

Industrialization, Innovation and Industrial Policy

Lawrence J. Lau, Ph. D., D. Soc. Sc. (hon.)

Kwoh-Ting Li Professor of Economic Development
Department of Economics
Stanford University
Stanford, CA 94305-6072, U.S.A.

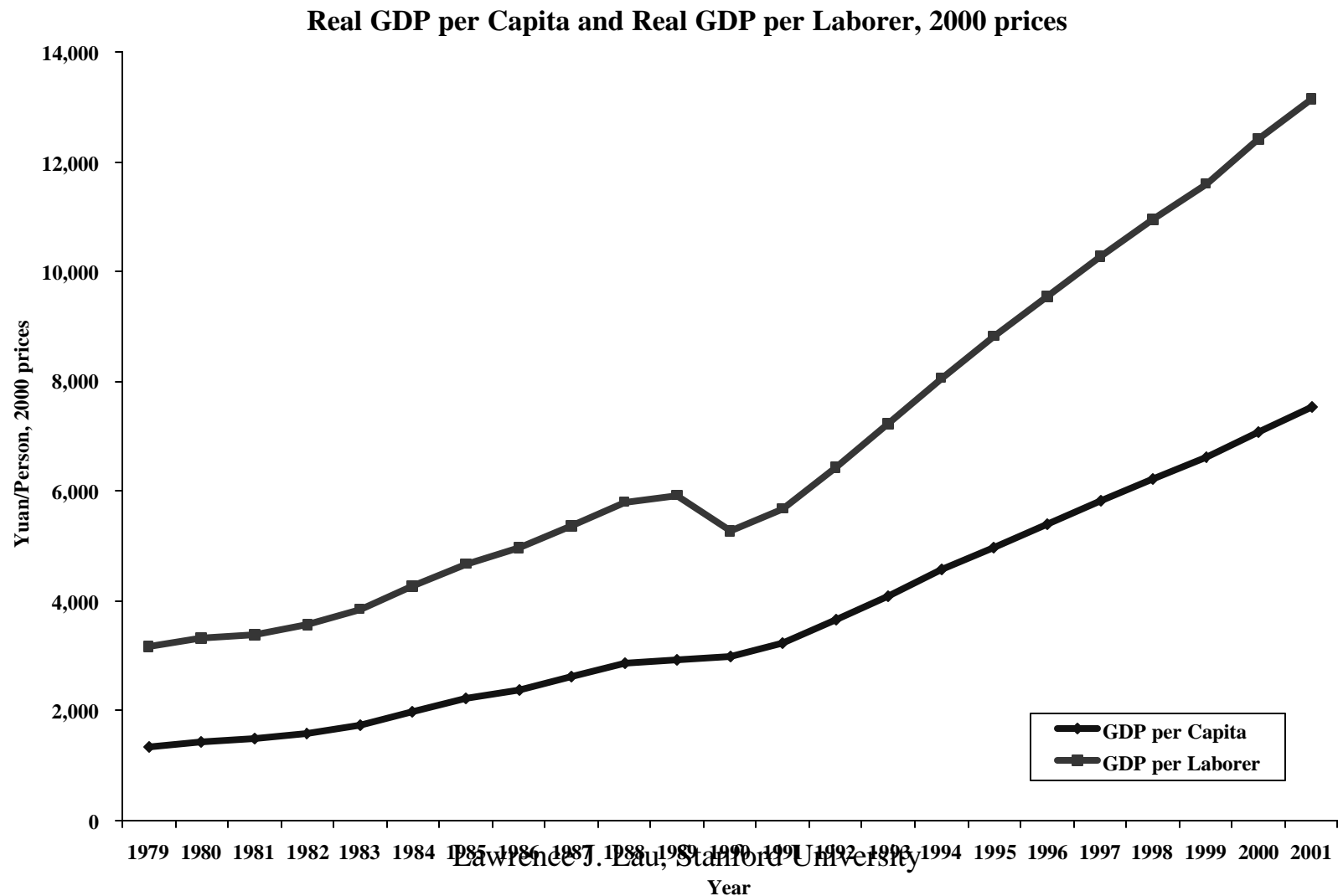
China Development Forum, Beijing, China
March 23, 2003

Phone: 1-650-723-3708; Fax: 1-650-723-7145
Email: LJLAU@STANFORD.EDU; WebPages: WWW.STANFORD.EDU/~LJLAU

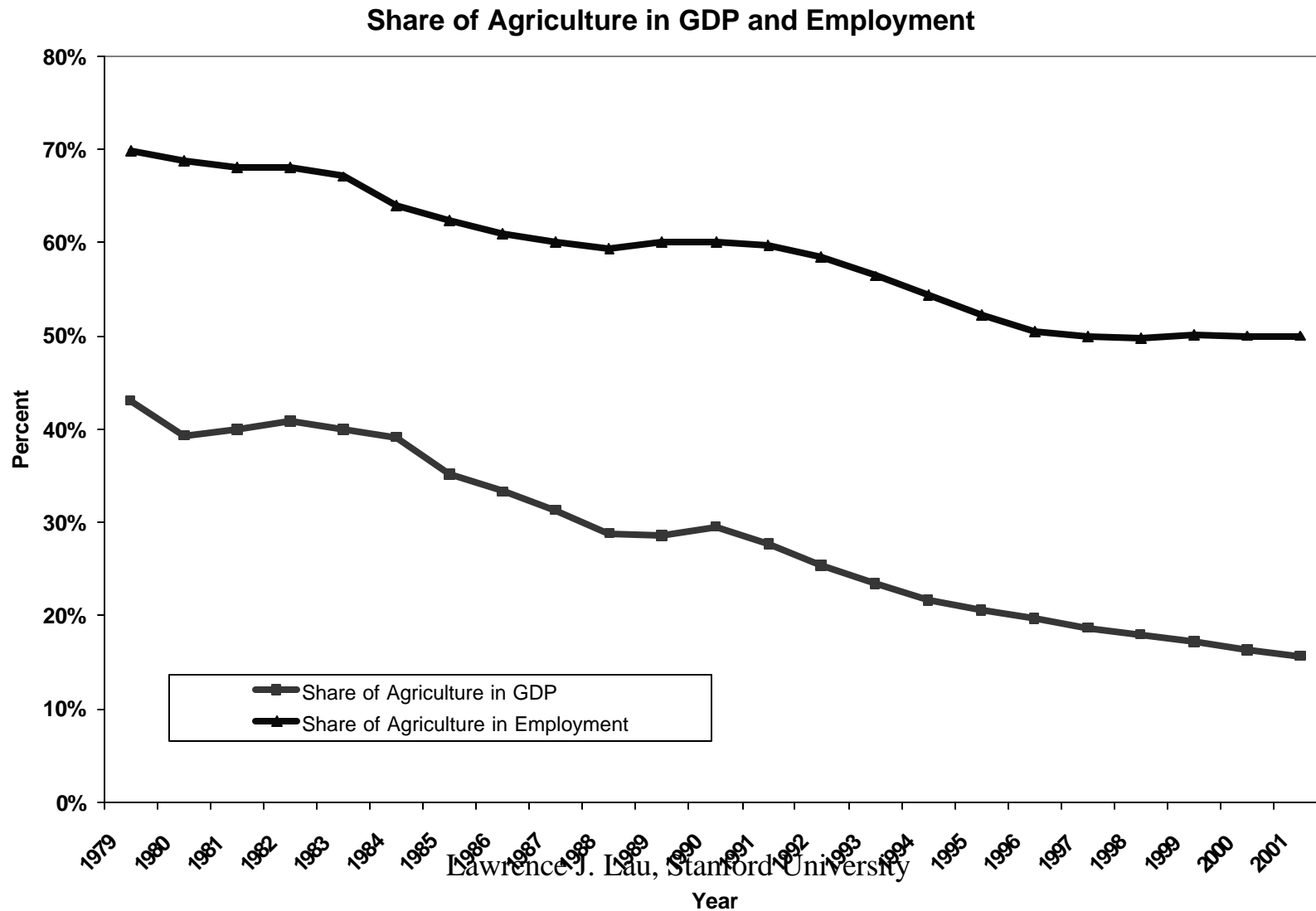
Preview

- ✍ Industrialization is the only effective strategy for raising per capita income in a sustained way in a large economy such as China.
- ✍ Urbanization is the natural complement to industrialization.
- ✍ The growth of the output (value-added) of the industrial (non-agricultural) sector depends on:
 - ✍ (1) Growth of tangible inputs—physical capital (plant, equipment and physical infrastructure) and labor; and
 - ✍ (2) Growth of intangible capital—human capital, R&D capital, and other forms of intangible capital (advertising (brand names), goodwill, software, business methods, organization, corporate or enterprise culture).
- ✍ The implications for public policy.
- ✍ Is there a role for industrial policy?
- ✍ The role of foreign direct investment.

