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Preface

As its subtitle indicates, this book is concerned with the output of the mining industries, with the draft upon the labor force which this output involved, and with the changing relationship between output and employment. Like others published by the National Bureau, this volume deals with a segment of the American economy and reports upon the progress that has been made in physical efficiency since the beginning of the present century. The studies in the series form a complement to other types of statistical inquiry—for example, those concerned with national income and the standard of living. Like such inquiries, the study of productivity changes touches one aspect of the general topic of economic progress. It affords an opportunity of examining the results of technological change, of new production methods, of the shortening of the workday, and of other factors which have influenced the productiveness of the individual worker.

The extraction of minerals from the earth is an activity of interest to many different kinds of specialist—the geologist, the engineer, the metallurgist, the geographer, the economist. Since the standpoint we have chosen is that of the economist or economic historian, and since we have further limited ourselves to certain aspects of all those which might appeal even to the economist, it follows that many features of the history of mining are scarcely mentioned in this volume or not discussed at all. Developments on the engineering or metallurgical side of mineral extraction are treated only insofar as they seem to the authors to have had a bearing upon productivity levels. Again, systems of wage payment, labor relations, and public policy toward the mineral industries, are mentioned only incidentally where they appear to have affected more immediately relevant aspects of mining history. Since we are interested chiefly in rather long run tendencies, the cyclical and other fluctuations to which most forms of mining are peculiarly subject will receive but the barest mention.

An inquiry such as the present one has two aspects. First there are problems of measurement, conceptual and statistical. For the period chosen, the data on mining output are fairly satisfactory and did not cause serious difficulty. The record of employment, on the other hand, had frequently to be pieced together from materials assembled for purposes quite different from our own—for instance, the computation of accident rates. As a result, figures for mining employment are for the most part clearly inferior to similar figures for, e.g., manufacturing or railroad transportation. Technical questions of industrial classification, and of the measurement of output and employment have, so far as possible, been excluded from the text of the report and reserved for appendix treatment.

The second part of the task had to do with the interpretation of the changes that occurred over the period in the effectiveness of labor in producing ouput—changes which were usually large enough to survive all doubts concerning the accuracy or comparability of the underlying data. In most branches of mining one may observe striking increases in output per manday; but in some industries these increases were much larger than in others, and in some productivity actually declined for periods as long as one or two decades. The authors believe that these developments and contrasts can be referred to the interaction of changing technology and resource conditions. For the mineral industries are peculiar in that their resources are subject to depletion, a phenomenon which it has in part been the function of technological advance to offset. This theme will recur at more than one point in the book.

The structure of the volume is briefly as follows: In Part One, Chapter 1 describes the field of study and clears the ground of certain preliminary matters. Chapters 2 and 3 review the course of output and employment, respectively, over four decades. Chapter 4 offers a summary view of changes in productivity, and contrasts the experience of different branches of mining.

Part Two treats technological changes in all mineral industries except petroleum and natural gas (the technology of the latter, radically different from that of other industries, is postponed until Chapter 10). Chapter 5 describes the progressive elaboration of mining methods, both underground and open pit, and the trend toward nonselective or mass mining. Chapter 6 examines the contribution that mechanization has made to this development.

Chapter 7 discusses coal preparation and ore concentration and the relation of these techniques to mining method.

In Part Three, Chapters 8 through 13, the relations between productivity levels, technological change and resource conditions are studied for each of the principal mining industries.

Part Four, which consists of Chapter 14, summarizes the results of the study and relates them to certain broad questions of economic theory and policy.

The five appendices are devoted to the presentation of statistics and to technical questions of measurement. The book concludes with a glossary of minerals and mining terms.

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