

Lectures in Development Economics
No. 1

Lecture on
Theory of Human Capital

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Biographical Sketch

FRITZ MACHLUP is an economist with strong transdisciplinary interests. Among his many books published since 1925 are *The Economics of Sellers' Competition* (1952); *The Production and Distribution of Knowledge in the United States* (1962); *Remaking the International Monetary System* (1968); *Methodology of Economics and Other Social Sciences* (1978); and the first two volumes for a projected ten-volume series on *Knowledge: Its Creation, Distribution and Economic Significance*; Volume I on *Knowledge and Knowledge Production* (1980), and Volume II on *The Branches of Learning* (1982).

He has taught at Harvard, Buffalo, Johns Hopkins, Princeton and, for the last twelve years, New York University. He has been elected Member of the American Philosophical Society, and Fellow of the American Academy of Arts and Sciences, and the AAAS. He has received Six honorary degrees, two of them from universities in Europe.

Born in Austria in 1902, he came to the United States in 1933. He has served as President of the American Association of University Professors, the American Economic Association, and the International Economic Association.

First published in Pakistan in 1982

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INTRODUCTION TO THE SERIES

The purpose of this new Series is to create useful knowledge about development economics and to disseminate it widely. It is not possible to prescribe exactly the topics that will be discussed in this Series. Indeed, it would not even be desirable to do so because this subject is still developing. The mystery of the development process is not yet fully understood. The days of chivalry, when economic development was seen as simply a function of physical capital formation, are gone. The importance of such factors as human capital, education and religion as determinants of both the rate and the composition of economic growth is now gradually recognized. And then there are the efforts to understand more clearly the relationship between economic growth and income distribution. In this connection, the vital role of structural reform is also being realized. The practical (social and political) requirements to alleviate the incidence of absolute poverty has brought to the fore the key role of agricultural development. Furthermore, there is now a greater awareness of the importance of endogenizing the demographic variables in order to understand fully the problem of underdevelopment as well as the many ways of solving it.

In direct proportion to the comprehension of these issues, the intellectual fashions have changed among economists. And there are no signs — a healthy sign, of course — that economists will remain far behind ladies in their love for fashion. As such, we have

left it to the contributors to this Series to decide on the topics of their lectures. And, yet, it is to be expected that economists, as if guided by an 'invisible hand', will select areas of enquiry that are most relevant not only theoretically but also for practical policy making.

The contributors to this Series are all members of the Advisory Board of the Pakistan Institute of Development Economics (PIDE) and of the Editorial Board of the *Pakistan Development Review*. The visits of these outstanding economists have been made possible by a generous grant by the Ford Foundation, which will be administered by the Institute of International Education (IIE), New York. It is to be hoped that the success of this Series, which we can predict with certainty, will lead to greater financial support from the Ford Foundation and other donor agencies. Even more important is the 'fact' that these contributions will serve the cause of knowledge formation in an area where its marginal productivity is most likely to be optimized.

The present lecture by Professor Fritz Machlup is the first in this series.* Prof. Machlup, who is also a member of the Advisory Board of the PIDE, was most eminently suited to give this lecture on "Human Capital". He is, at present, engaged in writing up his 10-volume *magnum opus* (*Knowledge: Its Creation, Distribution, and Economic Significance*) which deals with the various aspects of knowledge. The third volume of this work, is entitled *The Economics of Information and Human Capital* and is due to be published soon. The lecture is followed by a lively discussion which, in many ways, clarifies the various points raised by Prof. Machlup. It is to be hoped that this publication will be widely read and used by economists throughout the world.

Editor

*This lecture was *not* sponsored by the Ford Foundation but by the State Bank of Pakistan where Prof. Machlup gave Lecture No. 5 in the Zahid Husain Memorial Lectures series.

Chapter 1

INTRODUCTORY REMARKS

by

Syed Nawab Haider Naqvi

Prof. Machlup, Ladies and Gentlemen,

Professor Fritz Machlup is at present associated with both Princeton University and New York University. I think that those of us who have been in the Economics profession for long know him already quite well; but here we have also a large number of the members of the younger generation who may not have been so much exposed to a lot of things that Professor Machlup has been doing. Indeed, he has been doing such an awful lot that when last night I was trying to reconstruct the story to introduce him in 5 or 10 minutes, I found it very difficult to do justice to him. And then there are so many aspects of his personality, so many aspects of his interests and so many aspects of his associations. But, still, I will try to say a few things about his works and about some of his activities. Of course, he also has some extra-curricular activities – like skiing – that I will skip: I will concentrate only on the academic part of his life.

Professor Machlup was born in 1902 in Austria. He came to the United States in 1933, first as a visiting scholar, later as an

immigrant. Before going there he experienced what can be called an early flowering of the genius. He finished his doctoral dissertation at the age of twenty – even earlier than Byron’s “sweet two and twenty” – which is a time for a lot of us just to warm up for intellectual life, but he in that time had really reached a considerable degree of perfection. His writings have been quite varied. His first book, published in 1925, was on the gold-exchange standard. Since then he has gone over almost every aspect of knowledge. In Economics he has been concerned with economic theory, economic history, economic semantics, economics of information and, of course, international monetary economics, which remains his first and last love, if only because he has revealed his preferences most convincingly in this field. Of late, he has concerned himself with enquiring into the basis and the foundations of knowledge itself. This project will take him to write 10 volumes, of which 3 are already complete.

As they say, a man is known by the company he keeps. Professor Machlup has kept the company of all kinds of people. In 1965 he was elected to the membership of the highly exclusive American Philosophical Society. As a matter of fact, he has many writings in the field of philosophy. Some of these have found expression in a book, *Methodology of Economics and Other Social Sciences*, published in 1978. Those of you who want to know his views on philosophy of science can benefit from a study of his book. He was also elected to the National Academy of Education – in recognition of his work on education, chiefly in his book on *The Production and Distribution of Knowledge in the United States*, published in 1962. He was President of the American Economic Association in 1965 and President of the International Economic Association from 1971 to 1974. As if to combine ‘politics’ with academics, he has also been President of the American Association of University Professors.

Professor Machlup has taught widely, in almost all the top universities of the U.S.A., Japan, Australia, Germany, and Austria. His works have been widely read, not only in the languages in which he writes – viz. English, French, and German – but, through translation, also in Dutch, Swedish, Italian, Russian, and a few other languages that he himself cannot read – for example, the Japanese. (No less than ten of his books have been translated into Japanese.)

I will not go into all the details of his many-splendoured academic life, but only point to the outstanding characteristics of his writings. Professor Machlup has certain distinctions that set him apart from other economists. If I were asked to name one such quality of Professor Machlup's writings, I would say that it is the lucidity of exposition, which is liberally, though carefully, interspersed with subtle humour. Indeed, I remember that in Princeton, where I was his student, his colleagues used to call him the Dean of Faculty of Exposition. He is unrivalled amongst his peers for the ease with which he can reduce extremely complicated arguments to elementary economics. Sometimes his penchant for deductive reductionism can be embarrassing to some of the economists who think that they are saying something very profound. When Professor Machlup shows that what they said was something rather elementary and, what is worse, that they committed elementary mistakes in enunciating their profound thoughts, they must be feeling very small. For instance, take the concept of 'liquidity' which has given birth to a lot of fuzzy thinking, mainly because the economists using it do not always know what they are talking about. Professor Machlup has shown that it has many different shades of meanings, depending on whether one talks about the liquidity of assets, the liquidity of persons, banks, groups, nations, groups of nations, or the whole world; moreover, on what is the source of liquidity, the use of liquidity, and so forth. Another illustration is the concept of "equilibrium," which, like the ghost of

Hamlet's father, seldom leaves the ramparts of economics alone. Professor Machlup has shown the many senses – also non-senses – in which this concept has been used by economists. Such elucidations have been most disconcerting, indeed infuriating, to those who have acquired lasting vested interests in semantic non-chalance. However, for most economists, who use language as a vehicle of ideas, as a means of communicating them, Professor Machlup's contributions to economic semantics have been an unmixed blessing. (See his *Essays in Economic Semantics*.)

Another quality of his writings that sets him apart from his peers is his great taxonomic capability – i.e. he can readily divide complicated arguments into easily recognizable parts, sometimes in tabular form: see, for instance, his introduction to *International Mobility and Movement of Capital*. However, the most lovable characteristic of the man and the scholar is his capacity to “intermingle jest with earnestness,” which, according to Francis Bacon, is the hallmark of an intellectual. Indeed, he always used to advise us to make sure that we ‘smile’ in our writings once in a while, no matter how serious the subject. Every desert needs an oasis; likewise, an arid argument requires a ‘smile break.’ Professor Machlup has always stressed that one ought to be courteous to one's readers. This means that a scholar should go out of his way to make himself understood! Indeed, in the economics profession, and also in some other professions, the hallmark of knowledge is that you are so profound that you are not understood. Professor Machlup, however, has earned his reputation the hard way; he convinces his audience and readers of his great erudition by being understood. This is a quality which, I think, has become extremely rare among economists. Just cast a glance at the learned economic journals, and you will come away pelted in your face by odd symbols and bad prose.

Considering the breadth of his knowledge, the depth of his vision, and the fact that he manages to work fourteen hours every

day of the week, it is quite safe to say that he is one of the great geniuses of our time. Somebody defined a genius as one who could take infinite pains. Professor Machlup, like Sisyphus, does this every day, every night. If you want to find out how difficult it is to persist in work that long, you may try it just for one month!

Professor Machlup is at present engaged in an ambitious undertaking: to combine in one homogeneous whole, and in one place, his life-long preoccupation with different kinds of knowledge – philosophy, semantics, economics, education, and so on and so forth – to see its underlying unity. His interest in the economics of information and knowledge started with his book that was published in 1962 – *The Production and Distribution of Knowledge in the United States*. He first thought of updating it, but then abandoned the idea as he felt that the book, instead of being just updated, had to be expanded by a large factor. In the first instance, he conceived of the new work as comprising eight volumes, but now he proposes to complete it in ten volumes. He has already brought out two volumes, one on *Knowledge and Knowledge Production*, the other on *The Branches of Learning*. A third volume is on the anvil, so to speak. In Volume I you can find chapters like “The Known and the Knowing,” “Truth, Beauty, and Goodness,” and “Classes of Knowledge,” as if to show to the overspecialized economists that these broad subjects, which many believe to be outside their realm, deserve to be considered by all. We all wish and pray that Professor Machlup does complete his *magnum opus*, which promises to become the high-point of his long, distinguished and luminous academic career.