China's Economic Record: Real GDP per Capita and per Laborer

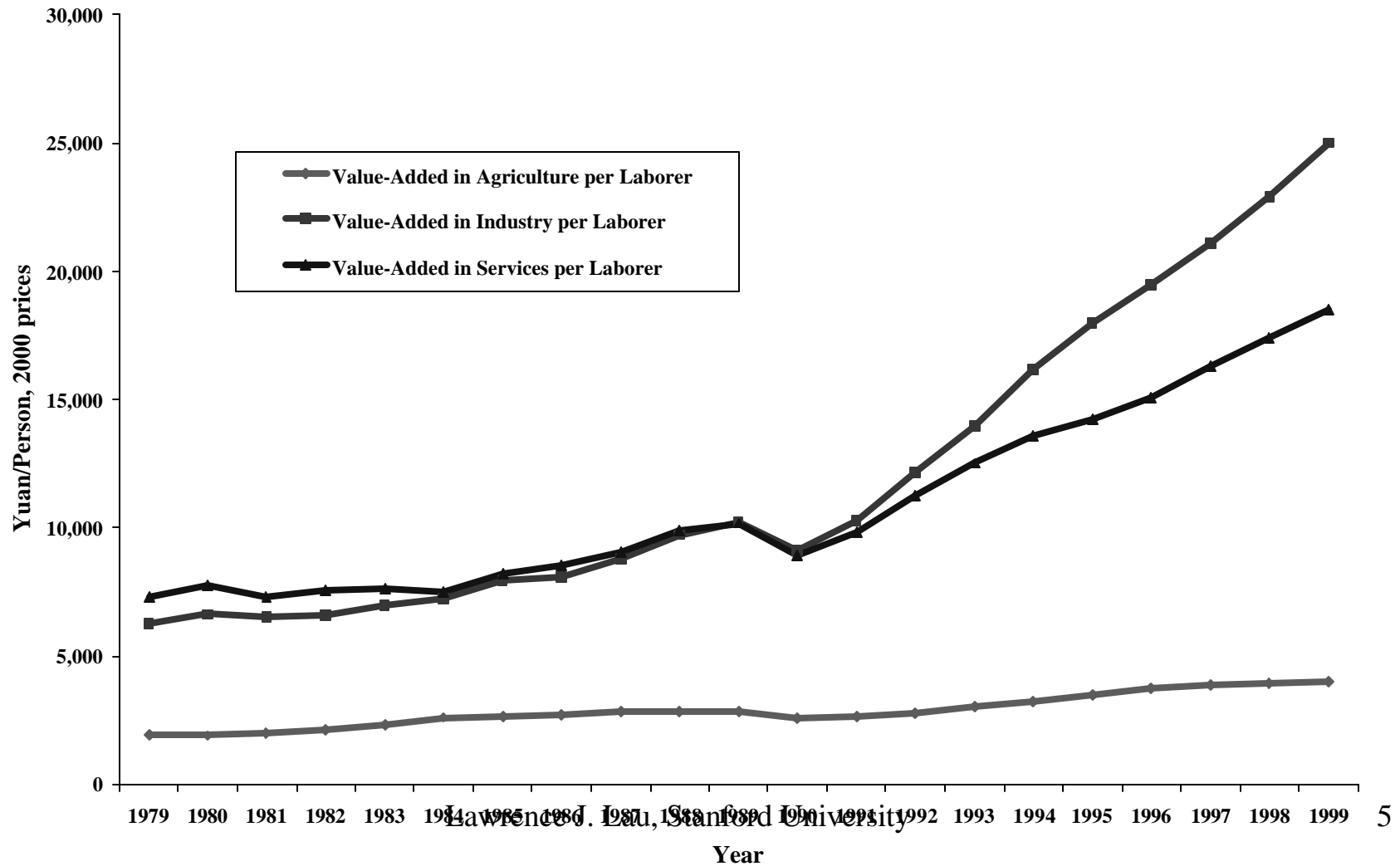


The Share of Agriculture in GDP and Employment

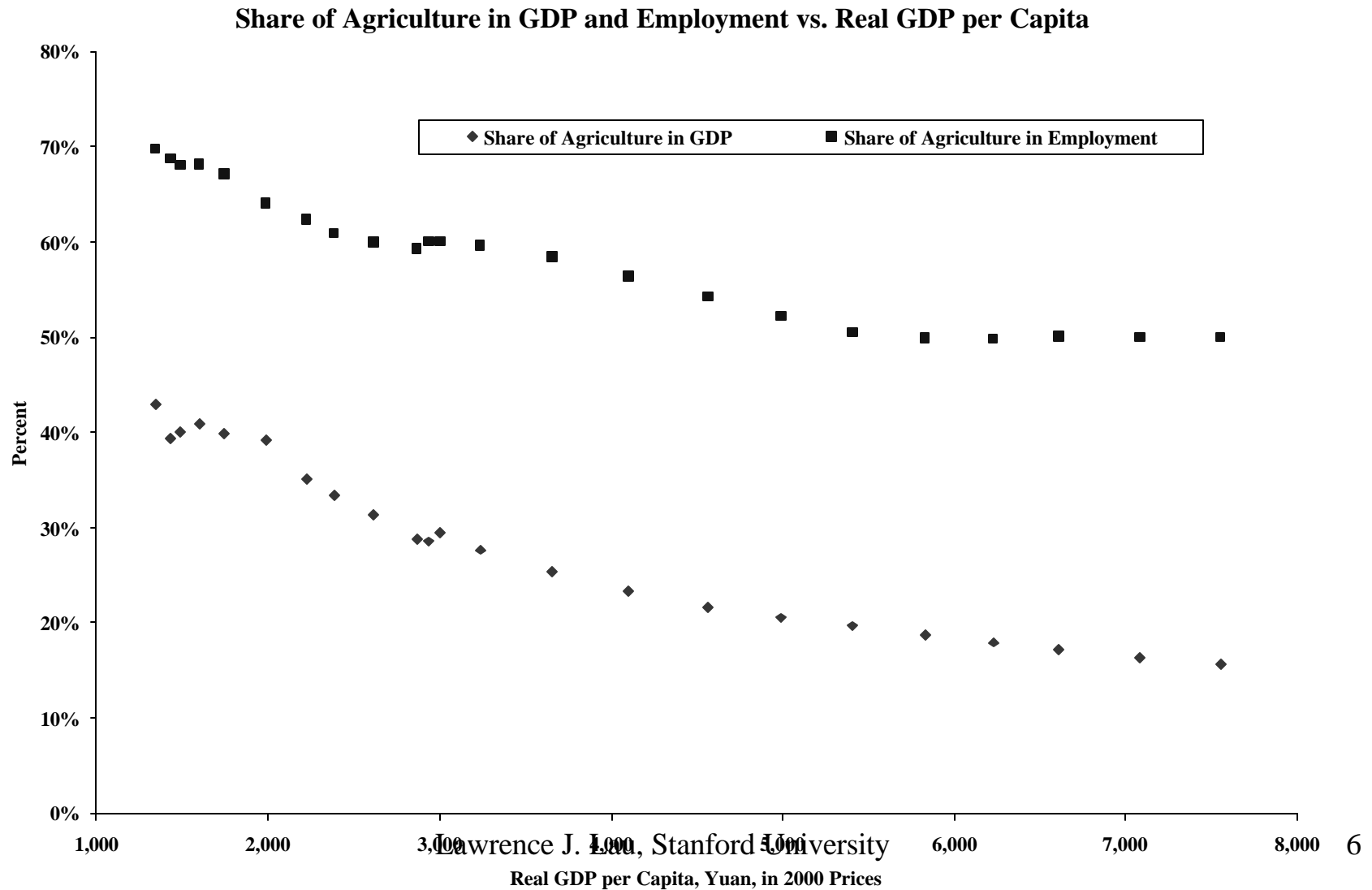


Comparison of Values-Added per Laborer in Agriculture, Industry and Services

Value-Added per Laborer by Sector, 2000 prices



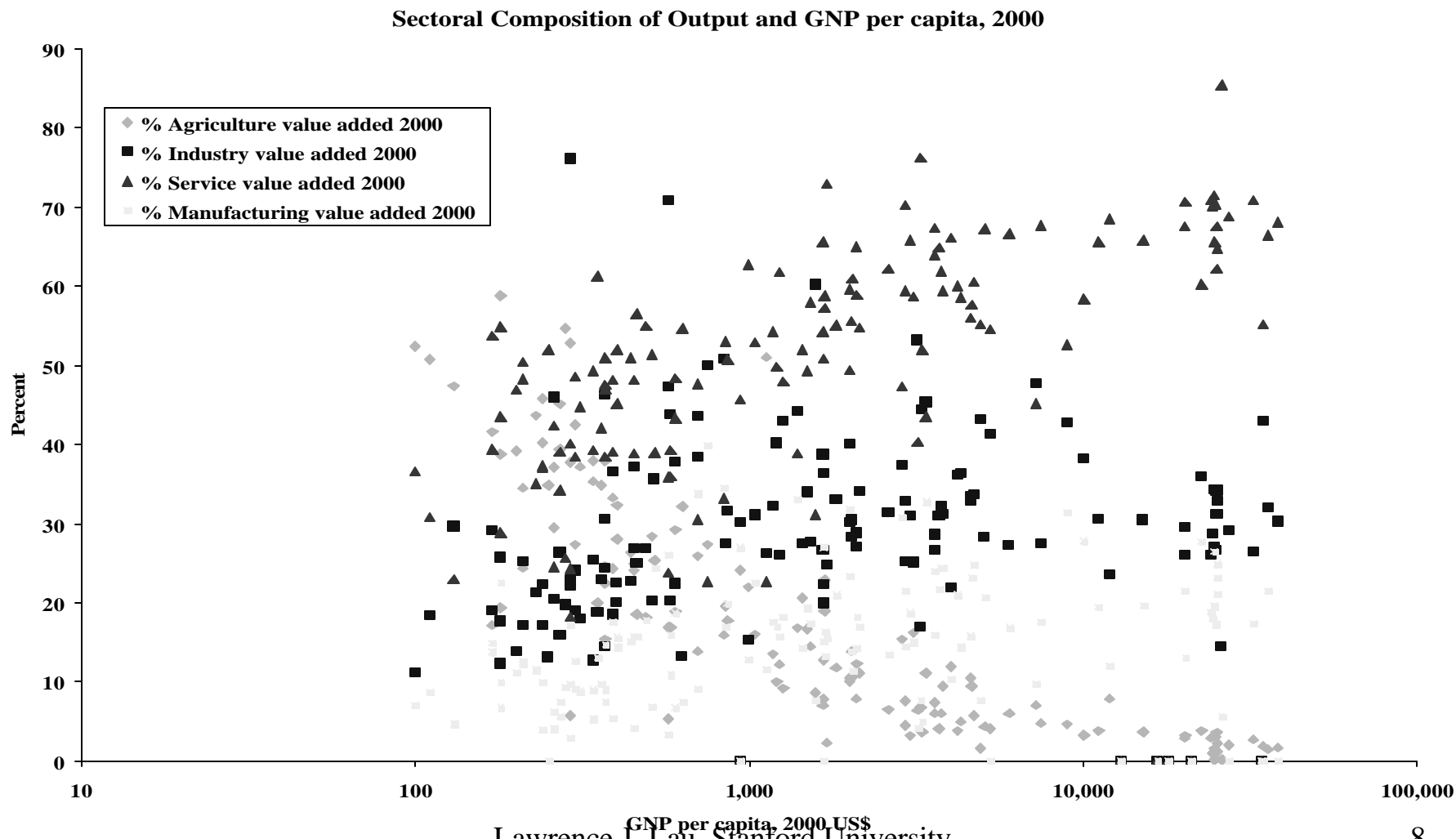
The Share of Agriculture in GDP and Employment versus Real GDP per Capita



Industrialization and Urbanization (1)

