

The New International Scholastic Order

An essay on political economy of science

Bijan Bidabad

Student Term Paper prepared for the class of Economic Development

(Master of Science in Economics)

Shiraz University

1980

Cognition of the problem

For having a look at the system of Metropolis-Satellite in the current world we have to put the dominance relation under a general survey. In this paper I try to inspect one of the aspects of this system that is the “EXPORTATION OF SCIENCE”¹ by metropolis to other countries and areas. Sometimes there is this ignorance about technology that it is based only on capital; but another actual different of its contributors would be: “technology is a combination of capital and science”. With this view about technology and science, I am going to say that the metropolis who has been exploiting undeveloped countries for a long time, would never give the above combination for his exploitation profits. If any undeveloped country has enough capital resources, she can not industrialize herself because of not having other factor (science) or on the other hand having “distorted science”. It would be plausible to say only the gap between metropolis and periphery is resulted from their per capita income or other criteria so like. They are just some deficient indicators. There are some rich undeveloped countries that can successfully compete in per capita income with highest progressed countries. By finding fruitful way of science using and therefore ways of production, this gap has been created throughout the history. Now we are settled in a world that some countries are very developed in science, and I think this is one of the most important factors which have been neglected.

With the above abstract looking at the problem let’s make following categories:

First: They (developed countries) know this factor (science) function and its importance in the world political-economic system.

Second: They do not send us (undeveloped countries) their science (because it is the secret of their domination).

Third: They know, one of the secrets of progress is technology-combination of science & capital- If undeveloped countries have these together, then will be able to develop. And also they know undeveloped countries shortages of capital, so they allow undeveloped countries to get some segments of other factor (science)- which is distorted or never useful for undeveloped countries with respect to their economic circumstances.

Fourth: There are some segments of science, top secret for ruling control over the other superpower.

Fifth: There are also some segments whom they keep out of reach of European countries (like their ways of production and so on)-because they are aware of this matter that is any other country finds their secrets of production, then it will create some powers like them and compete with them for domination on world markets.

I think, the problem has been introduced briefly. Now I am going to give my methodology for recognizing and proving above statements. At the first instance in a general acknowledgment, science terminology, function of scientist in the process of history, the thesis: “science for science” and thesis “science in the serve of people” will be inspected. In the second section the sphere of universities by implicit or indirect influence of ruling class of metropolitan area is described; and in the next, explicit direct role of public sector is going to be explained. The last section allocated to the channels of transfer of science from developed to undeveloped countries, and then the prevailed science is under question as conclusion.

¹ Definition of science will come later.

General acknowledgment

Everybody imagines science as a key to solve the problems and troubles for man in the process of history. When some influential people tried to use it as an instrument or tool for their benefits, it became slave for slave-dealer or ruling classes of the societies. As we have seen in the Medieval, science was a tool for Christian clergies. Scholastic is the name of this slave-being of science in the serve of church, or let us say the science, art, and philosophy had an obligation and it was scientific explanation and description of what church offered as principles of Christian religion. On the other hand, science did not determine her realm or principles and subjects; rather Christian clergies determined them. They ordered to science that should think about the specific unknowns and problems. Science had no any other way- an obligation- to do.

“Scholastic” derives from “schola” in the meaning of school. In Medieval schola formed of dependent schools to the church and there were many philosophers and scientists inside who were researching about the subjects that church offered them. Renaissance was the cry of science deliverance of the church domination. Having a look at the history of changes in Medieval, at the social science especially, and particularly at political ideas; will prove the above statement. When science became free of the church domination, lay under the hands of new industrialism startled to change the old ways of life and the societies suddenly. New civilization constructed during two or three centuries, and made the human -ruling class- dominant over the nature. The new civilization brought new circumstances and conditions for new ways of human exploitation. New upper classes appeared and begun to govern over this process; science went under the domination of this new classes again. As Franchises Bike said: “In spite of the science has not been fallen in a way to search truth, has been chosen to search benefits of powers and powerful”. So power substituted for truth, as the goal for science.

Today all sciences have one message and responsibility; it is granting power to the powerful. When the goal of science is: “making powerful” becomes powerless, because of science power derived from leading and guiding, and not power; and when attainment of power is the aim of science and pushes the truth searching out, results to make peace with her enemy “money”. This is the new scholastic who everybody thinks: science is free but it is “slave of power”. According to Max Plan speech: “over the door of science temple has been written, anybody who cross in must have faith”. For more analyses on science it is necessary to have meaning of science and function of scientist in whole aspect of social life.

With man as with every other species, the primary aim of thought and action is to satisfy her “needs” and to preserve her life. The “needs” which have been caused are not something new that suddenly inspired exceptional people to undertake anew kind of activity. They are ordinary springing from the general insecurity of human life: security is obtained by first knowing the facts, knowing what situation is in which we find ourselves and secondly knowing how to manipulate it to our own advantage. I do not want to pursue the investigation of anthropological background of science- but it was so helpful if restrictions would permit.

Knowing how to manipulate our environment to our own advantage, gives us the power upon which our general security can be based. This ability can be achieved in a limited way; by simply generalization of the information which we already had about the world, so that predictions of the future course of events can be made by inference from what is the case now.

For completing the above statement let us see another point of view: “when man first began

wonder about the world, science was born”.² But it is not acceptable; because abstractly, survival was more important than wondering, or let us say satisfaction of basic needs is more prior than more minor elements- like wondering. But this is true: as she wondered around for survival she learned about her environment. We should note that wondering is done for aim of survival not for the nature of wondering.

The thesis “science for science” is based on this-or above- foundation: satisfaction of inquisitiveness or curiosity sentiment. The expression offered has forgotten the social aspects of science; satisfaction of curiosity sense is beyond being alive and is based upon having security- without having security for being alive, satisfaction searching for wondering is fallacious. Therefore science came to bring: how ways of being secure and alive.

For my analysis in this paper I think it would be enough that a general definition of science be offered as follow: Science is general acquaintance and knowledge about general objective and objects.³ A branch of social sciences more dynamic than other branches, changes with changes occur in societies; social sciences are knowledge of these disciplines that deal with human behavior and its results in a society. The natural sciences like physic, chemistry and... have very stable conditions and rules that with the necessary appropriate environments are applicable. But in the social sciences there are no exactly axioms or rules. My purpose of determination of social science sphere of influence is because of this analysis will expand on the undeveloped countries circumstances.

For proving that the science is not beyond the social or natural relations and realities, I try to introduce the function of scientist and her behavior and methodology to solve the problems. Scientists observe what happens. Whenever she can manipulate things so that she may observe what happens under certain circumstances. This helps her to discover laws of nature. Having discovered some, they try to combine them into theories. Philosopher, even of science does none of these things. She asks himself such question as: what is a law of nature? What is a scientific theory? Scientist like everybody else makes deduction. For instance she deduces further laws from a theory which have been constructed by some others. Social scientists like all other scientists invent terms or concepts formulate laws and construct theories. She is not out of the society and finds her terms or concepts among the phenomena of the society or nature- there is nothing beyond this physical or material world for him to inspire.⁴ He acts in such a ways as follows:

- a. She finds some segments of the nature that have never been discovered and gives a law or theory; (there is a relation between “A” and “B”, or there is a relation between “B” and “C”).
- b. She combines some discovered laws and gives a new law; (there is a relation between “A” and “B” and also “B” and “C”; therefore there is a relation between “A” and “C”).
- c. She refutes the discovered laws and gives a new law; (there is a relation between “B” and “C”, and there is no relation between “A” and “B”; therefore there is no relation between “A” and “C”).

² For this point of view see: Science, Technology and Human Values; by A. Cornelius Benjamin, University of Missouri, Columbia 1965, P. 8 and also P.P.1-22.

³ Elimination of subjects is because of its inconsistency between science and scientific methodology; and subjectivism.

⁴ I am not going to discuss the metaphysic philosophy but assume the realm of research for a scientist is this material world (or let us say she is not a messenger of God to act with having a relation with metaphysic); and also I assert my neutrality to solve this problem in this paper because it is not related.

The way mentioned above is a dialectic process. On the other hand, in the terms of Hegel: there is a thesis primarily (instance a); then it creates an antithesis (instance b) for itself. This contradiction is solved when combination of a and b is generated, then we find a synthesis (instance c) and this way goes on.⁵ His tools in this process are “observation” and “logic” and as I cited before, there is nothing beyond this material world to observe. Therefore it is not acceptable: the term: science for science”; because scientist observes deficits, contradictions and problems of this world so science cannot be for any other things out of this world’s problems, deficits

After refutation of thesis “science for science” this question arises: what are goals of science and scientist. The answer comes fast from last discussion “science for solving contradictions and deficits”. Now would be qualified to say that science in the serve of people. Another series of arising questions would be: in the serve of which people? Is it really used for masses welfare? I respond “never”, if it were the masses had welfare! To prove this response some segments of the next survey will be appropriate.

At the end of this section it is concluded that according to the expression cited before, science is an acquaintance over the problems and objectives, and therefore it is based on socio-economic and political relations in a society. So this acquaintance is inappropriate for every other societies- It would be futile too. Another conclusion is science is a slave of powerful people.

⁵ There are logical interpretations for these interpretations but I ignore them to describe. From more reading see: Philosophy of Hegel, 2 volumes, by Bertrand Russell.

Educational Discrimination and Dependence between Educators and Ruling Class in Metropolitan Countries

In this section I try to prove two important hypotheses at first. The hypothesis that is conclusion of the general acknowledgment and it is: science is a slave of powerful people. The second hypothesis is the implicit dependence between upper class and science centers. For proving the first hypothesis I just give a sketch and for careful approach see the references.

At the beginning let us have a look at the educational system in Metropolitan countries: “The moneyed oligarchy which sits on the top of the social pyramid does not, for the most part, send its boys and girls to public schools at all, but rather to exclusive private institutions. The list of these private schools, like the list of the wealthy families which patronize them is relatively short: their total student boy in some 60,000 to 70,000. Their facilities are usually first-rate and their staffs are carefully selected and relatively well paid. The average expenditure per student is estimated to be well above \$1,000 per year⁶ and their graduates (particularly boys) usually continue their education in one of the ranking private colleges”.⁷ As Mills has considered: “if one had to choose one due to the national unity of the upper social classes in America today it would best be the really exclusive boarding school for girls and prep school for boys.”⁸

Let us see the Keneth B. Clark’s idea: in the words of a distinguished educator, “there is concrete evidence which demonstrates beyond reasonable doubt our public-school system has rejected its role of facilitating social mobility and has become in fact an instrument of social and economic class distinction in American society”.⁹ Indeed as professor Sexton shows in her remarkable book: “In the schools of modern America we still find that children from comfortless chain or to shift time and local from urban slums can not compete with the children of the elite. This ensures not necessarily because of any deficiency of talent or ability but because society being dominated by elites has given their children a head start and following the lead as always, the schools have compounded the advantage by providing them with superior educational services of every conceivable variety”.¹⁰

Now would be qualified to have a look at a few ingredients of this educational mix as yet confining attention exclusively to the economic aspects of the problem. When it comes to aggregate expenditure, we can do no better than reproduce to the relevant passage from a recent authoritative report: “the contrast in money available to the school in a wealthy suburb and to the school in a large city jolts one’s notions of the meaning of equality of opportunity. The pedagogic tasks which conform the teacher in the slum schools are far more difficult than those which their colleagues in the wealthy suburbs face. Yet the expenditure per pupil in the wealthy suburban school is as high as \$1,000 per year. The expenditure in a big city school is less than half that amount. An even more significant contrast is provided by looking at school facilities and noting the size of the professional staff. In the suburb there is likely to be a spacious modern school staffed by as many as 70 professional per 1,000 pupils, in the slum one finds a crowded, often dilapidated and unattractive school staffed by 40 or fewer professionals per 1,000 pupils”.¹¹ For

⁶ Boarding schools providing tuition, room and board cost approximately \$2,500 per academic year not counting clothing expenses, pocket money, and fares.

⁷ Monopoly capital. Paul Baran, Paul Sweezy, An essay on the American Economic and social order. Pelican Books.

⁸ C.Wright Mills, The power elite. Oxford University Press, 1956, P.64.

⁹ Kenneth B. Clark’s foreward to Patricia Cayo Sexton. Educational and income inequalities of opportunities in our public school. New York, 1961 P.IX.

¹⁰ Ibid.P. XVII.