Adam Smith – who, as Kenneth Boulding wittily remarked, was both the Adam and the smith of modern economics – once castigated economists for their narrowness: he said that the torpor of their minds incapacitates them so that they cannot see and understand the wider aspects of life. Professor Machlup is not one

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of them. He has been pursuing his interest with all the gusto and zest that it takes to produce so much on so many aspects of knowledge in such a short time. I now request Professor Machlup to begin his lecture.

Chapter 2

THEORY OF HUMAN CAPITAL

(Lecture by Prof. Fritz Machlup)

If I were a very modest man, I would be seriously embarrassed by the praise of my character and achievements which our chairman so emphatically bestowed upon me. Alas, I am not that modest and thus, if I blush, it is not from embarrassment but from happiness. What Professor Naqvi chiefly means to say is that he likes me, and what I can say in response is that I like him, too. I have had many students in my long life, but he is one of my favourite students. I thank you very much, Professor Naqvi, for your generous introduction.

Alternative Plans

Now to my topic, "The theory of Human Capital." Having devoted ten chapters of a forthcoming book to this subject, I have a hard time deciding how I should present it in a single lecture. Four different ways have occurred to me. I might give you a survey of the literature, but if it were to be a fairly complete survey, this would be an impossible undertaking. The bibliography is so immense that to offer even a selective survey of the literature would be impracticable in the time available for a lecture.

Alternatively, I could arrange the subject into a neat system, classifying it into several sub-topics and give a systematic and methodical exposition of what the main issues are in each class. I am afraid, however, such a classification may not be very helpful to those who do not know the subject well enough. So I rejected this option for my presentation.

A third possibility would be to follow the outline of the ten chapters that constitute a part under the title "Knowledge as Human Capital" and run to more than 300 typed pages. I could try to give you brief sketches of what I have written in each of these chapters. I fear, however, that this exercise would be dull, at least to me. After all, I know too well what I have written and I prefer to do something I have not yet done. I want to try to give you a free-flowing exposition, one that is not well planned and therefore gives me the freedom of bringing in ideas that occur to me while I speak. This can make the whole thing more alive; it would not be dead letters and stale sentences. I assume that we all can agree on the choice of this fourth way to present my material.

The Early Literature on Human Capital

Let me begin with an attempt to dispel the misconception that the theory of human capital is an entirely new field in economics. Many young students actually believe that the economics of human capital has developed quite recently, beginning in the 1950s or 1960s. This impression has arisen probably because of the work of two economists who, around 1960, put the notion of human capital on the map, prominent for everyone to see. They actually revived a venerable idea, showed its significance for the explanation of currently observed phenomena, and their presentation was forceful and rigorous. These two men deserve our respect and admiration. Fortunately, our profession has not failed to recognize their achievement. They are Theodore Schultz and Gary Becker, both of the University of Chicago. Their work in this area of

analysis and research has induced many other economists to enter this field and develop it further.

Schultz applied the notion of human capital to the economics of education, particularly to an explanation of the increase in productivity of human resources; he also examined the relationship between human capital and economic growth. Gary Becker engaged in more technical research in mathematical and statistical economics. He undertook to compute rates of return to the investments people have made in their own skills and efficiency—in self-improvement — chiefly through schooling and training. That Schultz and Becker were not the first economists to show the role of human capital does not reduce the magnitude of their achievement.

The first estimate of a nation's stock of human capital was probably made around 1676 by Sir William Petty for his *Political Arithmetick* (published posthumously in 1690). Petty did not, however, use his estimate in support of any substantive hypotheses or in connection with any theoretical model for the derivation of causal connections.

Exactly a hundred years later, in 1776, Adam Smith published his *Inquiry into the Nature and Causes of the Wealth of Nations*. Smith was quite clear about the role of human capital. In his discussion of the nation's "stock," he remarked on most people's preconception of the capital stock as always being something physical, such as factories, machines, or tools; and he warned the reader not to forget that one of the important parts of capital stock is the raised productivity of human beings. Smith considered education as one of the effective ways of increasing the productivity of human resources. That Smith was highly critical of the quality of teaching at Oxford University and of the counterproductive arrangements in the university education of his time should not

be mistaken as an argument against capital formation through education. He emphasized the development of skills through specific kinds of training.

In 1883, a German statistician by the name of Ernst Engel published a book on the "cost value of human beings." (Lest you confuse this Engel with Friedrich Engels, the collaborator of Karl Marx, let me assure you that they are neither identical nor related.) Ernst Engel planned two volumes on *Der Wert des Menschen* but finished only Volume I, treating the investment outlays made for man as productive factor; he was chiefly concerned with the cost of food invested in the growing child. (This conception has recently been revived by John Kendrick, an attempt to which I shall later return.)

In this brief intellectual history I must not leave out the English economist Joseph Nicholson. He published an article in 1891 on "The Living Capital of the United Kingdom." He was quite explicit regarding the fact that he was dealing with an old notion. He said that "almost all systematic writers on Political Economy have discussed the question whether or not the skill of the artisan . . . and other intangible elements of the social fabric should be included in the wealth of the individual or the nation." Nicholson looked to the cost of educating, not the cost of feeding the child, as the major investment in human productivity. Assessing the human capital accumulated in the people of the United Kingdom, he estimated that the total value of the country's "living capital" was more than five times the stock of "dead," that is, physical capital.

Alfred Marshall also should be cited for his clear vision of these ideas. He distinguished "personal" capital from "material" capital; he considered personal capital as being chiefly formed through investment by parents paying and caring for the education of their children.

Coming to the twentieth century, I want to refer to an article by John Raymond Walsh, published in 1935, entitled "Capital Concept Applied to Man." In 1945 we were given the pioneering study by Milton Friedman and Simon Kuznets on *Income from Independent Professional Practice*. This book undertook an elaborate empirical test of the thesis that investment in scarce skills was paying off.

My list of early contributions to our topic is surely not complete, but it suffices to show that the theory of human capital had been in the economic and statistical literature for almost 300 years before the floodgates were opened by Schultz and Becker.

Concepts of Capital

In a talk about human capital I must not dodge the issue of the semantics of the word "capital". Many textbooks circumscribe the meaning of the word rather narrowly, confining it to "produced producers' goods." Thus, the concept is not extended to intangibles and not extended to consumer durables. The stress is on physical goods that were "produced," that is, not provided by nature (like land, mineral deposits, or other natural resources).

Other writers, however, have found it useful to widen the meaning of capital in several respects. One extension relates to the users of capital: the use is no longer restricted to producers making other goods but is extended to consumers deriving from it a long-enduring flow of intangible services. To comprehend this, one merely has to think of residential housing. Most national-income statisticians include the construction of residential homes in capital formation. Capital is thus no longer a physical intermediate product used in the production of other physical products, but a durable structure that provides a flow of intangible consumer benefits. Economic theorists have gone beyond economic statisticians in that they include in the capital stock all sorts of dur-

able consumer goods, such as automobiles, home appliances, musical instruments, etc. Still, although the future benefits may be intangible, the assets in the capital stock are physical, "tangible."

Coming now to human resources, we find that the capital concept is no longer restricted to *tangible* assets yielding tangible or intangible services, but extended to *intangible* assets yielding tangible or intangible services. Still another distinction is to be made with regard to human resources, namely, whether the capital concept should be restricted to investments in improvements of the human resource as a productive factor or whether the human resource should be regarded as capital no matter whether any special outlay has been made to increase its productivity. Economists have sometimes been critical of the strange "fallacy" of regarding the birth of a lamb as an increase in wealth, but the birth of a human child as no such increase but, instead, as a burden, as a reduction of income per head of population. If the newly born child is not seen as an addition to wealth and capital, then at least the investments in feeding and caring for the future workers should in the view of these economists, be treated as capital formation. Counter-arguments, however, point to the possible absence of complementary capital goods, especially in countries suffering from overpopulation.

Investment in Education

Education is commonly regarded as the major form of investment in human resources. There is the question whether one should consider all outlays for education as formation of human capital regardless of whether the particular teaching and learning would increase the productivity of labour. Education can, by elevating the learners' intellect, improve their quality of life; but it may also improve the individuals' skills and efficiency in producing useful things. Some economists see an important difference between the contribution that education may make to the flow of

intangible satisfactions to the educated themselves (and their friends and contemporaries) and the contributions which the skilled and efficient workers will make by producing material goods in greater quantity or of better quality.

We find here again the problem discussed earlier in relation to durable goods: they may contribute to a larger flow of tangible goods or they may induce a larger flow of intangible services yielding psychic satisfaction, but no measurable increase in production. In other words, we face again the problem of distinguishing productive capital from consumption capital. Some economists prefer to treat durable consumption goods as wealth but not as capital. National-income accountants have decided against treating the sources of intangible flows of consumer satisfaction as capital. Other economists, however, do not recognize this as a significant difference, and they treat both kinds of "sources of benefits" as capital; they do not care whether the derived services are used for production or only for consumption.

Types of Investment Opportunities

Let us try to make this discussion somewhat more concrete, with regard to both physical and human capital. Assume that a country has a certain flow of investible funds available. The people of that country -- either private owners and borrowers of investible funds or the government -- have a variety of investment opportunities. Let us single out four types of potential investments: (1) Physical producers' goods, such as machines and factories; (2) physical durable consumers' goods, such as washing machines and residential houses; (3) schools and teachers to provide vocational skills; and (4) schools and teachers to provide knowledge of literature and dance. All four types of investment may yield future flows of benefits that will improve the human condition. Thus, they can all be regarded as capital formation in the wide sense of the term. Still, it may serve an analytic purpose to distinguish sub-

groups of capital. The investments mentioned under Nos. (1) and (3) may be characterized as productive in that they will increase the efficiency of the nation's productive factors employed to produce a larger output of real goods. In contradistinction, the investments mentioned under Nos. (2) and (4) may be characterized not as inputs in the productive process but as making the lives of people in the future more pleasant or more interesting. For example, using a washing machine is easier than washing by hand; living in a better house is more pleasant than living in sordid and overcrowded quarters; knowing the literary masterpieces of the past and understanding the rites of classical dance may lift people's spirits and add to the enjoyment of their lives.

