Working Capital and Technological Change

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I. Introduction

It is almost impossible to separate the concepts of capital accumulation and technological change which are the essence of economic development. In practice, changes in technique bring not only changes in the relative quantities of factors of production, but also changes in input quality which implies a change in the quantity of embodied capital. Furthermore, changes in production technique seldom occur without changes in the nature of the final product; and even a change in the quantity of final product—with no change in its characteristics—may require more than a mere expansion of existing distribution facilities and systems. It is difficult to conceive of changes in the pattern of input generation, and changes in the nature of output distribution, which do not require an increase in the amount of working capital.

Widespread technological change, and only such widespread change will be effective in the less developed nations where small producers predominate, will have a pervasive effect upon financial institutions—both formal and informal—and upon the demand for working capital. If the supply of working capital is constrained, and its cost in real terms forced to artificially high levels, the effect will be seen in a reduced rate of adoption of new technology. Working capital availability may be the "ghost input" which accounts for the observed variations in technological process and the observed differences in the rate at which a new technique is difused throughout a given industry, within the less developed world.

Perhaps because of their necessarily theoretical training, and the nature of the governmental or academic background from which most of them operate, economists interested in development problems have tended to under-estimate the role of working capital

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availability and cost. In the objectivist tradition of much of economics since the late 1930's, the main thrust of research has been to try and develop operational models in which such elements as working capital requirements are externally estimated and made subject to administrative control. There is, however, an older tradition of subjectivist thinking in economics according to which estimates of cost—and hence decisions about incurring costs—are inherently subjective; the problem is, therefore, not one of estimating and providing some "optimal" quantity of working capital for the production unit which adopts a new technique, but rather to seek a system within which the relative pecuniary cost of working capital funds will reflect the relative scarcity of such funds. The subjectivist view then argues that if relative costs reflect relative scarcities, working capital funds will move into their most highly valued uses, as seen by the multitude of producers and distributers throughout the economy. The subjectivist approach leaves little scope for the administrator in authority, rationing funds in the name of a policy designed to equate relative scarcity with some non-market concept of social marginal cost; for this reason, if for none other, the subjectivist view has not been popular in the less developed nations.

This study offers an initial examination of the role of working capital in the process of technological change and economic development. The discussion focuses on that majority of economies within the less developed world where within both the agricultural and the non-agricultural sectors production typically occurs in small units, with a few large scale and show-piece entities which are untypical even if not economically questionable. It is hoped that several of the hypotheses put forth in this study will prove amenable to further applied research, and that some light may be cast upon the presently unexplained behavior of producers in less developed countries in the presence of apparently feasible and economically preferrable new technologies.

II. Technological Change

Technology may be defined as "....useful knowledge pertaining to the art of production [Kennedy and Thirlwall (1972, p. 12)]." Hence technological change, or technological progress, refers to changes in useful knowledge. The element of usefulness implies that such knowledge can contribute to increased output of a desirable form; hence changes in technology are usually observed indirectly; in terms of how they effect output. The use of changes in output as a proxy for changes in technology has several disadvantages. First, it has proved very tempting to recognize only marketed output, and even to emphasize a sub-set of marketed output: tangible marketed

output as related to tangible and marketed inputs. Second, it has proved equally tempting, despite disclaimers to the contrary, to take technology as being an attribute of equipment—capital in a very narrow sense..., and to suggest that increases in productivity come about as a result of increased labor skills applied to existing equipment, or the use of new equipment embodying a superior technology. The concept of technological change as an increase in useful knowledge becomes narrowed in practice to an increase in useful knowledge applied to non-human factors of production.[1]

If the term technology is to be applied to useful knowledge about non-human capital, it becomes important to recognize what we in turn mean by capital. It is not enough to retreat into a symbolic statement of the production function—whether in flow-flow or stock-flow form—where capital is non-human by definition, and is nicely distinguished from the labor component. Smith, for example, has pointed out that a substantial, if not predominant, part of what is called investment in the United States does not take the form of increased quantities of hardware, but consists of expenditures on service elements and service activities which are usually considered arcilliary to the produuction process proper (Smith, 1970, p. 29). If the concept of capital is expanded to include more than the stock of physical capital equipment—to include anything which provides increased output in the future [Karnarck (1971, p. 6)]—we run into ever increasing problems.