¹¹ James B. Conant, slums and suburbs: A commentary on schools in Metropolitan area, New York, 1961. P. 3.

completeness of the above data Buchanan gives the cost per pupil of United States educational system \$280.¹²

Cavalier survey shows there are 130 private educational institutes for upper class teenagers. There is no necessity to explain that majority of these students continue their studies in exclusive colleges and universities. Approximately 90% of these students continue their studies in top universities. From 1900 to 1940 Harvard, Yale and Princeton and some other elite universities had gathered the students belong to upper class and substituted some local universities like Virginia university. The major function of these universities is to educate the upper class lawyers, physicians and intellectuals; Baltzel¹³ also considered these universities have been the major place for educating the U.S presidents in the first half of the twentieth century, five of eight had been graduated of the Yale and Princeton and Amherst universities and number six of Stanford or western Harvard.

Not only the presidents, the politicians and diplomats also were graduates of these universities. According to the Mills consideration 513 of politicians between years 1789-1953 who had posts like president assistantship, government speaker or cabinet membership or in supreme judicial courts, 22% were graduates of 3 above universities and if we add some universities like Dartmouth and Amherst one of third of these politicians and 44% of whose had academic studies had graduated of these universities.

In 1949 two million or so government employees perhaps some 1500 be considered as key official¹⁴: These include the headman of the executive departments under-secretaries and assistant secretaries, the chiefs of the independent agencies and their deputy and assistant heads, the chiefs of the various bureaus and their deputies, the ambassadors and other chiefs of missions, occupationally they include lawyers and air force officers, economists and physicians, engineers and accountants, aeronautical experts and bankers, chemists and newspapermen, diplomats and soldiers all together they occupy the key administrative, technical, military and professional position of the federal government.

In 1948 only 32% (502) of such key officials worked in agencies which had a formal career service, such as the foreign service of department of state, the military hierarchy certain appointment in the public health service. The top career men averaged twenty-nine years in government service, over half of them had earned graduate or professional degree; one-fourth in fact attended Harvard, Columbia Princeton, Yale, MIT or Cornell. These represented such higher civil service as the government then contained. "Of 120 American ambassadors in England, France, Soviet Union, Germany, Italy, Iran, Turkey and Japan and China, 4/5 had academic studies special in law, 1/3 had been in private school and nearly 50 persons had graduation in exclusive colleges and also 51% of 118 persons in foreign services were graduated of Yale, Harvard and Princeton."¹⁵

Controlling over U.S. important universities is very careful by members of business

¹² Keith Buchanan: Reflections on education in the third world, 1975, Spokesman Book, Nottingham P. 24, Table III data is estimated for 1965. For more information see the reference.

¹³ Baltzel, American business aristocracy.

¹⁴ On the 1500 key officials in the government see the American men in government by Jerome M Sosow, Washington D.C. 1949.

¹⁵ There are a lot of data and explanation as complement see PP6-8, 58, 70, 103, 106-7, 117, 128-9, 181, 193, 216-19, 207, 238, 248n, 233, 245, 295, 271, 301, 317-20, 363 of the power elite by C. Wright Mills, 1956 New York, Oxford University Press. And see American Business aristocracy by Baltzel and also see W. DumHuff, high circle 1969, and also see P. Sweezy book about ruling class.

Aristocracy. This control occurs directly by granting aid via private, foundations grant, gift, firm grant and also by serving in the boards of trustees of universities by upper class members. This mechanism gives power to the upper class to control the framework and long-run goals of universities.

American business aristocracy members emphasize on the scientific and technical education than traditional classic educations in their under-controlling universities, for instance Wharton granted \$600,000 to the University of Pennsylvania for establishing the Wharton business college and George Estiman also granted \$20 million for establishing another college in 1920-1921. The Rochester University is the best sample for comprehending the relation between very rich firms and universities, the majority of ranks of Rochester University's board of trustees are formed of ranks of Rochester firms i.e. Kodak, Xerox, Tailor and the head of board of trustees is chief of Xerox.

There is a study by Beck under the title men who control our universities; his study is on the 30 universities (14 private and 16 public) among them there are some important universities like Harvard, Yale, Princeton, Columbia, etc. Approximately 1/3 of trustees of these universities are of upper class.¹⁶ More than half of the 200 business firms had representatives in these 30 universities' boards of trustees and 25% of all members of boards of trustees were formed of lawyers and judges and 15% was formed of Bankers and 15% of entrepreneurs.

Of 194 representatives of 400 companies, each one of 175 persons meaningly had membership in seven or eight boards of trustees of universities. The studying of 100 persons of 12 foundations showed that a third of them was serving in the boards of trustees too and between 20 grate industry and important universities there were more than 60 kind of relations and connections.¹⁷

The list of military men also who, most of them without any specific educational qualification, have come to serve as college administrators; and in other educational capacities is impressive that I show some of them to stress on the proving the relation between US upper class and universities. General Eisenhower of course on his way to presidency was the head of Columbia University, as well as a member of the National Educational Association Policy Commission. An even a causal survey reveals a dozen or military men in educational positions for example: Rear admiral Herbert J. Grassie chancellor of Lewis college of science and technology, admiral Chester Nimitz, regent of the University of California at Berkeley; Major general Frank Keating a member of the Ithaca college board of trustees; rear admiral Oswald Colcough dean of the George Washington University law school; Colonel Melvin A. Casburg dean of the St. Lewis school of Medicine; Admiral Charles M. Cook Jr. A member of the California state board of education.¹⁸ Other interesting and impressive institutions that possess a lot of influence in educational system of U.S. are foundations twenty-five years ago there were no more than 250 foundations in the entire United States, today there are thousand.¹⁹ Generally a foundation is defined as any autonomous non-profit legal entity that is set up to "serve the welfare of mankind".

They are very progressive in extent and numbers, as from 1960 to 1964 their assets of 3 billion dollars increased to at least \$13.5 billion. The foundation -dependent to both firm and

¹⁶ You can see the characteristics of upper class members in books of Milles, Sweezy and Dumhuff.

¹⁷ There are a lot of data like I cited above for more descriptions see references.

¹⁸ See John Swomley Jr., Militarism in education Washington D.C. 1950, PP. 65-7.

¹⁹ C.Wright Mills, the power elite, PP. 154-5.

families- influence in all parts like arts, science, medicine, educational television and particularly in universities is sensible. In a survey in 1960 most influential foundations are as follows: Ford foundation, Rockefeller foundation, Endowment, Hartford Carnegie, Sloan, Lilly, Pew, Danforth and common wealth fund (although there are a lot of other powerful foundations with less fame).

Because of abstraction, I refer just to some of these foundations who have influence on universities. Among these foundations the most influential one in the educational system particularly in the universities is Carnegie foundations the sum of capital assets of three Carnegie foundations is approximately \$137 million. These three foundations are: Carnegie foundation for progress in education; Washington Carnegie institute and Carnegie endowment foundation for international peace. 12 of 14 members of Carnegie foundation's board of trustees are of upper class, two other persons are chief of great firms one of them; Gardner psychologist and was head of Carnegie foundation for progress, whom in mid of 1960 became the president Johnson assistant in health, education and welfare affairs. There is a resemblance in the boards of managers in four Carnegie foundations: 46 of 72 managers or 64% were managers of firms or members of upper class and 15% head of universities and 9% were the professor of universities.

All the nine above foundations are controlled by members of power elite, 2/3 of members of boards of trustees are of upper class (51%) and firm managers (16%). The majority of the remainder 1/3 are heads and professor of universities and also more than half of them (trustees) had been in Harvard, Yale and Princeton before.

There are strong connections and relations among Ford, Rockefeller, Carnegie and Common Wealth foundation, in 1950 became famous by way of grant and assistantship to universities arts and educational television. Until nearly end of 1960's this foundation had more than \$80 million expenditure in educational television and has increased it \$6 million every year. Jack White was the head of educational TV in mid of 1960s. He was the chief of the board of managers of the educational TV that formed of chief of the firms and head of universities. But his major responsibility and function was to control the national educational TV. He as the manager of educational TV controlled and inspected the entire programs of this organization that provided by Ford foundation's grants and aid. Of other Ford aids is to grant the budget of Russian research center at Harvard University. This foundation paid \$131 thousand of this center and remained paid by Carnegie foundation. This center with 57 distinguished researchers of universities is in the Boston area and gives advisory and informational services to department of defense, Central Intelligence Agency, Military schools, and council for foreign relations and foreign policy association.

The fame of Rockefeller foundations is in the fields of studying the tropical disease in demography research center in Harvard, Russian research center in Columbia and also protection of universities.

Danforth foundation emphasizes on higher academic education for example we can count the aids and assistantship of this foundation for educating the professors of universities and also forming the seminars for universities cadres of personnel so briefly in the survey of important foundations is reached to this conclusion that these foundations (and others) by granting aid restrict and determine the framework of science and shaping of common opinion.

Controlling of programs by any of these foundations indicates that the programs are under the improvement of some members in upper class. Foundations with emphasis on and stimulating some programs start to create implicit values and restrict the realm of cultural and intellectual

researches. The boards of the universities sketch the long-run policy and strategy (implicitly means that their upper class wants will be progressing and also they have power to recruit or not the chiefs, professors and other university personnel.

There are more many foundations that has not been noticed here but just as reference I cite some important else for example C.F.R (Council for Foreign Relations) F.P.A. (Foreign Policy Association) C.E.D (Committee for Economic Development) BAC (Business Advisory Council) NAC (National Advertising Council) and so on. Special these I have cited have interrelations with other foundations (whom cited before) and upper class or power elite whose function (abstractly) is to shape the American-both foreign and internal- policy.

At the end of this section would be so appropriate to have a look at the experts -because they are expert to their benefits and give everything consistent with their purpose and distort other things- even science.

Importance of experts and specialists in “Modern” world has increased day to day. Sometimes in this way of thinking it comes to mind that the increment of managers in firms indicates that the middle class experts who before their graduation had been in all level of society come into the firms and upper class participants substitute occurs. About the above symptom must be said:

1. Advise and prescription to decision maker does not indicate the decision making;
2. It would not be true that say the numbers of upper class experts is low -it is a fallacy- the members of this class are very serious and hard worker:
 - a. Approximately all who finish their studies in private schools goes to universities;
 - b. They who finish their studies in private school goes to the best universities of country who are the best educators of American experts;
 - c. The survey of this class shows there are a lot of experts and specialists in the upper class;
 - d. Approximately 1/3 of biggest law firms partner of wall street and other important resources of law and political experts are members of upper class;
3. The major educators of experts that are to say universities of Harvard, Yale, Princeton, Columbia, Stanford are controlled by members of upper class and this is the at least authority to select and educate for them who will be experts in future;
4. Selection of military experts by Defense Department whom is under domination of upper class members and chief executives of the firms;
5. Promotion of experts depends upon their success in solving the problem and systematic troubles of benefits of upper class.

Science, technology and politics

An administrative perspective (in U.S.)

Since World War II the federal government has become a dominant force behind scientific and technological changes in the United States. Private sector organization performs most of the nation's technical work, but government increasingly provides research and development (R&D) resources and policy direction. Who does control government policy in relation to science and technology? While the answer is far from simple, what is clear is that a major role is played by the operating agencies and departments of the executive branch. They stand at the nexus of government and science and technology they make day-to-day decisions year-in, year-out that determine who gets what, when and how in federal research and development. They play a role not only in the execution of policy but also in its formulation.

The science and technology intensive agencies serve to provide a focus for the broader interactions of government politics and R&D that I am going to give a survey of just its surface. They constitute a subset of the federal bureaucracy²⁰ that link scientists and technologists to public policy. They are technocratic bureaucracies or as the author calls them technoscience agencies²¹. These agencies include the Department of Defense (DOD). The National Aeronautics and Space Administration (NASA). The Energy Research and Development Administration (ERDA) the National Science Foundation (NSF), the National Institute of Health (NIH) and a number of others. Viewed individually and as a group, they are a key locus of science and technology decision making in the United States. They are among the most important yet least understood or investigated elements of the R&D policy process.

