A Note on Preschool-Age Investment in Human Capital in Developing Countries

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(continued on inside back cover)
A NOTE ON PRESCHOOL-AGE INVESTMENT IN HUMAN CAPITAL IN DEVELOPING COUNTRIES

MARCELO SELOWSKY

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A Note on Preschool-Age Investment in Human Capital in Developing Countries*

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It is true that schools have “inputs” and “outputs,” and that one of their nominal purposes is to take human “raw material” (i.e., children) and convert it into something more “valuable” (i.e., employable adults). Our research suggests, however, that the character of a school’s output depends largely on a single input, namely the characteristics of the entering children. Everything else—the school budget, its policies, the characteristics of the teachers—is either secondary or completely irrelevant.1

The above statement by Jencks articulates a widely held view in the current discussion concerning the effectiveness of schooling in the United States. It is a suggestive way of introducing the subject of preschool-age investment in human capital into the discussion of general human capital formation. The thrust of this paper is that this statement by Jencks ought to be a working hypothesis of prime importance in the discussion of human capital formation in developing countries.

The relevance of preschool-age investment in human capital—for the process of human capital formation in general and formal schooling in particular—rests heavily on the following set of evidence:

1. The acceleration of the rate of enrollment in primary schools in less developed countries is and will be characterized by drawing an increasing number of children from lower-income families. In other words, the fraction of children from low-income families in the elementary schooling system will increase over time.

2. There is a growing empirical evidence showing that preschool children from poorer segments of the population in developing countries have a lower performance in most ability tests than matching controls


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from higher-income groups. A large part of this evidence has been generated in medical studies attempting to isolate the effect of early malnutrition on mental development.2

3. The recent literature in the field of education and psychology suggests that, although heredity explains an important fraction of children's intelligence scores (Jensen), environment is still crucial in such explanation (Jencks) and particularly true for environment at early ages of life (Bloom).3

4. There is a growing literature in the medical field attempting to show that early protein type malnutrition—a phenomena that characterizes a large fraction of children in developing countries4—adversely affects mental performance as well as children's psychomotor activity.5

5. Considerations 3 and 4 would suggest that the determinants of low ability scores in preschool-age children—as noted by 2—are not completely exogenous to public policy.

If we accept 1 and 2, it will be true that the elementary schooling system in developing countries will be facing an increasing deterioration of its (entering) "raw input." On the other hand if the productivity of school inputs (in the production of abilities, however defined) is largely dependent on the quality of that "raw input" it will be true that the effect of schooling might be in the future highly sensitive to present policies concerning preschool-age types of investment in human capital.

As economists, two interdependent questions would seem appropriate: First, to what extent are we overinvesting in schooling vis-à-vis preschool-age types of investment? Second, what are the types of investment in pre-school age that can be manipulated by public policy and what is the "productivity" of such investments?

2 For such evidence see: F. Monckeberg, F. Donoso, S. Valiente, A. Arteaga, A. Maccioni, and N. Merchak, "Analisis de las Condiciones de Vida y Estado Nutritivo de la Poblacion Infantil de la Provincia de Curico," Revista Chilena de Pediatría, vol. 38 (1967); V. Kardonsky et al., "Cognitive and Emotional Problems of Chilean Students (7 to 10 Years) in the Northern Section of the City of Santiago," mimeographed (Department of Psychology, University of Chile 1971); B. Robles et al., "Influencia de Ciertos Factores Ecologicos sobre la Cond Lifita del Nino en el Medio Rural Mexicano" (IX Reunion, Asociacion de Investigacion Pediatrica, Cuernavaca, Mexico, 1959).


I. Framework

In order to focus on the economic questions of the earlier discussion, let us start with the following simplifying premises: (a) We want to analyze the contribution of preschool-age public policies to a vector of cognitive and noncognitive performance at adult age (or at the age the individual enters the labor force) as measured by available tests. (b) We are not going to worry at this stage about the mechanism by which cognitive and noncognitive characteristics of the individual affect economic productivity.\(^6\) (c) The "economic problem" becomes therefore how preschool-age investment in human capital can contribute to a "least cost solution" in the production of cognitive and noncognitive skills at adult age.

A glance to the literature on education and psychology would suggest we can use some of the tools familiar to us: Assume the production of cognitive and noncognitive performance at adult age \(\Pi\) can be written as:

\[
\Pi = F(A, S),
\]

where \(A\) is the vector of abilities of the child when he enters the schooling system and \(S\) is a vector of school and (nonschool) environmental inputs he is exposed to during schooling age. From now on let us interpret \(S\) as simply a vector of school inputs.