> Although "capital" would seem to have an easily accessible intuitive meaning, it is the most elusive concept of economics. The literature on this subject is immense, and there is little agreement among economists how "capital" can best be treated conceptually and what constitutes a satisfactory measurement of this Protean entity [Morgenstern (1963, p. 70)].

Given the problems we have with the concept of capital, we can hardly hope for greater precision in dealing with changes in the level of output attributible to the input of capital, as modified by changes in the quantity or quality of embodied or applied technology. And yet, it is asserted that we must attempt to measure the effect of changes in technology in order to appreciate its significance [Eckans (1962, p. 171)]; and the measurement of, or problems involving the measurement of, the effects of technological change have absorbed

1 The usual transfer of ideas is made by reading "technical innovations" for technical or technological change, and then letting the reader infer that since we do not physically produce improved or technically altered human beings as part of a production process, the phrase must infer useful knowledge embodied in or applied to machinery [Johnston and Kilby (1972, p. 76); Eckans (1965, p. 168)].

some of the best minds in economics. An explanation for this drive to measure the effects of technological change, particularly in the aggregate, can be found in the nature of economic science.

It is not only legitimate. but mandatory, to improve the scope and range of measurement in any science. Because the creation and application of useful knowledge has a cost to any economy, both in terms of time and other resources, it represents an economic problem. Furthermore, because it can be argued that the rewards to society as a whole from generating useful knowledge may exceed the rewards which any individual scientist, inventor, or innovator could capture personally,[2] there is a case for subsidizing the creation of such knowledge; thus there are policy implications which may require specific and quantified economic recommendations. If an economic policy is to be undertaken, it is certainly reasonable to base it upon the best available estimate of the most relevant magnitudes involved. Unfortunately, this pattern of policy decisions being followed by a search for appropriate supporting evidence and operational variables, is seldom treated with the contempt and derision it warrants. Only if the initial premises upon which decisions to correct alleged divergences between private and social costs or rewards are properly specified, and the necessary evidence about causality and magnitudes set forth, can explicit goals be established and appropriate policies developed. The whole question of attempting to measure the aggregate effects of technological change over time for policy purposes is open to challenge.

From a scientific standpoint the efforts to measure technological change and its effects has grown rapidly. Early work, based upon the existence of a definable aggregate production function for an economy, assigned the statistical residual to technological growth after the traditional categories of inputs had been accounted for; more recent work has separated that residual into various additional components, but the process and the results are still quite crude and general. Consider, for example, how the passage of time alone makes the definition of capital ambiguous [Stewart (1972, p. 114)], and then imagine how much more ambiguous must be any measure of average technological change which is based upon that definition of capital. Furthermore,

2 It is an unhappy fact of our time that the viceral response to an assertion that marginal social cost or reward exceeds the marginal cost or reward to an individual is to propose control or regulation by those in control of government, without serious recognition of the non-market imperfections and costs involved. We are beginning to understand how many of these situations are transitory, and how many can be corrected by an appropriate adjustment of the property rights involved [Clarkson (1975, p. 26)].

if the residual approach assumes that all identified factors of production are paid the value of their marginal product then the technique is patently absurd for the less developed countries, where pervasive laws and regulations about prices, wages, and the rate of interest, have the stated goal of ensuring that some groups are paid more, and others less than the market value of their marginal product.[3]

All of the conceptual problems involved in measuring the outcome of technological progress apart, the technical difficulties of appropriate index number for aggregation over firms and industries are enormous—and usually glossed over [Solow (1957)]..., and the data weaknesses are seldom explicitly recognized beyond the introductory comments of a study [Morgenstern (1963)]. A more useful activity, and one to which agricultural economists have made major contributions, involves the microeconomic approact: the attempt to measure, in partial and static terms, the contribution which a particular new technique or piece of equipment has made to the total output of an individual enterprise. But even here there are major problems. The goal of the producer is more likely to be the maximization of output from all inputs in combination—the attempt to equate, as nearly as possible, the marginal productivity per unit of expenditure on each input used—rather than to maximize output or the value of output obtainable from one new technique or input in isolation [Kindleberger and Herrick (1977, p. 142)].