These differences between production capital and consumption capital are no longer popular among economists. Many economists these days distrust the speculations behind the distinctions. Statisticians treat the four types of investment in a rather non-philosophical way. They would take the costs of the machines, the factories, and also of residential construction and call all of it capital formation. They would eliminate the washing machines from investment outlays and include them in consumption. And the official government statisticians would omit all formation of human capital and, instead, would treat the expenditures for education as current consumption.

Some academic statisticians oppose these operational decisions and make an effort to report investments in human capital. Even there, however, we find a certain inconsistency with regard to current investment and the future flow of benefits. In the case of physical capital goods, such as machines and factories, these items are included in the annual statistic of national product, and their future contributions to the flow of goods and services will appear again in the statistics of national product when the products are eventually sold. In the case of human capital, such as outlays for

schooling, these items are included (though only by the idiosyncratic-academic statisticians) in the statistic of national product in the year of investment, but the subsequent flows of benefits from these investments will remain unrecorded in later years except if they are giving rise to monetary transactions between sellers and purchasers. This is similar to the way in which in many countries, the services from owner-occupied residential housing remain unreported and unrecorded. While the construction of houses is included as capital formation, and while rentals paid in the future by tenants to landlords will figure in national income, the rental values of owner-occupied houses are disregarded. You can see that we all have great trouble getting our act together.

Investment in Research and Development

The situation becomes much worse when we proceed to the economists' treatment of outlays for research and development. Although everybody these days is convinced that such outlays are investments — even very good investments — the official statisticians have not yet decided in favour of a consistent treatment. Most of the official statistics record outlays for R and D as part of the national income (though not as part of capital formation) when the outlays are financed by government agencies or private research organizations. On the other hand, if the outlays for R and D are made by private industry, these outlays are not treated explicitly as items in the national product and, still less, as capital formation. Instead, they are treated as current cost of producing whatever the industries concerned are making and selling in the market. Thus, if business firms produce and sell soap, or medicines, or automobiles, their outlays for R and D are regarded as part of the cost of current production of soap, or medicines, or automobiles — not as investment or formation of intangible capital.

Some academic statisticians protest against this inconsistency and prepare and publish modified compilations of the national

product, in which the outlays for R and D are shown as capital formation regardless of who pays for them and whether or not any future benefits from them can be expected with confidence. To state this is not to make an implied criticism; statisticians cannot possibly judge the value of current research findings or of inventions, just as they cannot judge whether the machines and factories that are generally treated as capital formation will turn out to be efficient or worthless.

Four Categories of Capital

One of the most challenging and disappointing tasks of economists is to find statistical or other operational proxies for their theoretical counterparts, that is, for the mental constructs of which theories are made. I want to refer to the ambitious economist who has recently tried to compute and compile data on the formation and stocks of "total" capital. John W. Kendrick distinguished four categories of annual capital formation and of accumulated capital stocks: (A) non-human tangibles; (B) human tangibles; (C) non-human intangibles; and (D) human intangibles. To characterize the four categories, I shall mention some characteristic items for each.

- (A) Outlays for construction, machinery and inventory is investment in tangible non-human capital.
- (B) Outlays for rearing children to working age is investment in tangible human capital.
- (C) Outlays for research and development are investment in intangible non-human capital.
- (D) Outlays for education, training, health, safety, and mobility of people are investments in intangible human capital.

One cannot help being impressed by the neat symmetry of this arrangement, though one may take exception to category (B) –

tangible human capital represented by children from age 0 to 14 or 15. Undoubtedly, parents may derive much pleasure from their children and, hence, a psychic return on their investment in feeding them and caring for them, and in many countries parents may look to their children as a source of income in later years, perhaps their only support in old age. From the point of view of the economy as a whole, however, excessive increases in the population may reduce the productivity of labour.

One may wonder how Kendrick obtained his figures for the statistics of the four categories of capital formation and capital stock in the United States. For some of his series he had to make rather heroic assumptions. For example, for category (C) – the capital embodying the results of research and development – he started the accumulation with the earliest date for which reliable estimates of outlays were available. This can perhaps be justified by the fact that he produced figures for the stock existing in 1976; if the earliest statistic of R and D expenditures is for 1929, one may argue that in the meantime normal depreciation has reduced the earliest recorded outlays to almost zero.

Depreciation of Human Capital

This brings us to the question of depreciation. In general, depreciation may be subdivided into deterioration, depletion, and obsolescence. Kendrick does not, however, get too deeply involved in the economics of these reductions in the value of accumulated human capital. Instead, for his statistical series he is satisfied with the use of rules of thumb for acceptable rates of annual depreciation. As economic theorists we would have to engage in more painstaking analyses. We would have to realize that investment in the workers' training-on-the-job depreciates in different ways and at different rates where the depreciation is due to obsolescence of acquired skills, to the loss of the workers' physical and mental strength, to changing rules of their retirement from active service,

and so forth. I have attempted some of these analyses, but I shall spare you the questionable pleasure of listening to a report about many subtle arguments. If you were to ask me whether these exercises, analytic or statistical, serve any practical purposes, I would have to reply with a shrug of my shoulders. In economic research, as in basic research in other disciplines, it is best not to ask for immediate usefulness. It is enough if we say that the researcher has found his work interesting and that also some of his readers have been interested. If any hard-nosed pragmatists should question the value of such research work we could invite them to deduct some or all of its cost from the total investment in human capital.

Four Outcomes of Schooling

One may disagree with the view that education is always an investment, and a good investment, for the future, though any such judgments are always questionable. They may sometimes be specious in that one may easily confuse the look forward, the anticipation, with the look backward, the retrospect or afterthought. Perhaps, a little superficially, one may say that most of the cost of schooling is unquestionably investment, but that *some* is consumption, *some* is waste, and *some* may be a real drag, worse than waste. Let me explain these four possible outcomes.

There are surely some parts of the usual school activities that contribute nothing to the future, neither to future flows of psychic satisfactions (cognitive or emotional) nor to future efficiency (in production and in earning an income). Thus, these portions of the cost of schooling are not investment, but they may be current consumption. One would regard them as consumption if they give pleasure. Such pleasures may be the immediate satisfaction derived from learning, from stories, from playing, from enjoying games, talks, friendships. But not only the pupils may derive immediate satisfaction; their mothers may appreciate being temporarily relieved from the responsibilities of supervising their children;

to have the children away from home in the care of teacher-baby-sitters is a boon to many a mother. Neighbours, too, may be among the beneficiaries of the school system: they often appreciate not being bothered by the noisy activities of children on the streets. In my statistical work I have not tried to estimate the values of any of such immediate satisfactions which the school system may give to the learners, their families, or their neighbours. Yet, we should not completely disregard the possibility of regarding a part of the cost of schooling as consumption, particularly since in national-income statistics *all* of it is treated as consumption.

I have said that parts of the cost of schooling could be waste; such a judgment would be reserved for such parts that are neither investment nor current consumption. In other words, where school education yields neither present nor future benefits, it is waste. But it could be worse than waste, namely, if it not only did not please or help anyone now or later but actually harmed some. Harm to the schooled ones and harm to the nation could come from an educational system that turned out people unfit for work wanted by the community. Sir Arthur Lewis, the great scholar in the field of economic development, has given examples of countries where secondary and tertiary schools have produced unwanted knowledge and worthless skills – unwanted and worthless because of the excessive numbers of “overqualified” seekers of employment. Not that overqualified workers would necessarily be unfit to do less qualified work, but often they are unwilling to accept employment in occupations below the social status and below the income level they have come to expect. In other words, the educational system may have mismatched the preferences and the opportunities of those who have completed their studies. Most societies need lawyers and linguists, historians and literary critics, but not in unlimited numbers. A society not much above the subsistence level needs only very few of these types. If the educational system produces too many of them and they refuse to

till the soil or do unskilled manual labour, a reserve army of people without jobs will crowd the towns and cities. Education that reduces the employability of people and, in effect, reduces the productivity of labour becomes a drag to economic development.

Incidentally, what I have just said about educating too many for occupations for which there is not enough demand, holds not only for literary criticism, law, and other high-prestige occupations but also for the most practical occupations in manual work. We need carpenters, plumbers, and electricians, but not millions of them. We need barbers but it would be crazy to train too many to be skilled barbers; to educate everybody in the art of cutting hair and trimming beards would surely not be formation of human capital. I shall return later to the question of the right and wrong educational mix that is essential to the problem of the contribution of education to economic productivity and growth.

The difference between waste and drag should be clear: if we train a million lawyers who then, because no more lawyers are needed, work as taxi drivers, street cleaners, or in road-repair crews, the cost of their education is waste; but if they find such menial work demeaning and refuse to do it, their education is worse than waste. "Wrong" education may fail to improve productivity and thus be *wasteful*; or it may contribute to unemployment and thus be *harmful*. Perhaps I have overemphasized these possibilities, but my purpose has been merely to clarify an issue that is often misunderstood.

Efficiency and Equality

Having explained why too much schooling may be wasteful, I should also mention that too little schooling may be wasteful. Some investigators – psychologists and educationists – tell us that schooling, to have a positive effect, ought to go on for at least four or five years; that one or two years of schooling does little or nothing

for the child. Yet, some countries are so poor that they cannot afford giving four or five years of schooling to all their children. In a very poor country in the Caribbeans, only 16 out of 100 pupils finishing the first year of school have continued for a second year, and only 10 went to third grade. Even in some middle-income countries in Latin America, no more than 15 percent of children attending first grade stayed in school through the sixth grade.

