from 1895 to 1945, "Taiwan's death rate dropped from over 34 deaths per 1,000 persons a year in 1906, to 18.5 deaths per year in 1941," as one 1954 Princeton University study financed by the U.S. State Department complained. Because birth rates remained high, Taiwan's population rose dramatically. "If policies of betterment or exploitation follow this course," the Princeton study concluded, "they must eventually face the consequences of population growth, where it is the last thing that is needed."[10]

As China's eminent geographer Dr. Chen Cheng-siang has pointed out, this had everything to do with the improvement of Taiwan's land cultivation (**Table 1**).[11]

In 1895, "in addition to plague, cholera, and malaria, which flourished due to the use of human excrement as the sole fertilizer and pools of stagnant water as the sole irrigation methods," the Princeton study reports, "enteric parasites, tuberculosis, venereal disease, etc., were rampant. . . .

"By direct action and through state-owned companies, Japan enlarged communications facilities into a thorough public network of roads, bridges, railway lines, telegraph and telephone installations, tunnels and mountain trails; constructed harbor equipment to accommodate an ever-growing volume of shipping; expended a tremendous effort if not large sums on sanitation and disease control; relieved much of the uncertainty of weather by large-scale facilities for irrigation and flood control. . . .

"Rice yields were increased spectacularly through the spread of new strains of seeds," under which yields rose by 30%, from 15 to 22 hectoliters (100 liters) per hectare. "Fertilization was systematically introduced on a large scale, with rotation of crops, and matching of irrigation schedules to the growth cycle. . . ."[12]

Japanese sanitation innovations included strict quarantine, cargo searches, rat extermination programs, construction of sewer systems, construction of urban freshwater piping systems from mountain reservoirs and wells, garbage collection, inspections in markets, butcheries, and other public areas, and draining of swamps through the irrigation canal system.

Universal elementary school education was mandated, as had been the first act of the Meiji Restoration in Japan, to upgrade the agricultural workforce.[13]

As an imperial occupation, however, Japan deliberately did not create industry other than food processing, canning plants, and the power, rail, road, and other infrastructure needed to transport large amounts of agricultural produce to Japan. There was no creation of a native industrial labor force; the 600,000 skilled workers needed to run the trains and power plants were all Japanese. In 1937, Japan did begin a five-year plan to create fertilizer, chemical, textile, steel, oil-refining, shipbuilding, and metals industries, but this was cut off by the war.[14]

Dr. Sun's 'Principle of People's Livelihood'

Following their flight to Taiwan, Gen. Chiang Kai-shek and the nationalist Kuomintang party (KMT) embarked on an industrialization effort that far exceeded Tokyo's blueprints. The pullout of the 600,000 Japanese all but removed the island's industrial workforce, but they were replaced by almost a million KMT cadre fleeing the Mainland.

Most important was the KMT's policy on *labor power*. Focused on avoiding the terrible class and regional income disparity of China in the 1920s, which the KMT began to address during the "development decade" of 1927-37, General Chiang and KMT economic planners stressed Dr. Sun Yat-sen's Principle of People's Livelihood. This was a concept of national wealth, in which Confucian moral responsibility for the well-being of the population is realized by means of Alexander Hamilton's principle of government-funded national infrastructure and public projects.

Wrote Chiang: "Almost everyone has the view that our failure in the anti-communist struggle is due to our not carrying out the 'Principle of People's Livelihood' on the Mainland. However, let me ask: During the past four years on the Mainland, did any of our party branches ever carry out land surveys? Did any city party office conduct any labor survey? Did any provincial party office submit any report based on systematic social and economic surveys? The realization of the Principle of People's Livelihood is through actual practice, not just theoretical discussion."[15]

The KMT avoided the policy of "primitive accumulation" (looting) from the peasantry to fund industrialization. The KMT in the 1950s and '60s deliberately promoted rising peasant consumption standards, while in the process of transition to industry. Chiang called for a kind of benevolent Confucian industrialization process:

"Industry and commerce have great impact on agriculture," he wrote in *The Chinese Economic Theory* (1943). "The well-to-do people invest and speculate in land. As a result, land ownership becomes progressively unequal. . . . If we do not try to solve the land question, through work in industry and commerce, and (instead) resort to violence to equalize land ownership, then within a short time, inequality will occur once more. Today, poor peasants kill rich peasants. Tomorrow, will not the poor peasants become rich peasants? This method is opposed to human nature."[16]

Contrast this to Mao's program of imposing a 24% rate of accumulation of agricultural surplus to fund industry, in which peasants had to sell rice to the government at under the cost of production, to finance the creation of state industries. Communist China "is probably the only country in modern times to combine, over 20 years (1950-70), a doubling of per capita national income, and constant, or even declining, average food consumption," wrote one observer in the early 1980s.[17]

Instead, the KMT introduced extensive land reform, which transformed agriculture and population density on the island, and which had the double benefit of creating an instant industrial sector (Table 1). While the Japanese Occupation doubled Taiwan's population and population per cultivated crop area, the postwar Nationalist program more than tripled the population and the population per cultivated area, which rocketed from 698 to 2,292. The program was modeled on the land-for-industry reform of Japan's first finance minister, Count Shigenobu Okuma, which was itself modeled upon the writings of Alexander Hamilton.

All land under absentee landlords and huge monopoly land holdings was taken, and, along with state lands, was given to landless farmers. The amount of crop that farmers were obliged to pay in rent was reduced and regulated. Under a government purchasing program, parity prices were established high enough to guarantee farmers a working profit.

Then, an entire private industrial sector was created, by dirigist means. In return for their land, big landowners received titles to Taiwan's extensive state-run rail, energy, water supply, cannery, and other infrastructure and agribusiness companies abandoned by the Japanese. "Overnight, we were no longer farmers but became industrialists," as one elderly Taiwanese told *EIR*. "Despite the fact that we knew nothing about railroads, and despite their wartime dilapidation, we simply had to make them work, for our own survival and for the future of the nation."

An aggressive program was set up to train Taiwanese workers for industrial jobs, along with a major expansion of higher public education. Free secondary school (junior high and high school) education enrollment rates zoomed from 20% of school-aged youth in 1950 to 40% in 1965. Income taxes were made highly progressive.

Taiwan was able to afford this, partly due to the external assistance of U.S. aid from 1950-65 at the rate of $100 million a year, totaling $1.5 billion. The U.S. Mutual Security Agency, during a period when U.S. military planners still understood the principle of the Army Corps of Engineers as a force for development, helped to build not only Taiwan's military, but also its infrastructure. As much as 37% of U.S. aid went for non-military infrastructure such as harbors, warehouses, railways, highways, bridges, and power plants.

The P.R.C. also had external aid from the Soviet Union from 1949 until the 1960 Sino-Soviet split. Soviet shipments of ferrous metals in some years equalled in volume 40% of China's ferrous metals output; there were huge shipments of oil, coal, and over 1,000 Soviet industrial advisers were sent. "The volume of economic and technological assistance which crossed from the Soviet Union to the People's Republic of China between 1949-59 is unmatched in history," economist Leo Orleans told U.S. congressional hearings in November 1978. Out of China's total production in 1960, the share of products manufactured at plants built by Russia was: steel 40%, rolling stock 50%, turbines 50%, trucks 80%, and tractors 90%, Orleans said.[18]

The question, again, is: What is the *method* by which aid is used? Stalin sold Mao his most obsolete junk, and this aid was not free. The debt to Russia had to be paid by Chinese agricultural exports, adding to the drain on China's rural sector. The Korean War, in which a million Chinese died, created an additional Chinese war debt to the U.S.S.R. for military assistance.

Most significantly, the Soviets did not transfer skills to the Chinese population. In most Chinese industry, no significant technical improvement was made after the withdrawal of Soviet aid in 1960, when the Russians took home all their blueprints. "The industrial technology of our country in general is equivalent to the technology of the advanced countries in the 1950s or early 1960s," wrote two Mainland economists in 1982.[19]

The power of population density

The method of industrialization used on Taiwan has led to one of the highest concentrations of economic power in the world. During the past 40 years, this could also have been done in Mainland China, the greater size of the Mainland notwithstanding. The key was Taiwan's increase of its *relative potential population density,* which Lyndon LaRouche

TABLE 2
Initial physical economy indicators for 1970

	1970					Taiwan	
Country	**U.S.**	**Germany**	**India**	**Japan**	**P.R.C.**	**1970**	**1990**
Population per km²	22	245	170	279	85	408	571
1,000s kwh consumed per capita	3.7	2.1	0.06	2.5	0.12	0.94	4.3
Urban population as percent of total population	73.6%	81.3%	19.8%	71.2%	17.4%	60.5%	75.0%
Manufacturing work force as percent of total workforce	14%	23%	12.5%	30%	8.2%	20.9%	32%
Agricultural work force as percent of total workforce	4.1%	7.5%	74.9%	16.5%	80.8%	36.7%	12.9%
Tons of food produced per capita	2.9	2.6	0.8	0.8	0.3	0.7	0.5
Life expectancy at birth	71.3	70.6	48.4	73.3	59.1	69.1	74.1
People per doctor	636	575	4,870	887	3,800*	2,266	913
People per hospital bed	130	90	1,653	105	760*	602	228
Pupils per teacher	21.2	19.2	36.5	21.9	37.6	25.4	21.1

* Includes barefoot doctors with substandard facilities.

has described as follows.

At any given, fixed level of infrastructural and agricultural technology, there is a limit on the density of population maintainable per average area of land. This *potential population density* depends for each area of land upon rainfall, quality of soil, etc. Even at today's low technologies, China's fertile central plain can sustain 500 people per square kilometer, but the mountains of Tibet can sustain fewer than 10 persons per square kilometer. Normalizing the local natural factors to a standard average of a nation's land as a whole defines the *relative potential population density* of a given land area at a given level of technology.[20]

Because Taiwan's technological level, however, especially due to the island's concentrated buildup of infrastructure, has been not fixed, but is rising, Taiwan's *relative potential population density* has been rising virtually without limit. Indeed, *it is this very ability to sustain rising population density which has allowed an even faster rate of economic growth.*

The groundbreaking 1992 *EIR* study "Infrastructure and Economic Development" found a deep correlation between industrial success, infrastructure, and a high relative potential population density. **Table 2** here is adopted from that study of the United States, West Germany, Japan, India, and Mainland China, and to it we have added Taiwan.[21]

In the initial or basic physical economic indicators in Table 2, differences between the United States, West Germany, and Japan at the height of their powers in 1970, and India and China, are clear. West Germany's consumption of 2,100 kilowatt-hours (kwh) per capita is 35 times that of India and 161 times that of China. Japanese and U.S. electricity consumption per capita is even higher.

In 1970, Taiwan is at almost half the industrial standard of electricity consumption; in 1990, Taiwan has far surpassed American levels.

Figure 9 compares Taiwan's electricity consumption to that of Mainland China, which by 1991 had reached only half of Taiwan's 1970 level; it is barely on the same map. This was not exactly what one would call an "economic miracle."

Note that here, as with all figures available to *EIR* on the People's Republic, we are using official figures, which are known to exaggerate economic output.

The central problem is that China's enormous economy is still run on pre-twentieth-century technologies. Over 74% of China's energy consumption in heat terms (tons of coal equivalent) in 1985 came from burning coal, an eighteenth-century technology. Out of China's total final consumption of energy of 680 million tons of coal-equivalent, 504 million tons was consumed in the form of coal, 141 million tons in oil and gas (20.7%), and only 34.6 tons of coal-equivalent, or 5%, was consumed in the form of electricity, largely from coal-burning power plants. As recently as 1993, only a tiny 0.1% of electricity in China was produced by nuclear power. (As mentioned above, 40% of Taiwan's energy is consumed as electricity, of which 37% is nuclear generated.)[22]

In 1985, China's dilapidated rail system transported 1,356 million tons of total freight—over 40% of which was

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FIGURE 1
Population density is higher in Taiwan
(people per km²)

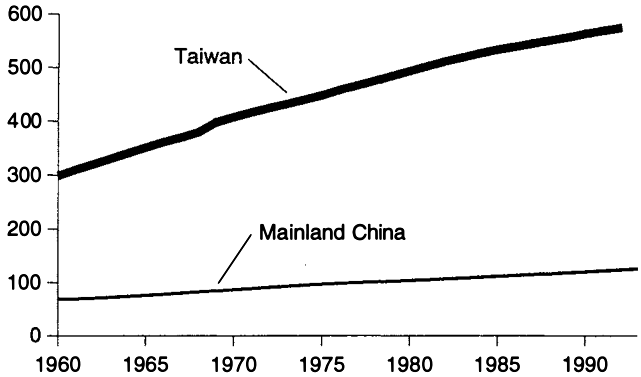


FIGURE 2
Renaissances cause population growth
(billions world population)

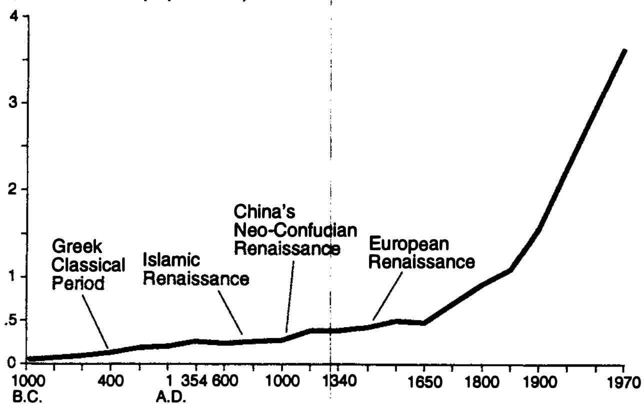


FIGURE 3
Life expectancy at birth improves in China
(years)