The most easily justified effort to measure the expected results of technological change must surely be the inevitable activity of the individual producer—or group of producers where decisions are arrived at in some collective manner—who has the greatest available amount of often non-quantifiable information about his world on which to base an estimate. It is at this level that we can begin to understand the crucial role of working capital. Although a number of economists have recognized the role of working capital as a separate input into the production process [Waters (1973); Kindleberger and Herrick (1977, p. 142)], and others have noted its role as a necessary condition if innovations are to be implemented [Kennedy and Thirlwall (1972, p. 56)], little work has been done on working capital as a factor of production—subject to price quantity, and quality variations just like any other factor.

Before we examine the impact which technological change is likely to have on the organizational and institutional structure of the firm and the economy, and the implications which this impact has for the supply and demand for working capital, it is appropriate to look

3 It is irrelevant that such policies are usually alleged to be pursued in order to correct some implied failure of the market. They are intended to distort factor prices.

at the reasons for and sources of technological progress. There are a multitude of motives and reasons why new techniques are created and applied; they can, however, be grouped into several broad categories: increased pecuniary rewards–profits or other form of wealth–; increased non-pecuniary rewards–fame, the thrill of discovery, *etc.*–; and as an end in itself–as when government authorities use research and development expenditures as a means to develop political support among various groups. Very little research has been undertaken to discover which type, and what particular form, of reward will permit or induce an increased rate of innovation within any given social structure in the less developed countries. The assumption seems to have been made by those in authority in the less developed countries that the appropriate pattern of rewards should be that of selected industrialized nations. Too often the pattern selected represents the ethos of those industrialized nations–the United Kingdom or Eastern European countries–which have been least successful in bringing new methods of production into widespread commercial use in recent years.

The generation and implementation of a new technique or process has an economic cost at every stage, and the relative costs is in part related to the source from which the technology is drawn, as well as the type of final product involved. The general sources of new technology available to a less developed nation are: local invention and innovation by producers, inventors, or scientists; local research institutes, formally structured to create new technology and distribute new knowledge; foreign technology imported from the more developed world and adapted for local conditions and local relative factor scarcities.[4] Much has been made of the question of the appropriateness of technologies and of particular products for the less developed world [Stewart (1972, p. 114); and Morley and Smith (1977)]. The problem would be irrelevant if domestic factor and product prices were free to reflect relative scarcities; unfortunately they seldom are. But, an obsession with market imperfections, and a paternalistic urge to prevent local producers from incurring risks and from learning by occasional business failure, is poor justification for policies which delay and distort the process of technological change.

4 The degree to which local adaptation of imported technology is actually undertaken has been the subject of some interesting research. Early conclusions that little adaptation actually takes place–that production methods and input ratios are imported unaltered–has been challenged, and recent findings indicate that a high degree of adaptation does occur, but that such adaptation is in response to market size rather than factor price ratios. [Morley and Smith (1977)]. It also appears that the decision to use labor-intensive or capital-intensive methods of production is determined by the type of product as well as the scale of operation.