We cannot be sure, of course, that schooling for no more than one or two years is absolutely wasted; some educationists believe it is better than no schooling at all. If it is true that it is almost worthless, but that four or more years of school would be very beneficial, then a serious problem of equity and justice may arise: how to allocate exceedingly scarce funds for education. Assume a country could not possibly afford allocating more than x percent of its total income to schooling its children and that this allocation would allow to give one year of school to all children, or two years to one-half the children, or four years to one-fourth of them, or six years to one-sixth. If additional years of schooling yield (in this range) more than proportionally increasing benefits, what can one say about the best social choice among these options? Equality of educational opportunity may be sheer waste under the assumed "educational production function." If four years of school produces enormous increments of productive capabilities compared with only two years of school, should society trade off more social justice to secure much more real national product ?

If you are convinced that total product will increase substantially thanks to the availability of people with four years of schooling, will you recommend to the community (the tribe, the nation) that one-fourth of the children be selected for admission to school, and the other three-fourths remain unschooled? I do not know whether your decision becomes more difficult or less as the proportion of educationally underprivileged increases: you may find it

more tolerable to educate a very small fraction of the population for positions of leadership, assuming that competent leadership can be of prime importance for increasing the health and wealth of the nation. I am glad that I do not have to make decisions about such conflicts between efficiency and quality. Most economists avoid the problem by rejecting the assumptions, by simply denying that they can be "true" or "relevant" in the real world. That's a cheap way out of a bad dilemma.

The ethical problem of optimal allocation of funds available for the improvement of human resources reminds me of a remark by Sir Dennis Robertson, one of the greatest economists of this century. He said that one of the most important functions of economics is to enable us to find out how expensive social justice and equity is in given circumstances. The cost may be higher than a society can afford. Robertson did not tell us how to decide in a conflict between efficiency and equity; he merely pointed to the need of considering the trade-off, the efficiency-cost of equity. Too often idealists insist on their ideas of social justice, usually egalitarianism, no matter what it costs. The idealists in one country may be satisfied with two years of schooling for all; in another country they are satisfied with no less than sixteen years for all.

Rates of Return to Additional Years of Education

Research on the question of how differences in annual incomes are statistically associated with differences in school years completed has occupied hundreds of economists in the last twenty-five years. Because of a lack of pertinent data, for most investigations a year of school became the unit of measurement without regard to the type of school and the subjects taught. Only in exceptional instances was it possible to distinguish among different curricula, but the price to pay for such additional information was often that the samples became smaller and therefore less representative. Still, with all faults—bad data, inappropriate samples and biased

specifications in the computations – some of the findings are suggestive of interesting facts and developments. Many of the attempts to compute rates of return to educational investment have yielded unexpected and seemingly inconsistent results, but even apparent errors and fallacies may be helpful in the task of designing more conclusive research projects.

Research in some developing countries in Latin America has led to quite conspicuous differences in computed rates of return to different kinds and lengths of schooling. For example, the highest rate of return was found for young women who had studied to become secretaries. The incremental investment was modest: language skills, typing, and short-hand. These skills are in high demand: foreign and domestic business firms need and look for schooled and trained secretaries; these women were then earning relatively high salaries, making for high rates of return to the investment.

Desperately low rates of return have been calculated for university education in the same countries. A serious flaw, however, may mar these findings: the data for the earnings of university graduates usually exclude the earnings of those who had left the country and were working abroad. Faced with poor job opportunities at home, some of the best graduates have obtained employment in a foreign country, probably at rates of earnings that made for high rates of return on their private investment. The social rate of return on the educational investment may still be very low in that public funds have subsidized the schooling of the emigres. Even this consideration may be offset by the thought that the emigres may send parts of their foreign earnings back home to their families. This may not compensate the government for the subsidies and stipends granted, but "society" includes also the relatives of the graduates, and the remittances received from abroad are part of the social gross benefits.

Informative studies have been published on comparative rates of return to material and human capital in India. Mark Blaug and his associates found for the year 1961 that the social rates of return were 13.7 percent on primary education, 12.4 percent on secondary education, and only 7.4 percent on college education; even compared with illiterates, the social rate of return on the investment in college graduates was only 12.3 percent. On the other hand, rates of return on investment in physical capital ranged from 17 to 26 percent, according to a study by Arnold Harberger. The low returns to human capital in India are in large parts due to the mismatch of aptitudes and attitudes of graduates, on the one hand, and job opportunities, on the other.

The Wrong Educational Mix

Education is not a homogeneous good, neither as an output nor as an input in other production processes. Much depends on whom you educate and how, in what kinds of knowledge or skill, at what levels, for how long, etc., and much depends also on the state of the economy in which the educated plan to work and earn a living. A rich society may have ample demand for art critics, securities analysts, and psychoanalysts, specialists not much in demand in a poor country.

If a poor country copies the educational system of a rich, the likelihood is great that it produces a wrong educational mix, especially at the university level. It cannot be a profitable investment for India, for example, to educate hundred of thousands of historians, literary critics, and lawyers. Personally, I am a lover of humanistic studies, especially the classical humanities and philosophy, but if I am asked whether I would regard such studies as good investments for a poor developing country, I cannot in good conscience answer affirmatively. Yet, the percentage of students being prepared for practically useful occupations has been relatively small in Indian universities. If high rates of pecuniary returns are being

sought, enrollments in schools of technology, engineering, business, and management have been too small relative to enrollments in studies suitable only for richer societies.

Educational policies in some other countries have been quite different. We are told, for example, that in Czechoslovakia over 60 percent of the students in institutions of higher education are in technological, physical, and mathematical sciences. Perhaps there is a terrible loss in this relative neglect of the humanities with their emphasis on values and history, a loss that may adversely affect the spiritual and intellectual development of the nation. But, viewed as an investment in the material productivity of human resources, the emphasis on technology may pay off through a faster rate of economic growth.

In any case, it is not education *per se* and, still less, schooling as such, that will pay off in the future, regardless of *what* abilities and attitudes it succeeds in developing. A positive return can be expected only from the *improvements of human capacities* that are effected by our educational efforts.

Complementarity

Some teachers have modeled the role of physical capital in the production process by imagining a universal tool or machine that can do everything in every technological process. Helpful as such a model may be for the comprehension of some economic relationships, it may be a hindrance in making the students grasp other economic relationships. The imaginary universal tool allows us to dodge the problem of complementarity of different capital goods: generators, motors, turbines, transmissions, transformers, boilers, tubes, pipes, cables, drills, hammers, screws, nails, and thousands of other hardware, tools, appliances, instruments, machines have to be available in required proportions. It would not do to have generators but no motors, hammers but no nails, electric power but no cables, and so forth.

Similar conditions exist concerning the stock of human capital. It is true that human resources are less “specific” than physical ones. Some people may be good in work of every sort, or they can quickly learn to be good in whatever is demanded, in manual or mental labour. By and large, however, people are specialized or, at least, relatively more suitable for some kind of work than for another. The stock of human capital, embodying the learning and training of people, accumulated over short and long periods of time, is composed of many different types of abilities and skills. In view of the existing complementarities, the stock can be valuable – that is, can yield high returns – only if the different forms of human capital are available in proportions that match the technological or organizational requirements of the place and the time. And, as times change, requirements are likely to change.

Complementarity exists also between physical and human capital. The best farm machines will do little good if there are no mechanics to maintain them, keep them in good repair. Skilled electricians will do little good where there is no electricity. Tailors need fabrics, needles, and thread in order to be useful. Computer centres need hardware, the computers, and software, the programmes provided by programmers. Enough of such examples, the message is clear. There is need for a complex matching of different forms of physical capital and different forms of human capital. The question is who will do the matching and how.

I do not believe that a central board of official “matchers” or planners can do a decent job of it. The free-market system, anonymously coordinating the decentralized self-matchers and professional small-scale matchmakers, operates with many errors and mistakes but still far more efficiently than a central “human-resources-planning commission.” No central brain (or team of brains) can be trusted with the task of predicting and providing for the right number of engineers, physicists, chemist, medical doctors,

statisticians, plumbers, house painters, electricians, mechanics, and so on, and so forth. A market system with flexible wage rates and flexible prices – raising the earnings of workers with scarce skills and increasing the profits of producers of scarce goods, and lowering the earnings of workers with low or abundant skills and eliminating the profits of producers of bad or abundant goods – can provide guidance for reasonably efficient self-channeling of resources into the uses demanded by the people. I know that this casual remark will not sit well with some of my audience. But I speak my mind even if it should make me unpopular.

The essential moral of my discussion of complementarity is that outlays intended to create human capital will in fact prove to have done so only if they result in the right mixture of human aptitudes and attitudes formed through the educational effort. And what is right or wrong in this context is not a matter of value judgment but will depend on conditions beyond the control of individuals, groups, cartels, commissions, legislatures, and governments.

Statistical and Econometric Research on Human Capital

Although I ought to come quickly to the end of this lecture, I should not leave unmentioned the large output of statistical and econometric research on problems of human capital or, more correctly, on the question of the contributions that schooling, job training, and perhaps other efforts to improve the efficiency of labour have made to earnings from labour. Primitive attempts to establish correlations between earnings and length of school enrollment were soon rejected in favour of regression analysis, factor analysis, or path analysis, recognizing that more than one single independent variable – the number of school years completed – was needed for a satisfactory “explanation” of differences in the earnings of different groups.

I have devoted a long chapter in my still unpublished book to a survey of educational production functions. In a "parade of variables and models" I showed the great variety of ways chosen by different investigators to estimate the effects of schooling, learning, and nonschool training upon earnings from work. Among the more widely used "personal variables" are early intelligence (measured by intelligence quotients before school), ambition (measured by grades received in early school years), skin colour, region of upbringing (urban, rural, region in the country), region of present residence, hours of work, and years of job experience; among "family variables" are father's education, father's occupation, mother's education, number of siblings; but some investigators have added "social-psychological variables," such as "friends' plans for college." Some models include the quality of the school (measured by its budget per student); others include more personal factors, such as health (length of illness) and marital status of the individual earner.

