

1 Introduction

1.1 MANAGEMENT, ACCOUNTING, ECONOMICS, AND THE BUSINESS PRESS

Managers make business decisions; they do so at the company level and, in different guises, at the industry or sector level, and the national economy level. Koopmans (1951) referred to these decision makers as “helmsmen,” for the way they steer their businesses. Management decisions determine the economic performance of the business, and have financial implications for its owners, its lenders, its customers, and its resource suppliers.

Accountants construct accounts from the outcomes of management decisions; they do so at the same three levels. These accounts describe financial performance and can be compared through time and across production units at each level. Although accounts record the financial consequences of management decisions, they also inform management decision making. Kline and Hessler (1952), Chandler (1962), Johnson (1972, 1975, 1978), and the historical papers collected in Temin (1991) describe in great detail the procedures by which accounts were used to guide management decision making at major businesses a century or more ago. Accounts thus guide management decisions and record their consequences. They contain an enormous amount of useful financial information, but they generally contain no entry labelled “productivity.”

Economists have analytical skills and interests that are complementary to those of managers and accountants. Although accounts contain no direct productivity information, economists are able to extract productivity information from them. This information enables them to quantify the

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Excerpt

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contribution of productivity change to change in the financial health of a business. They also are able to quantify the financial contributions of the main drivers of productivity change, generally but not exclusively identified with improvements in operating efficiency and the adoption of new technologies, and this information can be used to inform business and public policy. Finally they are able to identify the beneficiaries of the financial fruits of productivity change, and to quantify their gains or losses. The ability to extract so much relevant economic information from the accounts was emphasized many years ago by Mason (1941), who asserted in a preface to Dean (1941) that Dean's study of the relationship between cost and output in a leather belt shop "is a model of the way in which significant economic relationships may be derived from the accounting and operating data of a business firm." This ability also forms the cornerstone of the seminal contributions of Davis (1955) and Kendrick and Creamer (1961) that we discuss in Section 1.5 and exploit throughout the book.

With this complementary financial and productivity information at hand it becomes possible to associate alternative management practices with higher or lower productivity, and hence with better or worse financial performance. It is also possible to associate various features of the operating environment with productivity and hence financial performance. This information does not appear in company accounts, but it plays an important role in the relationship between productivity and financial performance. Accounting for variation in the operating environment, either through time or across businesses, levels the playing field when conducting a comparative performance evaluation. We discuss internal and external drivers of productivity and financial performance in Section 1.3. The relationship between productivity and financial performance is also influenced by movements in prices paid for resources and received for goods and services. The role of productivity and prices in influencing financial performance is an old theme that permeates the book.

Much of what we know about the relationship between productivity and business financial performance comes from business accounts. It is difficult to overstate the significance of the synergies between accountants and economists, or the significance of the resulting information. Most importantly, it is difficult to overstate the significance of productivity itself. At the company level, improvements in productivity go straight to the bottom line, to the benefit of various beneficiaries. Profitable companies expand, and their hiring and investment activities contribute to growth in the economy. At the economy level, these productivity gains raise income per capita and

contribute to a higher standard of living. Productivity patterns go a long way to explaining the Schumpeterian creative destruction responsible for the survival and disappearance of companies, and at the aggregate level to answering Landes's (1990) rhetorical question "Why are we so rich and they so poor?"

We gain additional insight into the relationship between productivity and financial performance from the business press, which reports on a regular basis on a number of issues bearing on events and trends in business productivity and financial performance. Although the press rarely provides precise definitions of critical terms such as "productivity," "profit," and "margin," much of its reporting is informative regardless of the definitions of these and related terms. At the aggregate economy level it reports and analyzes trends in various performance indicators released by government agencies. At the sector or industry level it chronicles trends in employment, productivity, sales revenue, and profit, frequently against a backdrop of regulation or overseas competition and occasionally based on information contained in consultancy studies. At the company level it regularly reports and analyzes corporate earnings results. We offer a brief analysis of aggregate economy and industry productivity and financial performance in Section 1.2, and we provide illustrative examples throughout the book.

Particularly at the aggregate economy level the business press is interested in three key issues:

- (i) What is the nature of the relationship between trends in productivity and financial performance? The business press acknowledges the link between productivity change and some notion of profit change, and attributes any divergence to the presence of variation in pricing power in output and input markets, which has varied, both in magnitude and source. A popular topic in the press is the attribution of price variation to variation in market power. An important objective of this book is to provide an analytical framework within which change in financial performance can be attributed to price change and productivity change.
- (ii) What factors drive productivity change? The business press cites internal factors under management influence, such as waste reduction, adoption of new technologies and business practices, and changes in business size and diversification. It also cites external factors such as the diffusion of technologies, and the overall business environment as characterized by the strength of competition, the

4 *Productivity Accounting*

regulatory structure, the availability and quality of public infrastructure, and other factors contained in the popular phrase “the institutional arrangement.” A second objective of this book is to provide an analytical framework within which the drivers of productivity change can be identified and their contributions quantified.