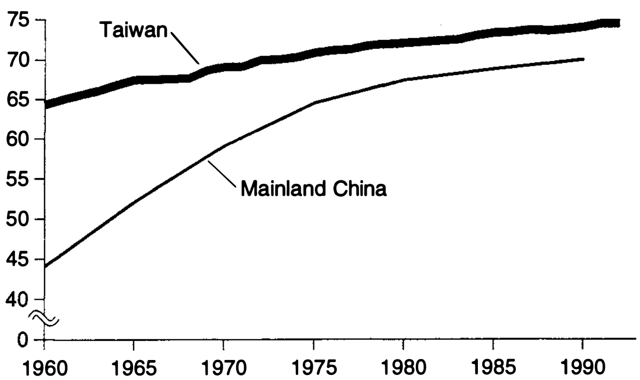


FIGURE 4
Electricity used p r household, 1970
(thousands of kilowatt-hours)

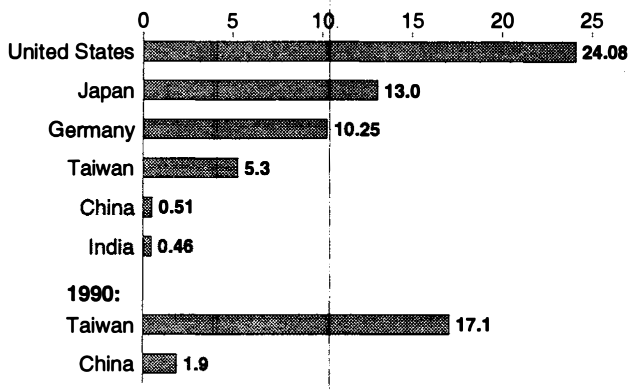


FIGURE 5
Urban population, 1970
(percent of total population)

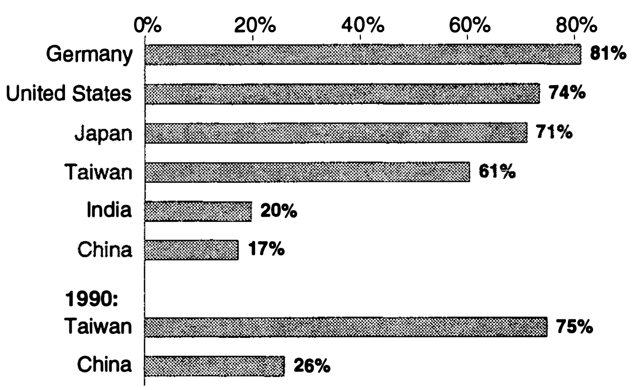


FIGURE 6
Industrial output, 1970
(tons per worker)

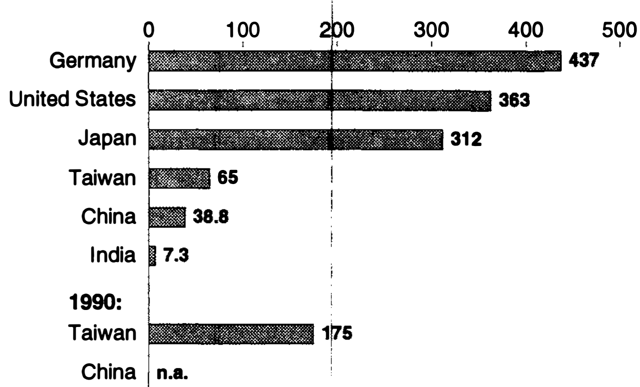


FIGURE 7
Food produced per km² crop area, 1970
(tons)

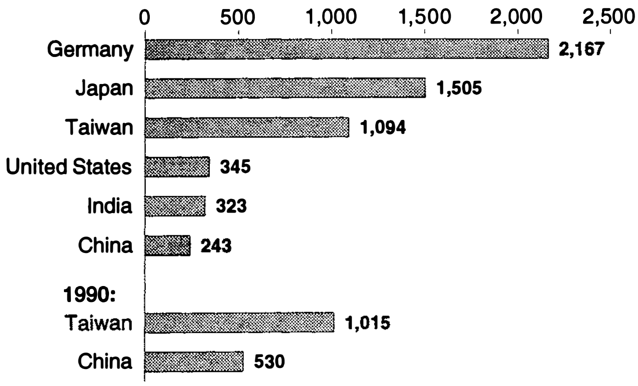


FIGURE 8
High level of electricity consumption in Taiwan
(thousands of kilowatt-hours per household)

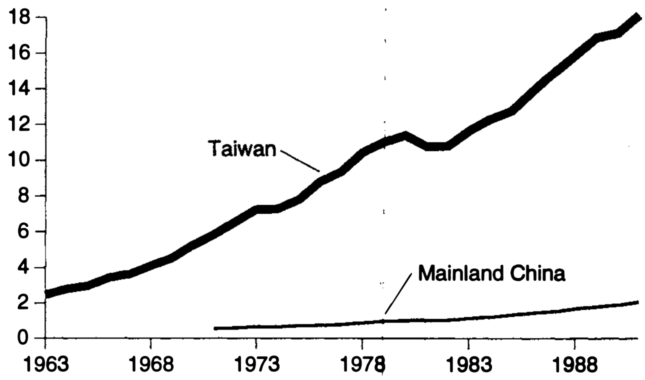


FIGURE 9
Per capita electricity consumption
(thousands of kilowatt-hours)

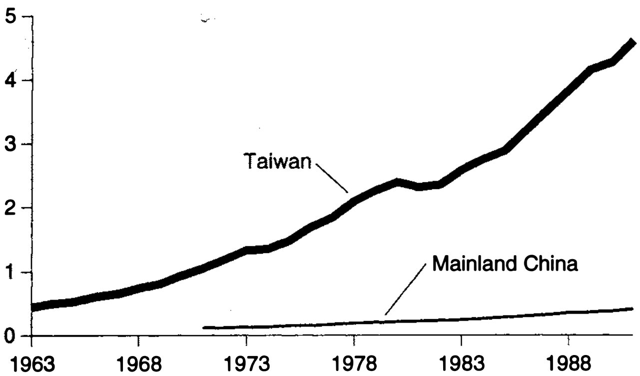


FIGURE 10
Urban population as percent of total
(percent living in urban areas 100,000 and larger)

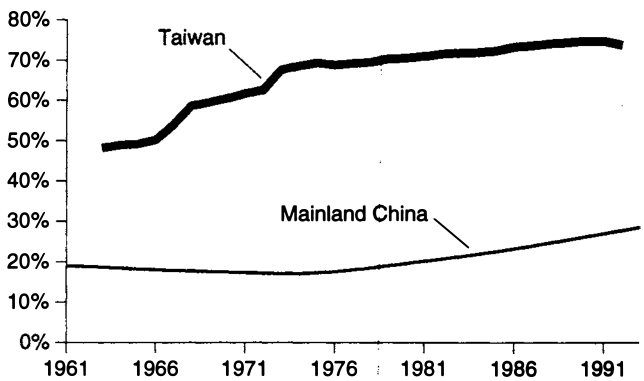


FIGURE 11
Manufacturing workforce
(percent of total workforce)

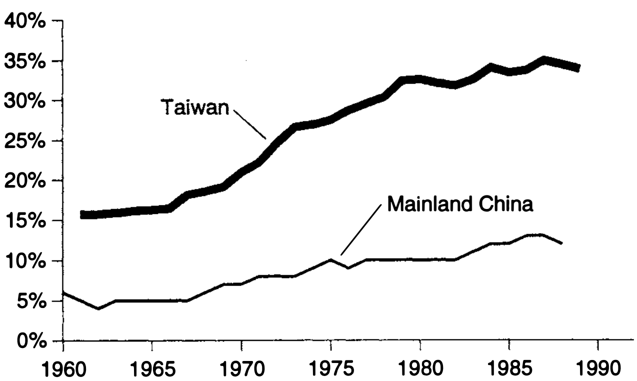


FIGURE 12
Agricultural workforce
(percent of total workforce)

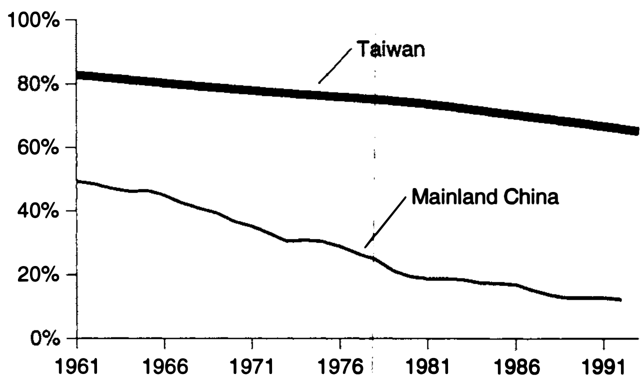


FIGURE 13
Taiwan's agricultural and manufacturing workforce
(percent of total workforce)

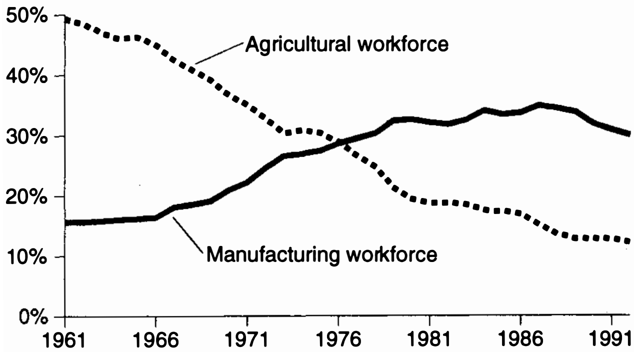


FIGURE 14
Mainland China's growing 'other' workforce
(percent of total workforce)

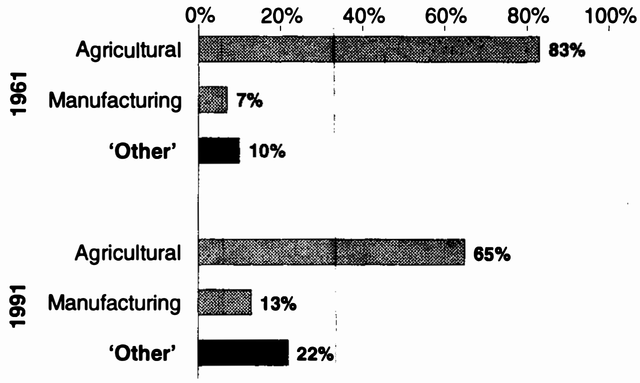


FIGURE 15
Taiwan's manufacturing workforce
(percent of total workforce)

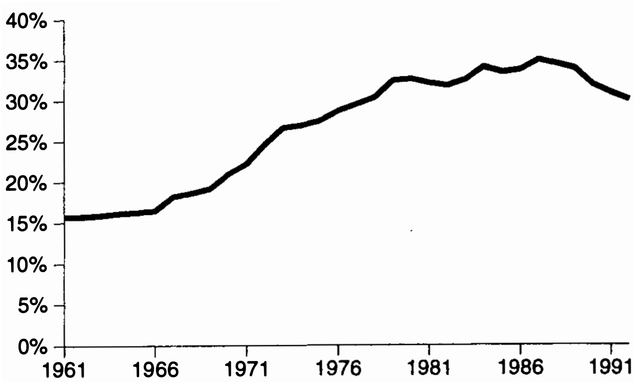


FIGURE 16
Taiwan's financial-commercial workforce
(percent of total workforce)

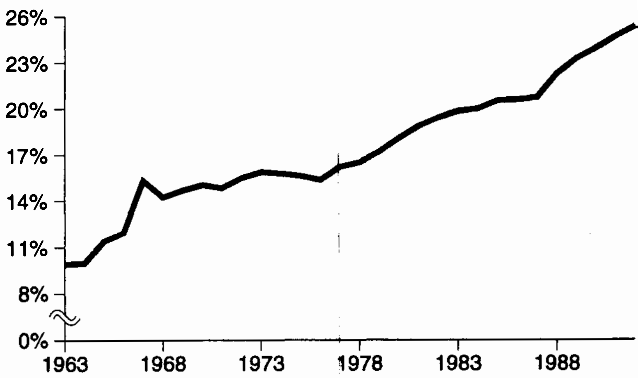


FIGURE 17
Structure of Taiwan's workforce
(percent of total workforce)

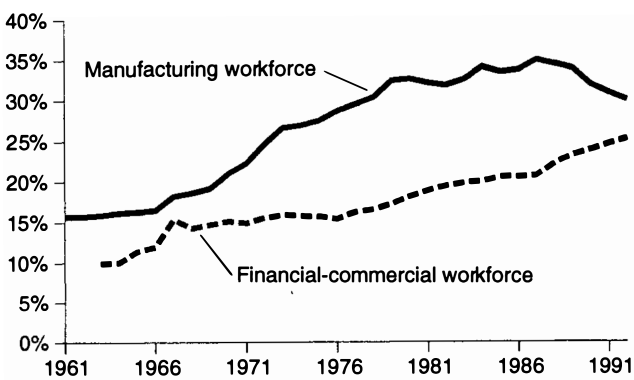


FIGURE 18
Convergence in per capita food production
(metric tons per 1,000 population)

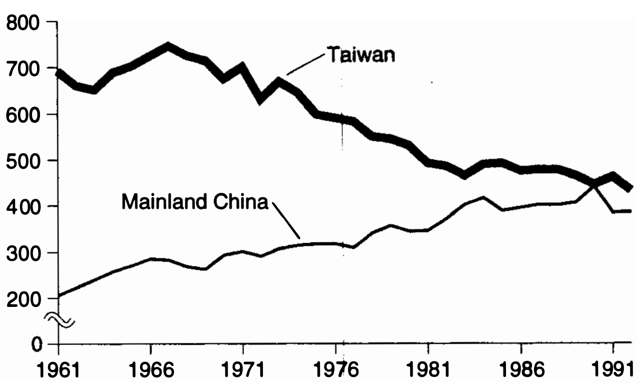


FIGURE 19

Taiwan's food productivity keeps rising

(metric tons produced per agricultural worker)

