

Proposed Study of Investment, Capacity Utilization and Changes
in Input Structure in American Manufacturing,
1955-57

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The general question of the relationship between investment and changes in input structure was opened more than 6 years ago at the Harvard Economic Research Project. At that time, it was proposed that technological change be taken into account in a dynamic input-output model by making the input coefficients themselves vary with capital expenditures for growth and change-over. The proposal was rooted in the notion that the input structures characterizing technologies of different "vintages." Investment in new equipment would increase the relative weight of the latest techniques in the industrial average while scrappage would decrease the relative weights of older techniques. If the technologies representing new capacity installed at various times were known, it would be possible to predict changes in the average technique from these and the time pattern of expenditures on equipment. Much of our work during the past several years has been directed toward evaluating this approach to the explanation of technological change, that is, to seeing to what extent changes in input structure over time could be predicted from technical parameters for "best practice" technologies and expenditures on equipment over the period in question.¹

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Until recently, available information on input patterns for newer and older plants has been very limited, and it has been possible to explore the approach only in a few industries with exceptional statistical coverage. The basic data required for pursuing this analysis, is, however, embodied in individual establishment reports and special surveys of the Census of Manufactures, and special arrangements have been made whereby the Harvard Economic Research Project may make use of this information to study the diffusion of new techniques

¹For a more detailed account of the history of this work see Harvard Economic Research Project, Report on Research for 1953 to date.

without violation of Census disclosure rules. Pilot studies of two 4-digit Standard Industrial Classification industries have already been made. For these two industries, it was found possible to explain or predict a sizable proportion of changes in the cross sectional distribution of individual plants' input structures in terms of their respective equipment expenditure patterns and a common "best practice" production function for each industry.

Specific plans have now been developed for extending the analysis tested in the two pilot studies to cover all manufacturing on a 4-digit industry basis for the period 1955-57. It is not possible to describe in this short report the technical details of the proposed computations. In brief, the plan is to estimate "best practice" labor and electricity and capital coefficients for new plants constructed during the period, to compare them to the techniques employed in the expansions of capacity in older establishments, and to relate the diffusion of new techniques in each industry to the investment and capacity utilization patterns of its component individual establishments. With comprehensive coverage and a detailed industrial breakdown it should be possible to gain insight into differences in the relation of technological diffusion to equipment purchase among the various industrial sectors and to provide an empirical basis for introducing technological change explicitly into dynamic input-output analysis.

The great bulk of the processing and analysis of data can be performed mechanically on Census high speed computing equipment. The work on investment and input requirements in newly constructed establishments requires hand-transcription of information and individual judgment and interpretation. Hence the cost of the project can be subdivided into three major categories:

1-	Analysis of new plant information -	
a.	Transcription of 5 years information at estimated cost of <u>\$325</u> per year	\$1,625
b.	Review, processing and interpretation of new plant records	1,500
2-	Machine processing of individual establishment data	
a.	Making tape	1,900
b.	Performing computations	6,500
c.	Machine programming costs	1,000
3-	Interpretation and analysis of results	<u>2,500</u>
	Total	\$15,025

Operations 1a, and 2a and b are to be performed at the Census Bureau, and the costs cited for performing them are official Census cost estimates. The other items - programming, processing of new plant data, and the analysis and interpretation of results will be performed at the Harvard Economic Research Project. Where census disclosure rules necessitate it, work will be done by Project personnel at the Boston Field Office of the Census Bureau, in accordance with procedures developed in the course of the pilot studies.

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(data from 1956 Handbook of the American Economic Association)

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"Where Do Construction Dollars Go?" (with H. Kistin and C. Cameron) in Chemical Engineering, 1954

"Capital Coefficients as Economic Parameters: Problems of Instability" in "Input-Output Analysis: An Appraisal" Volume 18 of Studies in Income and Wealth, N.B.E.R.