However, it would seem that some of Jencks's finding also allow us to say something about the shape of equation (1): according to him not only \(A\) has an important independent contribution to \(\Pi\) but it also determines the magnitude of the contribution of \(S\).\(^7\) This would mean we could write (1) as:

\[
\Pi = A^\alpha S^{1-\alpha}
\]

From expression (2) it is clear that the contribution or marginal productivity of school inputs (MPS) becomes now a function of the level of ability of the entering child:

\[
\text{MPS} = \frac{\partial \Pi}{\partial S} = (1 - \alpha) \left( \frac{A}{S} \right)^\alpha
\]

We can now interpret Jencks's statement: the more important is \(A\) in the production of \(\Pi\)—which implies a "large" value of \(\alpha\)—the more important becomes the quality of the raw input (the value of \(A\)) in determining the contribution of schooling to adult abilities.

On the other hand, points 3 and 4 of the previous section suggest that \(A\) is itself a function:

\[
A = Gf(O, E),
\]

\(^6\) For a discussion of such mechanism, see H. Gintis, "Education Technology and the Characteristics of Worker Productivity," *American Economic Review*, vol. 61 (May 1971).

\(^7\) "We have therefore abandoned our initial belief that equalizing educational opportunity would substantially reduce cognitive inequality among adults. This does not mean that we think cognitive inequality derives entirely from genetic inequality, or that test scores are immune to environmental influence. It simply means that variations in what children learn in school depend largely on variations in what they bring to school, not on variation in what schools offer them" (Jencks, p. 53).
where $G =$ genetic endowment, $O =$ index of inputs affecting organic and physical growth, and $E =$ environmental inputs characterizing the "milieu" of the child.

For policy purposes we can further breakdown some of the explanatory variables of the above expression:

$$A = Gf[N,H,E_h,E_o],$$

where $N =$ index of the quality of the food intake (nutrition) during preschool age, $H =$ index of health services the child is exposed to during preschool age, $E_h =$ index of the quality of the home environment the child is exposed to, and $E_o =$ index of the quality of "out-of-home" environment during preschool age.

Our first question—are we overinvesting in schooling vis-à-vis preschool-age investment in human capital—can now be summarized in figure 1. It will be true if, given the (vector) of relative costs of $A$ and $S$, we are situated in a point like $P_1$. Answering such a question will require: (a) information about $\alpha$, or the contribution of $A$ to $\Pi$; to a certain extent it can be obtained through "educational production function studies" where $A$ is introduced explicitly into such a function; (b) information about the coefficients of those explanatory variables of expression (5) that

Fig. 1.—Preschool ability and school inputs in the "production" of abilities at adult age.

can be affected by public policy; and (c) the resource cost of inducing changes in those variables affecting II, per unit change in II.

Section II presents some empirical evidence concerning \( a \) and \( b \) out of existing research.

II. Brief Review of Some of the Empirical Evidence Relevant to Our Hypothesis

The Coefficient of Early Ability (\( \alpha \)) in the Production of II

To my knowledge no research attempting to isolate the "value added of schooling" from the effect of the ability of the entering child has been undertaken in developing countries. Most of the research on this issue has been conducted in the United States by researchers from different disciplines.

An estimate of \( \alpha \) requires measurement of abilities in long follow-ups of individuals (at least 15 years) as well as data on all environmental variables in the interim period. Almost no study combines both requirements. Some of them, particularly undertaken by psychologists, consist of long follow-up studies of IQ measurements over time; however, most of them have little recorded data on environmental variables the individual was exposed to between these measurements.\(^9\)

We now review some of the research that, one way or another, is suggestive of the notion that early ability (at ages 4–6) is an important determinant of an adult's level of ability as measured by current IQ tests.

Bloom's particular interpretation of the results of the major longitudinal studies undertaken in the United States in the last 60 years is worth mentioning.\(^10\) These results, summarized in figure 2, show that the correlation coefficient between the IQ at any age \( T - t \) and the IQ score at maturity \( T \) increases for consecutive lower values of \( t \). Moreover such a relationship appears to be quite similar across studies "done with different groups of children, in different parts of the country, with different examiners, and at different times." What is relevant to us is the particular interpretation Bloom gives to the behavior of the correlation coefficient. His interpretation follows a line in psychology originally developed by Anderson called the overlap hypothesis:\(^11\) this hypothesis interprets the correlation coefficient among two (longitudinal) measurements of intelligence as the "percentage of elements which are common to the two sets of measures involved." This leads Bloom to conclude that "in terms of intelligence measured at age 17, at least 20% is developed by age 1, 50% by about age 4, 80% by about age 8 and 92% by age 13."