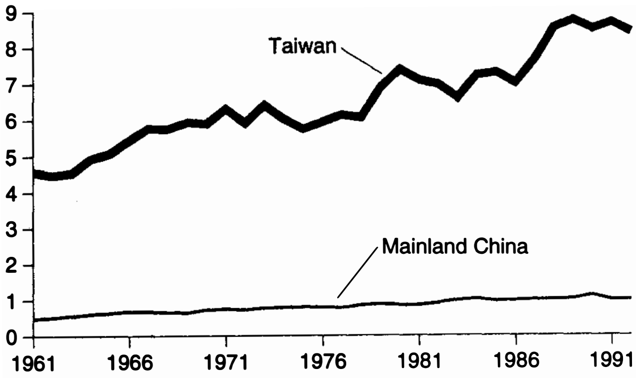


FIGURE 20

Grain consumption stagnates in China

(metric tons consumed per 1,000 population)

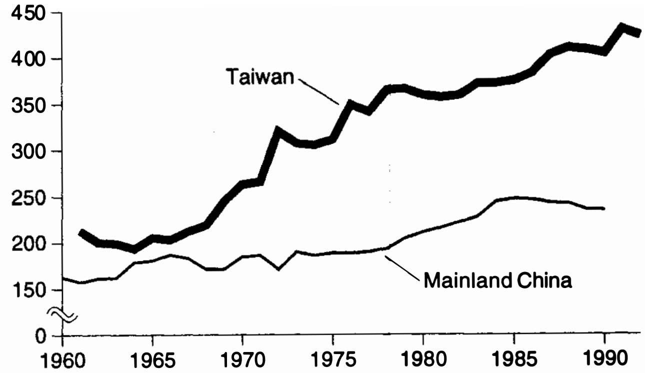


FIGURE 21

Taiwan: people per medical doctor

(number of people)

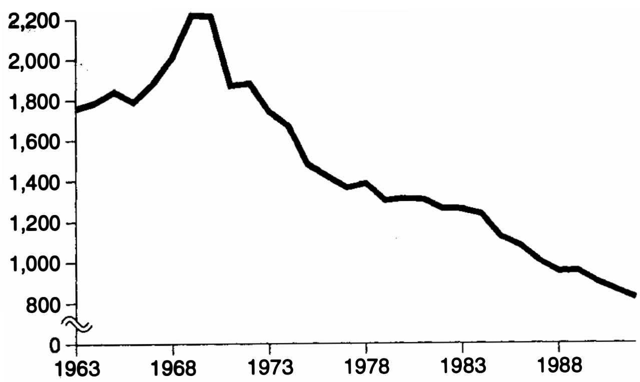


FIGURE 22

Taiwan: people per hospital bed

(number of people)

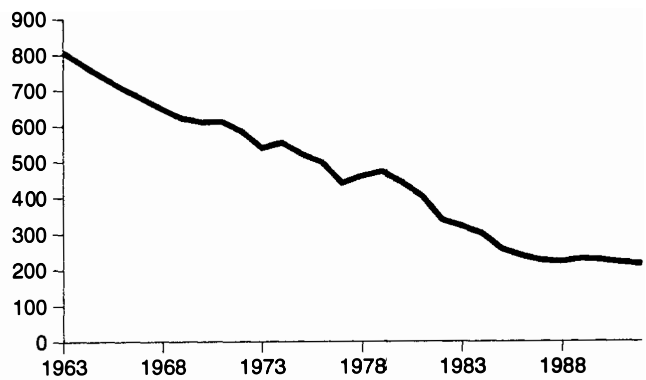


FIGURE 23

Taiwan: student-teacher ratios

(average number of students per teacher)

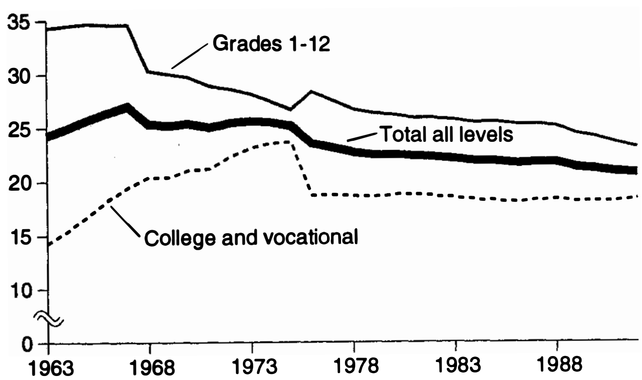


FIGURE 24

Taiwan: school enrollment

(total enrollment as percentage of school-age youth)

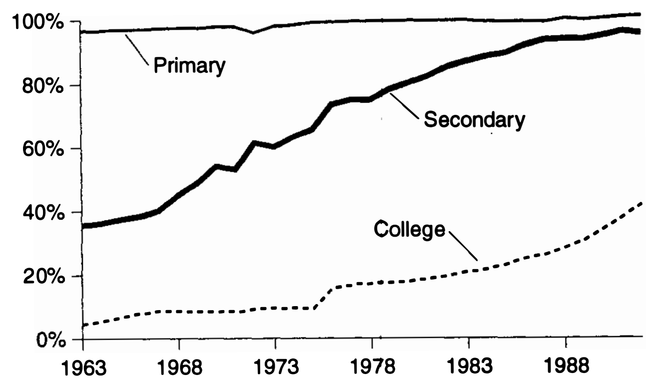
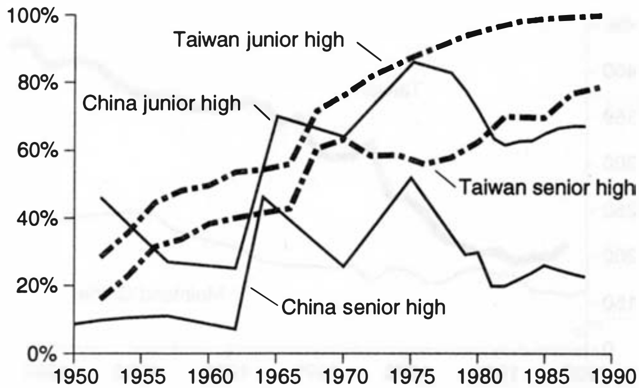


FIGURE 25

Student enrollment rates

(percent of students who could enroll)



Source: "Guidance to Modern Chinese Study," by Reiitsu Kojima (Iwanami Publishing Co., 1990, p. 376).

FIGURE 27

Lifetimes per square kilometer

(as of 1970)

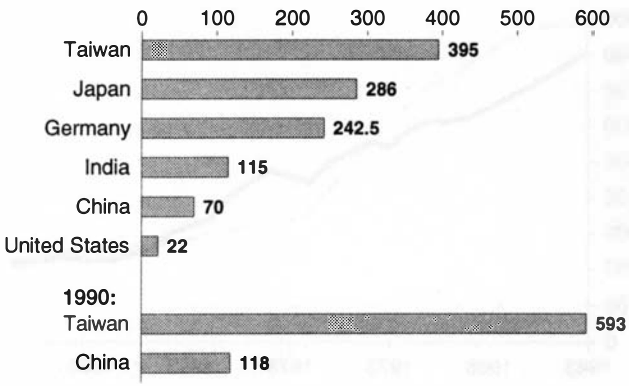


FIGURE 26

Taiwan employed persons, by education level

(millions)

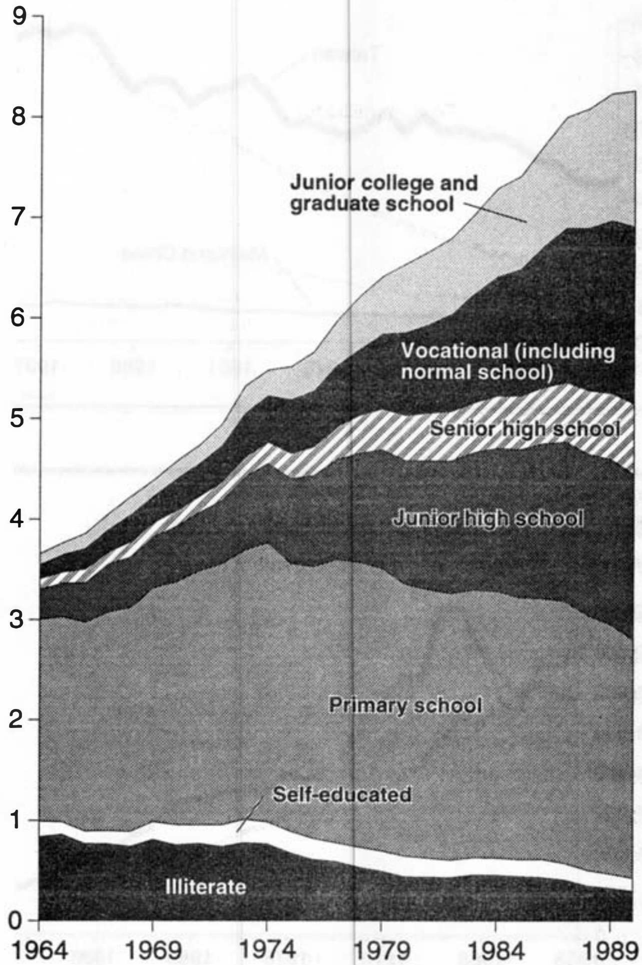


FIGURE 28

Lifetimes per km^2 in Taiwan and Mainland China

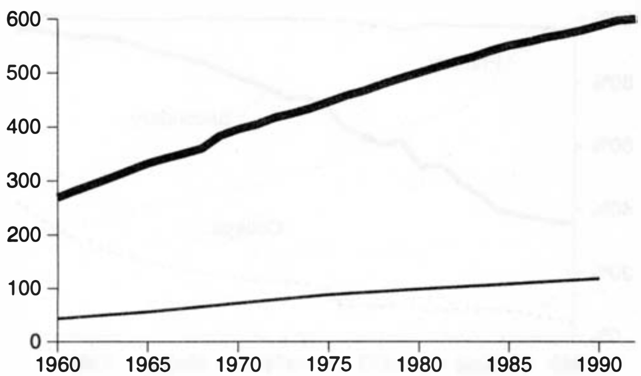


FIGURE 29

Lifetimes versus population density

(lifetimes, or population, per km^2)

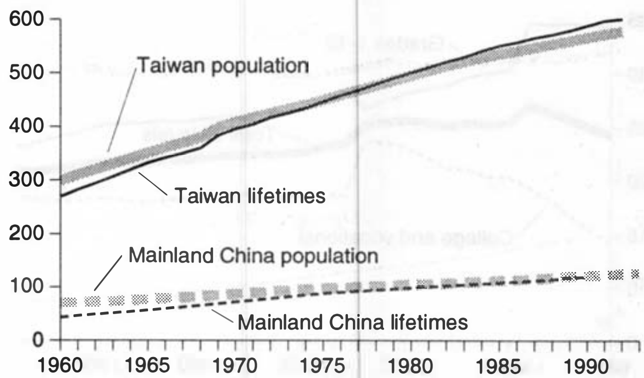


FIGURE 30
Rapid growth in Taiwan's households
(millions, or hundreds of millions)

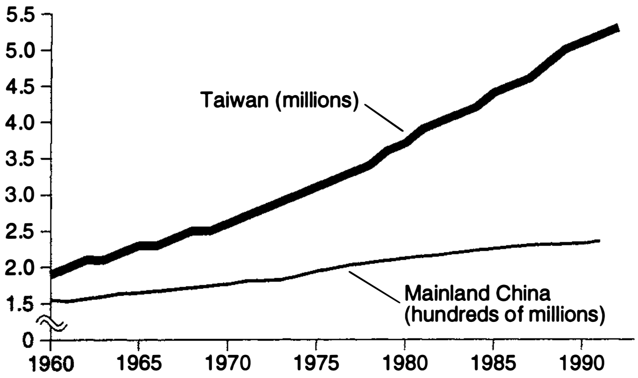


FIGURE 31
Average number of persons per household in Taiwan and Mainland China

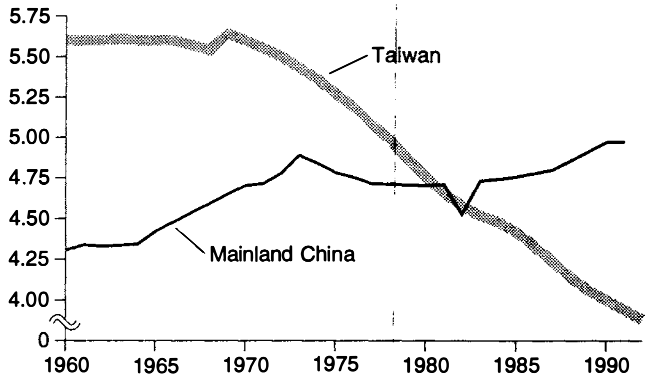


FIGURE 32
Taiwan's reproductive rate drops sharply
(gross reproductive rate minus infant deaths)

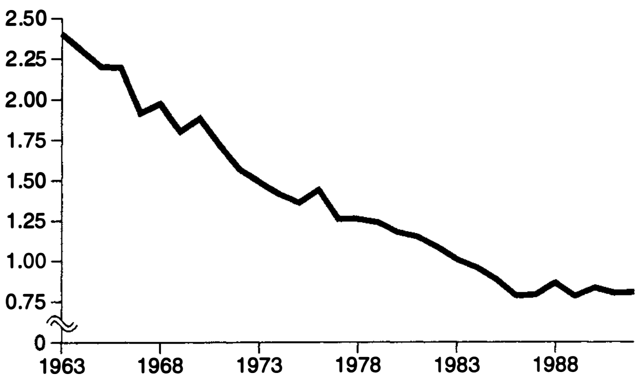


FIGURE 33
Mainland China's reproductive rate
(gross reproductive rate minus infant deaths)