Finally, there is the dangerous illusion of some optimal technology for the production of a particular commodity or range of commodities. The danger lies in the implementation of investment projects which embody the latest available technology, as though such a leap to some optimal process could eliminate or reduce the need for subsequent change. Technological change is a process which evolves continuously. It may be preferrable to opt for a currently sub-optimal technology if that will provide a lower cost over time by allowing greater flexibility and responsiveness in the face of change. Perhaps the most appropriate technology for a less developed economy is that which minimizes the cost of subsequent alternatives and which maximizes the development of domestic skills in creating subsequent and newer, but local, production processes. Major buildings in the United States are now being constructed with ease of subsequent dismantling in mind; but investment projects in the less developed nations are still being undertaken as though they were intended to stand for eternity.[5] If economic development means total social and economic change at an ever increasing rate, then the big, the solid, and the permanent project should be required to demonstrate its appropriateness twice over.

Perhaps most important for our purposes is the prevasive nature of organizational and institutional change which we may anticipate will accompany technological change on any significant scale in a less developed economy. Such organizational change may be a necessary concomitant to the introduction of a new technique, but if working capital cost or scarcity precludes the necessary organizational changes, then the new technique may be rejected despite apparent economic viability if viewed in isolation.

III. Organizational Change

Any technical progress which has a sufficiently widespread effect to be of economic significance for a less developed country will, as an inevitable result, induce changes in a variety of economic institutions and activities. Consider, for example, a technical change, an innovation or new process, which occurs in the production of some commodity. We can identify five proximate changes which may occur immediately. First, there may be a change in the pattern of in-put use—a change in the proportions in which existing inputs are combined—with no change in the absolute total quantity or the

5 This is not advocacy of obsolete technology, but rather a plea for recognition of the need for more research into the role of flexibility in the technology adopted, and for greater emphasis on the role of encouraging a domestic technology producing tradition [Bryce (1960, pp. 107-109)].

nature or quality of those inputs. Second, the scale of input use may change. Third, the quality of inputs may change; and here we approach the unclear distinction between changes in the quality of an input and the introduction of a completely new factor of production. Fourth, the scale of output may change, with no change in the nature or quality of the product. Fifth, there may be a change in the quality of the product; again we must draw the unclear distinction between an improvement in an existing product and the introduction of something entirely new. All five general categories of change resulting from a new production process will lead to substantial secondary reorganization and change.

On the input side of the production process changes in the relative levels of employment of given factors of production may or may not lead to an increased demand for working capital. If, for example, the change involves the employment of additional units of labor, and particularly if labor is considered — for legal or traditional reasons — a fixed cost, the amount of working capital which the firm must hold will increase to cover greater roundaboutness in production, but it will also increase to account for the greater leverage created and the resulting increase in risk of illiquidity. If the absolute scale of input use rises, the effect will be a combination of the elements discussed above, with the added likelihood of increased ancilliary facilities and supervision costs to the producer. The added facilities would include larger stocks of supporting inputs — spares, raw materials, maintanence materials, *etc.* and larger stocks of goods in process. There is, however, one compensating factor: larger stocks reduce the cost of information about short-run scarcities, and hence they reduce the level of anticipated risk. Thus, if increases in stocks can be financed at medium-term or longer, there may be a smaller increase in the demand for working capital than otherwise.

Technology costs money. There may or may not be a direct payment for information about, and the right to use, the new technique [Wionczek (1973, p. 93)], but there will certainly be an implementation cost and a settling in period during which the new technique requires greater supervision and maintenance than when fully operational. This bulge in working capital requirements can seldom be fully anticipated and covered as a part of longer term credit arrangements. It has been asserted [Shapiro and Miller (1977, p. 296)] that differential access to information about technology is a prime reason for the observable differences in technological efficiency within industry in the less developed countries; a much better explanation, and one which would be easier to test, suggests that the differences are due to the cost of information and implementation, coupled to the scarcity—and hence the relative cost-of working capital.