Jencks's "path model of intergenerational mobility" attempts to isolate the effect of an IQ measure at 11 years (IQ) from the educational

\(^9\) Bloom.
\(^10\) Ibid.
attainment of the individual \((E)\) on the Armed Forces Qualification Test (AFQT).\(^{12}\) The beta (regression) coefficients between IQ and AFQT and between \(E\) and AFQT turned out to be 0.80 and 0.20 respectively; in other words, holding education constant, one standard deviation change in the early IQ score would induce 0.80 of one standard deviation in the AFQT score.

If Bloom is correct it is plausible, however, that the regression coefficient obtained by using an IQ score at age 11 would represent an upward bias estimate of the contribution of an earlier IQ score (at preschool age).

A research by John Conlisk using longitudinal data on students' IQ scores found the following regression equations.\(^{13}\)

\[
\begin{align*}
IQ_{18} &= 4.77 + .490 \text{IQ}_{1-5} + 1.514 \text{ years schooling} \quad R^2 = .45 \\
&\quad (6.44) \quad (.099) \quad (.358) \\
IQ_{18} &= 8.11 + .527 \text{IQ}_{6-8} + 1.051 \text{ years schooling} \quad R^2 = .49 \\
&\quad (5.74) \quad (.093) \quad (.367)
\end{align*}
\]

\(^{12}\) Jencks.

\(^{13}\) Quoted in Bowles.
where the subscript of IQ denotes the age range at which the test was administered and where standard errors are in parenthesis.

Figure 3 shows the trade-off between early IQ and years of schooling in the production of later IQ (IQ\textsubscript{18}) implicit in the above results.

According to those results, three points of IQ at ages earlier than 5 are a substitute for one year of schooling; for IQ at later ages (between 6 and 8) two points of IQ are a substitute for one year of subsequent schooling.

Evidence on the Determinants of Preschool Ability Scores (A): The Non-genetic Determinants

General considerations.—For our purposes what is important is to identify variables determining A and able to be manipulated by policy instruments usually available to governments. Very possibly the "non-genetic variables" are the ones which fall in this category.

By now it is well accepted that an important fraction of children’s intelligence scores is explained by heritability. The recent discussion has centered on the order of magnitude of such explanation: in this respect we quote Jencks: “Whereas Arthur Jensen and others have argued that 80 percent of the variance in IQ scores is explained by genetic factors, our analysis suggests that the correct figure is probably more like 45 percent.”\textsuperscript{14}

The question remains to what extent these studies, if undertaken in

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\textsuperscript{14} Jencks.
developing countries, would show a relatively higher explanatory power for variables others than the heredity variable—that is, for the nongenetic determinants. A probable hypothesis in this respect is that the variance of the nongenetic variables across children is perhaps much larger for developing countries than for the United States; if this is true, and if these variables do influence the level of $A$ in the true theoretical model, the results obtained for the United States would not appropriately capture the relative explanatory power of the nongenetic variables vis-à-vis the heredity variable. For our purposes this is an important conclusion: it means an increased relative importance of the explanatory variables able to be manipulated by public policy, at least in the range of the value of the variables relevant to developing countries.

At this stage it is perhaps worth asking ourselves a pragmatic question: Is it worthwhile to disentangle the net effect of the different nongenetic variables to which low-income group children are exposed and which—as a package—are contributing to low preschool ability scores? If it is true that children from lower income groups—subject to a package of nutritional, health, and environmental deprivation—score worse in ability tests, why not directly affect the whole package of these variables?

Two kinds of considerations would reject such a view. First, some of the variables in that package are difficult to manipulate from an institutional point of view; and we do not know to what extent such variables are perhaps the “true” explanatory variables of children’s performance; in such case manipulating the rest of the package would not have a major effect on such a performance.

Second, it is realistic to assume that the resources available for such public programs will be highly constrained, particularly because they involve sharp redistributive policies. In that case we are interested in identifying those variables which have the major impact per dollar spent in manipulating that variable; this requires necessarily an estimate of the net impact of such a variable.