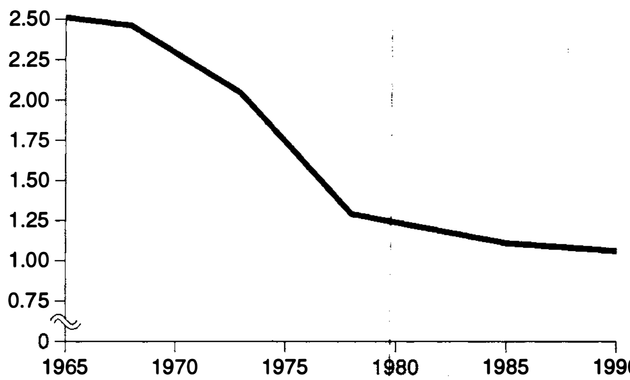


FIGURE 34
Used area per 1,000 households
(km^2)

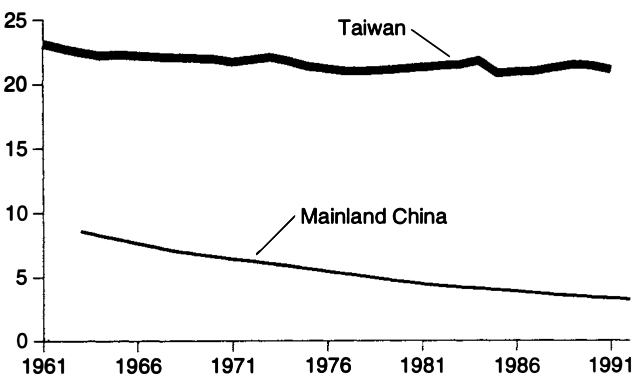


FIGURE 35
Urban area per 1,000 households
(km^2)

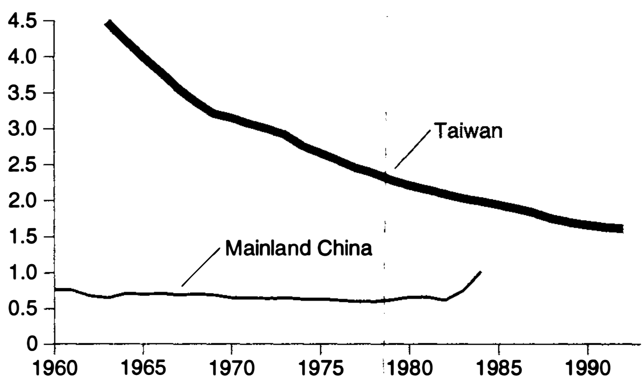


FIGURE 36
Electricity used per km² of used area, 1970
(thousands of kilowatt-hours)

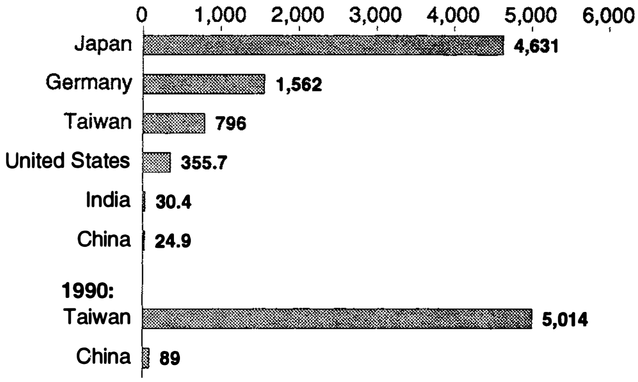


FIGURE 37
Electricity consumed per km² used area, 1970
(millions of kilowatt-hours)

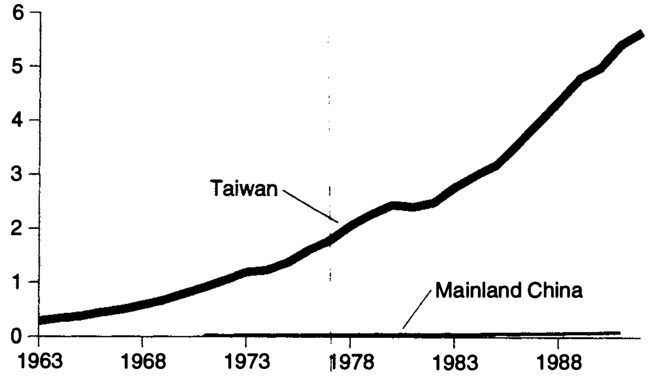


FIGURE 38
Total food production yields
(metric tons per km² crop area)

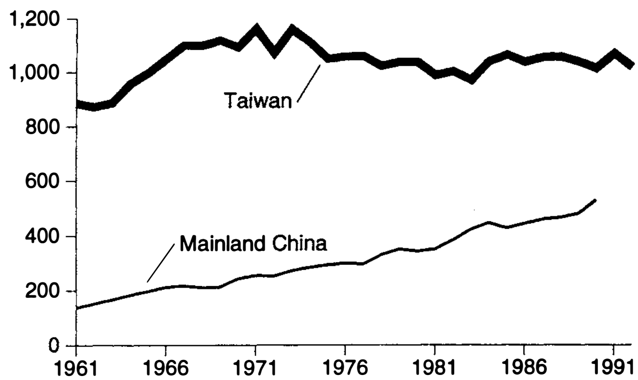


FIGURE 39
Total grain production yields
(metric tons per km² grain-growing crop area)

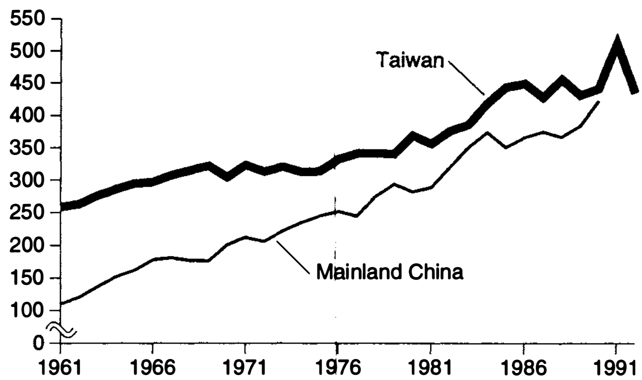


FIGURE 40
Total grain production per agricultural worker
(metric tons)

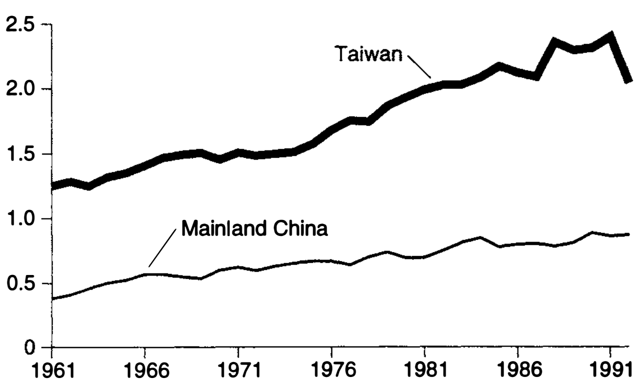


FIGURE 41
Rice production yields
(metric tons per km² paddy area)

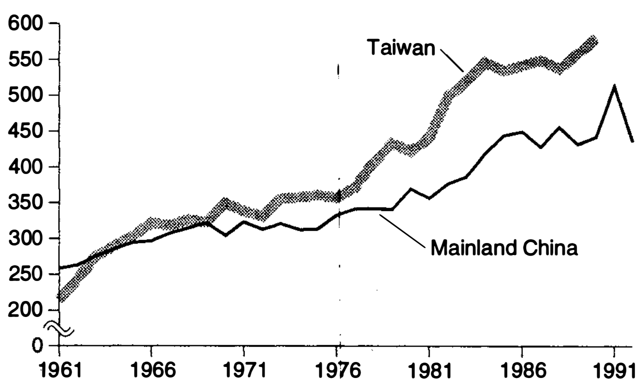


FIGURE 42
Rice production per agricultural worker
(metric tons)

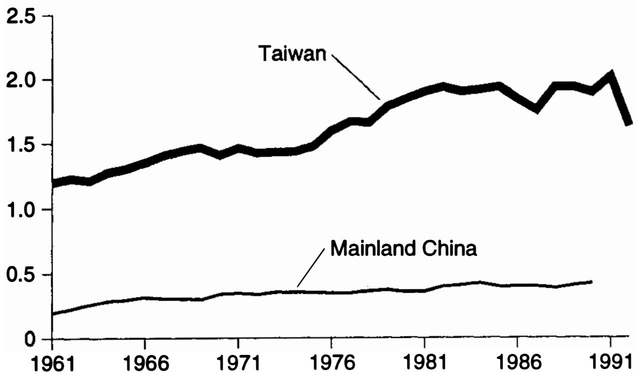


FIGURE 43
Meat production per km² crop area
(metric tons)

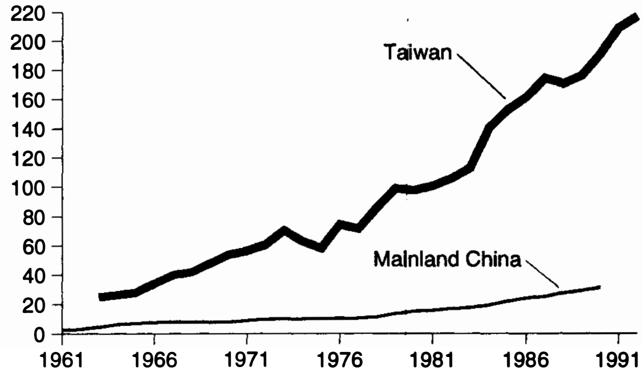


FIGURE 44
Meat production per agricultural worker
(metric tons)

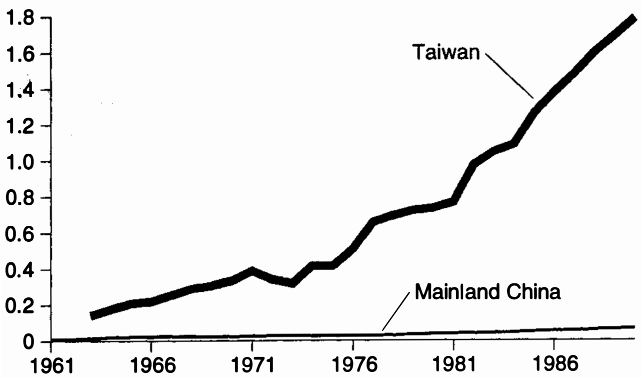


FIGURE 45
Meat consumption
(metric tons consumed per 1,000 population)

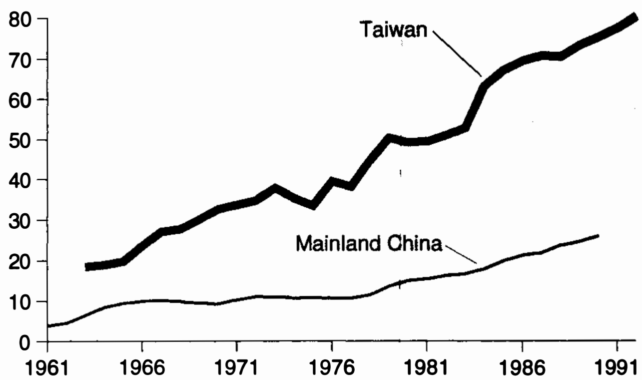


FIGURE 46
Taiwan: rice versus meat consumption
(tons consumed per 1,000 population)

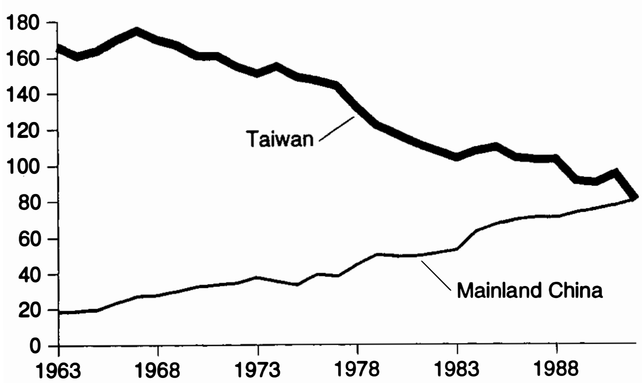


FIGURE 47
Taiwan: water withdrawn as percent of total water available

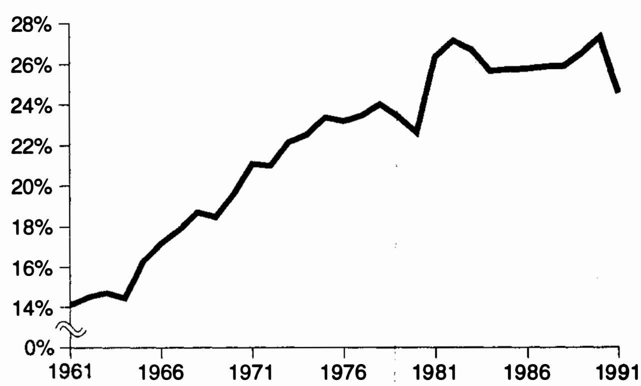


FIGURE 48
Per capita domestic water use in Taiwan
(m^3 used per person)

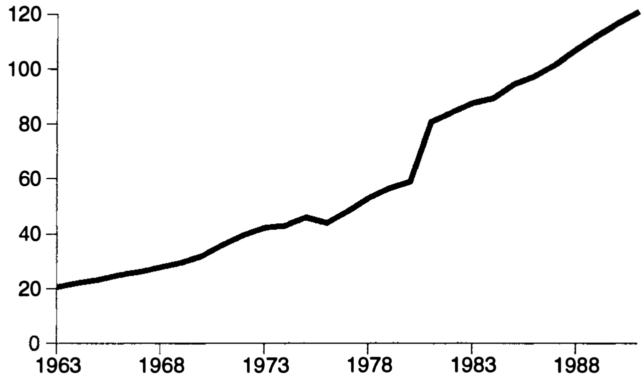


FIGURE 49
Taiwan: total water use per used area
(million m^3 per km^2)