- (iii) How are the financial benefits of productivity growth distributed? The business press acknowledges that productivity change creates winners and losers in the distribution game, and it mentions several groups, including, in order of popularity, consumers, employees, suppliers of intermediate goods, and business itself. To cite one example, the press writes that consumers typically benefit from productivity growth, most recently the ICT revolution. The means by which consumers benefit include falling prices, improving quality, or more generally falling quality-adjusted prices, and the introduction of new goods and services. David (1990), Crafts (2004), and many other writers remind us that this is not a new phenomenon; the benefits of previous general purpose technological revolutions, ranging from textiles production and steam power to railroads and electricity, *initially* accrued to business, but *eventually* went to consumers. A third objective of this book is to provide an analytical framework within which the distribution of the fruits of productivity change can be quantified.

Our investigations in Sections 1.2 to 1.4 address each of these issues, although not in great detail. The detail awaits the development of formal models in the remainder of the book. Indeed the primary objective of this book is to provide an analytical framework within which each of these key issues can be addressed.

1.2 PRODUCTIVITY AND FINANCIAL PERFORMANCE

Scholars have long known that the long-term relationship between productivity and financial performance is positive and relatively stable, but that the short-term relationship can be volatile. Scott (1950; 4) notes that “profit in itself cannot always be taken as a measure of industrial efficiency, for it is vitally affected by factors of supply and demand . . . A long history of satisfactory net profits is, however, substantial evidence of past efficiency. . .” Smith (1973; 53–55) emphasizes the importance of the relationship in the design of collective bargaining agreements intended to allocate the gains

arising from productivity improvements. He observes that “the existence of a relationship between the productivity of the firm and profits cannot be denied but there can be no certainty that they will move in the same direction at all times and under all circumstances.” He continues by noting that “there needs to be more research and analysis on the relationship between productivity and profitability [by which he means profit].” Kendrick (1984; 52) notes that “over the long run, probably the most important factor influencing profit margins is the relative rate of productivity advance . . . In the short run, the effects of productivity trends may be obscured.”

Many writers share this long-term view of productivity-driven profit growth, particularly at aggregate levels. However, the ability to discern a short-term relationship between productivity and profit *at the company level* hinges on whether conventional accounting data incorporate, or can be modified to incorporate, information required to measure productivity change. Diebold (1952; 62–63) observes that “[p]roductivity (or man-hour) accounting need in no way clash with good cost accounting; rather, it can effectively be made a working part of a company’s accounting system and used by management in a variety of ways.” He continues: “The data are generated by day-to-day operations and can be collected in a manner similar to cost data.” Davis (1955; 1) notes that an editorial in the February 1947 *Journal of Accountancy* suggests that company income statements be developed that “will indicate increases or decreases in productivity of the company and also the distribution of the ‘fruits of production’ among all parties of interest.” Davis’s interest in distribution is a recurring theme in this book. Wait (1980; 29) describes productivity measurement as “a management accounting challenge,” and notes that “it should be helpful to management to know both what gross improvements in productivity have been obtained and how those improvements have been shared.” Thus, even though productivity does not appear in the accounts, accountants clearly care about productivity.

Widespread interest in the relationship between productivity and profit provides us with an opportunity to forge a linkage between the business and economics literatures, in an effort to encourage interaction.¹ We call this relationship productivity accounting. Davis (1955) defines the term, which he attributes to Diebold, as the use of financial statements to construct the ratio of, or the difference between, revenue and cost, expressed in real rather

¹ The distinction between business and economics literatures is admittedly arbitrary, but we find it useful.

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[More information](#)6 *Productivity Accounting*

than nominal terms by adjusting for changing prices. The significance of productivity accounting is its ability to separate the impacts of productivity change and price change on business financial performance. Simply comparing nominal revenue and cost through time conceals the possibility that a relatively productive company is financially unsuccessful because it lacks pricing power, or that a relatively unproductive company is financially successful because it enjoys pricing power. Accounting for price change converts the comparison to one between real revenue and real cost, thereby accounting for the impact of productivity change on change in financial performance.

Productivity accounting provides answers to two of the three business press questions above.

(i) What is the nature of the relationship between trends in productivity and financial performance?

Formal models characterizing the relationship have been developed by Davis (1955), Kendrick and Creamer (1961), and Vincent (1968 and elsewhere). We examine these models and extensions to them developed by others in Chapters 2 to 6. The ratio models in Chapters 2 and 3 are based on index numbers, and the difference models in Chapters 4 to 6 are based on indicators. The models in Chapters 7 and 8 exploit both index numbers and indicators.

(ii) What factors drive productivity change?

Productivity accounting cannot answer this question, but it does provide the data and an analytical framework within which economic analysis can identify, and quantify the contributions of, the primary drivers of productivity change. The analysis is based on primal (production) or dual (cost, revenue, or profit) best-practice frontiers. We introduce these frontiers in Section 1.6, and we use them within a productivity-accounting framework, throughout the book.