We therefore proceed now to review some of the literature that, one way or another, gives some information about the net effect of the nongenetic variables outlined in equation (5).

The effect of early malnutrition.—The causal hypothesis by which early malnutrition, especially a deficit in the intake of “high quality” proteins, affects mental functioning is basically a medical one: nutrient deficiency produces a damage in the central nervous system given that early brain growth is largely a process of protein synthesis. This has been confirmed in experiments with animals and by preliminary findings of reductions in the number of brain cells in dead children who suffered severe malnutrition.

15 “High quality” proteins provide all of the so-called essential aminoacids. Proteins of animal origin provide all of such aminoacids.
What becomes relevant is to what extent these organic changes affect learning and behavior as measured by available test scores. Cravioto and De Licardie present in their survey a review of experiments undertaken in a variety of countries which tend to support such a hypothesis; what we want to emphasize here, however, is the fact that some particular types of abilities that seem to be affected by malnutrition appear to be crucial for further learning; if this is true early malnutrition would condition the effectiveness of school inputs at later ages. Table 1 presents a survey of some studies whose specific aim was to study the effect of malnutrition on different types of intersensory integration abilities crucial for basic learning.

Other causal mechanisms by which early malnutrition affects learning have been advanced in the literature. There is some evidence showing that infectious diseases are likely to be less severe and less frequent in well-nourished children; to the extent an infectious disease affects the

### Table 1

**Some Studies on the Effect of Malnutrition on Learning**

<table>
<thead>
<tr>
<th>Authors</th>
<th>Deficit in Performance</th>
<th>Probable Effect on Consequent Learning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cravioto and De Licardie (Mexico)*</td>
<td>Auditory-visual integration</td>
<td>Reading ability</td>
</tr>
<tr>
<td>Cravioto et al. (Mexico)†</td>
<td>Visual-kinesthetic integration</td>
<td>Writing and drawing abilities</td>
</tr>
<tr>
<td>Champakam et al. (India)‡</td>
<td>Visual identification</td>
<td>Reading abilities</td>
</tr>
<tr>
<td>Cravioto et al. (Mexico, Guatemala); Guthrie et al. (Philippines)§</td>
<td>Kinesthetic-visual, kinesthetic-haptic, haptic-visual, and auditory-visual integration</td>
<td>General learning abilities</td>
</tr>
</tbody>
</table>

**Source.**—Cravioto and De Licardie (see n. 5 above).


child's responsiveness to his environment it affects his cognitive development.

Apathetic behavior has been one of the most clear effects of malnutrition in almost all studies. Cravico and DeLicardie have an interesting hypothesis about the further effects of apathy: "It should be recognized that the mother's response to the infant is to a considerable degree a function of the child's own characteristic of reactivity.... Apathetic behavior in its turn can reduce the value of the child as a stimulus and diminish the adult's responsiveness to him. Thus, apathy can provoke apathy and so contribute to a cumulative pattern of reduced adult-child interaction."

The effect of early environment.—This is a difficult subject to summarize, with a huge literature and with contradictory interpretations of the same data by social scientists of the same discipline. One phenomenon is striking: the little research that has been done in this area in developing countries vis-a-vis developed countries, particularly the United States.

Let us start with a policy-oriented approach. We can define basically two types of environment the child is exposed to at preschool age: home environment and out-of-home environment. The policy options are to change the quality of both types of environment and/or change the "mix," to change the total fraction of time the child is exposed to a particular environment.

Figure 4 shows, under a particular setting, a hypothetical distribution of the time spent in both environments; the older the child the larger the fraction of time he spends (or can spend) in an out-of-home environment. On the same graph we plot an index of Bloom's development curve (BDC); the shaded area represents the limit of the variation that the quality of the environment can produce at different points of the development of the child. 18

Changing the out-of-home environment.—The best examples in this field are the large-scale programs of preschool compensatory education (between ages 3 and 5) undertaken in the United States, particularly the Head Start program. The RAND Corporation has undertaken a survey of about all the evaluation research of such programs. 19 Although there is a wide disagreement about the interpretation of such evaluations it would seem the results have not been encouraging.