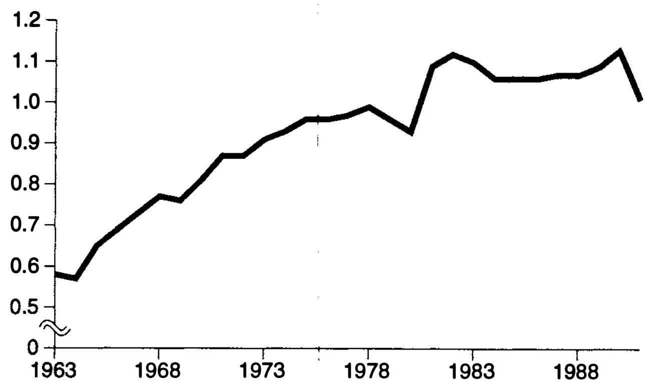


FIGURE 50
Taiwan: intensity of agricultural water use
(million m^3 used per km^2 cultivated land)

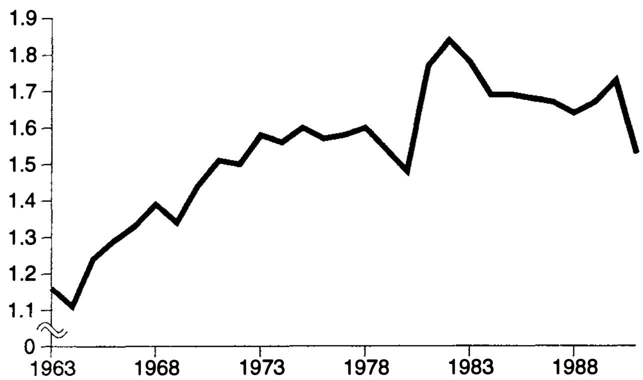


FIGURE 51
Taiwan: farm families' agricultural water use
(million m^3 used per 1,000 farm families)

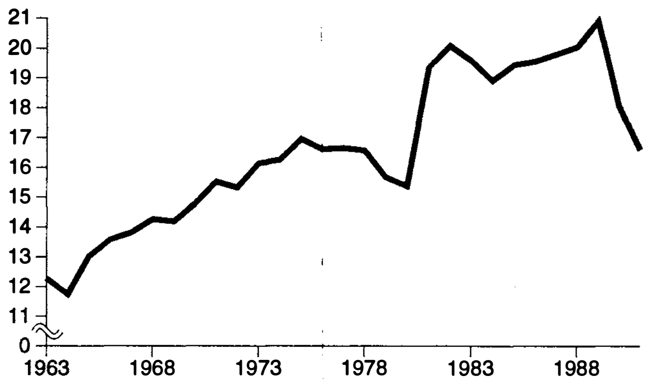


FIGURE 52
Taiwan: agricultural water use per farm laborer
(thousand m^3 used per farm laborer)

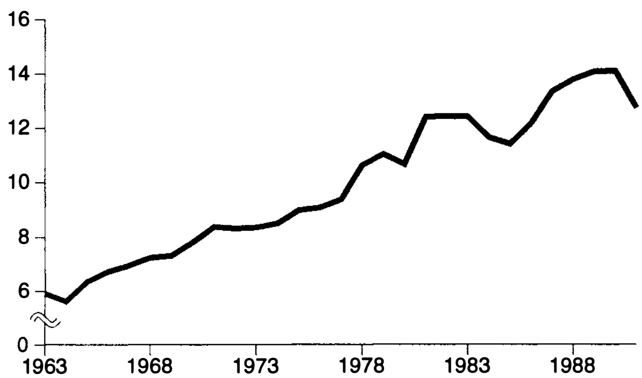


FIGURE 53
Taiwan: water use per 1,000 households
(million m^3)

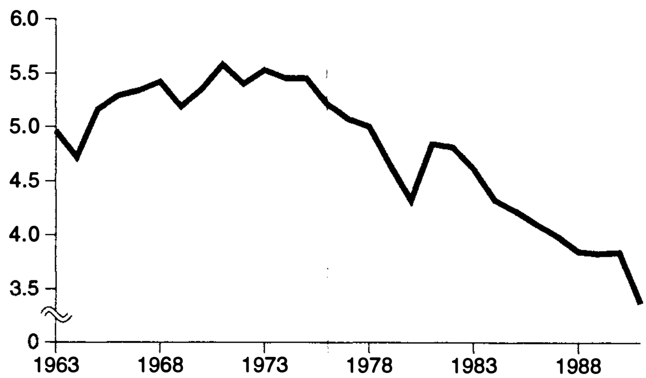


FIGURE 54
Taiwan: domestic water use (withdrawn)
(thousand m^3)

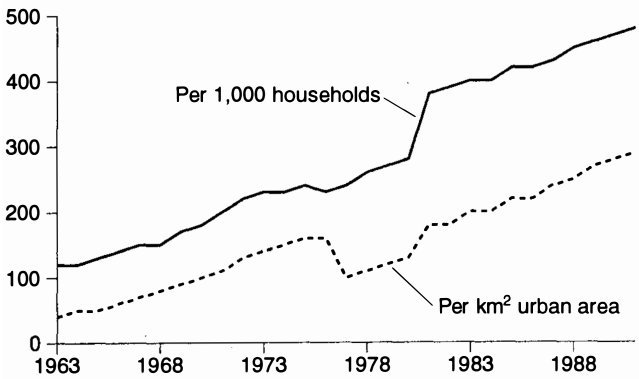


FIGURE 55
Taiwan: industrial water use per capita
(m^3 per person)

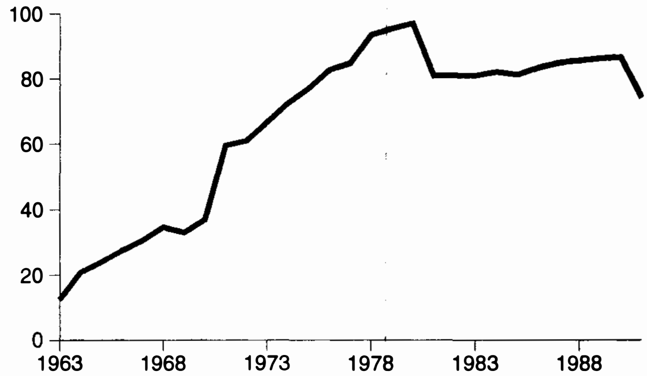


FIGURE 56
Taiwan: industrial water use (withdrawn)
(thousand m^3)

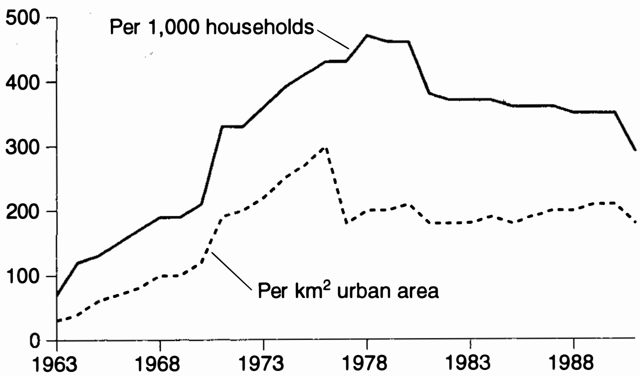


FIGURE 57
Taiwan: total freight per household
(metric tons)

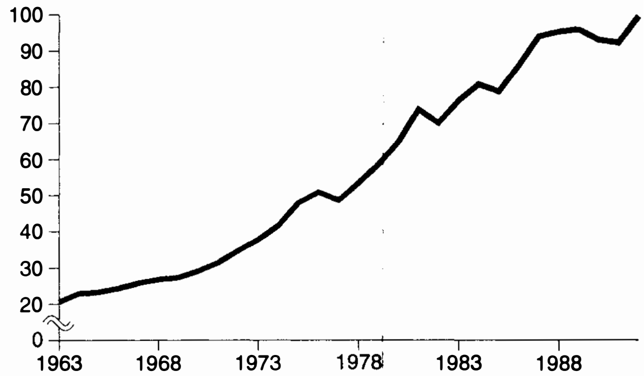


FIGURE 58
Taiwan: gross industrial output of manufactured goods
(million metric tons)

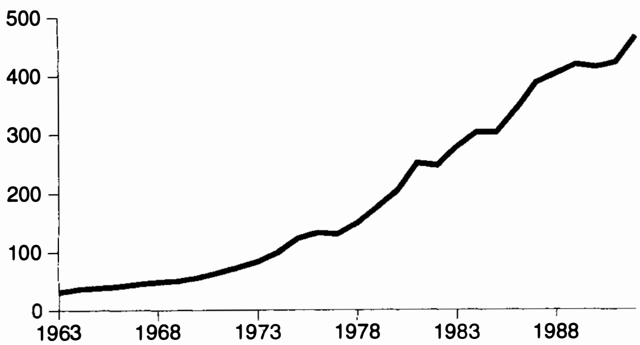


FIGURE 59
Taiwan: industrial output per 1,000 workforce
(metric tons)

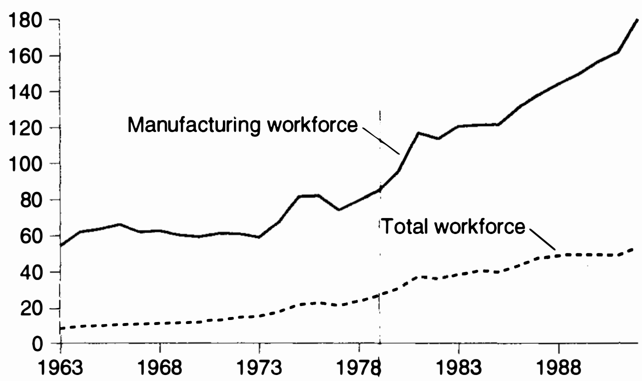


FIGURE 60
Cement produced per manufacturing worker
(metric tons)

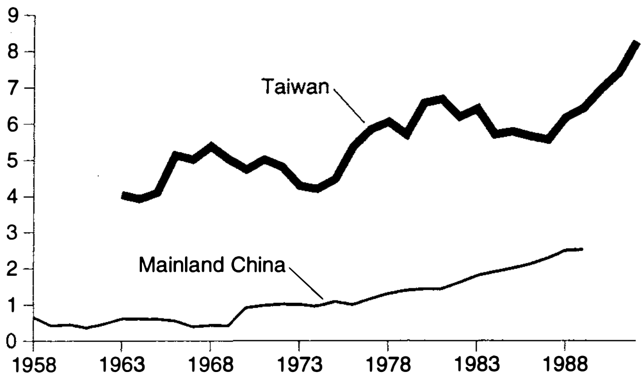


FIGURE 61
Taiwan: cement produced per household
(metric tons)

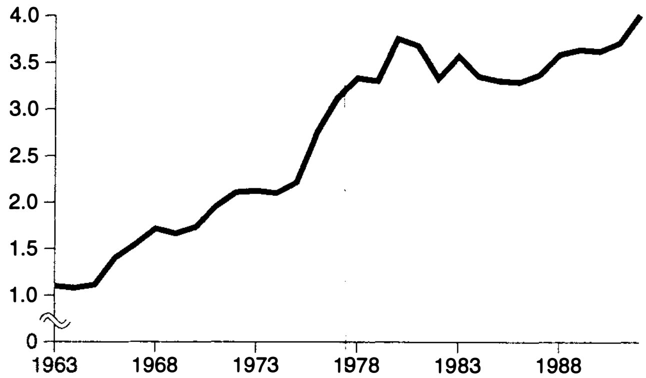


FIGURE 62
Steel production per manufacturing workforce
(metric tons per 1,000 manufacturing workers)

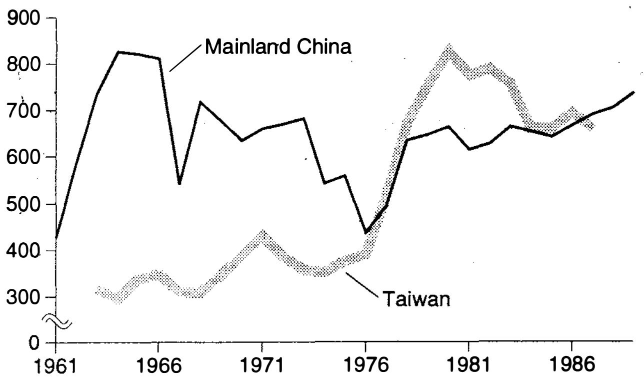


FIGURE 63
Taiwan: per-household crude steel production
(metric tons per 1,000 households)

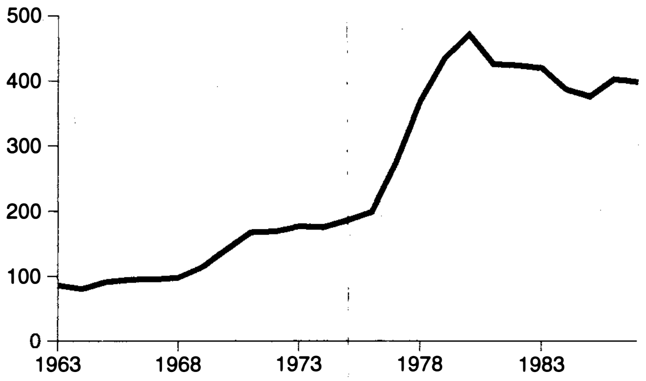


FIGURE 64
Fertilizers produced per 1,000 manufacturing workforce
(metric tons)