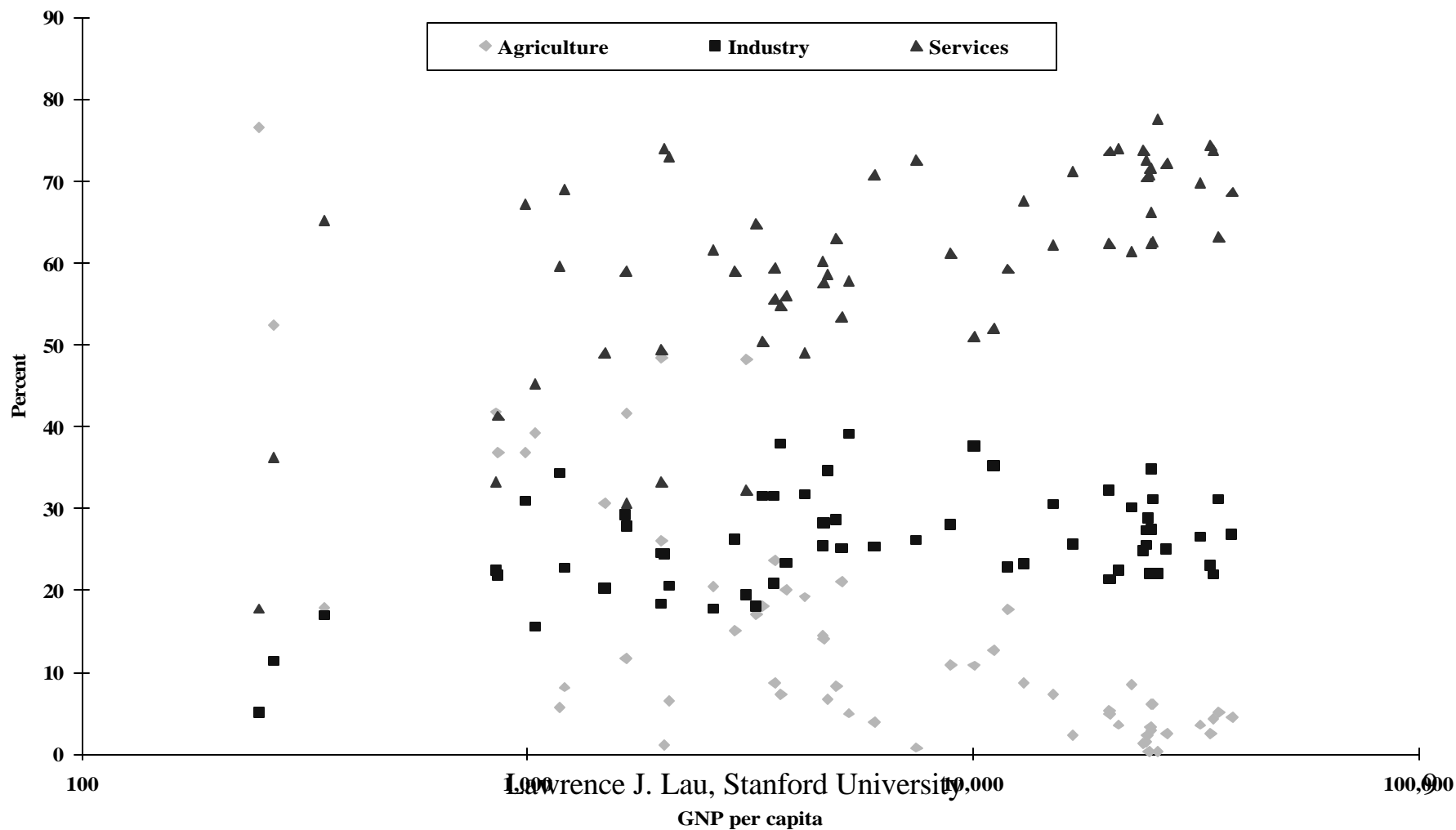
- ✍ The share of agriculture (primary sector) in GDP has declined from 43% in 1979 to less than 16% in 2001. Over the same period, the share of agriculture in employment has declined from almost 70% to 50% but appears to have stalled for the past few years.
- ✍ Given the large and increasing gap between the value-added per laborer in the agricultural and non-agricultural sectors, the transformation of the economy from agriculture to industry (and services) is inevitable in order that real GDP per capita can continue to rise. Historically, no large economy has successfully achieved a high level of real GDP per capita without a massive shift of the population and labor force out of agriculture.
- ✍ Industrialization and urbanization are complementary— industrialization (or more broadly the growth of the non-agricultural sector) requires urbanization and urbanization facilitates industrialization.

Sectoral Composition of Output and GNP per Capita, Cross-Section of All Economies, 2000



Sectoral Composition of Labor Force and GNP per Capita, Cross-Section of All Economies

Sectoral Composition of Labor Force and GNP per Capita, 2000

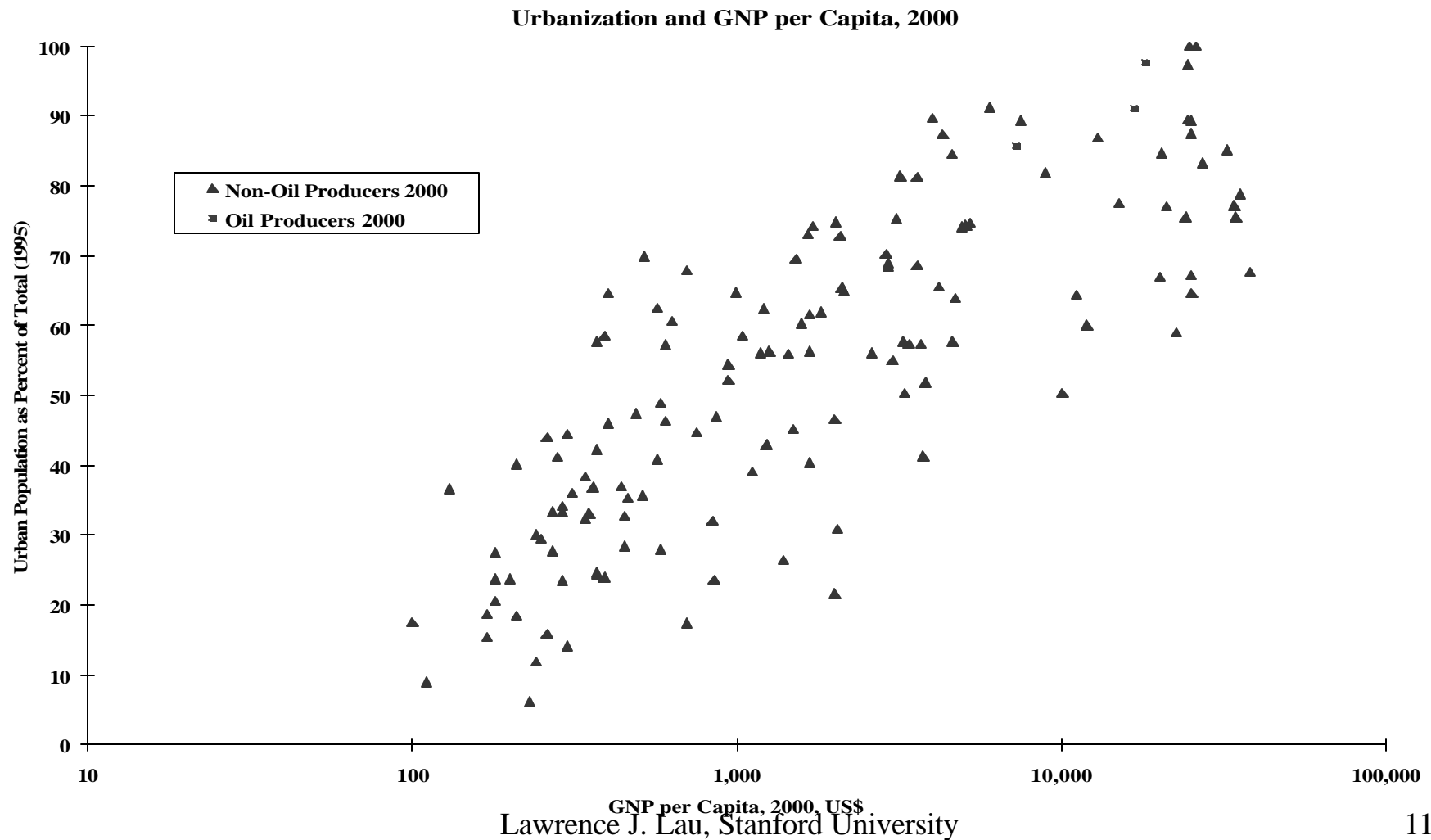


Lawrence J. Lau, Stanford University

Industrialization and Urbanization (2)

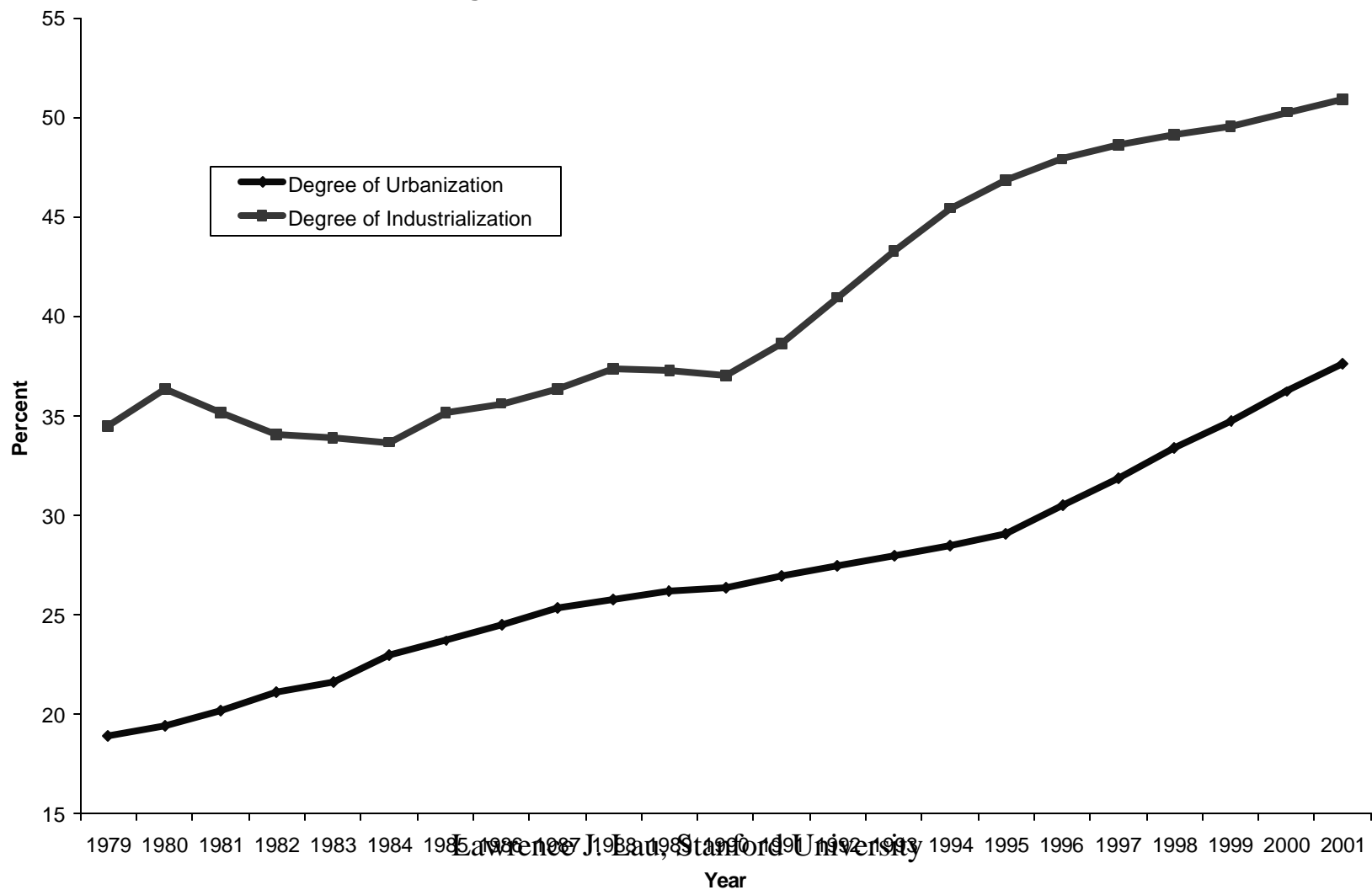
- ✍ The policy choice is: Should capital be brought to labor or should labor be brought to capital?
- ✍ Alternatively, should new cities be built where people currently live (in situ urbanization) or should people be encouraged to migrate to existing cities?
- ✍ Bringing capital to labor and building new cities where people currently live can help to redress the imbalance in the levels of development between the coastal and interior regions and minimize social disruption and costs.
- ✍ With the information and communication revolution, the costs of dispersion of people and resources are greatly reduced and the economies of agglomeration are also minimized.
- ✍ Building new cities and the associated communication, transportation and power infrastructure can generate a significant source of new domestic aggregate demand.