The technoscience agencies are at the heart of the federal R&D function. They represent public administration in the most dramatic role as innovator. The organizations of technoscience have become major agents of change. The amount of money that they control for research, development and related testing and demonstration is enormous- over \$20 billion in fiscal year 1976. The impact of this money on the people of America and world, today and tomorrow is incalculable. These R&D expenditures have significance well beyond their sheer Dollar volume. They reach deeply into higher education and the economy. They represent the nation's prime investment in its technological future. Technoscience agencies stand where the interests of the president, his executive office, congress, courts and other public and private interest group converge.²²

The goal of above introduction was going into the public research expenditures of US -(the function of the American public is out of the capacity of these papers.²³ I assume the reader has

²⁰ The executive branch maybe conceived as having the parts: the presidency including the White House office of president and the bureaucracy containing the various agencies, departments, commissions, etc. See Richard Schott, *The bureaucratic state: The evolution and scope of the American Federal Bureaucracy* (Morristown N.J. General learning press, 1974. P.35).

²¹ The author is indebted to Dwight Waldo for the term "Technoscience". He used the word in an essay: "Reflections on technoscience policy and administration in a turbulent milieu. This paper was presented at the conference on public science and Administration at the University of New Mexico, Sept, 1969.

²² See Philip Selznick, *Leadership in administration*, New York Harper & Row, 1957.

²³ For more information see: David Easton. *A framework for political analysis* N.J.Prentic Hall 1965. Anthony Downs, *Inside Bureaucracy*, Boston, Brown 1967.

acquaintance about the function noted above and the complete finding of the last section. Therefore, now I try to give a systematic survey for U.S. public interaction in the realm of science and technology.

There have been six distinct periods in the interaction of science, technology and government since 1940. The first was wartime era 1940-45; the second embraced the postwar years 1945-50. The third extended from 1950 to the launching of sputnik in 1957. The fourth lasted a decade from 1957 to 1967 when a combination of war in Vietnam and social problems at U.S. ended the accelerated growth of R&D expenditures. From 1967 to 1971 there was a fifth period of government, science and technology interaction. During this period of time federal funding for R&D fell. Since 1971 expenditures have begun rising dramatically in selected fields such as cancer research and energy recreation.

Period: 1940-45

During the war the basic outlines of the “modern” government, science and technology relationship were drawn what was important was not the enormous increase in money to R&D but the way the funds were managed. As Don Price has stated “... the most significant discovery or development... was not the technical secret that were involved in Radar or the Atomic bomb, it was the administrative system and set of operating policies that produced such technological feats”²⁴.

Under the national defense research committee set up in 1940 and the Office of Science Research and Development (OSRD) established in 1941, the nation’s scientific and technological resources were mobilized. While many scientists and engineers came directly into government service, most other performed their work for the defense effort under contract where they were, in university and industrial labs. OSRD was placed in the executive office of the President Franklin Roosevelt’s unofficial science advisor. OSRD served as a clearing house for much of the war time R&D intended for the army, navy, national advisory committee for aeronautics and other agencies. OSRD could also initiate what ever R&D projects were to build an atomic bomb. OSRD began the atomic energy program, transferred it to the army in 1943 only after much of the R&D had been done, and retained substantial connection thereafter²⁵. While most of the development work was accomplished by the operating agencies and departments, of the bureaucracy and through them, by the universities and industries, OSRD maintained strong control over the entire war time enterprise. The location of OSRD within the executive office of the president and in the Office for Emergency Management (OEM) was crucial to its power especially when combined with the wartime atmosphere that created a mood of cooperation from all part of the R&D system in the pursuit of victory and removed all normal restriction based on funding or congressional oversight. As Price pointed out: As the head of an independent agency in the OEM Vannevar Bush had every right to go directly to the president on issues involving the use of science and scientists during World War II. A position of direct responsibility to the president was not important mainly in order to let Dr. Bush as head of OSRD have personal

Harold D. Lasswell, *The analysis of political behavior, an empirical approach*. New York, Oxford University Press, 1948.

Robert E. Wood: *The rise of an political elite: scientists and national policy making*, edited by R. Gilpin and Christopher Wright, New York and London: Columbia University Press 1964, and also see the references at the end.

²⁴ Cited in US congress, house committee on science and astronauties subcommittee on science, *Research and development report: toward a science policy for the united states* (Washington D.C USPO 1970) P.81. Hereinafter cited a toward a science plicy (1970).

²⁵ J.Stefan Dupre and Stanford A. Lakoff, *Science and the nation*, Englewood Cliff, N.J., Prentice Hall, 1962 P.10.

conversation with President Roosevelt. It was much more important to give him the leverage he needed in dealing with the vast network of administrative relationship on which the success of a government agency depends. This is the point that is completely missed by those who think that the ideal position for a scientific agency in government is one of complete separation from the political executive²⁶.

1945-50

In 1939 federal science and technology expenditure stood at \$50 million. Most of the money was spent by the department of Agriculture; the bulk of federal R&D was performed in the government's own laboratories²⁷. At the close of the war in 1945 the government was spending \$1.5 billion primarily for defense and mainly via contracts to private organizations²⁸. The war had brought vast unprecedented change to federal administration. The R&D function had come into own. From 1945 to 1950 this administrative revolution was consolidated. Centralized wartime controls on government R&D were relaxed in the immediate postwar years, as OSRD phased out. In fact, the decentralized pattern for governing federal science and technology that was adopted *de facto* between 1945 and 1950 was at the opposite pole from wartime experience.

Science and technology were now important segments of government, part of the missions of various operating agencies and department. This bureaucracy had become technocratic and it wanted no part of a civilian OSRD. Nor did the scientists and engineers who had pioneered the new government and R&D relationship. They feared centralized power almost as much as did the new technoscience agencies. The closest proposal to a civilian OSRD was that of Bush in his 1945 report to the president: science, the end less frontier²⁹ Bush proposed what became the national science foundation. It would be the lead agency within the bureaucracy for sponsoring basic scientific research.

In the five years that it took to get NSF established however the military agencies AEC and NIH moved into the vacuum left by OSRD. The wartime pattern of government by contract was continued there was increasing use of grants to universities for basic research in accord with the preferences of the scientific community. During the World War II the federal relationship was almost exclusively with technology and applied research. In the post war period basic research began to be supported by government to a degree that the scientific community could hardly have imagined prior to 1940.

1950-57

The 1945-50 period was one in which a growing federal responsibility for R&D became increasing accepted as "normal". Also part of peacetime normalcy was the cold war between the United States and the Soviet Union. During 1950-57 the interests of science and technology and national security were jointed while expenditure for Health-related research grew the dominant spending technoscience agencies were military or military-related such as the AEC. The application of science and technology to economic growth and general welfare was secondary in priority. The Korean conflict, the explosion of the Soviet hydrogen bomb-these events combined to cast a long military shadow over all R&D expenditures. The nation's scientists and universities

²⁶ Don K.Price, Government and science, New York, University Press, 1954. Cited in: toward a science policy, 1970 P.80.

²⁷ Dupre and Lakoff op. cit. P.9.

²⁸ The budget figure is reported in: Toward a science policy 1970, P.115.

²⁹ Vannevar Bush, Science the endless frontier, Washington D.C: USGPO reprint 1960.

found that they could even satisfy much of their own needs for basic research in the name of defense. Some of the least restrictive administrative procedures for basic research within the executive branch were those of the military agencies. As expenditures for R&D continued to grow the budget occasionally called on NSF to exercise more national policy leadership -a task for which it had legislative authority. But NSF had neither the bureaucratic power nor the inclination to full fill this role. Federal science and technology obligations reached \$4.4 billion in 1957. They continued to be administered in an extremely decentralized manner.

1957-67

Then came the technological surprise of sputnik for a decade. The U.S. policy for R&D was clear: pre-eminence- to be first in all scientific and technological fields; but particularly in those related to defense and national prestige. That was *de facto* national science and technology policy. For several years after 1957 annual federal R&D funding increased at an accelerated pace. Basic research rose at an average 15% per year. By 1967 federal R&D obligations had reached \$17.1 billion. A major reason for the increase lay in the creation of the national aeronautics and space administration (NASA) in 1958 and the decision by President John F. Kennedy in 1961 that the United States through NASA should commit itself to achieving the goal before this decade is out of landing a man on the moon and returning him safely to earth.³⁰

NASA epitomized the drive by the United States for “pre-eminence”. It added that special bit of adventure and glamour to what many scientists later called their “golden years” the Defense Department however continued to be by far the most significant spender in federal R&D. Indeed when President Dwight Eisenhower created a white house science policy advisor committee (PSAC) he did so in part to get help in making choices among the many weapons proposals being pushed on him from Pentagon. The white house science and technology policy apparatus was further strengthened in 1962 when office of science and technology (OST) was established.

The sputnik-induced innovation at the subcabinet level was the Federal Council for Science and Technology (FCST) which was activated in 1959 and like the executive office bodies was headed by the president’s science advisor. FCST’s birth reflected and encouraged the elevation of scientists and engineers in the executive branch. A number of assistant departmental secretaries with responsibilities for R&D were appointed. The Pentagon led the way in reforms at the administrative level with the establishments of an Advanced Research Projects Agency (ARPA) in 1958. It was independent of the services and responsible to a new top-level Pentagon official the Director of Defense Research and Engineering (DDR&E). This individual not only served as science advisor to the secretary of defense but also had authority for managing all defense R&D.

Science and technology were thus strengthened throughout the executive branch and congressional interest in science and technology grew as well. The basic pattern of decentralized pluralistic governance remained intact however NSF’s national policy responsibilities were transferred to OST (Office of Science and Technology). While OST may have tried to bring more centralized direction to the nation’s R&D establishment it found itself too small too weak and too busy a staff organization.

However, for a decade there was constant growth in federal R&D funds for basic research and universities were plentiful and government stimulated and paid for the training of thousands of new scientists and engineers. With the coming of Lyndon John’s “great society in the mid-

³⁰ Toward a science policy, (1970) P.100.

1960” there were new departments (the Department of Housing and Urban Development and the Department of Transportation funding science and technology then the “golden years” of R&D ended.

1967-71

There was no one event to compare with sputnik that dramatically signaled the end of the former period and the beginning of this one. R&D could not grow forever at the post sputnik pace. On the other hand the suddenness of cessation came as a shock, both to technoscience agencies and their clients. What ended the rise so abruptly was the combination of Vietnam and the domestic crises in the cities. Neither priority was R&D intensive. For the most part the war used existing technology rather than developing new technology. At the same time science and technology were not as central to the problems of cities as they were to the space program. The inflation that accompanied war against communism in South Asia and against domestic problems –like poverty- are deeply into R&D. As the rise of NASA had heralded the “garden years” so its decline stood as a symbol of change. In 1969 NASA achieved its goal of a lunar landing within a few years its budget was only half what it had been at its 1960’s peak. There were some areas of growth in housing, transportation and other domestic/social fields. But these were very small gains when measured against declines in the big technology agencies. Thus in 1968 federal obligations R&D fell to \$16.5 billion. In 1969 they declined further to \$15.6 billion. In 1970 they dropped again to \$15.2 billion. In this period of decline as well as of rising inflation scientists and engineers suddenly found themselves out of work or underworked. Many questioned their “relevancy”.

This period was not just one of budgetary exigency it was also one of shifting public attitudes were toward technology and even science. These attitudes were very general but inevitably touched on federal R&D. In part they were simply anti technological. There was the feeling that technology had got out of democratic control³¹. In addition the attitudes were anti-military. The Vietnam conflict revealed for critics of the war what they saw as the “subverting” of science and technology and their institutions, including the universities to destructive purposes³². Moreover, the new mood arose from a positive interest in environmental issues, uncontrolled science and technology it was felt were despoiling and polluting the earth. In 1969 the National Environmental Policy Act (NEPA) was passed and as a result in 1970 a new Council on Environmental Quality (CEQ) and the Environmental Protect Agency (EPA) came into being. In requiring the filing of environmental impact statements, NEPA indicated that government technology would be subjected to scrutiny for its environmental costs as well as economic benefits.

Finally the new climate of opinion related to the fall of the university, the institution of science from public and governmental favor. Universities seemed unable to provide solutions to difficult social problems facing the country. Ironically while universities were chastised for irrelevance by some they were pilloried by others for being too relevant to the Pentagon. For many, however the universities lost credibility because their handling of student riots and uprising during this time suggested that they were incapable of managing themselves, much less helping the country deal with its problems. The national began expecting less of universities. It demanded

³¹ The flavor of this mood can be seen in the writings of Herbert Marcuse one-dimensional man, Boston 1964 and Jacques Ellul, the technological society, New York 1964. Such literature gained general widespread attention during this period. See also chap.2 philosophers of the technological age, in Albert H.Teich, ed., technology and man’s future, New York 1972.