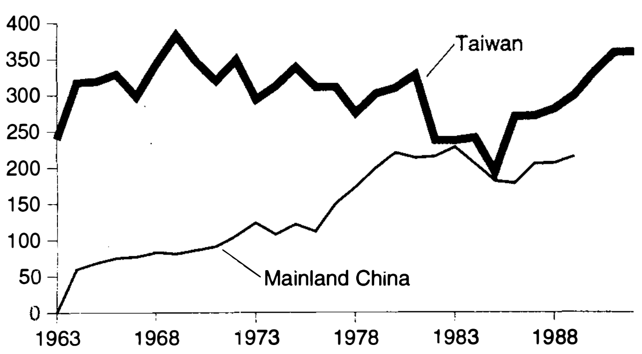


FIGURE 65
Taiwan: per-household fertilizer production
(metric tons per 1,000 households)

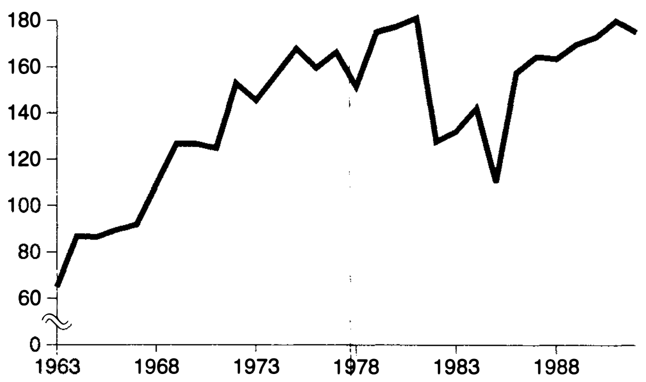


FIGURE 66
Tire production
(pieces per 1,000 manufacturing workforce)

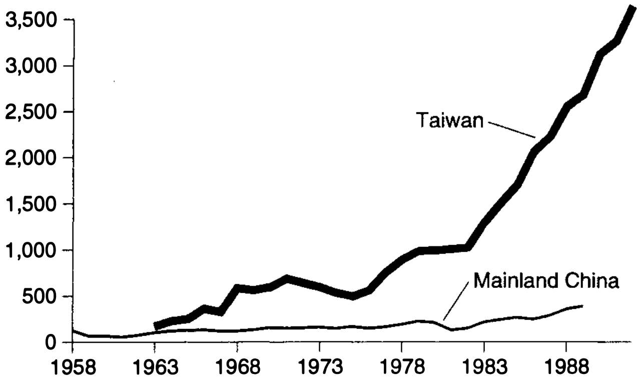
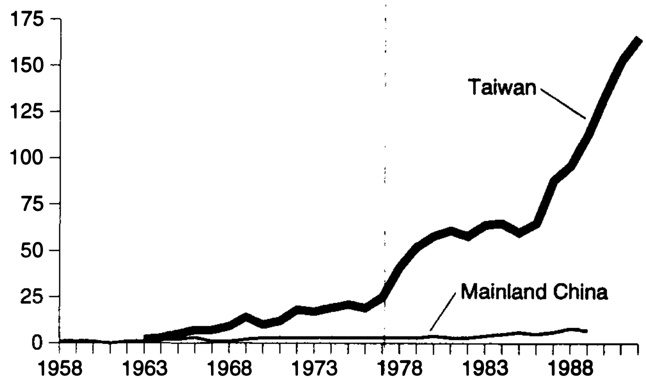


FIGURE 67
Motor vehicle production
(units per 1,000 manufacturing workforce)



(continued from page 23)
simply shipping around the coal, oil, and gas necessary to run the rest of the economy.

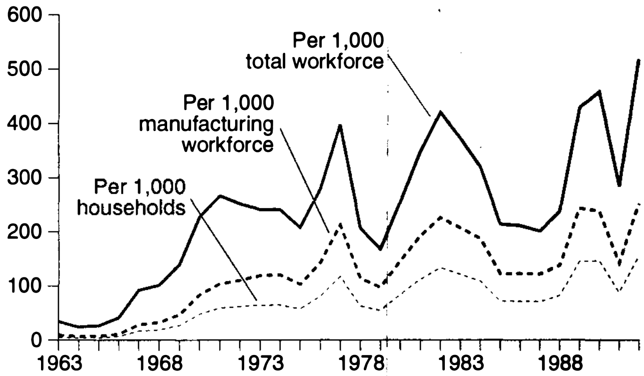
"Without a crash program for nuclear power generation, there is no solution for China," as LaRouche's "Emergency Plan for China for the Next 100 Years" notes. "The present official policy, massive expansion of conventional uses of coal, would constitute national suicide if continued into the medium term. . . . The problem is, that the power density of coal (and other fossil fuel technology) imposes such a low level of productivity that the Chinese economy will collapse. . . .

"Per unit of thermal (or electric) power generated, a modern nuclear power plant requires approximately *60,000 times less fuel by weight* than a power plant using coal, oil, or gas. . . . A coal power station producing 1,000 megawatts of electric power consumes 3 million tons of coal per year (about 38,000 railroad cars) whereas a nuclear plant generating the same power requires merely 50 tons of uranium."

Returning to Table 2, note that the industrial nations can support as an urban population, a much higher percentage of citizens (71-81%). As **Figure 10** shows, Taiwan surpassed this level by 1973, while the P.R.C. is still more than 70% rural.

The shocking fall in urbanization rates in the P.R.C. during the 1960s and '70s in Figure 10 shows the effects of Mao's Cultural Revolution. As a "solution" to urban unemployment, from 1965 until 1977, almost all graduating classes of secondary school (junior and senior high school) students, who would otherwise enter the labor force, were sent from the cities to remote rural areas to work on farms and be "re-educated" by the peasants. Under his "Third Front" policy, Mao also sent manufacturing workers and their families from major urban centers to remote rural areas or smaller cities, dismantling some machinery from their plants and

FIGURE 68
Taiwan: merchant vessel production
(deadweight tons)



moving it with them. Soldiers demobilized out of urban units were also sent to work on farms to avoid urban unemployment.

LaRouche's "Emergency Plan for China" seeks to finally fully reverse this legacy and calls for 1,000 new cities to be built on the Mainland.[23]

At least in West Germany and Japan, as Table 2 shows, with urbanization goes a higher percentage of the workforce (23% and 30%) employed in manufacturing, compared to West Germany and Japan's agricultural workforce (7.5% and 16.5%). India and China are the opposite, with 74.9% and 80.8% of their workforce in agriculture. The United States is already declining into a "post-industrial" service society; with only 14% of workers in industry and 4.1% in agriculture, the rest have become economic overhead.

Compared to Table 2, **Figure 11** shows that Taiwan's workforce has surpassed the United States in manufacturing force to total workforce, while the P.R.C. had not reached Taiwan's 1960 level. Compare this with the agricultural workforces in **Figure 12.** Because Taiwanese are able to be employed at a high rate in manufacturing, they are able to leave the agriculture sector at a high rate.

Figure 13 is the result. As noted above, in LaRouche's "Criterion 2" for a successful physical economy: "Urban physical-productive employment and market baskets output must increase relatively over rural, up to an asymptotic limit of feasible reduction in percentile of rural."

Not only is Mainland China at the opposite end of these scales, heavily dependent on a peasant economy, but the *rate of change* is almost flat compared to that in Taiwan in Figures 11 and 12.

More disturbing is **Figure 14.** Mainland China's workforce, according again to the official Beijing figures in Figures 11 and 12, has shifted from 83% agriculture and 7% manufacturing in 1961 (leaving 10% in "other" categories), to 65% in agriculture and 13% in manufacturing in 1991. That leaves 22% of the workforce in "other" categories. Did they all become stockbrokers? The purpose of getting peasants off the land is not to clear the land; it is primarily to employ them in industry.

What we see here is a very large disguised unemployment. Whether they have gone into the service sector or become homeless day laborers, clearly there are a great many displaced peasants whom Beijing has not been able to put into stable manufacturing jobs. Twenty-two percent of China's 463 million workforce is 102 million people, in official figures! No wonder that some economists estimate the "blind flow" of unemployed Chinese at up to 200 million.

Also quite disturbing about Taiwan's manufacturing workforce percentage as a percent of total workers is the very recent downturn (**Figure 15**). It began just after the 1987 financial deregulation in Taiwan which, done at the behest of London and Wall Street, will give Taiwan the same post-industrial financial AIDS which the United States has now, if allowed to continue. Upon examination, sure enough, Taiwan's "financial and commerical" workforce as a percent of the total began to rise that same year (**Figure 16**).

If this London-New York style of employment pattern is allowed to continue, under pressure from the international banking community to deregulate, Taiwan's economic miracle will be destroyed (**Figure 17**).

Table 2 also shows one good reason why the industrial economies, overall, can support urbanization: Food for the cities is produced on top of what the agricultural population consumes. Only a rising agricultural productivity (see values for "tons food produced per capita") would allow urbanization, which is what the figures for the United States, for example, show. The U.S. agricultural labor force as a percent of total workforce is one-eighteenth the size of India's and one-twentieth of China's, but in tons of food per capita, the United States produces 3.6 and 9.7 times more, respectively. The problem is not that American agricultural employment is low; in 1970 (unlike today), America was still feeding itself, and farm employment needed to be no higher than it was then.

The problem is that the United States since 1970 has implemented the crackpot theory of the "post-industrial society," in which the non-farm workforce has gone into overhead service jobs, not into manufacturing.

Taiwan's gross agricultural productivity of tons of food per capita (**Figure 18**) reached its postwar height in 1969, after the Nationalists had made every possible agricultural improvement *at prevailing 1960s levels of technology,* and even raised area under cultivation from 8,600 square kilometers at the end of the Japanese Occupation to a temporary high of 9,100 square kilometers.

Since 1970, Taiwan's planners decided to move so rapidly to a twenty-first-century industrial economy, that they made an error in agricultural policy: a strategic decision to abandon 100% food self-sufficiency. Land, as well as labor, was shifted into manufacturing at increasing rates. Food production per capita in Figure 18 dropped, because gross tonnage of food production was allowed to remain constant at about 9 million tons a year, while the island's population zoomed from 14.7 million to 20.7 million. There is a certain progress here, in that Taiwan has shifted from tons of rice production to higher-nutrition per ton production of meat, processed food, and vegetables. Less than half of Taiwan's cultivated land is now rice paddies. The policy, however, is wrong.

Beijing's figures in Figure 18 claim that the P.R.C. finally reached Taiwan's rapidly declining levels of food production per capita by June 1989. It must also be underlined that *food production figures* such as these, which are highly political in China, are some of the most inflated of official Beijing statistics.

According to the Beijing figures used in Figure 18, China's total food production more than doubled from 196 million tons in 1965 to 456 million in 1992. Anywhere from 10 to 30% of these tonnage figures, however, may be inflated by the inclusion of grain husks, stems, and leaves, in addition to other inedible parts of the potato and other plants, according to Indian agronomists interviewed by *EIR* who have traveled extensively in China.

The picture is clarified somewhat by comparing productivity of the agricultural workforces in **Figure 19.** Clearly Taiwan's agricultural workers continue to progress in what each is able to produce, and sharply outperform those in China, although the absolute number of them has fallen by 30% since 1970. This is a product of Taiwan's superior water and other infrastructure (see below).

Figure 20 shows that Taiwan's consumption of grains continues to grow, while even using official figures, con-

Fifteen thousand Taiwan farmers demonstrate in Taipei against free-trade looting by the General Agreement on Tariffs and Trade, May 1993. Many Taiwanese leaders today have succumbed to the British disease, and the nation will pay the price if this policy is not rapidly reversed.

sumption in the P.R.C. is not impressive. Large amounts of Taiwan's gross grain consumption in Figure 20, perhaps 20%, are actually consumed by animals as feed grains, so that this figure also represents Taiwan's highly industrialized standards for meat consumption. Percentage of grain fed to livestock in China is so small that Beijing does not even report it; it would not appear in the scale of Figure 20.

Grain consumption reflects the dislocations of the P.R.C.'s Cultural Revolution. The flat consumption levels from 1972 to 1978 reflect rice rationing coupons imposed upon urban residents during the period. After the Cultural Revolution was halted, Deng Xiaoping's "Land to the Peasants" reforms of 1977-78 allowed the leasing of substantial communal land to peasants. Under this "agricultural responsibility system," farmers could retain a surplus and sell it, and thus consumption levels rose from 1978 to 1984.

After a certain expansion, however, by 1984, this had reached its limit, as there was little new land to lease out, and consumption flattened. All during this period, agricultural infrastructure was not improved on any major scale, nor were new agricultural technologies introduced. Because of this, erosion grew into a serious problem; more recently, arable land has even been increasingly removed from agriculture to build up Deng's Special Economic Zones.

Neither has Taiwan's agricultural base, however, been significantly upgraded since 1969-73. The problem is not that Taiwan has been abandoning farming for industrialization. There is simply a real political problem with abandoning food self-sufficiency: It leaves a sovereign nation open to blackmail.

In fact, Taiwan's *relative potential population density* in the amount of population its agriculture will support, has been allowed to decline too far. By stagnating at 1960s or 1970s levels of agricultural technology, there is no way that the country's industrial sector can make up the difference. Taiwan should be moving into twenty-first-century food production technologies such as hydroponics, genetic engineering for yields, and even aeroponics, in which plants are cultivated partially in water and partially in air.

Taiwan's current practice of producing computers for export and then buying food on a collapsing world market, masks a failure to press forward the development of domestic agriculture. After exporting food, often massively, since 1900, Taiwan in 1973 had its last year of net food exports in tons, consuming 10.2 million tons of food and producing 10.4 million tons, leaving 200,000 tons for export. By 1992, Taiwan was consuming 14.2 million tons of food annually, but producing only 8.9 million tons. Taiwan's financial agricultural trade balance did not decline as rapidly, because the value of its meat and other processed exports per ton was more in dollar terms than the value of its largely grain imports per ton. By 1992, however, Taiwan's agricultural trade deficit was U.S. $1.5 billion, masked by an overall trade surplus of almost $10 billion.[24]

Such financial considerations are, however, irrelevant to true physical economy. An agricultural policy which is increasingly adapting to Adam Smith's free-trade theory in the end cannot do Taiwan any good.