The Degree of Urbanization and GNP per Capita, Cross-Section of All Economies

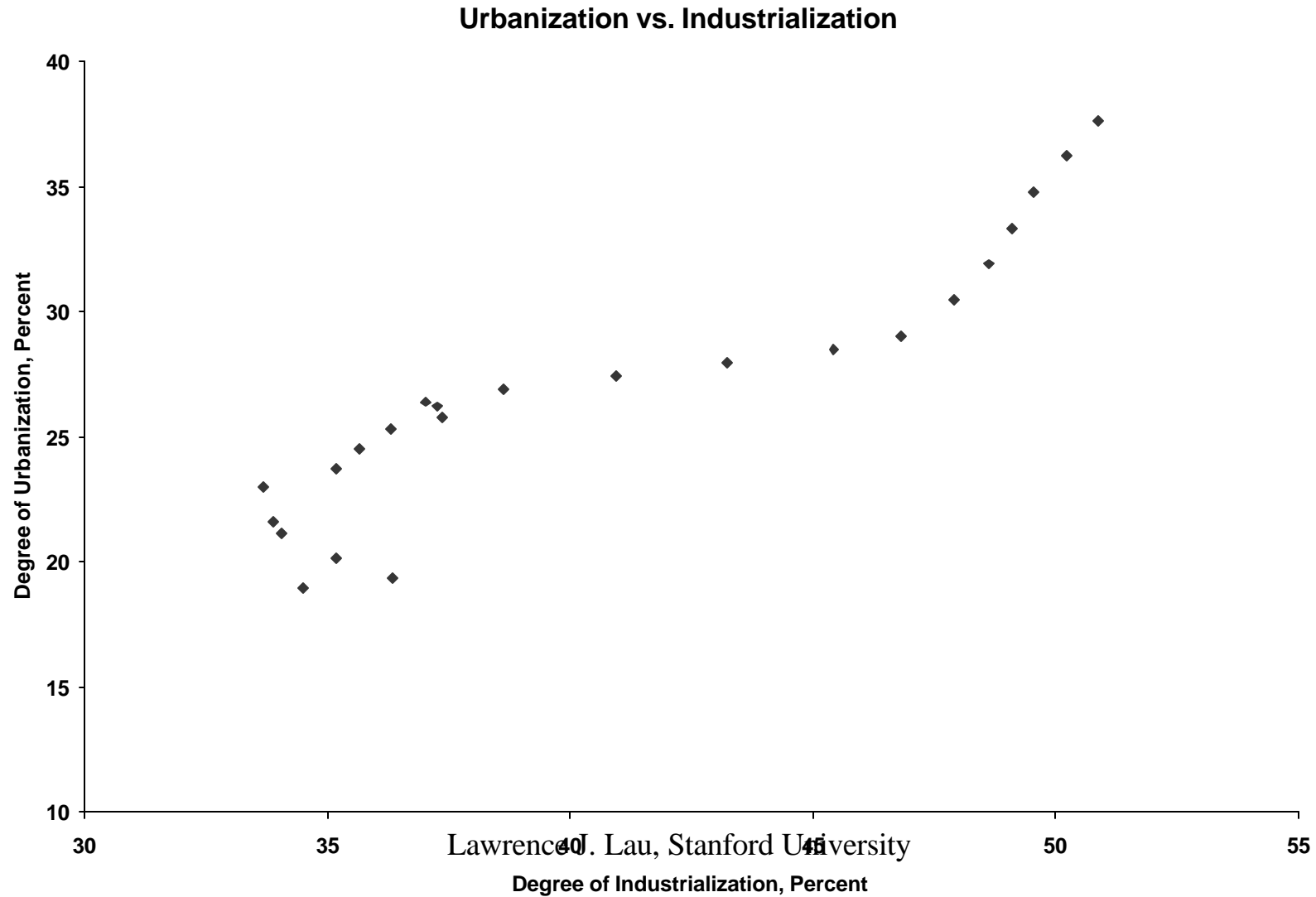


The Degrees of Industrialization and Urbanization in China

The Degrees of Industrialization and Urbanization

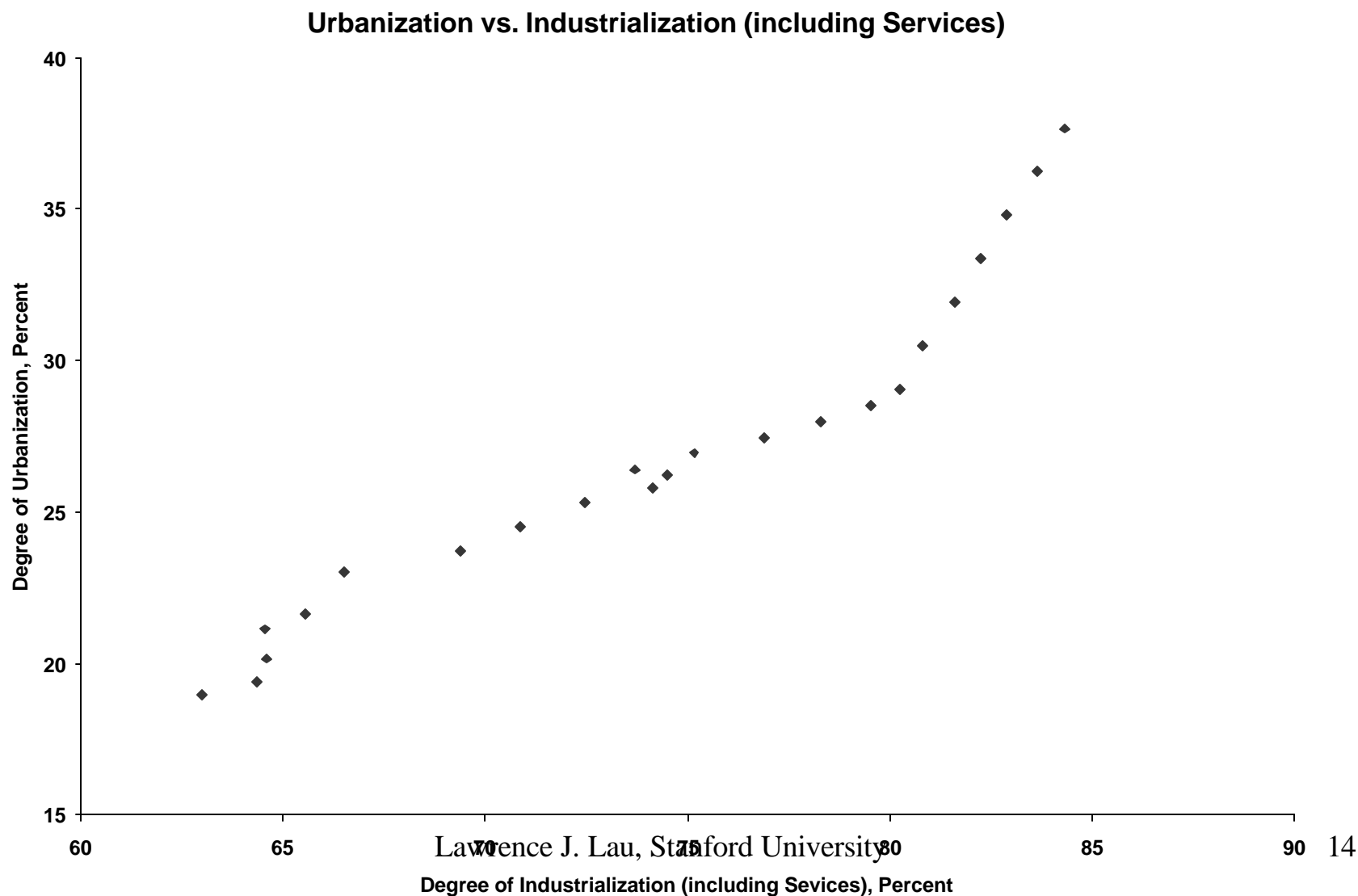


The Complementarity of Urbanization and Industrialization



Lawrence H. Lau, Stanford University

The Complementarity of Urbanization and Industrialization (Including Services)