Very complex relations are modelled in systems of simultaneous equations, some in sets of recursive regression equations, representing a sequence of production functions for intermediate products where each may include the same input variable that joins with other factors in determining the output at two or more intermediate stages and perhaps also the ultimate product, that is, "earnings." Earnings usually are annual earnings from labour after elimination of incomes from other sources; in a few studies, however, hourly earnings are regarded as the product of the educational production function.

The most delicate issue in this sort of research is the separation of *ability* and *education* in determining differences in earnings. The two variables certainly interact; ability increases the effects of schooling, and schooling increases ability. To use sequential tests of ability can attenuate but not eliminate the controversy between

those who place more weight on native ability and those who prefer to attribute all ability to environmental influences (milieu). Ability at age zero is not measurable and, in a sense, the entire increment of ability after birth is “acquired.” Nonetheless, the effect of IQ on earnings seems to increase over time; that is to say, that school experience and work experience seem to contribute to earnings larger increments for earners who have started life, or at least school, with a higher IQ.

These remarks of mine will again be unpopular with some of my audience, because the opponents of the concept of “genotypic intelligence” are very zealous in fighting for their position. Let me admit that I do not know how this controversy can be decided. I share this ignorance with all others who talk or write about the subject.

An Apology

My choice of a free-wheeling exposition of my topic was perhaps unwise. It has resulted in a rather rambling speech without any clear organization. Some sections were overly repetitive, some lacked clarity, some were deficient in coverage. Not knowing how much familiarity with my subject I should expect my audience to possess, I sometimes tried to express myself in too simplistic terms and to avoid technicalities, but at other times I was fearful of “talking down” to an audience consisting of well-trained scholars and thus I raised the pitch of my arguments to a higher level of sophistication. I must ask for your forgiveness for these shortcomings.

I hope I can make up for some of them during the discussion. Your questions will indicate the technical level appropriate for my attempts to answer. Please do not hesitate to be critical of my lecture, its substance as well as its form. We can learn only through criticism. I thank you for your attention and I invite your questions and comments.

Chapter 3

DISCUSSION ON THEORY OF HUMAN CAPITAL

Dr. S. K. Qureshi: I will try to chain two things together to ask you a question. While referring to the educational system and its appraisal by Adam Smith, you said that he was very critical. Now we have lot of people who say that educational institutions in Pakistan are not functioning properly and so on and so forth. On the other hand, empirical studies on the rates of return, both private and social, to different levels of education indicate very high rates of return to the resources invested in education. If the educational institutions are not imparting enough and right kinds of skills the educated people should be making low returns as we measure them. Contrary to expectations, as empirical studies have shown, rates of return from education are generally very high. An alternative explanation, i.e. the screening hypothesis – has it that the employers are interested in selecting the kind of candidates who will be good guys within the organisation. Educational certificates provide employers with an index of reliability and help them in the choice of the candidates. According to this reasoning, they prefer a highly educated man to a man who is not as well educated in the hope that they would be recruiting the people who would work well with other colleagues. Could this conflict be decided that

these returns are really returns to a particular selection mechanism rather than to the resources invested in education. If you agree with the screening hypothesis, then would you maintain that it would have been socially desirable if a large section of the society had not been schooled in the first place. That is my question.

Professor Machlup: Your question is excellent; it gives me an opportunity to fill a gap in my lecture. The problem is whether longer schooling, say, beyond a certain age, actually raises the capacity, efficiency, and reliability of the schooled or whether it merely leads to a certificate that helps employers select among job applicants, even if the certified graduates are not really better workers than those who have not had the additional schooling. In short, “productivity,” increased qualifications, versus “credentialism,” easier selection of job seekers. If the credentials certify only that the applicant has spent several years sitting in class rooms, not that he or she has acquired superior productive capacities, the additional years of school attendance may constitute a serious waste. No conclusive answer one way or the other has been forthcoming. That employers, or their personnel officers, may prefer to hire certified graduates is easy to understand; it saves them expensive tests of job applicants. They rely on the certificate because it implies that the graduate has not been thrown out of school and has shown enough perseverance to complete several years of (usually boring) school attendance. This information is better than none and cheaper than tests administered by the employers. But if this is all that extra years of schooling do for society – if productivity is not really increased – than the waste is exorbitant.

The majority of American economists seem to be inclined to reject the theory of “mere credentialism” on the ground that employers – except the government – will soon find out how well their workers perform on the job. Even if the school credentials assure the graduates preference in the selection for their first

jobs, the earnings for the next ten or twenty years will reflect actual performance, not the possession of a piece of paper at the first job application. (Again I must except the government as a prudent employer.) While the school diploma may explain differences in earnings in the early years after completion of school, it cannot explain such differences (in private employment) in later years. If the higher earnings of certified school graduates persist for many years, they are evidently not due to the certificate but to the qualifications.

Although this argument may weaken, or perhaps dispose of, the theory of "mere credentialism," it does not prove that the higher qualifications of the longer educated are due to the length of their formal education. These persons may have chosen to get more education because they were more ambitious, more intelligent, more capable from the very outset. The additional schooling has not necessarily made them more capable. No proofs for this either.

As to your first point, the reference to very high rates of return to educational investment in Pakistan, I must plead guilty of ignorance. I would ask, first, what percentage of the so-well-paid degree-holders are employed in private industry rather than in public agencies. Government salaries are probably not determined by marginal productivity. Secondly, I would ask what is considered a high rate of return in Pakistan. Is it high relative to the rate earned on physical capital invested in private industry? In times of great scarcity of capital, 25 percent per annum may be a poor rate of return on investment.

Professor M. Rashid: You will recall that in the south of France, we devoted two or three weeks to the economics of education and I happened to be there in 1963. We have come a long way since that conference. In this country and in India, we have a historical background which has stood in our way. You referred in your talk to the preference to white-collar jobs among the Indians and the over-emphasis on humanities and Lewis's argument of market

forces not clearing the surplus in terms of earnings. But this takes me back to the conceptual framework. Strumilin in 1924 in Russia, Dennison of Brookings Institution in Washington, Schultz and Becker in Chicago, by their valuable contributions have made us great advocates of larger allocation in our plans for education and training. But we find hard-headed realists here in the Ministry of Finance who continually confront us with this question of the wasted element in education. We plead for more allocation because it means more investment for education and training which, hopefully, after the gestation period is over will increase productivity by producing more skilled people. Unfortunately, this is not happening, perhaps because of historical reasons. Then the market forces are rigid here. The rates of returns, however measured, do not really correspond to the investment made. At lower levels of education, there are large drop-outs. At secondary level, there are problems of output. The composition of output is more in favour of humanities. Very little of science is taught and whatever is taught is wrong science; worse still, it is badly taught. At higher levels, the professionals, like doctors and engineers, raise the issue of misallocation by way of a perverse movement of human capital. We invest and the U.S. economy benefits because our graduates go away there in very large numbers. What is it that one could do, therefore, with the theory which says investment in education and in human resource development is good for a country. The real life experience of the developing countries is that more and more investment, if available, will lead to all kinds of waste at all levels of education which the market is unable to clear. I am reminded of Ivan Illich, whom I met some years ago in Singapore in a conference on education, who insisted on his experience based in Mexico that we should follow a deschooling society pattern. I had a big argument with him. I thought he was not being realistic. One thinks of many things when talking about education. For example, if education is good investment, however measured, whether it is the cultural value or the material value of education, what about

the investment in health. What is wrong with that. So much of productivity is lost even when it is at a higher level because of poor health, debilitating diseases, anemia, malnutrition and all that. Why not invest in producing more clean water so that able-bodied people can work – of course not like Prof. Machlup fourteen hours a day, but at least eight hours a day without interruption and contribute to output. There are so many conceptual problems around this concept of human capital which have not been clarified, if I may say so, with due deference to the great works including those of Kendrick and others. And it is in this context, Sir, that I welcome your highly illuminating lecture this morning.

There are even greater ambiguities when it comes to making policy prescriptions. I give you one example. You can say I am the product of neo-colonial past. I speak English. Obviously, I can because the British were here. If the Russians were here, I would speak Russian, for example. Now the fact is that these developing countries got their political freedom 30 to 35 years ago in Asia, Africa and Latin America. Their education systems are based on illiteracy. Their value systems are conditioned by the historical responses to change. They are not willing to adjust like the Chinese are doing in trying to transform their society's structure. I suspect that the investment in human-capital formation in a country like China produces better returns because the elitist concept is not dominating in policy making. I have not been there but I suspect from the reports which we read that they have produced more scientists and more technologists. Their projects are better implemented. They may be doing so at the cost of personal freedom of the individual but they are producing better results in tackling the real-life problems while we talk of arranging a marriage between the old and the new demands put on the society. We are saddled with a huge waste of investment in education. I do not know what your response will be to these comments.

Professor Machlup: My general response is an expression of agreement. I have not noticed any part in your intervention with which I would seriously disagree. I am glad that you reminded me of our association during that lovely week at Menthon St. Bernard in France, where we tried to sort out some of these problems. I agree fully with you that the calculations of the rates of returns to educational investment are usually inconclusive, if they mean anything at all. I also agree that investment in public health may be far more important than investment in education of the kind now offered in our schools. And, as you know, I agree that educational outlays may in many countries be sheer waste or even a drag. I have pointed to the harm done by the educational process if it produces people who do not want to work in the only jobs that are available and who choose to wait for jobs that may satisfy their tastes.

I would go even further. John Stuart Mill, one of the best of our professional ancestors, told us in his autobiography that his father, James Mill, refused to send him to school because most schools, besides teaching some skills, are teaching children to loaf. The climate of many schools is such that it reduces the child's performance below his or her potential. Perhaps James Mill was exaggerating, overdoing an elitist ideal. He was an exceptionally stern father, seeing to it that his son could speak classic Greek when he was three years old. We do not want such pressures either from our fathers nor from our schools, but it seems to be true that schools teach us some counter-productive habits. Schools may succeed in making some of the students into highly skilled machinists and mechanics, but at the same time they instill into them an attitude of not accepting strict work discipline, of not obeying work rules except the ones they make for themselves, and of preferring long tea-breaks to persevering work. Does such a school system really create effective human capital? Human productive capabilities are capital only if they are adequately used. Sometimes this requires full utilization of capacity. If we create capabilities

that *could* be human capital *if* used adequately, but are in fact allowed to stay idle and to rust, then they are not capital. Schools often produce a potential but at the same time an attitude against the use of that potential. In this case, education is a failure. In this case, also, the computations of rates of returns to the educational investment may be wrong if they count the earnings of only the few who actually hold the highly-paid jobs and omit the cost of schooling those who are “destined” to stay unemployed.