Health and education

The health and education parameters in Table 2 all show similarities for the industrial countries on the one hand, and the underdeveloped countries on the other. Industrial countries' life expectancies are over 70 years; underdeveloped nations, below 60—sometimes far below. The number of people who must be served by each doctor and hospital bed, and the number of pupils each teacher must educate, are lower in industrial economies. In every category, Taiwan's health and education data have reached industrial standards (**Figures 21-26**).

Official Beijing statistics are not believable in these categories, and so Mainland China's data have not been included in most of these figures. For example, the data on education in Beijing's *Statistical Yearbook of China in 1991*, claim that the ratio of students per teacher in middle and high schools is a mere 14.6—a level much higher than even the most expensive private schools in the United States.

One Japanese researcher did, however, produce a realistic comparative graph (**Figure 25**) which shows the effects of the P.R.C.'s Great Leap Forward (1957-61) and Cultural Revolution (1966-76).[25] As previously mentioned, beginning in 1965, most graduating classes of secondary schools were sent to the country. To avoid this, students from 1965 to 1970 quit senior high school in large numbers, and even quit junior high. In 1970, under the influence of Deng, Mao temporarily halted the policy, encouraging students to return to school (note a rise in the graph), but in 1975, the policy was again implemented and the regime even closed large numbers of schools, especially in rural areas, to force students onto the farms to "learn from the peasants." Since 1980, enrollment rates have recovered, but new school construction has had to make up the huge deficits of the 1970s, plus keep pace with the rising school-age population.

The development of an educated workforce on Taiwan is instructive. **Figure 26** shows how Taiwan has virtually wiped out illiteracy since the war. The percentage of the workforce with an education higher than primary school has zoomed from 700,000 out of 3.7 million or 19% in 1964, to 5.5 million out of 8.3 million in 1990 or 66%. Virtually the entire growth in the workforce has been in high school and college graduates.

Looking further 'behind the numbers'

More careful inspection shows that the indicators in Table 2 should be refined to reveal more about what it is "behind the numbers," which makes an industrial economy function and grow. **Table 3** tries to do this. It underlines that it is the very concentration of *relative potential population density* which best encourages industrialization and progress. Truly the anti-population theorists are trying to stop the modern industrialization of the nations they victimize.

As the life expectancy figures in Table 2 show, a human life in underdeveloped nations is not the same as a human life in industrial countries. Instead of raw population per area density, Table 3 therefore measures *lifetimes* per area, against the standard of the 1970 U.S. life expectancy of 71.3 years. In 1970, an Indian's life expectancy of 48.4 years, was only 68% of the average American's; a Chinese life expectancy was only 83% of an American's.

Multiplying these percentages by raw population per area in Table 2, we derive Table 3, line 1: "lifetimes per area." In lifetimes per area, India and the P.R.C. are even more underpopulated than they were in simple population per area in Table 2. India's population density falls from 170 to 115 and the P.R.C.'s from 85 to 70. Japan is now clearly the most population-rich of the industrial nations, and Taiwan outstrips Japan (see also **Figure 27**).

Comparing lifetimes density in Taiwan and the P.R.C. over time, **Figure 28** shows the superior rate of increase in Taiwan. Taiwan's lifetimes density has the steepest slope, rising from 269 in 1960, to 600 in 1992, compared to Taiwan's simple population density rising from 300 to 570.

Figure 29 compares the new measure of lifetimes to the old one of simple population density for both countries. As Taiwan's living standards reach U.S. levels in the mid-1970s, and then exceed U.S. levels, Taiwan's "quality of life" measure of lifetimes per area rises above its simple population density. But for the P.R.C., by 1991, the measure of lifetimes per area has barely reached the simple population density rate. China's simple population density rises from 70 to 120 people per square kilometer—but China's lifetimes per square kilometer are only 43 to 118. This is because China's life expectancy, which was only 44 years in 1960, was still, in 1991, below the U.S. standard (at 70 years versus 71.3)—even if Beijing's figure for life expectancy is accepted, which is open to question.

Table 3's next improved measure, "people per household," refers to the fact that people do not exist as discrete, countable individuals, but rather, human life is organized through the family household. Only the family household can produce a new generation, support those who work, and care for the aged. A society organized around anything less

TABLE 3
Improved physical economy indicators for 1970

Country	1970 U.S.	1970 Germany	1970 India	1970 Japan	1970 P.R.C.	Taiwan 1970	Taiwan 1990
Life expectancy	71.3	70.6	48.4	73.3	59.1	69.1	74.1
as percent of 71.3 years	100%	99%	68%	103%	83%	97%	104%
x population per km²	22	245	170	279	85	408	571
= Lifetimes per km²	22	242.5	115	286	70	395	593
People per household	3.2	2.9	5.1	3.9	4.6	5.6	4.0
Km² used area per 1,000 households	72.7	6.8	15.5	2.8	22.1	6.6	3.4
1,000s kwh consumed per capita	24.08	10.25	.46	13.06	.51	5.3	17.1
1,000s kwh consumed per km² used area	355.7	1,562	30.4	4,631	24.9	796	5,014
Tons food produced per km² crop area	345	2,167	323	1,505	243	1,094	1,015
Freight tons per household	82	129	2.6	195	8.5	29	93
Tons industrial output per worker	363	437	7.3	312	38.8	65	175
Millions m³ water consumed per 1,000 households	7.6	1.3	3.3	3.2	2.1	5.4	3.8

than a real household will not be able to reproduce its workforce. People work and produce sustenance for themselves, and for children and other non-working population, via the household. In Table 3, the United States and West Germany average some 3 persons per household, and Japan almost 4. India and the P.R.C. are more in the range of 5, while Taiwan is declining from of 5.6 to 4.

This ratio requires further interpretation. On the one hand, industrialization would allow young couples to move out of peasant extended families and create a rapid rate of *new* household formation in urbanization, which is desirable. If an economy reflects a prosperous large ratio of new young couples, with only two (or three) persons per household in their first few years, that would reduce the number from an average five or six persons per household. **Figure 30** shows indeed that Taiwan's rate of formation of new households is rising rapidly, almost tripling from 1961 to 1991. This reflects the postwar baby boom generation forming new families. In Figure 30, the P.R.C.'s number of households (while vastly larger in absolute number) shows a much flatter slope, a lower rate of rise; it does not even double from 1961 to 1991.

On the other hand, if young couples are not having children, thanks to the malthusian population propagandists, a too-rapid fall in people per household could indicate an economy in danger of becoming a post-industrial junkheap. The collapse of population growth in the United States, West Germany, and Japan by 1970—reflected today in Japan's massive labor shortage—is also shown here. An average of three to four persons per household in 1970, in what Adam Smith advocates mistakenly call "mature economies," meant that couples in these particular industrial nations were not even having two children each, totalling four per household. A fertility replacement rate of 2.3 births per woman is needed just to maintain the existing population.

By that measure, China's "one-child policy" has been an economic abomination as well as a moral one. We know from Figure 30 that China is not producing many new, prosperous young households. **Figure 31** shows that the average number of persons per household is also stagnating, after a big drop following implementation of the one-child policy in 1974.

Figure 31, however, also shows that Taiwan is endangering itself. The precipitous rate of collapse below the four per household danger point, shows that Taiwanese couples may be heeding the malthusian "post-industrial" credo and simply not having enough children.

If this ratio does not level off and continues to fall, it should be read as a red flag in Taipei. Taiwan's net reproduction rate (**Figure 32**), the rate at which women are reproducing female children, is also falling sharply and seems to bear out this reading. Gross reproduction rate is the average number of female babies expected to be born during their lifetimes, to all those fertile females alive in that year. Net reproduction rate is the gross rate, minus (net) of infant deaths under the age of one. At a net reproduction rate of 1, each woman is reproducing on average 1 girl during her fertile years, and thus, on average, 1 boy. The family is producing 2 children per 2 adults. Thus, if the rate is under 1, Taiwan is not even reproducing its population.

Even the edited official Beijing and U.N. figures show that the net reproduction rate of the P.R.C. is undergoing a similar precipitous drop (**Figure 33**).

Power density per used area

Table 3 also shows that the use of land in each nation is not uniform. There are different classes of land which are put to different uses. Therefore, one must take into account productivities per different types of land. A nation has farmland or cultivated area, urban area, industrial area, and "used area," which refers to the sum of these and all land area modified and used in some way by man. Further, the cultivated or urban portion of the land is improved, in different ways in each country, by different densities of networks of transportation, power, water, and other infrastructure.

In Table 3, another measure of *relative potential population density,* "square kilometers of used area per 1,000 households," is a significant change from the initial population density figures in Table 2. It shows a major distinction for especially Japan and Taiwan, which use less of their territory than do either the United States or even West Germany. In Table 2, Germany and Japan had comparable population density rates of 245 and 279 people per square kilometer, both ten times that of the United States. In Table 3, however, compared to the American used area per 1,000 households of 72.7 square kilometers, West German households used one-tenth of this space—but Japanese housholds used one-twenty-sixth of the space. By this measure, Japan's household population density is another order of magnitude more intense than that of even West Germany.

This is not a question of Japanese "living in rabbit hutches," as they are often slandered to do—packed into one-room apartments at a low standard of living. Rather, it reflects the trend of the Japanese economy as a whole to become "metropolized," more like the living conditions in the better areas of New York City and Tokyo, where small ground areas of urban land can support very large numbers of people, as in a Fifth Avenue skyscraper, at quite high standards of consumption. Unlike Fifth Avenue, these areas can also exhibit very high industrial productivity.

Comparing Taiwan and the Mainland, **Figure 34** shows a similar relation. Taiwan's used area per household is, of course, a fraction of that on the Mainland, but of real interest again is the slope of the graphs. Taiwan's sharply declining area use, an increased household density per used area, indicates a Japan-like pattern of high technology per area development. The most important aspect of the P.R.C. number is that it stagnates. There are no significant improvements in technology being introduced.

The use of urban area per household makes this more clear. **Figure 35** shows Taiwan's superior urbanization in area terms. Even though Taiwan's density of households per urban area is increasing rapidly, leading to more efficient use of urban area, Taiwan's rate of urban development still eclipses that of the P.R.C.

An improved measure of electricity use illustrates why this is not just "crowding" in Tokyo and Taipei. In Table 2, a measure of 1,000 kilowatts of electricity consumption per capita showed the U.S. consumer using 1.7 times the German consumer and 1.5 times the Japanese consumer. In Table 3, a new measure of electricity, 1,000 kilowatt-hours consumed per square kilometer of used area, shows something different. Here, German usage of power is 4.4 times as intense per area as in the United States, and Japanese usage is 13 times more intense.

Thus, the United States higher per capita energy consumption is a form of physical economic waste. Americans consume more only because the land area of the United States has not been subject to the same depth of improvement effected over more than 1,000 years, as in Germany, every inch of which is "gardened," or in Japan since the Meiji Restoration.

Higher-technology cities permit a higher relative potential population density, because they permit a concentration of per area resources which more than offset any lower per capita supplies (**Figure 36**). The much higher "per area" measures in Table 3 for Japan and West Germany are a reflection of the level of infrastructure improvement to the land, which permits more people to be supported per unit area, at comparable standards of living, because of the lower costs per physical unit of capital improvement. Anyone who has ever taken a German or Japanese train to work, at a low cost, will appreciate immediately how much more efficient this is for an economy, than having the workforce sit on the Washington or Los Angeles freeways during rush hour.

Again, comparison of Taiwan's energy density per used area with the Mainland shows that the P.R.C. is not even on the map (**Figure 37**).

Agricultural productivity

The new measure of agricultural productivity in Table 3, tons of food produced per square kilometer of crop area, also shows the superiority of the Japan-Germany population density economic model. With 1.8 times the labor force employed in agriculture compared to the United States (refer back to Table 2), German farmers produce 6.2 times more per unit crop area than American farmers, and Japanese farmers produce 4.3 times the United States per area output. Again, Taiwan approches Japanese levels of agricultural productivity per crop area.

Figure 38 shows the comparison for Taiwan and the Mainland. Higher yields per unit crop area reflect a higher density of infrastructure in Taiwan, as in Japan and West Germany, which cheapens the economic cost of both food production and distribution. The cost of delivering the manufactured products the farmers need—machinery, fertilizer, etc.—is less. The farmer is receiving more man-made water supply in irrigation and sanitation per crop area. Farm, transport, and household refrigeration facilities are better. Each farmer can do more; you don't have to go so far from the city to bring the food to market; fresher produce is available to city dwellers.

Examining Taiwan and the Mainland's agriculture in some detail, we get a better understanding of the P.R.C.'s famous agricultural yields. **Figure 39** isolates out only grain and grain-producing areas. Only half of Taiwan's crop area produces grain, while the Mainland produces grain on over 95% of its crop area or more. Still Taiwan's productivity per grain area has been superior on this measure until recently.

The 1979-81 agricultural reforms, returning land to the peasants in the P.R.C., created a spurt in grain production per area as shown on the graph. It is also true that P.R.C. per-area productivity comes from an enormous input of untrained, uneducated, and poorly fed and housed peasant labor per area. Recall too that all Mainland agricultural production figures are believed to be inflated.

On a farm labor basis, however, **Figure 40** shows that the average Taiwan farmer simply has a far higher technological input from infrastructure and living standards generally than the Mainland peasant. There is still no comparison between the per-worker agricultural productivity.

It is only in the enormously labor-intensive rice sector that the Mainland is able to outstrip Taiwan in the sheer number of peasants it can crowd into an area of paddy, producing superior yields (according to official Beijing rice production figures) per paddy area (**Figure 41**).

Once again, however, the productivity from machinery, fertilizer, and infrastructure at the command of each Taiwan rice farmer is one full order of magnitude higher than the productivity per worker of the Mainland rice farmer (**Figure 42**).