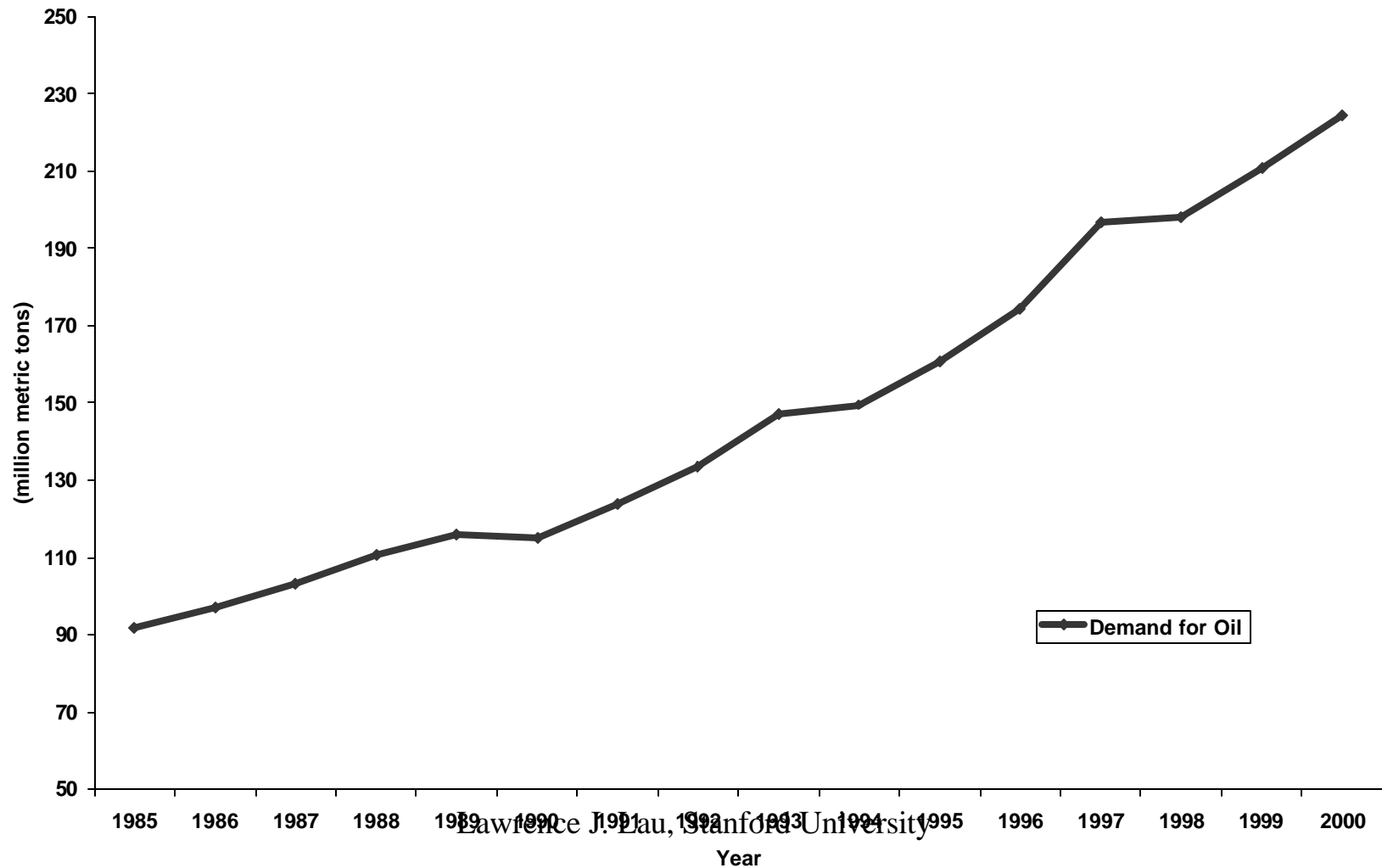


Industrialization and Urbanization (3)

- ✂ What types of cities are the best for China (and for the world)?
- ✂ “A car in every garage” is a nightmare scenario for China and the World. (Imagine 400 million automobiles on the road and a replacement demand of at least 40 million automobiles a year eventually!)
- ✂ China has become a net importer of oil in the mid-1990s and its import dependence is well on its way to exceeding 50% within a decade or two.
- ✂ Urban life in Los Angeles and San Jose, where an automobile is indispensable, is not the right model for Chinese cities; the right model is London, New York, Paris and Singapore.
- ✂ Urban sprawl and the traffic congestion that it generates are the natural outcomes of the growth of cities in the absence of adequate urban planning.
- ✂ Convenient, user-friendly urban mass transit is the only feasible substitute to the automobile, but it works effectively only in cities with high-density residential and non-residential neighborhoods.
- ✂ In order to achieve high densities, urban planning is essential.
- ✂ New cities can be planned from scratch, and the design and construction of mass transit (including the manufacture of the equipment and rolling stock) in medium-sized (say, between 1 and 2 million population) cities can become a growth industry in itself. Over the next decade or two, the number of such new cities is easily on the order of 50 to 100.

The Chinese Demand for Oil

Total Petroleum Consumption

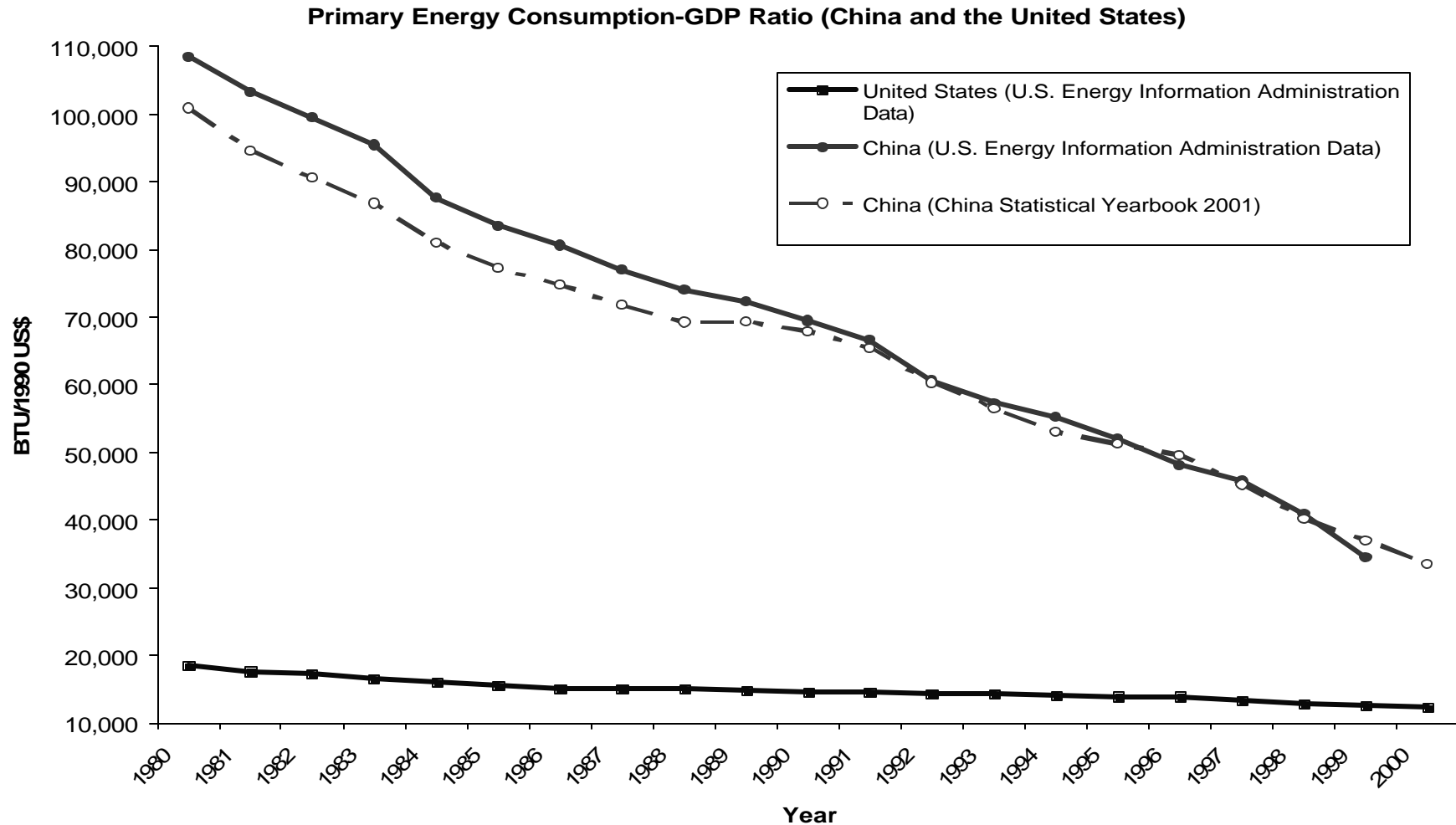


Lawrence J. Lau, Stanford University

Energy Efficiency

- ✍ Energy efficiency, in terms of energy consumption per unit GDP, has improved significantly in the past decade.
- ✍ It is, however, still considerably higher than that of the United States, Japan, and other developed economies. In part, this reflects the sectoral composition of GDP; but in part, this also indicates considerable room for further improvements.
- ✍ The government can mandate energy efficiency standards, and can impose taxes on particular industries and/or products. For example, in addition to the promotion of urban mass transit, China can impose a tax on gasoline consumption that is similar in order of magnitude to that in the Western European countries, or a gas guzzler tax (license fee) that penalizes inefficient automobile engines, or both.
- ✍ Encouragement of the substitution of oil by other fuels, such as natural gas.
- ✍ Support for the development and commercialization of new technologies, such as fuel cells, or a hydrogen car. China has the potential of leap-frogging because it has a vast domestic market but no strong vested interest yet to protect, no existing investment that must be amortized. It is relatively low cost for China to switch to a hydrogen car but not so for the United States because of all the sunken investment in the stock of automobiles, in the invested structures and equipment of the automobile industry, and in the extensive gasoline-based fuel distribution system. (The potential for leap-frogging is real. For example, most Chinese people do not know what a VHS videotape recorder player is and never will. They go directly to the video compact disc (VCD) and then the DVD. In contrast, sales and rentals of VHS videotapes are still a substantial business in the United States.)

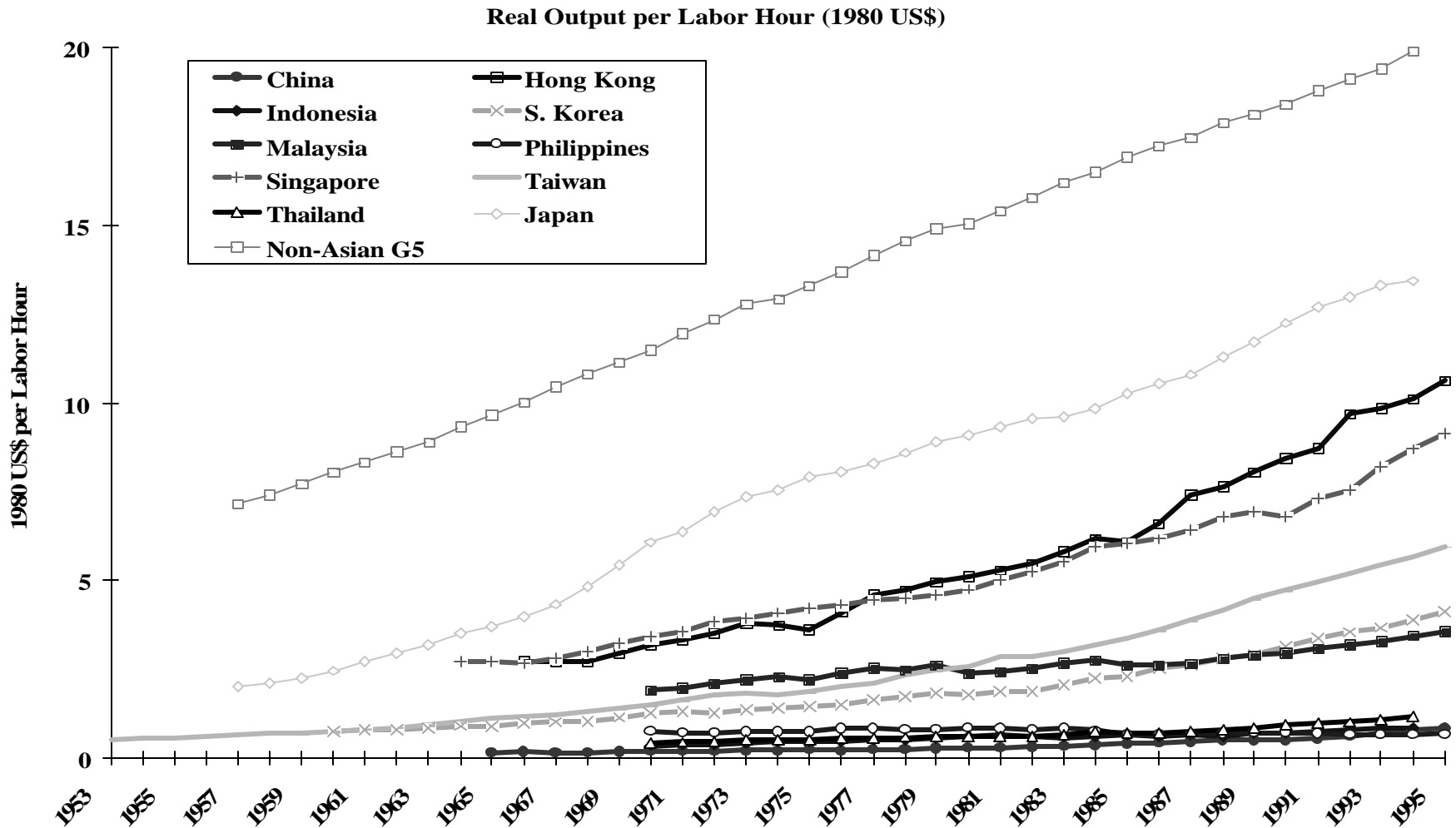
Primary Energy Consumption-GDP Ratio (China and the United States)