As a teacher talking to an audience that includes a good many teachers, I must regretfully admit that we teachers are not free from guilt in perpetuating a system that works poorly. There is no doubt that the system could be much improved, costing less and yielding greater benefits. But instead of raising its cost-effectiveness we demand larger appropriations of funds. We want the educational system to expand, not to teach better but to teach more students in the same inefficient manner that has failed to produce efficient and hardworking members of the labour force, equipped with skills that are needed by the economy. The increase in the numbers of students kept in school for ever longer years cannot help lowering the standards. The percentages of the relevant age group wanting diplomas and degrees have increased in many countries, but the percentages of students who really want to learn have been falling. The demand for learning has declined while the demand for school credentials has increased. And many teachers, eager to satisfy this demand, support the political demands for larger appropriations of funds for educating those who will join the ranks of unemployed graduates. Annual expenditures for education rise, but the stock of human capital does not increase.

Dr. Ghulam Rasool: May I take up the question to which the learned Professor made a reference, namely, the selection of the few in the context of social justice. You said that there could be a clash between social justice and efficiency. For the selection of few

people, I would like to know what criteria, being a practical planner, one should apply while selecting the few in the education system. May I also make a reference to the outflow of the educated, as you yourself mentioned. Others benefit from the very expensive education which the nationals of a country might get from the education system. I have a second small question as well. You talked about the allocation of resources within the system. What happens or what should happen when allocating resources between sectors. When we select a few, we do so because of shortage of funds. Is there any criterion to help us decide how much should be directed towards education system vis-a-vis the demands of the other sectors in the economy.

Professor Machlup: Good questions deserve good answers. These are good questions, but I must disappoint you – and myself – because I have no good answers. We all have learned the basic principles of optimal allocation of resources. Do they tell us how we should allocate the scarce funds of the government among the different tasks – among education, health, highways and railways, telecommunication, protection of the environment, irrigation, agricultural pest control, police, courts of justice, national defence, and all the rest? In principle, yes; in practice, no. Equalize marginal cost and marginal benefits! But do we ever agree on the valuation of the benefits? Perhaps we can know why the estimates of other “experts” are wrong; but we cannot convince others of the correctness of our own estimates – provided we have any.

And after we know how much money has been appropriated for education, how should we select the few whom we can afford to educate to the higher levels, to the completion of a course of study that leads to the learned professions or to highly qualified occupations? I would place much weight upon self-selection of candidates who have enough self-confidence to commit themselves to repay the cost of their education out of their future earnings.

This self-confidence would have to be matched by solemnly affirmed expressions of confidence of teachers and testers in severe processes of competition for the scarce places in the higher schools. The chief constraints on the selection process should be strict exclusion of political influence and of religious, ethnic, and social prejudice.

Dr. A. R. Kemal: I have two questions: My first question is : In Pakistan, like most of the developing countries, private costs and returns to education and training fall significantly short of social costs and returns. It is suggested sometimes that the private costs and returns be increased to social costs and returns to help solve the problem of brain drain. Will such a policy not lead to more income inequalities by restricting education to a very small well-endowed segment of the population? My second question is: the export of manpower leads to receipts of foreign exchange earnings by a country and under certain circumstances, the costs on education and training may be outweighed by the present value of remittances. In such a case should we worry too much about brain drain at all? Should we not continue the policies of keeping the costs of education low through subsidies.

Professor Machlup: For instances in which social benefits and costs are different from private benefits and costs, welfare economists have long recommended that we attempt to "internalize" the external portions of the social benefits and costs. It is true that, if this were done in the area of education, the rich would have it easier to buy for themselves places in the educational system. However, if facilities for student loans are available, the less affluent and even the poor could obtain the funds to pay the cost of their education provided they have enough confidence in their ability and diligence to undertake the risk of getting into debt.

I have touched on the problem of the brain drain and mentioned that remittances from highly trained emigrees should be

counted among the benefits of the nation, although they are collected by the emigrees' families, not by the government. If the government has subsidized the schooling of the emigrees but their remittances go to their parents, I cannot see a good justification for such an expensive transfer of funds from taxpayers via the government to parents of children who choose to live and work abroad. That the remittances come in the form of foreign exchange makes no difference. Shortages of foreign exchange are due to over-expansive monetary policies and overvaluation of the domestic currency by the authorities. Thus, although I do not see here a case for government subsidies, I do agree that the foreign earnings of the emigree or at least his remittances should be counted as part of the return to the investment in his education.

Chapter 4

CONCLUDING OBSERVATIONS

by

Syed Nawab Haider Naqvi

We just heard Prof. Machlup's "free-flowing exposition" of the highly important subject of knowledge as human capital. It was real and vibrant. Precisely because it was not pre-planned, the process of idea creation proceeded unchecked during the lecture, as if guided by an 'invisible hand'. I suspect that the 'invisible hand' has been particularly helpful, because Prof. Machlup is such an admirer of the market mechanism! At any rate, the end-product has been a lucid presentation of a very intricate subject. I very much hope that during the lecture and the ensuing lively discussion some new ideas have occurred to Prof. Machlup, making a net contribution to knowledge – that is to human capital.

The importance of human capital as an agent of economic growth is now gradually though, I must say, very grudgingly being realized in the developing countries. In this connection the vital role of education is getting recognition, though it has had to pass through a veritable jungle of 'vested interests' – especially of those

who have invested so much in physical capital, but even more of those who have been brought up on the Harrod-Domar model of economic growth being exclusively a function of physical capital formation. That both Harrod and Domar spoke in the context of societies where education is not the monopoly of the fortunate few and where the process of technological change has not been obfuscated by mass illiteracy has been conveniently forgotten. We also forget Adam Smith's observation, of which Prof. Machlup has reminded us during the course of his lecture, that one of the important parts of the "stock" — i.e. capital — is the productivity of human beings, and to increase this productivity education is essential.

It is in this connection that I wish to state, drawing together the various points made by Prof. Machlup, Prof. M. Rashid and other scholars who spoke to-day, that in a country like Pakistan the process of knowledge formation through education is inextricably bound up with structural change — a change in which the distribution of wealth cannot remain as unequal and unjust as it is now. I may add that if an elitist programme of the education of the few is super-imposed on the highly unjust social systems prevailing in most of the developing countries, then education will itself contribute to social injustices. This point was made by the British philosopher, Bertrand Russell. As most empirical studies have shown, primary education is a very potent policy-instrument to correct at least the worst form of social injustices. We must face the dilemma that education, to become a meaningful agent of social change, has to be *universal*. However, while we emphasize these 'facts' of our environment, and change them one way or another, we must listen carefully to what the high-priest of the economics profession has just said on what is productive education and which one is "wrong", wasteful and "harmful". And, mind you, Prof. Machlup does not envisage productive education only as one that yields *material* gains. An increment in the "enjoyment" that comes from knowledge is a net gain to human capital as well.

Education is wasteful if it neither contributes to an increase in the productivity of the recipients of education – a highly scarce resource – *and* if it does not enhance their enjoyment. It is harmful when it contributes to unemployment by producing over-qualified people who will not accept a job which is beneath their dignity. Indeed, as he points out, education can be an ‘absolute’ drag: quoting Arthur Lewis, he cites wasteful education to be one in which there is a mismatching of workers’ preferences and their opportunities. This is true, but this argument can really be taken too far and in the wrong direction. No one can doubt the wastefulness of an education that reduces the employability of people and the productivity of labour. However, the real problem lies in the *recognition* of such situations in practice. From both theoretical and practical points of view, an obsession with “mismatching” can be misplaced because a perfect matching would require perfect knowledge of and information about opportunities. Since labour markets are notoriously imperfect, even the market mechanism cannot be relied upon to clear the markets at all times. Furthermore, opportunities are not static in that a special type of education may open up opportunities not perceived before. In the context of growth such arguments must be properly qualified and carefully hedged. And Prof. Machlup, in his masterly way has taken all such precautions in stating his argument, the essence of which is that we should be reasonable and expect a positive return not from education *per se* but only when it leads to an “improvement in human capacities”. And this improvement may well take the form of an emphasis on technological, physical, and mathematical sciences at the expense of more education of ‘humanities’. As long as this de-emphasis on humanities does not dehumanize us, there is a net social gain in this structural shift in education – if only because it will lead to higher growth rate through technological change.

At any rate, no one can question Prof. Machlup’s observations that producing too many literary critics is a definite waste of scarce

resources. I would add that this would be bad also because literary critics, once rejected by the market and the society, do nothing but talk of revolution – of course, in air-conditioned coffee houses! Furthermore, they definitely decrease the enjoyment that comes from the reading of poetry and literature. Also, nobody can dispute Prof. Machlup's strictures against a policy of producing too many barbers. Perhaps he is being a little unfair in this case because these poor souls indulge in the entirely laudable 'activity' of the 'face-lifting' of so many dishevelled human beings, thereby contributing to the *quality* of human capital, if not to its size. Being a lover of poetry and music, he has not made an adverse mention of poets and musicians. He may argue that they, after all, do add to the total quantum of enjoyment in the society. However, a stage may reach when even Prof. Machlup may get exasperated with too much of music and exclaim, like Shakespeare, "This music mads me, let it sound no more." Too much of anything is bad.