³² See Dorothy Nelkin, The university and military research, New York, Cornell University Press, 1972.

less of science. In dollar that took account of inflation federal funding for academic research consequently fell 17% between 1967 and 1971³³. In every sense this was a period of economic recession for R&D. It was one of transition in public/government attitudes toward science and technology. It left many scientist engineers industry and university executives and even government officials bewildered and embittered.

Since 1971

In 1971 the federal science and technology budget began a recovery. Obligations stood at \$15.54 billion in fiscal year 1971 and \$16.5 billion in FY-1972, \$16.8 billion in FY-1973, \$17.4 billion in FY-1974, about \$18.7 billion in FY-1975 and \$21.6 billion in FY-1976. Nearly half of federal R&D went to the defense department whose R&D spending gained considerable once the United States military involvement in Vietnam ended. However as a percentage of overall R&D spending, defense was actually falling because other sectors were on the rise.

This was not to say that the technoscience agencies and associated clientele were prospering again. With inflation rates reaching double digits in this period, the level of support for most programs was still not what it was in 1967 in terms of non-inflated dollars. But the trend, at least was upward and this buoyed some technocratic spirits. Furthermore certain fields were experiencing dramatic upswings. Apollo-style rhetoric was used in 1971 when President Nixon launched a crusade against cancer. Similar language was applied when project independence-an effort to make America self-sufficient in energy-came into being during the Arab oil embargo of 1973-74 from the energy crisis emerged a major reorganization of federal technoscience. In late 1974, legislation was passed that created a major new agency on the federal R&D scene; the Energy Research and Development Administration (ERDA) subsumed the Atomic Energy Commission (AEC) and smaller energy R&D units located in other agencies. The regulatory side of AEC was split off and placed in a new Nuclear Regulatory Commission (NRC).

The science and technology agencies were regaining their strength at the very time the capacity of the president to govern this segment of bureaucracy seemed to be weakening. In 1973 President Nixon demolished the entire White House science policy advisory apparatus and divided this advisory function between the director of NSF (for civil R&D) and the National Security Council (for military R&D). Leaders of the scientific community lobbied hard to reverse what they regarded both as a demotion for science and the creation of a dangerous vacuum in technical inputs to presidential decision-making. In May 1975 it appeared they might succeed when President Ford “pledged ... to key members of congress that he would act to reestablish as a permanent part of the White House organization, the office of science and technology that his predecessor abolished”³⁴. Meanwhile congress was attempting to assert a new role in technoscience. In 1972 it created the Office of Technology Assessment (OTA) to provide greater legislative larger leverage over the executive branch in science and technology affairs. Relating to congress in much the same way as the general accounting office, OTA could be useful to congress in overseeing technology and helping to push reach no science agencies to consider the broader implications of their R&D programs early in the decision-making process.

Moreover in 1974 as a result of the passage of the congressional budget and impoundment control act the Congressional Budget Office (CBO) was established with a new budget committee in both the House and Senate to write resolutions laying out total spending, spending priorities

³³ Harvey Brooks, “Are scientist obsolete?” *Science*, vol.186, Nov. 1974, P.501.

³⁴ Ford to seek Re-establishment of White House science office, *New York Times*, May 23, 1975.

total revenue and appropriate budget survey or deficit for the coming fiscal year. The full Senate and House which never before have come to grips with these broad budget concepts were to agree on a budget resolution. Thus, budget committee members are in a position to have great influence over the pattern of federal spending much depends upon when and how such tools as OTA and CBO are used. A major problem in overall congressional power to assess technology or influence the executive budget lays in the lack of control by congress as a whole cover the various congressional committees. Such functional committees have interests similar to those of agencies in resisting comprehensive efforts in public management whether by president or congress.

The congressional initiatives were part of a general management thrust evolving in this period that had significant implication for technoscience. The anti-technology mood has dissipated somehow. The nation seemed committed or at least reconcile for maintaining and strengthening the R&D function -but more on the terms of government than those of scientific and engineering researchers. One dimension of the management trend lay in a stronger effort to set priorities and to maintain economy and efficiency in R&D. The effort to target basic research in cancer studies was symptomatic of this trend. At the same time, there was a new cognizance that science and technology could create problems as well as solve them. In this sense management of technology related to a new quest for anticipatory policy.

There was ambivalence in the government's overall relationship to science and technology. Various government agencies sought to stimulate the technological genie, while other sought just as strongly to put it back in the bottle. Thus, the military developed more sophisticated weapons while the State Department and Arms Control and Disarmament Agency (ACDA) worked equally to limit their use through international agreement. Similarly for virtually every energy solution put forth by the new energy agency, the environmental protection agency would be on guard for possible environmental dangers. Such bureaucratic conflict seemed far a field from rationalistic management notions being emphasized at the same time. But neither bureaucratic politics nor management techniques would likely lead to a national policy for science and technology- at least one set independently of technoscience agencies and their allies.

Inspire of connotation before this has to be added the general tendency for the militarization of science has continued into the years of peace. That fact as the National Science Foundation has made clear is responsible for the relative neglect of fundamental science. Out of the \$2 billion scientific budget of 1955 only \$120 million (6%) was for basic research but as we have 85% was for military technology.³⁵

³⁵ For more information about the relation between military and science see: The power elite, C. Wright Mills, PP.216-219.

Conclusion

I think the surface of the U.S explicit function in the realm of science and technology was shown, but at the end let us take a closer look at this problem abstractly. This relationship between science and the public or more directly between the universities and the federal government, first became intimate during World War II and has since grown to very substantial proportions. About three fourth of all university researches, one third of all graduates students in science and a majority of the students in the final phases of their Ph.D. researches are now supported by the federal government and federal funds pay for about one third of the cost of all new science, facilities -recently this support has been extended by various new programs of the National Science Foundation (NSF) to bring training and participation in research to college teachers and undergraduates. The many federal programs of support for science involve about more than four hundred colleges and universities, including all Ph.D. granting institutions in the country.³⁶

In this section transfer of science and finally technology with emphasize on the word “transfer” will be talked about. With respect to political conditions and circumstances of undeveloped countries there often exists a system of political leadership whom is dependent to the world metropolis. This dependence necessitates a capitalist form of economic structure be prevailed to exploit the surplus value generated by people. It is precisely the need for an alliance between the peripheral state and capitalists from the center (with the peripheral bourgeoisies as a junior partner at best) that imparts to capitalist growth in the periphery a particularly uneven and repressive character. The class relations characteristic of the periphery no longer necessarily inhibit economic growth per se, but they serve to aggravate some of the negative qualities that have always characterized the capitalist growth process. Generally successful capitalism growth in the periphery has generally been associated with highly authoritarian political rule.³⁷

The particularly authoritarian political context of capitalist growth in most third-world countries may be attributed in part to the absence of a revolutionary bourgeois triumph over the old order in those countries. Instead of being led by an indigenous bourgeoisie rebelling under a democratic banner against pre-capitalist bastion of privilege, capitalism growth in the periphery has been fostered by an alliance of elites -both traditional and modern- operating through a relatively powerful state.

In the third-world countries that are presently experiencing some economic growth these same sociopolitical circumstances are modified primarily by the addition of foreign capitalists to the alliance of dominant classes. This modification serves only to reinforce authoritarian tendencies for foreign capital and foreign governments have much to fear from the nationalist and populist forces that are likely to gain strength with the inclusion of middle and lower classes into the political process. It is no accident that so many of authoritarian regimes of the contemporary third world- in Brazil, Chile, Indonesia, etc- have come to power with the active assistance of the United States government and her agencies like CIA. Both, foreign and domestic capitalists tend to see in strong authoritarian regimes the best hope for political and economic stability in the periphery today. In the capitalist center bourgeois democracy serves an important legitimizing

³⁶ Science government and the universities, ed.by F. Redenrick Seitz (president academy of sciences) University of Washington Press, P.9.

³⁷ Every capitalist society is authoritarian in the sense that the most important decisions reflect disproportionately the interest of dominant capitalist class. For a detailed discussion and documentation of the degree of democracy and authoritarianism in different countries throughout the world see: annual comparative survey of freedom published by freedom house (New York).

function without seriously threatening capitalist economic interest³⁸. In the capitalist periphery however democracy usually serves to inhibit the process of capital accumulation and this is because of dependence of periphery elite to metropolis elite.³⁹

Finally my use of this section is to show how the science and technology comes from metropolis and in “periphery”. The channel referred above is one of the most important alternators of science who restricts it for their purpose of prevailing capitalism for their benefits and does not permit to prevail generally.

Other channel of science is: private students go to the world metropolis and bring with themselves something as “science”. It can be under the title “science”. I offered the function of science and told that it comes to solve the deficits and contradictions that human involved -but not useful for us because our problems is in other way and depends on our sociopolitical, economic ... circumstances. They are expert but resolve the problem in a capitalist society or in somehow who had been and had studied.

Now yet as the “new elites”, the brown sahibs of the third world demonstrate, the salesmen of the western way of education have not been without success⁴⁰. And also Richard Harris describes “education in the west ... happier living in the west.... (whose) opinions are a reflection of western opinion”⁴¹ who represent one of the firmest supports for the policies of the imperialism in the third world.

They represent a group deliberately fabricated through western education by the governing class of the metropolitan countries. They were fabricated initially to act as cogs in the administrative machine of empire, then -as the summer- glory of imperialism waned, they were fabricated with increasing subtlety and sophistication in either the metropolitan country or in one of the new universities which sprang up like mushrooms in the aid-warmed autumn of imperialism. That they might act as media through whom the cultural, political and economic influences of the metropolitan country might be prolonged. They were educated, are still being educated in the language of the metropolitan power and as Pierre Vanden Berghé observes: “of all the manifestation of neo-colonialism, the cultural and linguistic one is the most insidious, the least visible, and the long run the most effective.... Linguistic imperialism is the main type of colonial influence which a former great power can afford when its cultural prestige survives its political and military might.”⁴²

This policy of elite-training using a non indigenous language to inculcate non-indigenous values, deprived the societies of the third world of their natural leaders for, as Renato Constantino puts it, speaking of the American-dominated Philippines: “English became the wedge that separated the Filipinos from their past and late was to separate educated Filipinos from the masses

³⁸ See Edward Sand Reich, section 6.5 P.252, on the role of democracy in the United States.

³⁹ For more information and analyses: “Capitalist development of underdevelopment in Chile” and “Capitalist development of underdevelopment in Brazil” in “capitalism and underdevelopment in Latin America” (New York) and London; Monthly Review Press, 1967 and 1969; and “The political economy of development and underdevelopment” edited by Charles K. Wilber, part 1,2,3. 1979. and “The question of imperialism, Benjamin J. Cohen “Political economy of dominant and dependence, New York, 1973 Pp.189-199.

⁴⁰ See the work by Tarzie Vittachi, cited above and also Nirad C. Chaudhurn. The continent of circe, London 1965.

⁴¹ Richard Harris, Independence and after, London 1962, P. 13. Robert McDonald in his article “The arrogance of ability” suggests “the mass-distribution of student leaders in the developed countries (both Western and communist) of the works of Franz Fanon. The New African, 1966.

⁴² Pierre Vanden Berghé. “European language and Black Mandarins in transition”, Dar-es-Salaam, 1968, P.19.

of their countrymen.”⁴³

At the same time it created a docile, metropolitan-oriented elite group whose allegiance and final alienation from the masses were ensured by the excessive advantage appropriated by the group advantages whose continuing existence has been made possible by external financial aid. It is an elite group which especially in the countries of Africa and southern Asia, is tending to become more exclusive and more isolated from the masses (whose luxury living levels are a perpetual incitement to masses) and which rather than attempting to tackle this dangerous disparity is more likely rouse. Its political power to increase yet further its privileges and while this group comprises a high proportion of Cosmopolitan and poly-glottal intellectuals who became bureaucrats or army officers it includes also the teacher and the academics who transmit to the young those selfishness and materialistic preoccupation they acquired during their formation: “The pampered undergraduates on generous government bursaries are carefully being groomed for elite-status, and expect an upper-level position upon graduation. They remain silent in the face of despotism but they rise up in protest when they are asked to double up in dormitories in order to make room from more students.”⁴⁴

Another channel that I am going to verify is the educational aid that I evaluate it generally. The scientific and educational gap between the advanced and the developing countries is growing. As education becomes more complex and requires larger expenditure it is often put beyond the means of some developing nation. And it is under these conditions that the political implications on educational aid begin to become transparently clear. It is true that as far back as 1960 the journal: higher education suggested that: “there are many indications that we are beginning to use education as a principle instrument for international objectives”. But much frankness is exceptional, the real motivations behind educational aid are usually much more discreetly veiled and the aid is sanitized by being proffered through the medium of one of the giant foundations.