The Sources of Economic Growth

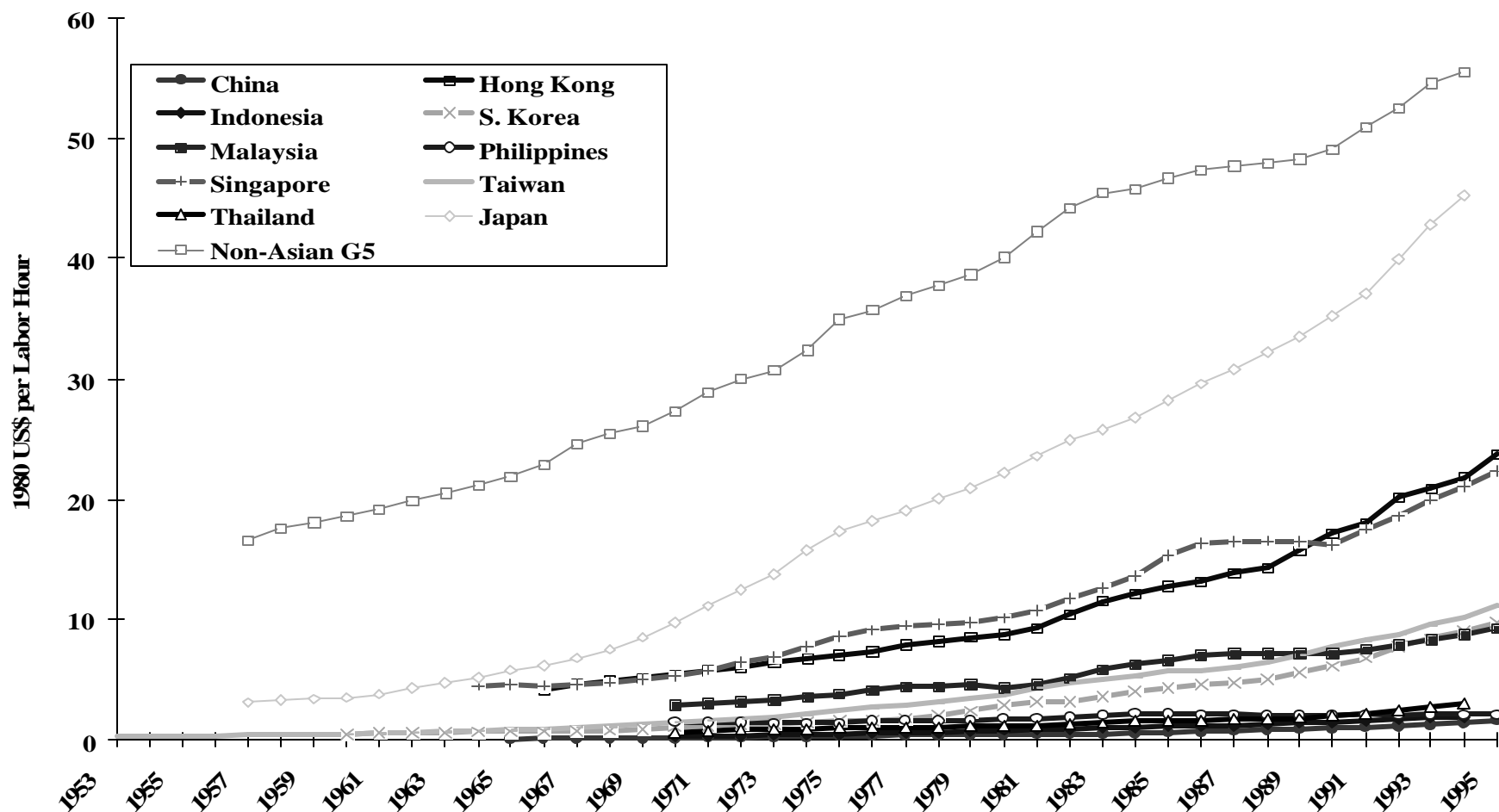
- ✍ Different types of measured inputs--tangible capital, labor, and intangible capital-- play different roles at different stages of economic growth.
- ✍ Tangible capital accumulation is the most important source of growth in the early stage of economic development, and in particular in the East Asian NIEs and China in the postwar period. Technical progress, the ability of producing greater output with the same inputs, which may be identified with economically significant innovation, has played only a minor role in the East Asian NIEs, in contrast to the situation in the developed economies.
- ✍ But simply accumulating tangible capital is not enough--it must also be efficiently allocated. Efficient tangible capital accumulation is the major accomplishment of the East Asian NIEs in the postwar period and of China since its economic reform began in 1979.
- ✍ Intangible capital accumulation, which is the primary cause of measured technical progress, becomes important only after a certain level of tangible capital per worker is achieved. However, there is also evidence of positive measured technical progress in the more recent period in South Korea, Singapore and Taiwan, reflecting their increased investment in intangible capital.
- ✍ The growth of tangible inputs, in particular tangible capital, will continue to be the most important source of economic growth in China as it catches up to the developed and newly industrialized economies in terms of tangible capital intensity (equivalently, the tangible capital per unit labor). Given the existing Chinese factor proportions—a very low tangible capital per unit labor—the marginal productivity of tangible capital will remain high for years and decades to come.
- ✍ There are, however, also opportunities for leap-frogging.

Real Output per Labor Hour (1980 US\$)