Prof. Machlup also makes the general point that in the pursuit of social justice – e.g. providing education to all – societies may condemn themselves to permanent poverty. And, with a candidness that has always been the hallmark of Prof. Machlup's thought, he also warns us, quoting from Dennis Robertson, that social justice and equity can be very expensive – indeed too expensive. While such a warning must be duly considered by all those social reformers who demand social justice no matter what, I may point out in all humility that a bloody-minded efficiency-mongering can be equally, even more, expensive in terms of the deprivation and social suffering and the loss in human enjoyment of life that such a pursuit almost always entails – and don't forget the social revolutions *caused* by the so-called efficient economic growth. We have to consider not only the efficiency-cost of equity, for which Dennis Robertson pleads, but also the equity-cost of efficiency. Ever since the economist has been condemned to the uncomfortable avocation of tight-rope walking, we must for ever balance on the margin the

rates of return from justice and efficiency. It must be accepted by all that, when the chips are down, there is the perennial paradox of the trade-off between equity and efficiency that all societies must resolve one way or the other; and that a denial of such trade-off in the real world is, to quote Prof. Machlup, "a cheap way out of a bad dilemma". However, I, for one, will argue for the priority of justice over efficiency *if* the marginalist's balancing act fails – as it mostly does with the helpless walker on the rope invariably falling in the lap of the rich; of course, to advocate and, if possible, to promote efficiency! It might gladden the heart of Dennis Robertson, but not of the millions stuck in the quagmire of poverty. And the great humanist that Prof. Machlup is, I am sure, it will not gladden his heart either. I suspect that it is precisely because of this aversion to misery, which the single-minded pursuit of efficiency may spell for the poor, that he considers it fortunate not having to decide the "conflicts between efficiency and equality".

The subject is vast and complex and opinions can clash; and such clashes can generate both heat and light. I am gratified to note that this beautiful morning has become even more so because of the light that Prof. Machlup's lecture has shed on it. With these few remarks I close today's session, once again thanking both the learned speaker and the distinguished audience.

Appendix

BIOGRAPHICAL SKETCH OF FRITZ MACHLUP

- Date and Place of Birth: December 15, 1902 Wiener Neustadt,
Austria
- Nationality: U.S.A. (Naturalized in 1940)
- Academic Degrees
and Honours: Dr. Rer. Pol., University of Vienna, 1923
LL.D. (Hon.), Lawrence College, 1956
Dr. Sc. Pol. hon.c., University of Kiel,
1965
LL.D. (Hon.), Lehigh University, 1967
L.H.D. (Hon.), Case Institute of Technol-
ogy, 1967
LL.D. (Hon.), LaSalle College, 1968
Honorary Senator, University of Vienna,
1971
Dr. oecon. hon.c., University of St.
Gallen, 1972
Dr. Rer. Pol. 50 Year Renewal, Univer-
sity of Vienna, 1973
Bernhard Harms Prize, University of
Kiel, 1974
- Academic Positions : Visiting Lecturer, Harvard University,
1934-35, 1938-39
Goodyear Professor of Economics, Uni-
versity of Buffalo, 1935-47
Visiting Professor, Cornell University,
1937-38
Visiting Professor, American University,
1943-46
Hutzler Professor of Political Economy,
The Johns Hopkins University, 1947-
60

Visiting Professor, Kyoto University and
Doshisha University, Japan, 1955

Walker Professor of Economics and
International Finance, Princeton Uni-
versity, 1960-71

Visiting Professor, City University of
New York, 1963-64

Visiting Professor, New York Univer-
sity, 1969-71

Visiting Professor, Osaka University,
Japan, 1970

Visiting Professor, University of Mel-
bourne, Australia, 1970

Professor of Economics, New York
University, 1971-

Visiting Professor, University of Vienna,
1972-73

Also Visiting Professor for Summer
Sessions :

Harvard University, 1936

Northwestern University, 1938

University of California, Berkeley,
1939

Stanford University, 1940 and 1947

University of Michigan, 1941

Columbia University, 1948

University of California, Los Angeles,
1949

Fellowships: Rockefeller Foundation, 1933-35
 Ford Foundation, 1957-58

Government Positions : Consultant, U.S. Department of Labor,
 1942-43

Chief, Division of Research and Statistics,
Office of Alien Property Custodian,
1943–47
Consultant, U.S. Department of Treas-
ury, 1965–77

Membership in

Honorary Societies: Phi Beta Kappa – Honorary Member,
elected 1937
American Academy of Arts and Sci-
ences, elected 1961
American Philosophical Society, elected
1963
National Academy of Education, elected
1965
American Association for the Advance-
ment of Science elected Fellow, 1966
Accademia Nazionale dei Lincei, Rome,
Foreign Member, elected 1974

Membership in

Professional Societies: Austrian Economic Society Secretary-
Treasurer, 1927–33
Royal Economic Society
American Economic Association
Member, Editorial Board, 1938–41
Acting Managing Editor, 1944–45
Vice President, 1956
Member, Executive Committee, 1956,
1965–68
President-Elect, 1965
President, 1966
Distinguished Fellow, 1968–

Southern Economic Association
Member, Executive Committee,
1958–62
President, 1959–60

Mont Pèlerin Society
Treasurer, 1954–59
Member of Council, 1954–64

American Association of University Pro-
fessors
Chairman, Economic Committee, 1957–
60
Member of Council, 1957–70
1st Vice President, 1960–62
Member, Executive Committee, 1960–
68
President, 1962–64

International Economic Association
Member of Council, 1966–71
President, 1971–74
Honorary President, 1974–

BOOKS BY FRITZ MACHLUP

A. English

The Stock Market, Credit and Capital Formation (London: Hodge, and New York: Macmillan, 1940), xii and 416 pages.

International Trade and the National Income Multiplier (Philadelphia: Blakiston, 1943), xvi and 237 pages; (3rd printing, New York: Augustus M. Kelley, 1961).

Financing American Prosperity, Paul T. Homan and Fritz Machlup, eds., (New York: Twentieth Century Fund, 1945), xi and 508 pages; (4th printing, 1949).

A Cartel Policy for the United Nations, Corwin D. Edwards ed., (New York: Columbia University Press, 1945), vi and 124 pages, esp. pp. 1–24.

The Basing-Point System (Philadelphia: Blakiston, 1949), vii and 275 pages.

The Political Economy of Monopoly (Baltimore: Johns Hopkins Press, 1952), xvi and 544 pages; (4th printing, 1967).

The Economics of Sellers' Competition (Baltimore: Johns Hopkins Press, 1952), xx and 582 pages; (5th printing, 1969).

An Economic Review of the Patent System. Study of the Subcommittee on Patents, Trademarks, and Copyrights of the Committee on the Judiciary, U.S. Senate (Washington: Government Printing Office, 1958), vi and 89 pages.

The Production and Distribution of Knowledge in the United States (Princeton: Princeton University Press, 1962), xix and 416 pages; (4th printing, 1971. paperback edition, 1972).

Plans for Reform of the International Monetary System. Special Papers in International Economics, No. 3 (Princeton: International Finance Section, 1962), 70 pages; (Revised edition, 1964), 93 pages.

Essays on Economic Semantics (Englewood Cliffs, N. J.: Prentice-Hall, 1963), xxxii and 304 pages; (Paperback edition, New York: Norton, 1967; 3rd printing, New York University Press, 1975).

International Payments, Debts and Gold (New York: Scribner's, 1964), vii and 472 pages. Paperback edition *International Monetary Economics* (London: Allen & Unwin, 1966); Second, enlarged, edition (New York: New York University Press, 1975), x and 514 pages.

International Monetary Arrangements: The Problem of Choice, Report on the Deliberations of an International Group of 32 Economists, Fritz Machlup and Burton G. Malkiel, eds., (Princeton: International Finance Section, 1964), 121 pages.

Involuntary Foreign Lending (Stockholm: Almqvist & Wiksell, 1965), 129 pages.

Maintaining and Restoring Balance in International Payments with William Fellner, Robert Triffin, and eleven others (Princeton: Princeton University Press, 1966), xii and 259 pages; (2nd printing, 1968).

Remaking the International Monetary System: The Rio Agreement and Beyond (Baltimore: Johns Hopkins Press, with the Committee for Economic Development, 1968), x and 161 pages; (2nd printing, 1970).

Economic Means and Social Ends: Essays in Political Economics with Adolf Lowe et al. Robert L. Heilbroner ed., (Englewood Cliffs N. J.: Prentice-Hall, 1969), ix and 240 pages, esp. pp. 99–129.

Roads to Freedom: Essays in Honor of Friedrich A. von Hayek with Erich Streissler et al., Erich Streissler, Gottfried Haberler, Friedrich A. Lutz, Fritz Machlup eds., (London: Routledge & Kegan Paul, 1969), xix and 315 pages, esp. pp. 117–146.

Approaches to Greater Flexibility of Exchange Rates: The Bürgenstock Papers with C. Fred Bergsten, George N. Halm, Robert V. Roosa, et al., George N. Halm ed., (Princeton: Princeton University Press, 1970), xi and 436 pages, esp. pp. 31–47, 297–306, 309, 320–321.

Education and Economic Growth (Lincoln, Nebraska: University of Nebraska Press, 1970), ix and 106 pages; (2nd printing, New York University Press, 1975).

The Book Value of Monetary Gold (Princeton, N. J.: International Finance Section, 1971), 24 pages.

The Alignment of Foreign-Exchange Rates (New York: Praeger, 1971), xi and 95 pages.

Reshaping the International Economic Order: A Tripartite Report by Twelve Economists with C. Fred Bergsten et al. (Washington, D. C.: Brookings Institution, January 1972), 23 pages, esp. pp. 6–11.

International Monetary Problems with Armin Cutowski and A. Lutz (Washington: American Enterprise Institute for Public Policy Research, 1972), 136 pages, esp. pp. 3–36, 55–57.

International Mobility and Movement of Capital, Fritz Machlup, Walter Salant, and Lorie Tarshis eds., (New York : National Bureau of Economic Research-Columbia University Press, 1972), xi and 708 pages, esp. pp. 1–24.

Optimum Social Welfare and Productivity with Jan Tinbergen, Abram Bergson and Oskar Morgenstern (New York: New York University Press, 1972), 175 pages, esp. pp. 153–165.

International Monetary Systems (Morristown, N. J.: General Learning Press, 1975), 60 pages.