If working capital is scarce, and its relative cost high, the producer can make internal adjustments to conserve the scarce resource. It may, as we suggested above, be possible to find increased stocks from sources other than those usually relied upon for working capital. It may be possible to use lower quality supervision, or inputs which require immediate payment, and thus lower working capital needs. But any such solution is patently inefficient and only shifts the cost to the future. An example of this process—the behavior of producers in the presence of scarce, and high cost, working capital—can be seen in the use of second hand or old equipment [Smith (1974); Schwartz (1973)]. It may be true that older equipment allows greater latitude in the selection of output levels and in the quality of raw materials used [Stewart (1972, p. 107)], but the trade-off may be less reliable, higher maintenance costs, and increased supervision costs [Johnston and Kilby (1975, p. 109)]. Reorganization to minimize working capital needs is a complex question which warrants a great deal of research.[6]

In terms of output, technological change is seldom implemented merely to increase production of a given commodity with no change in its quality. However, if output were increased in this way, there would still be the increased demand for working capital due to the need for greater storage and stock control, greater quantities of product in the distribution system, and the need for new dealers and distributors. Also, trade credit would have to increase as small dealers try to use the producer as a source of their own working capital needs.[7] If, on the other hand, the new technology results in a product of different quality than before, the increased need for working capital may be acute. A substantially altered product may require a new advertising campaign to overcome information costs; which may be equally true of an improved strain of staple food or a new product of any industrial type. Furthermore, a substantially altered product may enter a new realm of competition, and face added celling costs

6 This may be a partial explanation for the apparent reluctance of producers in less developed countries to take full advantage of the stock of second hand equipment available to them in the industrialized nations. It does not, however, explain the controls and regulations through which officials restrict the availability of second-hand equipment in the less developed countries.

7 From the author's experience selling small packages of petroleum products in rural Uganda, the small distributers full understand the cost of using trade credit, but they use it to the full due to the scarcity and cost of working capital from other sources. The use of consignment policy by producers and distributers in less developed countries has few of the advantages it has in economics with more sophisticated rediscounting and working capital facilities.

by virtue of having to compete with products previously not seen as substitutes. It may even be necessary to develop new dealerships and retail outlets, with access to new markets, but also with dealer skills in initial repair and maintenance which were not considered necessary before.

Technological change can lead to changes in the nature of industries and markets if the scarcity and cost of working capital induces firms to internalize their costs by integrating backwards into the resource base, and forwards into the distribution system for their product [Stewart (1973, p. 113)]. This kind of behavior has been particularly characteristic of cooperative societies, where there has been a traditional scarcity of working capital due to the decision making structure and the nature of rewards to risk taking within the organization. Also, the creation of a producers monopoly or cartel —which will only be a viable alternative with legal sanction and government backing to share the enforcement costs—to neutralize the effect of the technology embodied in imported substitutes, which might reduce the rent and increase the working capital requirements related to present domestic practices [Wionczek (1973)].

Institutional research is intended to reduce the cost, and increase the flow of, useful information to the producer. Unfortunately, there has been little research into the economic costs and benefits of expenditures on institutional research, but the little evidence which exists appears to indicate that the contribution to economic development is negligible if one discounts the anecdotal evidence of a few outstanding achievements [Reichelt (1972, p. 145)]. Research in formal, and in particular in government or international agency controlled, institutes tends to become increasingly abstract and alien to the process of current domestic production. Research workers, as scientists, destain the commercial basis of their activities and in this they are quite realistic. The rewards to an individual scientist in a government research station are not related directly to the successful application of any new technology which he may generate; the rewards he does obtain are non-pecuniary and related to the recognition his purely scientific efforts receive from his professional peers in an international confraternity. Hence, apart from any other effects, we observe the bias towards imported physical capital in research into technology [Kindleberger and Herrick (1977, p. 144)], and the preference for pure rather than applied work. The effect of institutional research may even be to increase working capital requirements through the type of technology generated.

Where applied research in new technologies is undertaken it tends to be within the agricultural sector and predominently through the extension activity. But, much of the activity in small farm agriculture tends to be an attempt to correct situations created by the

previous introduction of new techniques and inputs. For example, the creation of maintenance and repair facilities to service the equipment provided for farmers without any corresponding increase in working capital flexibility and availability [Bhattasali (1971); Laberenz and Sain (1971)]. The promotion of mechanization in agriculture with only institutional credit on rigid terms to cover increased working capital needs is a most questionable aspect of developmental policy [Gemmill and Eicher (1973); McPherson and Jackson (1975); Lele (1975); and Ulinski and Becker (1976)].