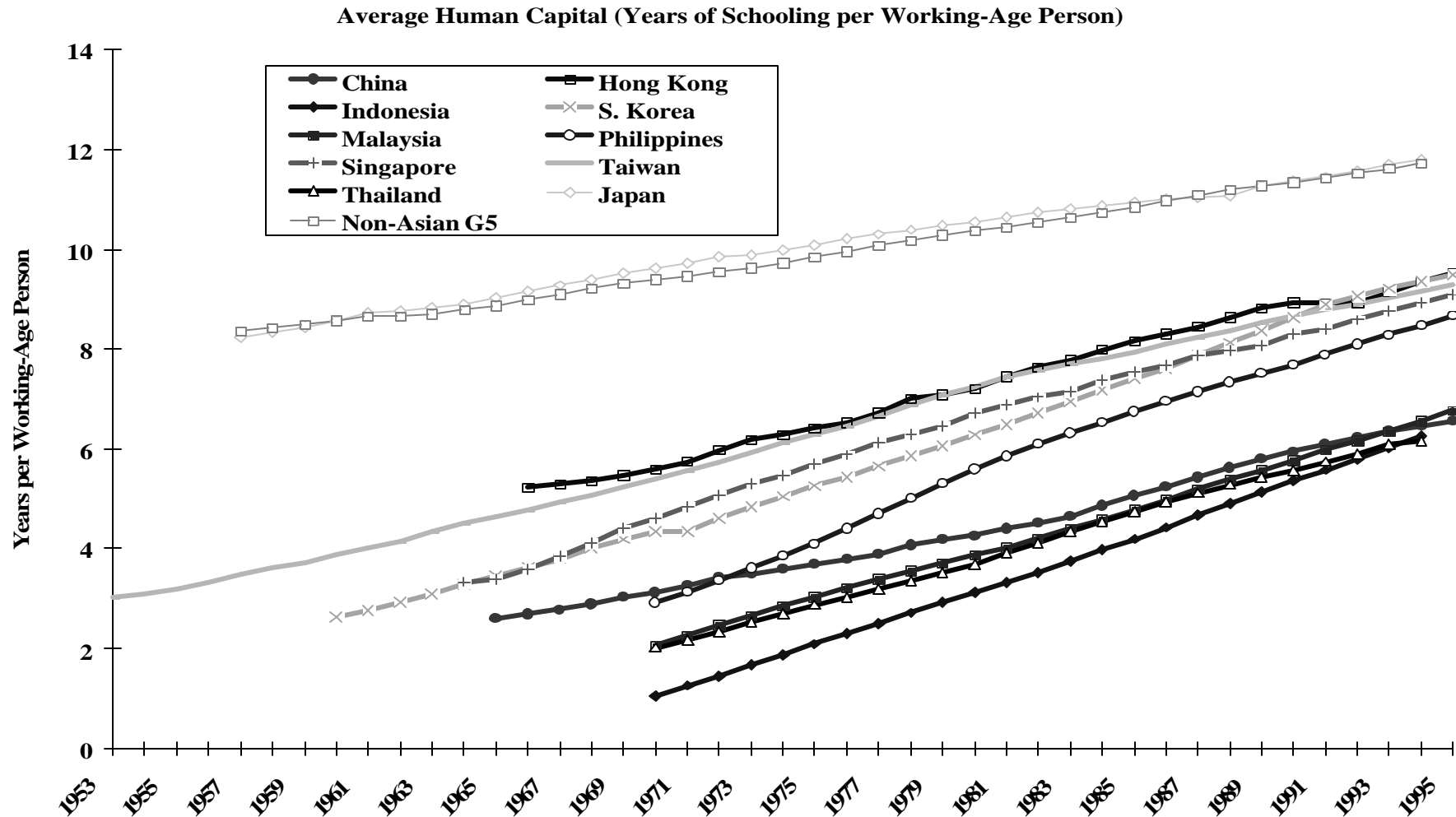


Tangible Capital Stock per Labor Hour (1980 US\$): Selected Economies

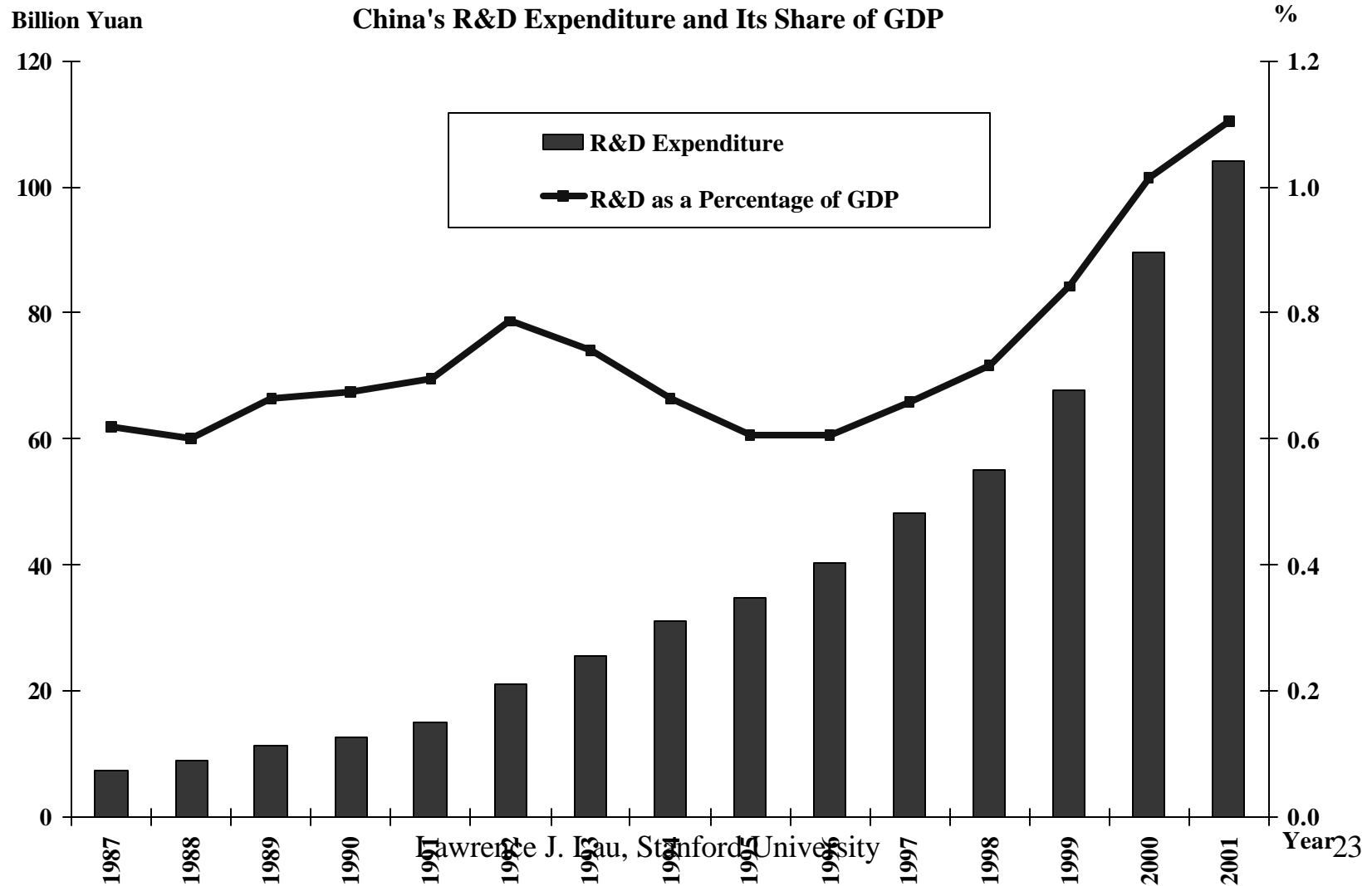
Tangible Capital Stock per Labor Hour (1980 U.S.\$)



Average Human Capital: Selected Economies

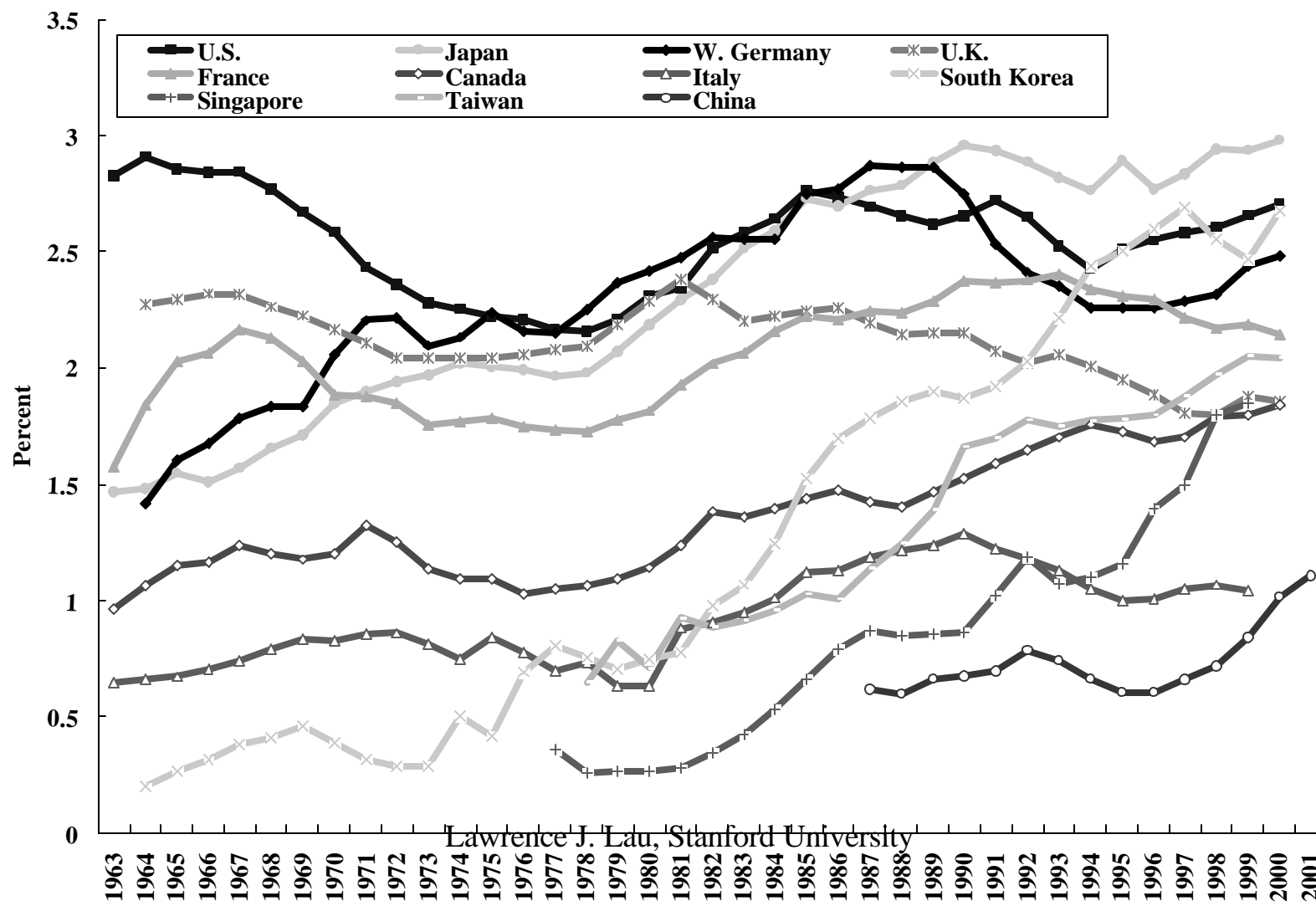


R&D Expenditures: China



R&D Expenditures as a Ratio of GDP: G-7 Countries, 3 East Asian NIES & China

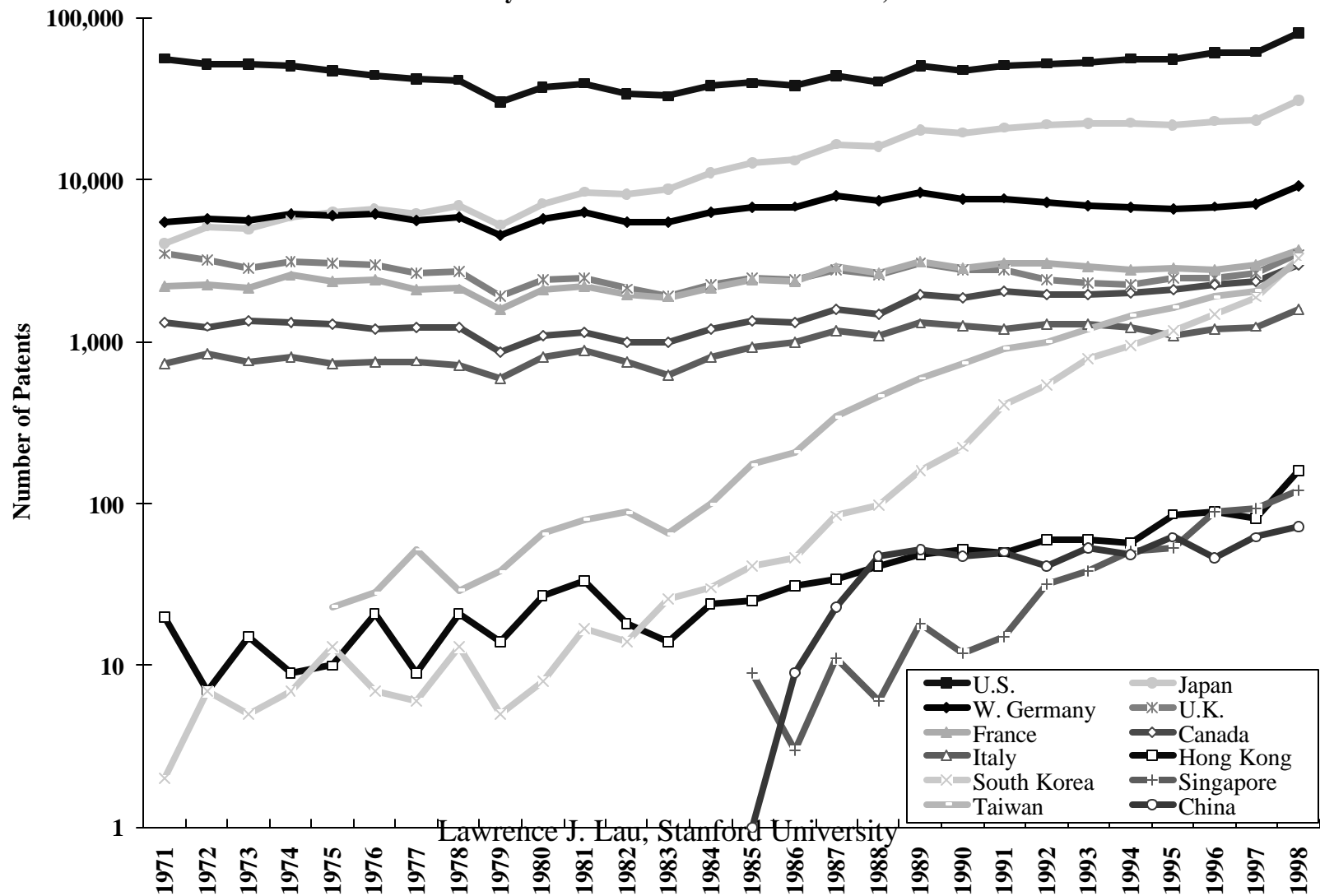
Figure 8.1: R&D Expenditures as a Percentage of GDP: G-7 Countries, 3 East Asian NIEs and China