Those preliminary findings concerning large-scale compensatory programs in the United States have led researchers into two new areas of study: First, to determine to what extent such findings are a result of the failure of such programs to adapt themselves to the characteristics of disadvantaged children. To a large degree some features of the Head Start

18 One of the major conclusions of Bloom's study is that "variations in the environment have greatest quantitative effect on a characteristic at its most rapid period of change and least effect on the characteristic during the least rapid period of change."

program were based on the nursery and kindergarten model originally adopted by high-income families and whose aim was the free play. In this respect it is relevant to quote Hunt: "Headstart is not synonymous with compensatory education. Compensatory education has not failed. Investigations of compensatory education have now shown that traditional play school has little to offer the children of the poor, but programs which made an effort to inculcate cognitive skills, language skills and number skills, whether they be taught directly or incorporated into games, show fair success."\(^{20}\)

The second line of research stresses the fact that current compensatory programs start too late, in the sense that—if Bloom is correct—the child by age 3 or 4 has already been conditioned by the environmental deficits in the family.\(^{21}\) The main constraint in pursuing this line of research is that very possibly there is a limit to the minimum age a child can be physically withdrawn from the family in order to be exposed to an institutionalized program.

Outside the United States we have found a piece of research which

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must be mentioned. This research—undertaken in Cali, Colombia—
atttempts to identify the types of intervention (nutritional supplemen-
tation as well as behavioral stimulation) necessary to overcome specific mental
deficit in preschool children (age 3) from the lowest economic level families
of that city. The importance of this research stems from the facts that (a)
the children analyzed are not characterized by extreme malnutrition, the
kind of cases usually studied in the "pure malnutrition studies"; they tend
to represent a more typical situation of low income families in urban areas
and therefore more relevant for our purposes; and (b) particular emphasis
is being given to analyze the separate effect of particular types of stimula-
tion interventions on specific mental tasks of the child relevant for further
learning. Their preliminary findings showed that particular stimulation
and nutritional interventions at age 3 can boost certain mental capabilities
over and above the performance of well-nourished children from similar
income groups.

Home environment before age 3.—Bloom's hypothesis and the fact
that probably there are institutional constraints on the earliest age a child
can be drawn from the family into an out-of-home compensatory program
has led some researchers into new areas of study: the effect of different
rearing practices and different mother-child interactions before age 3. In
this respect we quote Kagan: "A final strategy, not exclusive of the first
two (school and preschool years 2½–5), is to change the mother's relation-
ship with her infant. The idea for this suggestion rests on the assumption
that a child's experience with his adult caretaker during the first 24 months
of life are major determinants of the quality of his motivation, expectancy
of success, and cognitive abilities during the school years. In a moment
we shall consider data in support of this position."

In an experiment with 140 infants of different socioeconomic classes
Kagan found significant differences in fixation time, vocalization, and fear.
In another experiment 60 10-month-old girls from two different socioeco-
nomic groups were studied. The families were visited and the child-mother
interactions were recorded. In the higher socioeconomic group the mother
"spent more time in face-to-face posture, more time talking to her and
issued more distinctive vocalization to the infant. They were more likely
to entertain their children with objects, to encourage walking and to
reward them for mastery." Behavior of the infants at the laboratory
showed that those belonging to the upper group were better able to

22 H. M. Kay, A. MacKay, and L. Sinisterra, "Behavioral Interventions Studies
with Malnourished Children" (Western Hemisphere Conference on Assessment of
23 J. Kagan, "On Class Differences and Early Development," in Denenberg (n. 21
above).
24 The socioeconomic groups were characterized as follows: In the upper one, one
or both parents had graduated from college and the father had a professional job. In
the lower one, either one or both parents had dropped out of high school and the father
was working at a semiskilled or unskilled job.
differentiate meaningful from nonmeaningful speech and its source. At the same time they showed a stronger will of resolving the discrepancy of acoustic differences between different voices.

The Ypsilanti Carnegie Project has found an important effect on the mental growth of young infants of programs where specially trained teachers work with the mother and the infant at home. The main objective of the program has been for the teacher to affect the child via the mother.²⁵

Other lines of research concerning the effect of very early environment refer to brain damage from being reared in the dark. None of this research has been undertaken with humans yet; however, experiment with different animals seems to show a very clear result.²⁶

III. Where Do We Go from Here?
The research implications for developing countries out of some of the earlier hypotheses are enormous; however, some priorities ought to be pointed out. I have chosen the following criteria in such a selection: (a) research that can be helpful in guiding policy instruments available in the short run, (b) research requiring the cooperation of the existing logistics of the educational system, and (c) research whose policy implications are directly relevant to existing educational systems.