In the meat production sector, where nutrition is far higher per ton, Taiwan's modern meat industry far outstrips the Mainland in productivity per farm area. The fact is that the Mainland is still so unsure of its ability to feed the population with grain—reports of child malnutrition in the interior are widespread—that the Mainland Chinese cannot afford to feed many animals or to eat much meat (**Figure 43**).

The productivity of Taiwan's meat industry per agricultural workforce is even higher. The Mainland, again, is barely on the map (**Figure 44**).

While according to Beijing's official figures, meat consumption is rising, the Mainland's per capita figure bears little comparison with Taiwan's meat consumption per capita (**Figure 45**).

Figure 46 shows Taiwan's profile rising to an industrial population's standard for consumption of food. The more expensive, more complex protein of meat is able to be substituted for rice at an accelerating rate. Mainland China does not reveal any rice consumption figures, but it is safe to say that no such graph as this could possibly be drawn.

Water supply and productivity

One of the major factors of productivity in agriculture and general health and sanitation in Taiwan and the P.R.C. is water use, for crop irrigation (the largest part of it), industrial, and domestic household (municipal) use. The last line of Table 3 shows a comparison of total national water use per household (known technically as "water withdrawals"). As with the initial figures per household and per capita for electricity use, the United States is clearly the highest consumer, for good and also not so good reasons.

Another frequently used measure is water withdrawn (used by man from nature) as a percent of total water available in nature from rainfall (minus evaporation). As the natural availability averaged out over a decade does not change much, this "withdrawn ratio" is a measure of how much man is intervening into nature to harness its resources. In 1970, U.S. and German withdrawals per availability were 31% and 37%, Japan and India were at 21%, Taiwan at 20%, and the P.R.C. at 17%. (Japanese withdrawal as a percent is only apparently low; Japan's rainfall is unusually high per habitable land area, compared to the United States and West Germany).

Figure 47 shows how Taiwan harnessed its water power since 1963, nearly doubling withdrawals of available water to 28%. Comparable figures show the P.R.C. stagnating at the 17% level.[26]

Regarding the general consumption figure at the bottom of Table 3, American personal home sanitation water withdrawal standards are clearly the highest of the six countries. American 1970 sanitation standards estimated a necessary 60 gallons per person per day in a U.S. private home; below 20 gallons was considered below the sanitary minimum. Actual domestic use per person in 1970 in the United States was 77 gallons, 36 gallons in West Germany, 30 gallons in Japan (including predominantly public baths in 1970), 30 gallons in Taiwan, 20 gallons in Mainland China, and 16 gallons in India.

Over time, **Figure 48** shows, Taiwan's domestic water supply system has increased per-capita domestic use dramatically, from 20 cubic meters per capita to 121.

But in all of these countries, domestic withdrawal of water was a small percent of the total withdrawn, only 7% of the total in the United States. The bulk of withdrawals went for agriculture in most countries, except in the United States, where agricultural use, while major, was outstripped by power use. The United States uses 35% of its water in agriculture, a full 45% in electrical generation cooling, and 13% in industry.

As with electricity, however, the United States has a relatively plentiful supply of water—and uses it very freely spread out over large areas. Thus, America's water usage per unit of used area development of the American water system is not that impressive.

Measuring water withdrawal usage, as with electricity, now using the more sophisticated measure of water withdrawn per used area, Japan and Taiwan in 1970 used ten times the water per used area than any of the other countries, as with their electricity-per-used-area figures earlier. In part, this was because of major rice proportion of crop, which requires large water volume of irrigation relative to wheat, for example.

It was also due, however, to greatly improved water supply systems per unit area. **Figure 49** demonstrates the development of Taiwan's water withdrawal per general used area of the country.

By contrast with the United States, in 1970, India, Taiwan, and China used 93%, 93%, and 86% of their water for agriculture. For these nations, this meant that there was absolutely no room for expansion without dramatically increasing the ratio between basic water withdrawn by man and that available from nature.

As was seen in Figure 47, Taiwan did that; India and China did not. In absolute terms, Taiwan from 1960 to 1990 was able to increase its total water withdrawals from 10 billion cubic meters to 19.5 billion, almost doubling. Within this, withdrawals for agriculture increased from 9.5 billion (almost the total) to 15 billion cubic meters. That also meant a healthy rising margin of water remaining for industrial and domestic use, which margin rose from 0.5 billion to 4.5 billion cubic meters.

Figure 50 shows the sharp rise in Taiwan's improvement of the water used by each square kilometer of agricultural land in particular.

The tremendous productivity of the Taiwanese farmer is here revealed to have a great deal to do with Taiwan's postwar water development, seen in **Figure 51** as the rising water use per agricultural household, and in **Figure 52** per member of the agricultural labor force.

This is why Taiwan exhibits a falling gross overall consumption of water per household in Table 3 between 1970 and 1990. First, recall that the number of households in Taiwan is booming. More importantly, because the principal use of water in Taiwan, agriculture, is becoming so much more productive per unit area, and more developed in its water use per unit area, the number of households on the island can increase even faster than the also-impressive increase in total gross water supply. Thus, gross usage per household (**Figure 53**) falls because of the sheer intensity with which Taiwan is using its water.

At the same time, Taiwan's domestic water supply to homes has increased in absolute terms, from 200 million cubic meters in 1961, to 2.5 billion cubic meters in 1991. Domestic water provision due to the growing overall water supply system is even growing fast enough to rise in domestic-use-per-household terms (**Figure 54**).

At the same time, industrial use of water rose in absolute terms from 95 million cubic meters in 1961 to 1.5 billion in 1991. It is also rising in per-capita, per-household, and per-urban-area terms (**Figures 55** and **56**).

Industrial producton

The final lines of Table 3 also include preliminary measures for industrial production per se. At the time of this writing, comprehensive data on Mainland China's industrial sector had not been located; these are now being gathered for processing in the near future.

Still, preliminary conclusions may be drawn. Freight tons per household in Table 3 is the gross amount of freight in tons carried by rail, road, and internal waterways, per every household in the country. This is a gross measurement of how much industrial, agricultural, and useful raw material product each family in the country is able to create for the rest of the country. The biggest "deliverers of the goods" are Japan, with 195 tons per household, and West Germany, with 129 tons. India and the P.R.C. are two orders of magnitude below these figures, because in these agricultural societies, a significant tonnage of food and other goods is consumed by the rural population that produces it. This production does not show in the freight figures here, because we are measuring industrial production proper beyond the need of the producers.

Figure 57 shows that Taiwan by 1988 had already surpassed the U.S. level of 82 tons freight per household and is rising toward Japanese levels.

In Table 3, industrial output in tons per worker is derived to make a gross comparison of industrial production in real terms. From the total tons of freight carried by the nation, the weight of total food production in tons and of fuels consumed, and the major industrial raw materials, are subtracted, leaving a figure for gross industrial output. Per manufacturing workforce, the United States, West Germany, and Japan are clearly ahead.

Figure 58 shows that Taiwan's gross industrial output in metric tons has been rising quite sharply.

Figure 59 shows that the productivity of Taiwan's industrial workforce has also been rising sharply.

The few comparative figures available for the Mainland at this writing show roughly the same trend as the comparative agricultural production figures, with some interesting aberrations. We have arrayed the comparative figures by productivity per manufacturing workforce, as the gross production numbers published by Beijing were so rough as to make any other measurement seem almost meaningless.

Figure 60 shows a general low but recently rising productivity in cement production for the P.R.C. which is, typically, barely on the same "map" as Taiwan.

Figure 61 gives an idea of Taiwan's overall population productivity in cement output.

Figure 62, "Steel production per 1,000 manufacturing workforce," causes those who have escaped the Mainland since 1980 a certain painful laughter. These official Beijing figures for crude steel during the 1961-69 period include the binge of peasant backyard steelmaking begun earlier during the Cultural Revolution, which continued through the 1960s. Counted here (and likely also inflated) are the millions of tons of useless steel produced when peasants were forced to melt down their woks, tools, and other iron implements in backyard furnaces. The "steel" output was useless for anything else and lay in heaps rusting all over China, while the peasant "no longer even had a wok to cook in," as one participant put it.

Figure 63 shows Taiwan's production of steel by household. **Figures 64** through **68** show other aspects of industrial production by particular industries.

Since the beginning of 1994, however, China has begun a shift. The crisis in China due to past economic policies has so impressed itself upon Beijing's planners, that they have begun to examine new models.

Chinese Vice Premier Zhu Rongji, who is also head of China's central bank, told a Tokyo audience in March that China will not accept the proposal of U.S. Treasury Secretary Lloyd Bentsen and Federal Reserve Chairman Alan Greenspan for a restructuring of China's central bank on the Federal Reserve model. Nor will China soon make its currency, the yuan, convertible soon, he said, despite demands for this from Morgan Bank, Citibank, and other Anglo-American bankers. "Zhu emphasized that China's government needs more centralization to get the economy under control," a Tokyo diplomat told *EIR*. "The Chinese are well aware of the dangers of the extreme free-market system, and won't be pressured into it."

The significance is that China has begun to seek advice from proponents of the Alexander Hamilton system of national banking and economic "industrial policy" in Japan, Taiwan, and South Korea. Planners from these countries are now advising Beijing with both the reform of its banking system, and with general economic and infrastructure planning.

All three of these nations maintained Hamiltonian national banks which directed credit to infrastructure and new technologies, rather than Federal Reserve-style private central banks, throughout their postwar economic development until the late 1980s. Were China to give up its banking system to the British free-market theorists, there would be no hope of financing such vast infrastructure programs of the magnitude which will be required to electrify and industrialize a country that size, and bring it into the twenty-first century.

Shortly after China rejected the Federal Reserve model, Zhu's economic team announced that Beijing was suspending certain programs in the speculative Special Economic Zones, and began serious negotiations in Europe for a major new national infrastructure program, notably during Prime Minister Li Peng's July trip to Germany.

Notes

1. Jonathan Tennenbaum and Lyndon H. LaRouche, Jr., "An Emergency Plan for China for the Next 100 Years," *EIR*, Feb. 11, 1994.

2. Lyndon H. LaRouche, Jr., *So, You Wish to Learn All About Economics?* New York: New Benjamin Franklin House, 1984, p. 23.

3. Paul Gallagher, "Population Growth Is Caused by Renaissances," *Fidelio, Journal of Poetry, Science and Statecraft,* Winter 1993, p. 13.

4. "Two Hundred Years since Hamilton's 'Report on Manufactures,' " *EIR*, Jan. 3, 1992.

5. Lyndon H. LaRouche, Jr., "The Truth about Temporal Eternity," *Fidelio, Journal of Poetry, Science and Statecraft,* Summer 1994.

6. Christopher White, Marcia Merry, and Anthony Wikrent, "Infrastructure and Economic Development," *EIR*, May 29, 1992.

7. Lyndon H. LaRouche, Jr., "Conceptual Problems of Economic Modeling," private paper available through *EIR*.

8. *Ibid.*

9. Kathy Wolfe, "Hamilton's Ghost Haunts Washington from Tokyo," *EIR*, Jan. 3, 1992.

10. George W. Barclay, *Colonial Population in Taiwan,* Princeton, New Jersey: Office of Population Research, Princeton University, 1954 p. 146, p. 255.

11. Dr. Chen Cheng-siang, *China: Essays on Geography,* Joint Publishing Co., Hongkong 1984, p. 325, and *EIR*-updated data from *Statistical Yearbook of Republic of China,* 1993.

12. *Op. cit.*, George W. Barclay, p. 26, pp. 133-36, p. 146, p. 255.

13. Lin Ch'ing-chiang, "Higher Education," in *Seventy Years of Education in the R.O.C.*, Taipei, 1981; cited in Alan Liu, *The Phoenix and the Lame Lion,* Stanford, California: Hoover Institute, 1987, p. 35.

14. Y. Dolly Hwang, *The Rise of a New World Economic Power,* Westport, Conn.: Greenwood Publishing Group, 1991, p. 12.

15. Chiang Kai-Shek, *1950 Yearbook of the R.O.C.*, Taipei, 1951, p. 123.

16. *Collected Works of Chiang Kai-Shek,* Vol. I, Taipei, 1963, p. 181.

17. Nicholas Lardy, *Agriculture in China's Modern Economic Development,* Cambridge, U.K.: 1983, p. 159.

18. Leo Orleans, "Soviet Perceptions of China's Economic Development," in *Chinese Economy Post-Mao,* Volume I, Joint Economic Committee of the U.S. Congress, Washington: Nov. 9, 1978, p. 126.

19. Wang Chueh and Wu Cheng-kun, "Strategic Key Points Are Keys to Realization of Strategic Goals," *Jen-min Jih-pao,* Oct. 8, 1982; cited in Alan Liu, *op. cit.*, p. 15.

20. *Op. cit.*, Tennenbaum and LaRouche, "An Emergency Plan for China," footnote 1.

21. *Op. cit.*, Christopher White et al., "Infrastructure and Economic Development," p. 20-21.

22. The World Bank, *China: The Energy Sector,* Washington, D.C., 1986, and *Nuclear Power Development in Asia," International Atomic Energy Agency Bulletin, Geneva, April 1993, p. 6.*

23. *Op. cit.*, Tennenbaum and LaRouche, "An Emergency Plan for China," footnote 1.

24. *Statistical Yearbook of the Republic of China 1993,* Table 142: External trade by commodities, p. 242.

25. Reiitsu Kojima, *Guidance to Modern Chinese Study,* Tokyo: Iwanami Publishing Co., 1990, p. 380, reproduced in *Development Strategies for the 21st Century,* Tokyo: Institute of Developing Economies, 1992, p. 50.

26. Dr. Chian-Min Wu, chairman, Water Resources Planning Commission, Ministry of Economic Affairs, R.O.C., *Management of Water Resources in an Island Nation: the Taiwan Experience,* Taipei, 1990. *EIR* is also grateful to Dr. Wu for his help in providing additional statistics for this study.