Finally, there are two areas of organizational change which result from the adoption of new technologies, and which are frequently seen as only ancillary whereas they are in reality central. The first is in government sector, where technological change can also occur directly, and where we have evidence that agencies and bureaus do respond to changes in factor prices by altering the ratios in which factors are employed. Also, with any institutional change which occurs as a result of a technological advance, there arises an opportunity for those in control of the government to expand their sphere of control and regulation, thus transferring to the officials part of the rewards which a new technology may create. Hence we have an explanation for the eagerness with which extended administrative control of economic processes is advocated [Cilingirouglu (1975, pp. 52-53); Balasubramayam (1973)]. Second, is the financial sector.

IV. Financing Working Capital

Small producers predominate in the less developed countries, and economic development thus depends upon the growth of small producers. It is, however, true that the problems of liquidity which growth inevitably brings are also faced, although perhaps not with such stark urgency, by larger producers and even governmental agencies. The cost of having too little working capital will be to risk technical insolvency [Archer (1966)]; the cost of holding too much working capital will be the profitable investment opportunities forgone—such as increased inputs for higher output—and the actual interest paid on idle funds. Thus working capital however defined—usually as current assets minus current liabilities at any moment—requires above all the characteristic of flexibility. Cash, or close substitutes which can be turned into cash rapidly and with no loss of value in the transaction, must be available when required, but not held during those periods when production levels are low and sales receipts begin to exceed input costs for a time. The ideal solution is a growing line of revolving credit with a bank but this is seldom available, for reasons we will discuss.

The producer must hold working capital to cover a changing production period which will depend upon his estimate of future input

costs, future production costs, future distribution costs, the future costs of collecting accounts from customers or distributors, and the future rate of inflow of receipts. The producer must also consider the possibility of unexpected opportunities to expand output, or otherwise increase the value of his activity; and this means trying to anticipate how much effort and cost should go into opening up credit relations for future use. With every element there is a purely subjective estimate of risk, and that is what differentiates the able and efficient manager from the mere administrator. Also, the very subjective nature of working capital management, based as it must be upon local knowledge of circumstances, institutions, and personalities, means that objective and externally arrived at estimates have seldom been adequate.

Working capital requirements have been slighted in project analysis [Gitttinger (1972, p. 107); Steward (1972, p. 117)], and even based upon arbitrary ratios to some more easily arrived at magnitude [Sen (1975, pp. 47-48)]. If a producer cannot obtain a truly flexible source of working capital funds, he may be forced to substitute some alternative such as longer term credit; and even if it is available, this is a less efficient and higher cost solution which may also involve some attempt to hide the real use of the funds from the lender. In general, government agencies—which usually encompasses the cooperative societies—tend to prefer lending against tangible physical assets, with detailed and supervised new procedures. If a sudden opportunity, or urgent need, for working capital arises outside the prescribed use, there is immense pressure on the producer to divert funds accordingly; unfortunately the effect is cited as either corrupt or unthinking behavior if the reason is not fully understood. The pressures on small producers to raise working capital wherever they could have resulted in the trite observation that small farmers in particular have a high propensity to get into debt [Lewis (1955, p. 127)].

There are four basic sources of working capital available in varying degrees to the small producer in a less developed country. First, the non-formal, non-regulated, financial markets, where money lenders and local traders predominate. Although the nominal cost of such credit is high in relation to the rates quoted for credit in the various regulated market, it may in fact be quite realistic in terms of the scarcity of funds and the rates of return on working capital.[8] Un-

8 In East Africa during the late 1950's small kerosene dealers were quite aware of the cost of trade credit but were prepared to use such credit wherever possible because of the even higher rates of return they could get by expanding their activities. Hence while the officials in the government and cooperative credit agencies were debating the inequity of an increase in their nominal rate from 3% to 4%, the energetic traders were quite happy to take all the credit they could get at 10 times that figure.

fortunately, and to the detriment of small scale production, there has been continual pressure by the authorities on the non-formal sources of lending, usually based upon some ethical assumption that the high rates of interest that they charge their customers represent a conspiracy to extort; the evidence is all to the contrary [Bottomley (1970, Section 3, pp. 79-120)].