The objectives behind policies of educational “aid” have remained remarkably constant over the centuries and from the time of the Romans through the Inca Empire to the heyday of British Empire, colonial powers have sought to consolidate their position in their dependent territories by taking the clever children of the colonial upper class and molding in metropolitan ways and steeping them in metropolitan value. The pay-off was described by a distinguished Indian civil servant Sir Charles Trevelyan in 1853: “The only means at our disposal for preventing revolution is to set the natives on a process of European improvement. They will then cease to desire and aim at independence on the old Indian footing. The national activity will be fully and harmlessly employed in acquiring and diffusing European knowledge...”⁴⁵

A similar policy was adopted by General Arthur McArthur in the Philippines at the beginning of the century in recommending a large educational appropriation primarily and exclusively as an adjunct to military operations calculated to pacify the people. Today the same motive- that of turning the victims of imperialism into its defenders with a vested interest in the status quo underlies the educational programs of the affluent nations though the thrust of the policy is no longer towards an individual country but has become global in extent.

⁴³ Renato Constantino, “The mis-education of the Filipino”, in journal of contemporary Asia, autumn, 1970, P. 24. And see also Pierre vanden Bergh P.20.

⁴⁴ Pierre Vanden Berghe. This generalization is far less relevant in the case of Latin American students than in the case of African students.

⁴⁵ By W. G..Archer, India and Modern Art, London 1959, P.19.

External aid to education whether it takes the form of funds, educational advisors and teachers or higher-level training in the metropolitan country, conditions the youth of the developing countries to repel their own liberation in many ways. Whether the aid be western or soviet the programs it supports inculcate strong value or venations; the values are those of the donor nation, however irrelevant these maybe to a third world nation facing totally different issues arising of a totally different historical experience. And these values, it has been noted are not merely intellectual values but include the material values and aspirations of the society of consumption. In a sector of the world where social progress depends on swift and drastic social changes the emphasis on concepts such and modernization and institution-building means that the educational process produces technocrats obsessed with the need for stability without which they are taught, normal economic development is impossible. There is a strong emphasis on the production of elites socialized by the pressure to conform to established (and multinational) professional norms. Politicization of the education system is firmly eschewed, since polarization generally implies a radical orientation and the myth of academic objectivity⁴⁶ is sedulously fostered and the high wastage rates of system underline that there is little concern with the masses, with their motivation so that they might act as a decisive force fore hang rather is the emphasis on training skilled personnel for private (often foreign-owned) industry for government service. As Rick Greenspan observes “that many of the education programs in the USA are designed by experts to socialize the urban lower classes into on already existing and standardized system of education -a system traditionally controlled by the white middle class”.⁴⁷

Educational aid in the third word has a similar objective to fit the masses of the developing world into an international system of super-ordination and subordination controlled by the ruling classes of metropolitan countries and just as the great foundations are playing an increasing role in funding educational programs with in the USA (using such programs as means of cooling down centers of growing discontent) so too in the third world do Rockefeller and Ford cooperate.⁴⁸ With US government agencies in using education as means of controlling and directing social changes the extent strategy of this penetration in Africa are illustrated in map 2, the pay-off of these policies is spelled out by the institute of international education in the following words: “US corporation recognize -abroad as well as home- that education offers the best means for stimulating purchasing power, encouraging political stability and most important of all developing a reservoir of the trained manpower so necessary to their overseas operations”⁴⁹

For the advanced countries, and especially the USA the third world is exploited not only as a source of raw materials but also of those skills needed to service the machine of empire, it is also and increasingly exploited as a source of raw data to be synthesized and analyzed in the developed societies and which is critical to the formulation of those policies by which empire is consolidated and expanded. In this field the third world universities and their mentors in the foundations and government departments of the western ruling classes play an essential role. And the importance of the links between the center and the dependencies is illustrated by the fact that the US organization education and world affairs which provides a master computer file on the involvement of US higher education in international programs has processed 2,185 programmers

⁴⁶ On academic objectivity see for example: Robert Engler, *Social science and social consciousness in the dissenting academy*. Ed., Theodore Roszak New York, 1967 and Noam Chomsky, *American power and new Mandarins*, Penguin, 1969.

⁴⁷ Rick Greenspan, “Secondary education: the corporations more in pacific research and world empire telegram, Nov.1970, PP.10-16.

⁴⁸ Remember the American upper class evaluation.

⁴⁹ Institute of international education, *African research group, Africa Retort*. Cambridge, 1970 PP.70-71.

at 522 universities.⁵⁰

The growing opposition of the population of many countries to this cultural colonization is indicated by the claims of Latin Americans that US educational assistance programs are nothing more than a brain drain plot, devised to make them pay the cost of increasing the US supply of professionals and technicians and the opposition is articulated in even stronger terms by radical groups in America's oldest colony the Philippines. The university says the MPKP is an organic part of a sick society an aim of an exploitative neocolonial system. It is they claim "corrupted by massive dole-out" from American foundations (and) fast becoming a service station for imperialist economic military bureaucratic and ecclesiastical powers. Now fully integrated into the neo colonial system it can offer no meaningful alternatives to the prevailing order and no original ideas for social change. This is further aggravated by consequent integration of the studentry into service station framework".⁵¹

Mean while the education system effectively widen the gap between the elites and masses and between the affluent and the proletarian nations like the existing international economic system it is a powerful agent of underdevelopment.⁵²

⁵⁰ Ibid p.69.

⁵¹ Malayang Pagkakaisa Ng Kabataang Pilipino (MPKP) people power (no date) PP.8,6.

⁵² For make information see the references in the End.

Concluding part

What are the prevailed sciences in LDCs?

After the problem came before I have to bring some point about science. Fundamentally the science comes to solve the problems of a society and giving the solution generally for major and minor contradictions in that special society. As Thomas S. Kuhn's idea gives the science is based on paradigms he says: "... these many other works served for a time implicitly to define the legitimate problems and methods of a research field for succeeding generations of practitioners. They were able to do so because they shared two essential characteristics. Their achievement was sufficiently unprecedented to attract an enduring group of adherents away from competing modes of scientific activity. Simultaneously, it was sufficiently open-ended to leave all sorts of problems for the redefined group of practitioners to resolve achievements that share these two characteristics, I shall henceforth refer to as **paradigms** a term that relate closely to normal science, by choosing it I mean to suggest that some accepted examples of actual scientific practice provide models from which spring particular coherent tradition of scientific research."⁵³

With an explanation to Kuhn's idea it has to be said this paradigm comes from the problems, troubles, deficiencies, contradictions, etc. With the above introduction I can say that the science or let me say achievement in finding the solution is appropriate to especial society that is made for itself. Secondary especially in social sciences the solution that would be given by scientist is suitable for the social values and socio-economic cultural and political institutions of the scientist's society. With a comparative look over societies and their way of solutions whose had offered by scientist will show this phenomenon completely. Therefore originally this concept "science importation" is a fallacy in action -although it seems to be fantastic in theory.

Now let's have a look at the "science" that LDCs import, on the other hand MDCs export. I divide this "science" to two sections:

A. Kind A is appropriate and useful for the countries who export.

B. Kind B is created just to export by MDCs to LDCs in each kind there is two subdivisions: social sciences and technical sciences.

Under the title technical science what whom is exported to LDCs should be noted generally that nearly all of them are inappropriate and futile for LDCs. They are "sophisticated" and "professional" that are useful for them who have appropriate tools and machines to use them in one side and in other side we have a lot of other sort of problems which involved other ways of solutions in another side more we do not have their problem to need their science to solve them. For instance even in Medicine, our problems are: to make a subsistence healthy society, of epidemic diseases or them whom derive from starvation or bad nutrition than to import high professional machines whose are used for some for example heart diseases or "modern" urban diseases - that always uses for rich people in LDCs. And also in one side when we import this "progressed" technology we have no technicians to deal with those apparatuses and if we allocate all of our technicians and physicians to deal with them then what we can do with above majority

⁵³ See the structure of scientific revolution by Thomas S. Kuhn, 1972, The University of Chicago Press.

troubles.

In other sorts of technologies whom used in factories and industrial manufactories should be noted that using these technologies bring more troubles for LDCs for example one of our problems is unemployment in different forms (disguised, seasonal, lompanism, etc.) application of imported technology bring more unemployment because of capital intensive character of technology; and on the other side accumulate income in the hands of rich people.

Export of technical science has also these advantages for MDCs that at first it takes us far from our ways of finding problems and science, second makes us dependent to MDCs, third when we import science then we are obligated to import technologies due to the imported science... This would be truer in social sciences. The basement of the western social scientist analyses are based upon the assumptions, values of the capitalist socio-economic institutions. Generally, our societies are not capitalist -with their special values- we are "kept backward countries" our values based on "being under domination" and theirs are how to exploit and how to use this surplus value in the way of their living.

As evidence it would be so bright for some topics of their "science" that I refer are not really useful for LDCs as follow: i.e. the problems like imperfect competition in economics. We have problems like monopoly, oligopoly, monopsony, oligapsony, duopoly and etc. right alike then but as "science" it offers in our universities; or consumer theory that is not consistent with LDCs situations for instance when the food has infinite utility for hungry people there could never exist any other choice for other combination of commodities. Other courses which are really interesting are like sociology which is taught at the LDCs universities is exactly their approach for their societies; even we import their textbooks and teach word-by-word.

Let us have a look at the Kind B now: the "science" which is generated just to export to LDCs. This segment is one of the most important instruments that metropolitan countries use for domination over periphery countries. This approach often use in social sciences especially in economic development branch. It also uses significantly in political science and international economics. In the sphere of political science would be so obvious with respect to LDC's & MDC's elite relations. Generally this function is in this way that all topics and subjects are legal to teach and discusses that LDC's ruling class and elite permit which derives from their benefits of relating to MDC's; in this form all western "democratic" ideas are permitted to teach -or let's say advertising. Application of this instrument in economics of development realm with respect to influence of upper class of MDCs in universities and research centers direct and indirectly (which I have cited briefly in last parts) has made it very complex to recognize. With respect to this complexity I give some examples to introduce this distortion which we call it science.

In the last parts of this paper I already showed some influent factors in science realm and its transfer to LDCs and how it can be distorted in this process. Now let see some examples all the economic development books are talking about the capitalist way of development and open economy. Why?

The answer is quite simple because if we apply open economic and capitalist ways and policies for development they will have much more benefits with corresponding relation with us. By this way it makes us more dependent and they can exploit the LDCs assets resources and also surplus value and more important we do not go to the sphere of influence of other superpower...

The problem that: which way of development would be more appropriate, is discussable,

but I refer generally to: comparison China with a socialist way of development and India with a capitalist. Which one is more developed? When in India there is a lot of death which derives from starvation. In China everyone has been fed, clothed and housed. China has kept them healthy and educated most, millions have not starved, side walks and streets have not been covered with multitudes of sleeping, begging, hungry, and illiterate human beings; millions are not disease-ridden⁵⁴. To find such deplorable conditions one does not look at China these days but rather to India, Pakistan and almost anywhere else in the underdeveloped world. These facts are so basic, so fundamentally important that they completely dominate China's economic picture, even if one grants all of the erratic and irrational policies alleged by her numerous critics. The Chinese - all of them- now have what is in effect an insurance policy against pestilence, famine and other disasters. In this respect China has outperformed every underdeveloped country in the world and even with respect to the richest country in the world, it would not be far-fetched to claim that there has less malnutrition due to mal-distribution of food in China over the past twenty years than there has been in the United States.

In spite of all cited matters we see that how the metropolitans' intellectuals indicate it undesirable. Most of the economic researchers have inspected China as though it was little more than a series of tables in a yearbook⁵⁵. Economic research on China suffers from an ailment common to most of economics - a narrow empiricism. Thus, most of the research studies of the Chinese economy deal with very small segments of the development process, and within these tiny areas the researchers busy themselves with data series adding up the numbers, adjusting them in numerous ways, deflating them for price changes and doing a lot of fussy statistical work. There are not many economists in the China field who try to see Chinese economic development as a whole as the comprehensive totality of historical process. Indeed it is quite apparent that many of them consider China to be no the beloved, but the enemy. And in dealing with the enemy, their research often reveals very strong biases against China.