Essays on Hayek with William F. Buckley, Jr. and five others, Fritz Machlup ed. (New York University Press, and Hillsdale College Press, 1976), xxiv and 182 pages, esp. pp. xi–xix and 13–59.

Selected Economic Writings of Fritz Machlup, George Bitros, ed. (New York: New York University Press, 1976), xiv and 603 pages.

Economic Integration: Worldwide, Regional, Sectoral, Proceedings of the Fourth Congress of the International Economic Association, Fritz Machlup, ed. (London: Macmillan, 1976), xxiv and 375 pages, esp. pp. v–viii, 1–13 and 61–85.

A History of Thought on Economic Integration (London: Macmillan, 1977), xi and 323 pages.

Methodology of Economics and Other Social Sciences (New York: Academic Press, 1978), xiv and 567 pages.

Information Through the Printed Word: The Dissemination of Scholarly, Scientific, and Intellectual Knowledge, Vol. 1: Book Publishing with Kenneth Leeson *et al.* (New York: Praeger Publishers, 1978), xviii and 302 pages.

Information Through the Printed Word: The Dissemination of Scholarly, Scientific, and Intellectual Knowledge, Vol. 2: Journals with Kenneth Leeson *et al.* (New York: Praeger Publishers, 1978), xxiii and 339 pages.

Information Through the Printed Word: The Dissemination of Scholarly, Scientific, and Intellectual Knowledge, Vol. 3: Libraries with Kenneth Leeson *et al.* (New York: Praeger Publishers, 1978), xv and 204 pages.

Information Through the Printed Word: The Dissemination of Scholarly, Scientific, and Intellectual Knowledge, Vol. 4: Journals, and Bibliographic Services with Kenneth Leeson *et al.* (New York: Praeger Publishers, 1980), xxvii and 339 pages.

Knowledge: Its Creation, Distribution, and Economic Significance, Vol. 1: Knowledge and Knowledge Production (Princeton: Princeton University Press, 1980), xxix and 272 pages.

The World Monetary Order. Zahid Hussain Memorial Lecture Series –No. 5 (Karachi, Pakistan: State Bank of Pakistan, 1981), 26 pp.

Knowledge: Its Creation, Distribution, and Economic Significance, Vol. 2: The Branches of Learning (Princeton: Princeton University Press, 1982), xii and 205 pages.

B. German

Die Goldkernwährung [The Gold Exchange Standard] (Halberstadt: Meyer, 1925), xv and 203 pages.

Die neuen Währungen in Europa [The New Currency Systems of Europe]. [Finanz- und volkswirtschaftliche Zeitfragen, No. 92 (Stuttgart: Enke, 1927), 83 pages.

Vorschläge für eine wirtschaftliche und sichere Währung von David Ricardo [Proposals for an Economical and Secure Currency by David Ricardo]. German translation (with Wilhelm Fromowitz) and Introduction by F. M. (Halberstadt: Meyer, 1927), 29 pages.

Börsenkredit, Industriekredit und Kapitalbildung [Stock-Market Credit, Industrial Credit, and Capital Formation]. (Vienna: Springer, 1931), xi and 220 pages.

Führer durch die Krisenpolitik [Guidebook through Crisis Policy] (Vienna: Springer, 1931), xi and 232 pages.

Der Wettstreit zwischen Mikro- und Makrotheorien in der National-ökonomie [A Contest between Micro- and Macrotheories in Economics] Walter Eucken Institut, Vorträge und Aufsätze, No. 4 (Tübingen: Mohr-Siebeck, 1960), 55 pages.

Die Pläne zur Reform des internationalen Geldwesens [Plans for the Reform of the International Monetary System]. Kieler Vorträge, Neue Folge, No. 23 (Kiel: Universität Kiel, 1962), 65 pages.

Die wirtschaftlichen Grundlagen des Patentrechts [The Economic Foundations of the Patent Laws]. (Weinheim: Verlag Chemie, 1962), 141 pages.

Wettbewerb im Verkauf: Modellanalyse des Anbieterverhaltens [Competition in Selling: Model Analysis of Sellers' Behavior]. (Göttingen: Vandenhoeck & Ruprecht, 1966), xviii and 568 pages.

Hochschulbildung für jedermann: Eine Auseinandersetzung mit einem Gleichheitsideal [University Education for Everyone: Critique of an Egalitarian Ideal]. (Zürich: Schulthess Polygraphischer Verlag, 1973), 43 pages.

Der Aussenwert des Dollars: Zum Problem der Unterbewertung und Überbewertung einer Währung auf den Devisenmärkten [The Foreign Value of the Dollar: The Problem of Undervaluation and Overvaluation of a Currency in Foreign-Exchange Markets]. Translated by Hans-Wolfram Gerhard. (Kieler Vorträge, Neue Folge No. 78, Tübingen: Mohr-Siebeck, 1974), 54 pages.

Würdigung der Werke von Friedrich A. von Hayek [Appraisal of the Works of Friedrich von Hayek]. (Walter Eucken Institut, Vorträge und Aufsätze, No. 62, Tübingen: J.C.B. Mohr-Paul Siebeck, 1977), 75 pages.

C. French

Guide à travers les panacées économiques [Guidebook through Economic Panaceas]. Translated by R. Hadekel. (Paris: Librairie des Médicis, 1939) 331 pages.

Essais de Sémantique Economique [Essays in Economic Semantics]. Translated by A. Berthaud. (Paris: Calmann-Lévy, 1971), iv and 342 pages.

D. Italian

La concorrenza ed il monopolio [Competition and Monopoly].
Translated by Michelangelo Giordi. (Turin: Unione Tipografico-Editrice Torinese, 1956), xv and 660 pages.

La verifica delle leggi economiche [Verification of Economic Laws] with Terence W. Hutchinson and Emile Grunberg
(Milan: Editrice L'Industria, 1959), 79 pages.

E. Japanese

Urite Kyoso-no Keizai Gaku [The Economics of Sellers' Competition]. Translated by Masahiro Hattori, supervised by Keitaro Fukuda (Tokyo: Chikura-Shobo, 1965), 72 and 612 pages.

Chishiki Sangyo [Knowledge Industry]. Translated by Tatsuo Takahashi and Hiroshi Kida (Tokyo: Sangyo Nohritsu Tanki Daigaku, 1969), 35 and 477 and 16 pages.

Kabushikisijyo Sinyo Oyobi Sikon-Keisei [Stock Market, Credit, and Capital Formation]. Translated by Eiju Nagata (Tokyo: Chikura Shobo, 1970), 17 and 296 and 41 and 13 pages.

Chishiki Sangyō no Kōsō. [The Structure of the Knowledge Industry]. Collected by the Institute for General Telecommunication Research (Tokyo: Diamondo, 1971), 24 and 188 pages.

Gendai Keizaigaku no Tembo [Views on Selected Topics in Modern Economics]. Edited and translated by Yasukichi Yasuba (Tokyo: Nihon Keizai Shimbun Sha, 1971), 199 pages.

Kokusai Kinyū no Riron [Theory of International Finance]. Translated by Toru Mabuchi (Tokyo: Diamond, 1973), 17 and 327 pages.

Tokkyoseido no Keizaigaku [The Economics of the Patents System]. Translated by Teruo Doi, with a new foreword by F. M. (Tokyo: Nihon Keizai Shimbun, 1975), 214 pages.

Kyōiku no Keizaigaku [The Economics of Education]. Translated by Motoo Kaji; with a new preface by F. M. (Tokyo: Shunju-Sha, 1976), 10 and 148 and 5 pages.

Kuoiku no Gense [Illusion of Education]. Translation supervised by Hiroshi Kida. (Tokyo: Gyosei, 1979), 11 and 180 pages.

F. Russian

Plany perestrojki mezhdunarodnoj valutnoj sistemy [Plans for the Reform of the International Monetary System]. Translated by D. V. Smyslov, supervised and introduced by N. N. Lyubimov (Moscow: Progress, 1966), 159 pages.

Proizvodstvo i rasprostranenie zaniy v SShA [Production and Distribution of Knowledge in the United States]. Translated by I. I. Diumulen, U. I. Kozlov, and M. Z. Shterngarts, with a preface by G. V. Poluminoi, edited by E. I. Rozental (Moscow: Progress, 1966), 462 pages.

G. Spanish

Ensayos de Semánticos Económica, [Essays in Economic Semantics]. Translated by Pablo J. Gallez. Colección Metodológica,

No. 1 (Bahia Blanca, Argentina: Universidad Nacional del Sur, 1962), 128 pages.

Planes de Reforma del Sistema Monetario Internacional [Plans for the Reform of the International Monetary System]. (Mexico: Centro de Estudios Latinoamericanos, 1965), 257 pages.

Análisis sobre el mercado de eurodolares [Analysis of the Euro-dollar Market]. (Mexico: Centro de Estudios Latinoamericanos, 1971), viii and 100 pages.

Semántica Económica [Economic Semantics]. Translated by Pablo J. Gallez and Francisco González Aramburo] (Mexico: Siglo Veintiuno Editores, 1974), viii and 306 pages.

Ciclo de Conferencias Dictato en la Bolsa de Comercio de Buenos Aires [Series of Lectures Delivered at the Stock Exchange of Buenos Aires]. (Buenos Aires: Bolsa de Comercio de Buenos Aires, 1980), 48 pages.

H. Swedish

Kris I Valutasystemet: Ar Pappersguldet Losningen? [Crisis in the Monetary System: Is Paper-Gold a Solution?] With introductions by Erik Dahmen and Goran Ohlin (Stockholm: Studieforbundet Naringsliv och Samhalle, 1970), 204 pages.

I. Dutch

Inleiding tot de onderwijs-economie [Introduction to the Economics of Education]. Translated by R. de Boez (Rotterdam: Universitaire Pers, 1971), ix and 59 pages.

J. Serbo-Croatian

Medunarodna Trogvina i Multiplikator Nacionalneg Dohotka
[International Trade and the National Income Multiplier].
Translated by Branko Vemic (Sarajevo: Svjetlost, Izdavacko
Preduzece, 1973), 191 pages.

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