Additional information concerning A in developing countries.—Three questions concerning the levels of abilities of entering students (A) appear relevant for further exploration:

1. How large are the differences in A across socioeconomic and ethnic groups on a country wide basis? Up to now this information has been obtained through isolated samples and by a variety of scientists of different disciplines and therefore hard to compare. Is it possible to institutionalize a generalized common test of abilities to be administered, in groups and by the same schools, to entering children? What are the relevant questions to be asked in these tests? What can educators suggest in this respect?

2. What are the socioeconomic and ethnic groups that, in a particular country, will be incorporated into the elementary schooling system during the next decade? How do they perform in the test outlined in question 1 above?

3. If it is true that the level of A will be changing—given the information obtained through questions 1 and 2—what are the implications for changes in the quality and types of school inputs? Are certain types or school inputs better substitutes for A than other ones?

Affecting the determinants of A.—Policies to change the out-of-home environment through wide scale preschool compensatory programs would seem difficult to undertake in the short run; unless we think of those programs as simple extensions of the existing elementary schooling system in such a way they can simply draw children one or two years earlier into

²⁵ Weikart and Lambie.
²⁶ Hunt.
kindergarten programs. However the United States' experience has shown that simple extensions of the "kindergarten type" are not sufficient or properly designed to compensate for the environmental deprivation low income children have suffered before. A much more complex type of program appears to be required.

A partial substitute for the above solution, at least in the short run, is a policy attempting to correct for the fact that lower income children enter primary schools at a later age (1–3 years later) than higher income students. This evidence is at least clear for Latin America. An important research topic in this area is to study what determines the parents' decision concerning the age at which they send their children for the first time to school.

How can we use the logistics of the existing educational system to affect the determinants of $A$ that take place at home before age 3? In the short run ad-hoc educational programs for young women concerning child rearing practices would provide one type of solution; it is one kind of education for which we economists never compute rates of return!

From our earlier analysis two types of educational programs—with clear research implications for their proper design—appear to be important. First, nutrition education, particularly the one relevant for infant feeding and breast-feeding practices. There is growing evidence that the decline in breast-feeding practices in low-income families of urban areas is a major determinant of infant malnutrition. The resource cost of substituting breast milk appears to be quite large: some preliminary estimates by Berg suggest that if 20 percent of the mothers in the urban areas of developing countries do not breast-feed the loss in breast milk is around $365 million per year; if half of the other 80 percent of the mothers do not continue breast-feeding after the sixth month the total loss reaches $780 million.27 This is an important area to be researched: what determines the length of breast-feeding and how could it be lengthened through educational programs.

Second, education on child rearing practices with particular emphasis on early stimulation seems another course of action. Educational programs concerning this issue involve some preliminary research which, to my knowledge, has not taken place on a wide scale in developing countries. How different are child rearing practices across families in developing countries? What are the factors determining these differences? Are they related to income groups or to particular ethnic groups of the population?

27 Berg (n. 5 above).
Lesotho: A Development Challenge by Willem Maane, distributed by The Johns Hopkins University Press, 1975

Nigeria: Options for Long-Term Development by Wouter Tims and others, published by The Johns Hopkins University Press, 1974

The Current Economic Position and Prospects of Peru by José Guerra and others, distributed by The Johns Hopkins University Press, 1973


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Redistribution with Growth by Hollis Chenery, Montek S. Ahluwalia, C. L. G. Bell, John H. Duloy, and Richard Jolly, published by Oxford University Press, 1974
World Bank reprints


No. 21. V. V. Bhatt, "Some Aspects of Financial Policies and Central Banking in Developing Countries," *World Development*

No. 22. Bela Balassa, "Reforming the System of Incentives in Developing Countries," *World Development*


No. 27. Efrain Friedmann, "Financing Energy in Developing Countries," *Energy Policy*


No. 29. V. V. Bhatt, "On Technology Policy and its Institutional Frame," *World Development*

No. 30. Bela Balassa and Ardy Stoutjesdijk, "Economic Integration among Developing Countries," *Journal of Common Market Studies*


No. 32. Marcelo Selowsky, "A Note on Preschool-Age Investment in Human Capital in Developing Countries," *Economic Development and Cultural Change*


No. 34. Shlomo Reutlinger, "A Simulation Model for Evaluating Worldwide Buffer Stocks of Wheat," *American Journal of Agricultural Economics*

No. 35. John Simmons, "Retention of Cognitive Skills Acquired in Primary School," *Comparative Education Review*