It is general about other ways of development they always ignore or distort it, as Kindelberger⁵⁶ in his book "economic development" writes: "but collectivization has proven to be a difficult technique at best; it prospect leads to slaughtering of live stock which peasants prefer to eat rather than see collectivized, and the addition of capital inputs seems to be more than matched by loss of interest and energy on the part of the peasants in an enterprise from which they cannot expect to benefit". The above statement that really is spurious. They know with such policies the underdeveloped countries will develop so fast and cut their benefits (Metropolis) of LDCs.

This problem that which way of development is the best: certainly a policy which eliminates dependency is the best one but they always in various ways want to prove us that the best way is industrialization- then we must import the industry.

Generally as Andre Gunder Frank considered⁵⁷: that the satellites experience their greatest economic development and especially their most classically capitalist industrial development if and when their ties to their metropolis are weakest". This point of view is almost diametrically opposed to the generally accepted thesis that development in the underdeveloped countries

⁵⁴ See Monthly Review. Maoist and capitalist economic development, by John G. Gurley, Feb. 1971.

⁵⁵ The full text of Gurley's paper includes at this point a listing with brief commentaries of some dozen book on China by western economists. See: capitalist and Maoist economic development, by John G. Gurley.

⁵⁶ Kindelberger, Economic development, pp. 217-218.

⁵⁷ For proving and empirical evident of this matter see: Political economy of development and underdevelopment edited by Charls K. Wilber, second edition, New York, 1979. PP.: 108-9.

follows from the greatest degree of contact with and diffusion from the metropolitan developed countries.

All other offered method by western economist for economic development are alike for example, Rostow theory about stages of economic growth.⁵⁸ He implicitly says do not worry about your development you will be developed after approximately one century and half. He says you do not need to do anything for your development because you must wait till the dynamism of growth start and promote the progress and development!

There are some others who think we are completely foolish, give some theories that implicitly say you are sorrily: unfortunate, unhappy, unluck,... and have no chance to develop- they try to impact these in our minds and make us hopeless about development-, some theoreticians and theories whom offered are like: vicious circle⁵⁹ by Ragnar Nurkse (1953), Hans W. Singer (1944), It says: you are involved in vicious circle that day-to-day poverty is going to increase,....

Nurkse's fuller statement attracted more attention. The theory is that two mutually reinforcing vicious circles perpetuate low income. Either alone would be sufficient to do so one consists of the relationships among lack of capital income and saving because income is low there is little capacity to save. The low income is a reflection of low productivity, which in its turn is due largely to the lack of capital, the lack of capital is a result of the small capacity to save and so the circle is complete. The other vicious circle relates market size, income and investment. "The inducement to invest" Nurkse wrote may be low because of the small buying power of the people which is due to their small real income which again is due to low productivity. The low level of productivity, however is a result of the small amount of capital used in production, which in its turn maybe caused at least partly by the small inducement to invest" the circle is complete; there is little inducement to invest because income being low, the market is small, so long as there is little investment, income will remain low and market small.

The fallacies of above statement are so bring on the one side they say that the dynamism of capitalist society pushes the growth upward but why and how it is not true in the LDCs. Or there is decline in the economic process of LDCs certainly there had been an increase before- because they have not been in zero economic development in their histories. This matter logically refutes the theory of vicious circle⁶⁰. But let's see the purpose of offering this theory; the solution they give is big push, they finally say for breaking this circle you need big push and therefore you need money landed of foreign countries. Generally they distort the small problems and ignore the essential matters. For instance the most important vicious circle which exist is international vicious circle not by above mechanism but with exploitation mechanism which surplus value goes to metropolis and satellites become poor and poor in this way. I refer to first hypothesis of Frank⁶¹ that says: "The metropolis tends to develop and satellites to undeveloped". His hypothesis is derived from the empirical observation and theoretical assumption within this world- embracing metropolis- satellite structure.

There are a lot of alike theories for example: Huntington argued in a series of books that lack of development in the present backward areas of the world is due in large part to effect of

⁵⁸ W.W. Rostow, The stages of economic growth: A non-communist manifesto 1960.

⁵⁹ See: Economics of development E. E. Hagen, 1975, P.163-9, Revised edition. Irwin, USA.

⁶⁰ For economic critique, see Hagen, P.164-9.

⁶¹ Development of underdevelopment, in book edited by Charles K. Wilber; Political economy of development and underdevelopment, 1979.

their climate on man and also Dr. Douglas H. K, Lee professor of physiological climatology at John Hopkins university, doubts the deleterious effect of tropical climate on human performance.⁶² These are also fallacious because there were great civilization in the ancient history till mid of medieval in tropical and subtropical areas of the world and also now there are a lot of developed countries in sub-tropical areas like United State and also Europe.

There are more examples like: two gap analysis⁶³ by Professor H.B. Chenery. The gap analysis especially in its applied form, assumes that the ex-ante saving-investment gap and ex-ante import-export gap are inter-related. The aim of posing this problem in my point of view is this matter that LDCs with lending money of MDCs can vanish the gaps which offered by Chenery is just to make dependency ties to MDCs stronger and then find more value of interest and also sales their goods to LDCs and finally the LDCs will have these gap wider. The problem is very interesting they also help us to close these gaps in one side and help us to “industrialize”. Their aim of doing in this way is based on some important work. At first if we try to industrialize we become more dependent to western industry and technology second we become the adjuster of their economies and by the channel of international trade and also elite relation they pushed their economic problem like unemployment and inflation to our countries, as occurred a lot of times.⁶⁴

In related to the above, economic development criteria also offered to LDCs are rate of growth in GNP not vanishing poverty and equal education and health and so on. These matters are also consistent about international economics. They always advertise equal international trade relations -but never the structure of the world have based upon equal countries in aspect of economic power. The best sample would be Ricardian theory, the assumptions which this theory is based approximately the entire western in international trade possess them. They assume -or major assumption- all countries are equal in economic power and finally they conclude it causes more welfare for nation by application the theories. Lots of evidences indicate that it is completely at the contrary.

This subject must be noted too that there can not be any confidence on empirical approaches and evident as a sample the Gustave F. Papanek contribution shows some spurious and plausible empirical studies about the LDCs. He indicates with comparison of some different empirical evident that the variation between 0.11 and 0.77 in average impact of foreign inflows on investment and technological dispersion noted in table one (I) are not negligible⁶⁵. They might be explained in part by differences in samples time period and methods of analysis. However comparing times series results for the some countries still produced widely different estimates (Table II) of course the specification of the models differ among analysis but the very large variations should give one pause, especially science the differences are not systematic as one might expect if they were due to differences in specification.

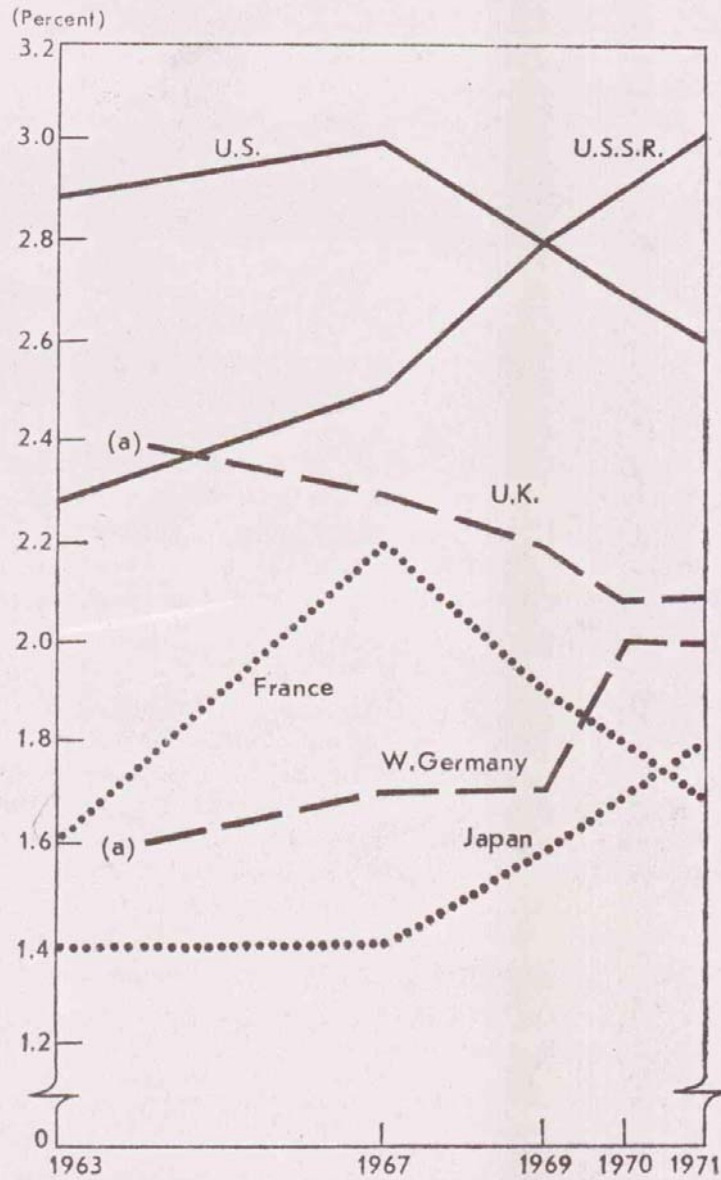
⁶² See Hagen, ch.7, Economics of development 1975.

⁶³ Export and propensity to save in LDC, The economic journal June, 1971.

⁶⁴ For example when the unemployment was rising in Hillman industry in England, the Iran national company stopped to produce Peykan and Hillman cars imported to Iran.

⁶⁵ Reader may know the limits of these variations are between 0 and +1 see Gustav F. Papanek: The effect of aid and other resource transfers on saving and growth in LDCs. The economic journal, Sept.1972.

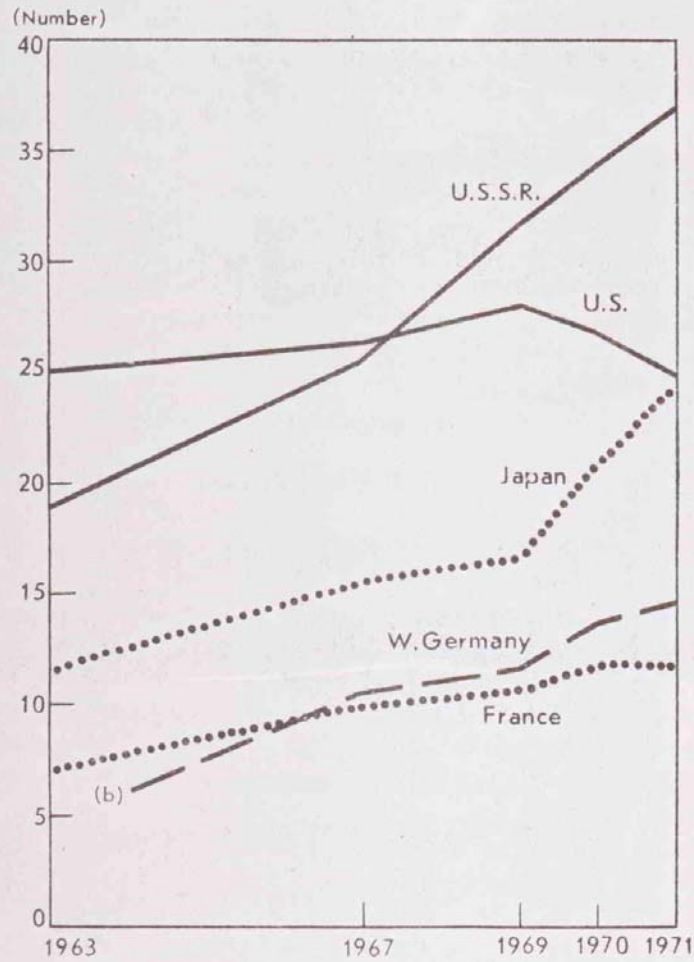
Figure 1
 R and D Expenditures as a Percent of
 Gross National Product, by Country, 1963-71¹



(a) 1964

SOURCE: Organisation for Economic Cooperation and Development;
 National Science Foundation estimates for 1970 and 1971;
 U.S.S.R. estimates by Robert W. Campbell, Univ. of Indiana