Second, the small scale producer may use the regulated, but still non-governmental, financial market. But formal institutions, such as commercial banks, are often constrained by usuary laws or by such weakly defined property rights that they cannot rediscount any commercial paper which a small producer could issue. Furthermore, there is little incentive for the bank to lend to the higher cost, and higher risk, small innovator when returns are the same from lending in larger amounts to stable and therefore lower risk borrowers who represent established ways and lawer administrative costs. Third, the small producer may seek credit from one of the many government agencies [Waters, (1973, pp. 436-444)]. Government agencies have traditionally tied their lending to contract loans against tangible assets, with a heavy overlay of advice bordering upon detailed control [Harper (1975)]. It is widely recognized that the below market rates of interest charged by government agencies usually involve considerable time cost to the borrower in terms of application procedures and waiting for loans to be approved or rejected. Such loans tend to go to tre larger producers in any situation; the producers who represent the least risk and the least cost – in terms of effort – to the loan officer [Gotsch (1972)]. Because the value of time is not the same to all producers, such loans also tend to go to the producer whose time in other activities is lowest, and not – as surely we would hope – highest. Despite the pattern of lending by government agencies, the advice given to those who would create greater flexibility in financial markets is usually to establish even more agencies as older ones ossify [IBRD-SIDA (1974, p. 91)]. Finally, stocks and other relatively liquid substitutes for cash or standby credit might provide an alternative source of working capital [Apparadhanulu (1971)]. Storage problems, deterioration due to weather and pests, price fluctuations, and constraints on their use as collateral cause stocks to have a relatively high cost for most producers if used for working capital purposes.

V. Conclusions

Working capital, as well as skilled labor bottlenecks, limit the range of effective technologies available to producers in less developed countries [Stewart (1972, p. 117)]. We have little research into the management, let alone the availability of, working capital [Smith (1973, p. 63)], and practically no research on the role of working capital in the development process. It does appear that

the concept of working capital is poorly understood by planners and administrators. While the demand for working capital funds appears to decline proportionally with the size of production unit in the more developed nations, it is at least likely that the relation is linear in the less developed world; and if this is so, there is considerable scope for research into the distributional effects of policies which alter access to working capital funds.

Scarcity and cost of working capital can provide at least a partial explanation for reluctance to adopt new technologies, despite the efforts of extension workers and the availability of institutional credit (unless such credit is highly fungible); it also helps to explain the slow spread of new technology, the fact that bigger producers adopt new technology more readily than smaller producers, despite the general assertion that bigger producers in less developed countries are oligopolistically or monopolistically organized, and the observed preference for new equipment even where second hand equipment may be available.

It is imprortant that working capital should be seen and treated as a separate and distinct productive input, and made available to those producers for whom the value of its marginal product is highest. It would be interesting to know what effect the freeing of interest rates in Korea, and to a lesser extent in Taiwan and Indonesia had on access to working capital [Brown (1973)]. As a point of departure, it would be useful to analyze the structure of property rights surrounding working capital markets in various less developed countries. Indications are that property rights are less well specified or understood with respect to market services than for tangible physical assets [Clarkson (1975, p. 25); North (1974, pp. 18-25)]. Finally, the study of economic development is at the same stage as meteorology: we understand its characteristics but not the specific causalities and how it can be accelerated [Nelson (1974, p. 62)]. It does, therefore, seem reasonable to at least avoid aggravating the situation and let markets work openly rather than in constrained and oblique fashion. Competition seems much superior and more promising than controls [Johnson (1971)], particularly when we know so little about the complexity of the market for working capital.

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