Lawrence J. Lau, Stanford University

Patents Granted in the United States: G-7 Countries and East Asian Developing Countries

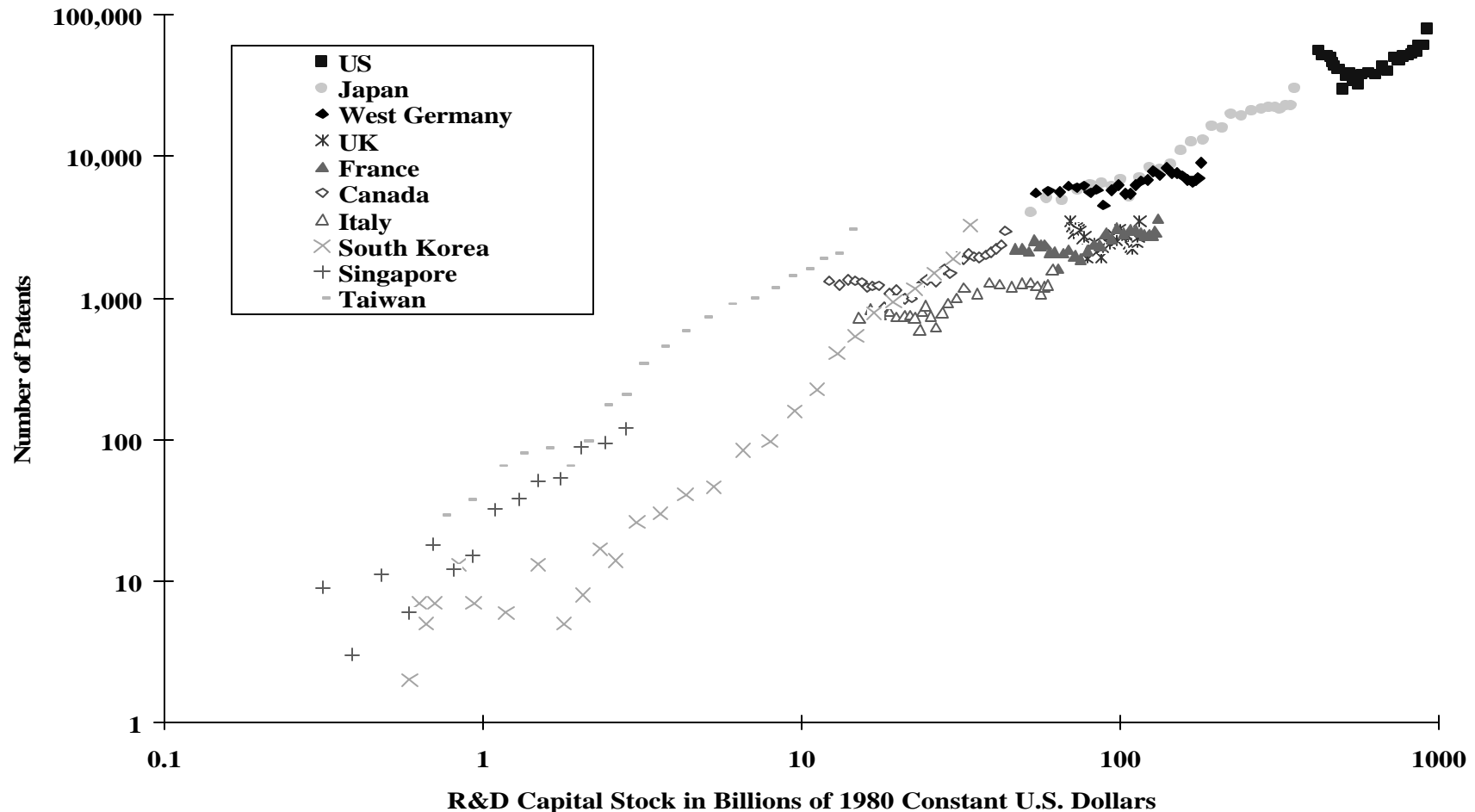
Table 8.3: Patents Granted Annually in the United States: G7 Countries, 4 East Asian NIEs and China



Lawrence J. Lau, Stanford University

Patents Granted in the United States and R&D Capital Stock

Figure 8.4: The Number of U.S. Patents Granted Annually vs. R&D Capital Stocks



Lawrence J. Lau, Stanford University

The Implications for Public Policy: What Can and Should the Government Do?

- ✍ Maintenance of a stable macroeconomic climate and an open and competitive market environment with free entry and exit (use of anti-trust laws to prevent unfair competition and monopolistic practices). This includes the eliminations of barriers to the free flow of goods, services and factors (capital and labor) so as to create an integrated national market within China itself. Competition and a large domestic market both facilitate innovation.
- ✍ Investment in infrastructure (both tangible and intangible), especially in development-leading infrastructure (e.g., the development of the Great West).
- ✍ Promotion of investment in intangible capital (human capital and R&D), especially basic education and basic research; tax incentives for education and R&D, which are the long-run foundations for innovation. Investment in human capital at the basic education level is the proven most effective way of making the income distribution more equitable.
- ✍ Implementation of the “rule of law”—enforcement of contracts and prosecution of fraud; insistence on transparency and good corporate governance and stringent auditing standards; protection of tangible and intangible property rights, including patents, copyrights, brand names and trade secrets.
- ✍ Creation and continued provision of a credible and viable social safety net, independently of enterprises, that enhances labor mobility and flexibility as well as social stability without diminishing the incentives to work.
- ✍ Commitment to and focus on economic development—creating and reinforcing self-fulfilling expectations.

Is There a Role for Industrial Policy, Broadly Defined?

- ✍ It is in general difficult to “pick winners and losers.”
- ✍ It is also in general difficult to justify picking winners and losers, except in cases of (1) significant non-appropriable externalities (and indivisibilities), e.g., urban mass transit; basic research; (2) co-ordination failures (lack of credible commitment); and (3) incompleteness or imperfection of markets.
- ✍ The Government should, insofar as possible, not do anything that the non-state sector can do adequately. It should also try, over time, to move to a system of regulation by negative lists rather than positive lists. In other words, enterprises should be allowed to do anything that is not expressly forbidden or violates any current laws or regulations rather than just those things that are explicitly permitted. Allowing enterprises more freedom and flexibility can encourage greater experimentation and hence innovation.
- ✍ Direct and indirect support for education and for R&D—Information and communication technology, biotechnology, nanotechnology.
- ✍ Investment in “development-leading” infrastructure, e.g., the “New Silk Road.”
- ✍ Facilitating the creation and expansion of demand—e.g., the creation of a market for mortgage-backed bonds for the long-term financing of private, residential, owner-occupied housing; the accreditation, regulation and standardization of public services such as education and healthcare.
- ✍ Strengthening the capital markets and encouraging and facilitating long-term equity investments by the public.

The Role of Foreign Direct Investment (1)

- ✍ With a national savings rate of approximately 40%, a recurrent healthy current account surplus and ample reserves, it is not the money that China needs.
- ✍ Doing business in a foreign country is always more difficult. Foreign direct investors invest in China only because they believe they can add significant value based on their comparative advantage in technology, know-how, marketing (including established brand names) and business methods. They only come because they know they can bring something that China does not have and do something that Chinese enterprises on their own cannot do. Thus, foreign direct investment facilitates innovation in China.
- ✍ Foreign direct investors should be accorded national treatment, no more, no less. There should be a level playing field between foreign-invested enterprises and domestic enterprises (and between state-owned and non-state-owned enterprises), except possibly in industries critical to national security, such as defense industries and telecommunication or public transportation.
- ✍ Except in these industries, as long as a foreign direct investor is not given special privileges, including monopoly or quasi-monopoly franchises, that domestic enterprises do not have, and comply with all applicable Chinese laws (e.g., on environment, foreign exchange transactions, labor and taxation), it should be allowed to make its investment, up to 100% ownership, and conduct its business as it sees fit.
- ✍ As long as a foreign direct investor is prepared to invest (and risk) its own money, the Chinese Government should not worry excessively that the investment project of the foreign directly investor, according to the analysis of the Chinese Government, does not seem to yield an economic return. The Chinese Government has little or nothing to lose.

The Role of Foreign Direct Investment (2)

- ✍ After all, the tangible investment (the structures and equipment) will be located in China and most of the new employment generated will be taken up by Chinese workers. If the investment does not work out for any reason, chances are that another enterprise will be able to pick up the pieces for a fraction of its original cost and continue operating it in China.
- ✍ Competition, both domestic and foreign, should be encouraged. The Chinese domestic market is large enough to have multiple major players. Chinese consumers and Chinese workers will ultimately benefit from the competition among Chinese and foreign-invested enterprises through lower prices and higher wages and greater opportunities for learning.
- ✍ Foreign direct investors should be allowed to decide on their own whether they need Chinese joint venture partners or not. Requiring a joint venture as a prior condition may actually discourage foreign direct investors with the most advanced technologies. Technology transfer will occur through diffusion and spillover in any case.
- ✍ Foreign direct investment is long-term investment, and unlike foreign portfolio investment and bank loans, cannot be easily withdrawn in a time of crisis. Foreign direct investment brings mostly benefits, and little costs and risks to China. It is true that some inefficient Chinese enterprises may have to shut down because of the competition. But if they are not economically viable to start with, closure is only a matter of time, without or without the foreign direct investor. It is far better for Chinese workers to work at an enterprise that is viable in the long run, regardless of its ownership, than to hang on at an enterprise with a precarious and uncertain future.
- ✍ Both inward and outward foreign direct investment should be encouraged.