Figure 2
 Scientists and Engineers^(a) Engaged in R and D
 per 10,000 Population, by Country, 1963-71¹



(a) includes all scientists and engineers (full-time-equivalent basis).
 (b) 1964

SOURCE: Organisation for Economic Cooperation and Development;
 National Science Foundation estimates for 1970 and 1971;
 U.S.S.R. estimates by Robert W. Campbell, Univ. of Indiana

Table 8

**Company Diversification in the US Manufacturing Industries;
Industry Shares of R & D Manpower; Research Investment Share in Net Sales
(data for 1964)**

Number of industries per company	Number of diversified companies per industry												
	food	textiles	paper	chemicals	oil-refining	rubber	building materials	iron and steel	metal-working	machine-building	electrical engineering	automotive	aero-space
30-45	—	—	—	—	—	—	—	—	—	—	2.9	—	—
25-29	—	—	—	—	—	—	—	—	—	—	5.7	3.3	—
20-24	—	—	—	2.4	—	—	—	—	3.2	4.3	—	3.3	—
15-19	1.3	—	—	4.9	—	12.5	—	—	3.2	8.6	8.6	—	—
10-14	5.3	—	—	24.4	16.7	12.5	—	10.0	16.1	4.3	14.3	20.0	17.6
5-9	16.0	8.0	28.6	41.5	33.4	37.5	47.3	54.0	45.2	24.0	48.5	40.1	30.2

Number of industries per company	Number of diversified companies per industry												
	food	textiles	paper	chemicals	oil-refining	rubber	building materials	iron and steel	metal-working	machine-building	electrical engineering	automotive	aero-space
Total companies involved in five industries or more, per cent													
	22.6	8.0	28.6	73.2	50.1	62.5	47.3	64.0	68.7	41.2	80.0	66.7	47.8
3-4	30.6	32.0	33.3	12.2	23.3	25.0	26.3	24.0	25.9	34.9	17.1	30.0	17.7
1	14.7	48.0	23.8	4.9	13.3	12.5	5.3	12.0	3.2	17.4	—	3.3	30.3
2	32.1	12.0	14.3	9.7	13.3	—	21.1	—	3.2	6.5	2.9	—	4.3
R & D personnel per 1,000 employees													
	7	3	6	40	17	19	13	5	15	27	52	20	107
Research investment share in net sales													
	0.4	0.5	0.7	4.5	1.2	2.1	1.6	0.8	1.5	4.3	9.8	3.6	28.9

Calculated from *Economic Concentration*, Part 3, p. 1274; *Research and Development in Industry 1968*.

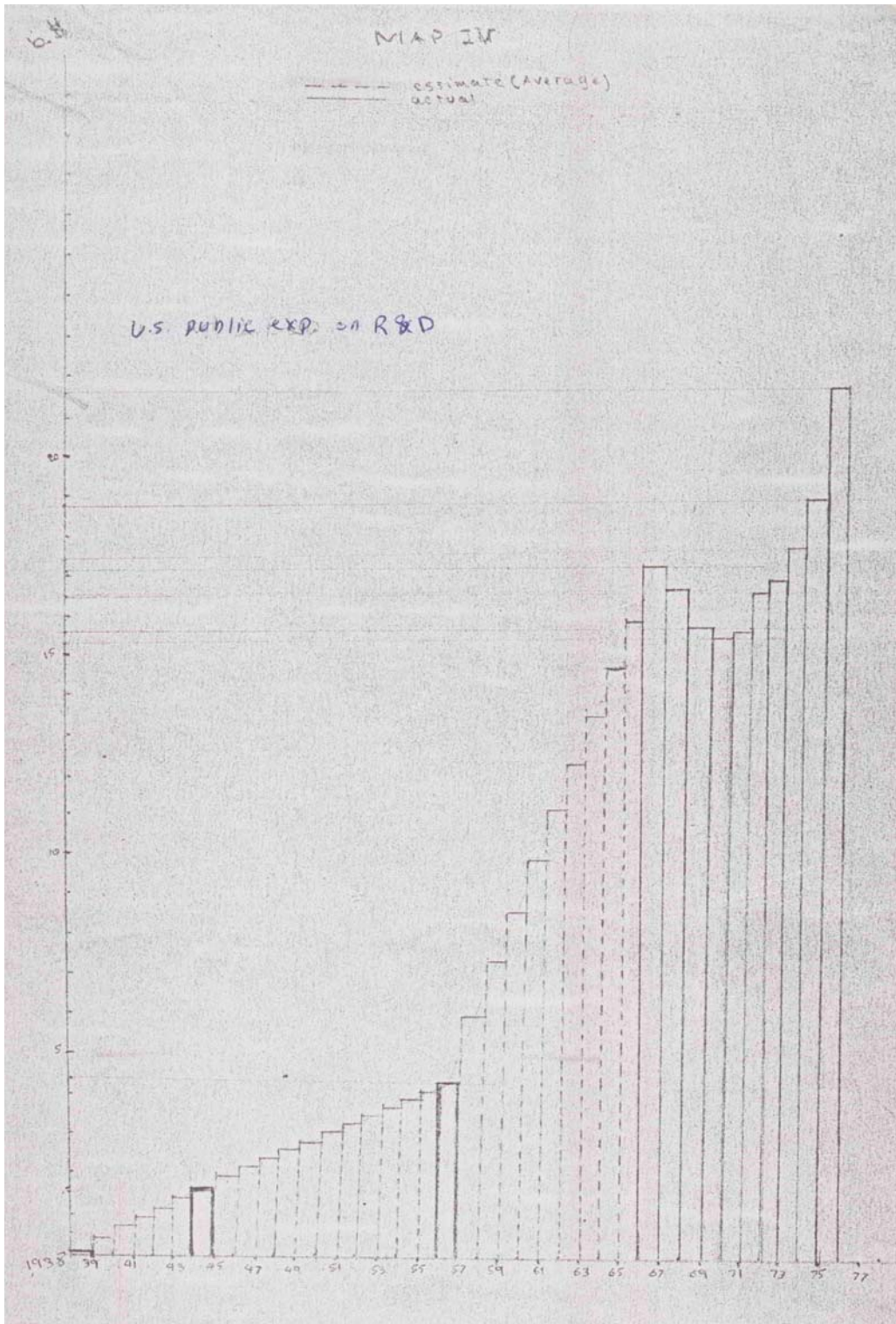


TABLE I
The Effect of Resource Inflows on Savings or Investment

	No. of observations.	Time series or cross-country.	Savings or Investment.	Effect of foreign inflows on savings or investment.
Griffin & Enos ¹	82	C	S	-0.73
Griffin	31	C	S	-0.25
Rahman	22	T	I*	+0.40*
Areskouf	38	T	S	-0.23 †
Weisskopf	16	T	S	+0.64 †
Chenery (JPE)	16	T	S	-1.15 ‡
Chenery (EDR 148)	90	C	S	-0.49
Chenery (EDR 148)	90	C	I*	+0.11*

* Since savings in all calculations is defined as investment minus foreign inflows a 0.40 increase in investment is equivalent to a 0.60 decrease in savings and vice versa.
 † According to Weisskopf this is a minimum estimate and the reduction in savings is probably greater.
 ‡ 12 out of 16 countries show a negative relationship.

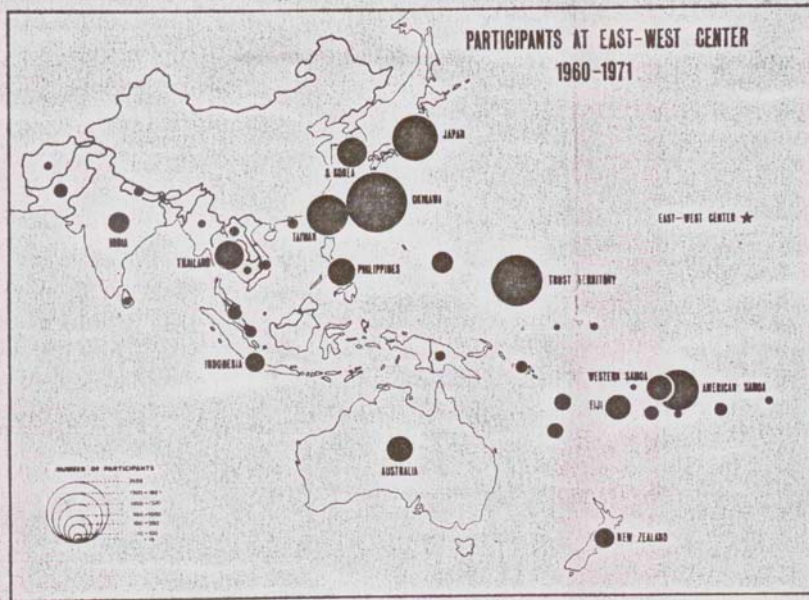
TABLE II
The Effect of Foreign Inflows on Savings as Estimated in Three Time Series Analyses

	Weisskopf (generally 1953-60)	Chenery (J.P.E.) (generally 1950-64)	Areskouf ¹ (generally 1950-64)
Colombia ²	-0.07	-0.36	-1.53
Costa Rica	-0.58	-0.26	
Honduras	-0.88	-0.25	-0.58
Mexico	-0.06	-0.70	+0.01
Chile		-0.42	-1.02
Brazil		+0.07	+4.30
Guatemala		+0.02	-0.57
Panama		-1.15	+1.54
Paraguay		+0.04	

¹ Actually Areskouf calculates the effect of foreign borrowing on investment, not savings. His relationship has been transformed into savings by simple arithmetic, using the identity $S = I - \text{Inflows}$.

² For 1950-63 Griffin's coefficient is -0.84.

MAP ()



9. Participation at East-West Center 1960-1971

The East-West Center, linked with the University of Hawaii, is a major example of “cultural imperialism” in the Third World. Its programmes draw in carefully selected students from all the countries of the Pacific Rim – and as far west as Afghanistan. It meets the needs of the American Empire for the services and loyalties of the trained and domesticated Asian and Pacific middle class needed to implement the Pacific Rim strategy. Its courses run the whole range from counter-insurgent training of Indonesians to training of Melanesians as beauticians (with emphasis on hair-straightening techniques).

Says John Witeck: “The Center’s past serves as its present indictment. Its future promises more of the same. Its unsavory affiliations, its acquiescence and its complicity in US foreign policy, its intimidating environment, its technological and technocratic bent, its “Free World” mythology and liberal suppositions, its elitist nature, its tourism development seminars and “modernization” conferences, and its firm stance for the status quo make the continued existence of the East-West Center intolerable. Who can estimate how many have died and suffered as an indirect or direct result of its allegiances, its training programmes, and its benevolence? Its claim to innocence and neutrality are a mockery. Its role in fostering, promoting, and institutionalizing a Pacific Rim strategy aimed at increasing US profits and control augurs disaster for the target peoples of the Pacific.”

The East-West Center: An Intercult of Colonialism (Special issue of the journal *Hawaii Pono*, Honolulu, c. 1971)

References

1. The structure of economic science, edited by Sherman Roy Krupp. Prentice Hall New York 1966.
2. Philosophy of science-Lakatos, Musgrave (Edited) 1968 North Holland.
3. Science theory and man- Erwin C Schrodinger, New York dover publication 1957.
4. Philosophie scientifique et philosophie Morale, by Felicien Challaye (1929) Paris-Persian translation by Y. Mahdavia. Tehran University 1350.
5. Science, technology and Human values, A. Cornelius Benjamin, Columbia, University of Missouri Press 1965.
6. The structure of scientific revolution, Thomas S. Kuhn University of Chicago Press 1974.
7. An introduction to the logic of the science, by R. Harre, London Macmillan. 1965.
8. The social science and American civilization, Bruce Waston, William Tarr New York 1964.
9. Philosophy of science, Gustav Bergman, the University of Wisconsin Press 1966.
10. An introduction to logic and scientific method. Morris R. Cohen & Ernest Wagel, London 1964.
11. The social science and American civilization Bruce, Waston, William Tarr New York, 1964.
12. Science, government and the universities Frederick Seltz, University of Washington Press 1966.
13. Governing science and technology, W. Henry Lambright New York 1976.
14. Pedagogy of the oppressed, Paulo Frere, Penguin translated by Myra Bergman Romos 1973.
15. Patterns and politics in higher education, G. Brosan, Charls Catter. R. Layard, P. Venable, G. Williams, England Penguin books 1971.
16. R&D in social reproduction, 1975 A. Nikolayev, Progress Publishers Moscow.
17. Science policy: problems and trends Y. Sheinin, Progress Publisher. Moscow 1978.
18. Economic theory and underdeveloped regions, Gunnar Myrdal, England 1972.
19. Reflections on education in the third world, Keith Buchanan 1975 Nottingham.
20. The political economy of development and underdevelopment, edited by Charls K.Wilber, University of Notre Dame New York 1979.
21. Monopoly capital, Paul A. Baran and Paul Sweezy, an essay on the American economic and social order, Pelican book, 1973 England.
22. Existentialism, science and new scholastic, Mohammad ali (Ashena) (Persian) GOM 1358.
23. The Irony of democracy an uncommon introduction to American politics. Thomas R. Dye and Harmon Zeigler, 1975 USA. Wadsworth publishing company.
24. The power elite, C. Wright Mills, 1956 New York, Oxford University Press (fifth printing 1963).
25. The shortage of science and engineers Hugh Fold 1970 U.S.
26. Against stream: critical essays on economics Gunnar Myrdal, 1974 England.
27. The question of imperialism. The political economy of dominance and dependence, Benjamin J. Cohen New York 1973.
28. The effect of aid and other resource transfer on saving and growth in LDCs, the economic journal Sept, 1972.
29. Expert and propensity to save in LDC, the economic journal, June 1971.
30. Economics of development E.E. Hagen, 1975 revised edition MIT USA.
31. W. W. Rostow, The stages of economic growth: A non-communist manifesto 1960.
32. Economic development Kindelberger.
33. Capitalist and Maoist Economic development by John Gurley, Monthly Review Feb. 1971.
34. Hengel philosophy vol.2. by Bertrand Russell.
35. Kenneth B. Clark's forward to Paricia Cayo Sexton, Educational and income inequalities of opportunities in our public school New York 1961.

36. James B. Conant, *Slums and Suburbs: A commentary on schools in Metropolitan area* New York 1961.
37. Baltzel, *American business aristocracy*.
38. *American men in Government* by Jeromo M. Sosow Washington D.C 1949.
39. *High circle* W. Dum Huff 1969 New York.
40. *Militarism in education* Washington DC 1950.
41. *The Bureaucratic state: The evolution and scope of American Federal Bureaucracy*, Richard Schott N.F. 1974.
42. *Leadership in Administration* New York Harper & Row Philip Selznick 1957.
43. *A framework for political Analysis* N.J. Prentice Hall 1965 David Easton.
44. *Inside Bureaucracy* Anthony Downs, Boston 1967, Little and Brown.
45. *The analysis of political behavior an empirical approach* New York Oxford University Press 1948 by Harold D. Lasswell.
46. *Arise of a political elite: scientist and national policy making* editing by R. Gilpin and C. Wright New York 1964.
47. *Toward a science policy for the United States* Washington D.C. USGPO 1970.
48. *Science and the nation*. Englewood cliff N.J. 1962 by F. Stefan Dupre and Stanford 49.
49. *Government and science* New York Don K. Price 1954.
50. *Vanneevor Bush science the endless frontier* Wash, 1960.
51. *Philosophers of the technological age-technology and man's future* New York 1972.
52. *The University and military research* New York Cornell University Press by Dorothy Nelkin 1972.
53. *Are scientist obsolete* Harvey Brooks 186 Nov, 1974.
54. *Ford to seek reestablishment of White House Science Office* New York times May 23, 1975.
55. *Annual comparative survey of freedom by freedom house* New york.
56. *On the role of democracy in the United States* Edwards and Reich.
57. *Capitalism and underdevelopment in Latin America* Month review Press 1969 New York, London.
58. *The continent of circle* N.C. Chaudhurn London 1965.
59. *Independence and after* Richard Harris London 1962.
60. *European languages and black mandarins in transition*, Dar-es-salaam, Pierre Vandenberg, 1968.
61. *Renato Constantino, the Mis-education of the Philipine* 1970.
62. *India and Modern Art* W.G. Archer London 1959.
63. *American power and new mandarins* Noamchomsky Penguin 1969.
64. *Social science and social consciousness in the dissenting academy* ed. By the Odor Roszak New York 1967.
65. *Secondary education* Rick Green Span 1970.
66. *LDCs- Technology transfer and adaptation: The Role of the indigenou science community* by Richard Nelson University of Sussex.

CHAPTER 12

THE LOGICAL CRUX OF ALL SCIENCE

The Relation between the Moral and the Intellectual Discords

When the facts of international economic inequalities and their tendency to grow are confronted with the state of public conscience in the richer nations and with the economic theory which has developed in the cultural setting of those countries, discords are brought into the open both in the moral and the intellectual spheres.

Of these the moral discord is undoubtedly the fundamental one. On the one hand, there is in these nations, on the general plane of valuations, a common adherence to the ideal, inherited from far back in history, of the right of all persons to equality of opportunity, irrespective of race and colour, religion and creed, social status and nationality. On the other hand, in their daily life as individuals and as citizens, people there are not, in fact, prepared to take the consequences of this great moral principle, in a measure which even remotely approaches completeness.

Economic theory is only a segment of the total culture. It becomes modulated to serve opportunistic rationalisation needs. In order to live on as comfortably as possible with the moral discord in their hearts, people there need an economic theory that diverts attention from this moral discord.

This need enhances the survival strength of those old doctrinal predilections of economic theory which have an instrumental value as antidotes to that theory's own basic equality doctrine, and also of such theoretical devices for "proving" those predilections as the stable equilibrium approach, and the abstraction from the "non-economic" factors. The combined effect of these tendencies in economic theory—which are all logically related to each other, and to the philosophies of natural law and utilitarianism from which economic theory has branched off—has been, and is, to keep theory, as far as possible, aloof from such facts and causal relations which.

Economic Theory and Under-developed Regions

if analysed, would focus attention on the economic inequalities as between regions and countries and thus on the fundamental moral discord.

In this situation the untheoretical twist which we have observed in the rapidly growing literature on the problems of the under-developed countries would seem to be a sound reaction on the part of those social scientists who are devoting their efforts to these problems. Attempting to do without a general theory would seem to be a safer course than using one that is biased and faulty.

The Logical Necessity of a Theory and the Need of Adjusting it to Facts

It must be said, however, that theory is indispensable for scientific work. Theory is necessary not only to organise the findings of research so that they make sense but, more basically, to determine what questions are to be asked. Scientific knowledge never emerges by itself, so to speak, from empirical research in the raw, but only as solutions to problems raised; and such solutions presume a logically co-ordinated system of problems stated.

Theory, therefore, must always be *a priori* to the empirical observations of the facts. Facts come to mean something only as ascertained and organised in the frame of a theory. Indeed, facts as part of scientific knowledge have no existence outside such a frame. Questions must be asked before answers can be obtained and, in order to make sense, the questions must be part of a logically co-ordinated attempt to understand social reality as a whole. A non-theoretical approach is, in strict logic, unthinkable.

Underlying and steering every systematic attempt to find out the truth about society, there is therefore always a theory: a vision of what the essential facts and the causal relations between them are. This theory which determines the direction of research should be made explicit. The danger of keeping the theory implicit—as unstated reasons for asking the particular questions that are asked, and organising the findings in the way they are actually organised—is, of course, that it escapes criticism.

If theory is thus *a priori*, it is, on the other hand, a first principle

The Logical Crux of All Science

of science that the facts are sovereign. Theory is, in other words, never more than a hypothesis. When the observations of facts do not agree with a theory, i.e. when they do not make sense in the frame of the theory utilised in carrying out the research, the theory has to be discarded and replaced by another one which promises a better fit.

Theory and fact-finding research should thus be continually readjusted to each other, on the principle, however, that in the final analysis the facts are decisive. As the theory is merely a hypothesis, the criterion of its truth can never be anything else than the pragmatic one of its usefulness in bringing our observations of facts into a meaningful and non-contradictory system of knowledge. And so scientific progress can be expected to result by a process of trial and error.

In the moral sphere, the corresponding logical process is moral criticism, proceeding on the assumption that there should be consistency between our valuations, a demand raised by feelings which are real because of the rationalism which is also part of our culture. As the valuations refer to social reality, and as therefore their inter-relations logically involve people's beliefs concerning this reality, the process of correcting their theories to fit the facts plays at the same time an important role in the attempts to give clarity, honesty and consistency to their moral ideas: to purify and strengthen the public conscience.

For people want to be rational. Scientific truth-seeking, by rectifying their beliefs also influences their valuations. "In a rationalistic civilisation it is not only that the beliefs are shaped by the valuations, but also that the valuations depend upon the beliefs."¹

The Provenance of Truthful Theory

For realism and relevance scientific research thus depends on a major *a priori*: an insight into what the essential facts and causal relations really are. This *a priori* theory then becomes corrected in the course of research to fit ever closer the reality studied. But

¹ *An American Dilemma*, p. xiv; cf. pp. 1028ff.

Economic Theory and Under-developed Regions

from where, in the first place, is the *a priori* theory inferred? Where is its fountain head?

To take it from one's own hunches is almost certain to be a choice of one of the innumerable roads to unreality and irrelevance. The theorist's individual hunches do not even have the quality of being random, which would at least preserve the possibility that occasionally he would by pure chance strike upon what is essential and thus be in a position to pose questions which truly reveal reality and draw relevant inferences. For he is mostly, *nolens volens*, under the impact of the inherited theory which tends to serve as a vehicle for the predilections which I commented upon in Chapter 10.

The "purer" a theorist is, the more he seems to be under the influence of the inherited predilections. The devotion of so much theoretical effort even in recent decades to "welfare economics"—though it was conclusively proved long ago that this approach is unrealistic and, in fact, without logical sense—is a demonstration of this point.

My next point is that there is no other rational way to reach that insight into what is really essential, and which is indispensable for the choice of variables for theory, than the cumbersome and laborious one of comprehensive and intensive empirical social science research. Only on the basis of a close contact with social history and social knowledge generally can we hope to construct the "model of the models" which can be used as the guide to realism and relevance for our abstract theory.

This basic empirical research would need to encompass social facts and relations in all fields. In Chapters 1 and 3 I noted that our traditional division of knowledge into separate and delineated social science disciplines has no correspondence in reality: concrete problems are never simply economical, sociological, psychological, or political. A theory of under-development and development which works only with "economic" variables is for logical reasons doomed to be unrealistic and thus irrelevant.

And this comprehensive social science research prior to the construction of the abstract theory and needed for assuring it realism

The Logical Crux of All Science

and relevance, should be freed as far as possible from the powerful predilections I have referred to. The general method to accomplish this is to work with explicit value premises, themselves tested both as to relevance and significance.

This comprehensive research, however, needs itself, from the start and continuously as it proceeds, to formulate hypotheses in order to direct the observations and ask the pertinent questions. It needs theory. As I just stated, empirical knowledge cannot be assembled and systematised without organising principles, i.e. an insight into what are the essential facts and relations. Empirical research needs in fact for its own pursuit a nucleus of the theory which I am insisting can only be constructed on itself as a basis.

The Crux of all Science

This is the logical crux of all science: it assumes in all its endeavours an *a priori* but its ambitions must constantly be to find an empirical basis for this *a priori*. A worth-while theory of underdevelopment and development, if it can ever be formulated, would have to be based on ideas distilled from the broadest empirical knowledge of social change in all its manifold aspects, acquired under the greatest freedom from tradition-bound predilections. Only thereby can the bold simplifications be safely founded which can serve as the theoretical direction of research. But the empirical knowledge itself cannot be acquired without principles of selection and organisation, i.e. without a vision of a theory.

We are thus constantly attempting what in its perfection is impossible, and we are never achieving more than makeshifts: these, however, can be better or worse. In our present situation the task is not, as is sometimes assumed, the relatively easy one of filling "empty boxes" of theory with a content of empirical knowledge about reality. For our theoretical boxes are empty primarily because they are not built in such a way that they can hold reality. We need new theories which, however abstract, are more realistic in the sense that they are in a higher degree adequate to the facts.

Meanwhile, I believe it to be a disciplining force in our dispersed

Economic Theory and Under-developed Regions

efforts in the field of under-development and development that a clear concept of the ideal is constantly kept in mind and given a directing role in all our research. To begin with, we need to free ourselves from the impediment of biased and inadequate predilections and unreal and irrelevant theoretical approaches which in our academic tradition we are carrying with us as a heavy ballast.

89