(iii) How are the financial benefits of productivity growth distributed?

Davis's procedure for productivity accounting not only quantifies productivity change, it also quantifies the sharing of the fruits of productivity change. Both productivity accounting and accounting for the distribution

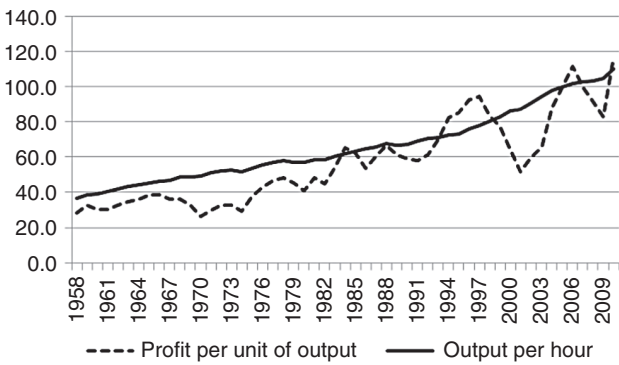


Figure 1.1 Labor productivity and unit profit in the US economy

of the fruits of productivity change have been implemented by Kendrick and Creamer and, extensively, by writers associated with the French public institution CERC (Centre d'Étude des Revenues et des Coûts) (1969a and elsewhere). We illustrate the distribution issue throughout the book.

1.2.1 Some empirical evidence

We provide scattered evidence on productivity, financial performance, and distribution from three sources: US Bureau of Labor Statistics (BLS)² data on US non-financial corporations, Organization for Economic Cooperation and Development (OECD)³ data on Germany and Italy, and US Bureau of Transportation Statistics data on US airlines (www.bts.gov).

The US economy

Figure 1.1 depicts trends in labor productivity (output per hour) and unit profit (profit per unit of output) for the nonfinancial corporate sector since 1958, both indexed to 100 in 2005. The BLS does not measure total factor productivity in this sector, but labor productivity in this sector behaves similarly to total factor productivity in the private business and private nonfarm business sectors, increasing more rapidly due to the positive

² The BLS productivity page has five areas: labor productivity and costs; multifactor productivity; international productivity; productivity research; and productivity overview. We use the first three throughout the book, but rather than refer to each area separately we simply refer to the BLS and provide a link to its productivity page www.bls.gov/bls/productivity.htm.

³ As we do with the BLS, we refer to all OECD references with a single link to its economy page www.oecd.org/economy.

8 *Productivity Accounting*

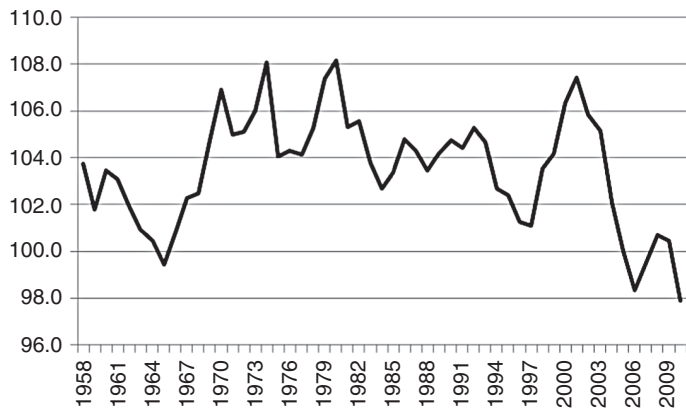


Figure 1.2 Labor’s cost share in the US economy

impact of capital deepening. Figure 1.1 illustrates a point raised by Kendrick (1984) and many other writers; over a long period of time productivity and financial performance increase apace, but over short periods (say, from 1993 to 2010) the relationship can be much more volatile, with sub-periods of rising productivity and falling, as well as rising, unit profits. Because the volatility comes from the behavior of profits, it is clear that prices play a role in financial performance, a fact we revisit throughout the book.

Figure 1.2 shows the trend in labor’s cost share (labor compensation as a share of value added) in the nonfinancial corporate sector, also indexed to 100 in 2005. The trend is upward and volatile until its 1980 peak, and downward and volatile thereafter, with the 2010 value being the lowest on record at the time. The volatility has relatively narrow amplitude about an actual 2005 value of about 67%. Since value added consists of payments to labor and capital, capital’s cost share was the highest on record in 2010. The peaks and troughs in labor’s share correspond to troughs and peaks in unit profits in Figure 1.1. It is clear that the benefits of recent productivity growth have not increased labor’s share of value added. We examine the distributional impacts of productivity change in Section 1.4 and throughout the book.

Germany and Italy

In this exercise we compare labor productivity (output per unit labor input), wages (labor compensation per unit labor input), and unit labor cost (labor compensation per unit of output), each indexed to 100 in 2005,

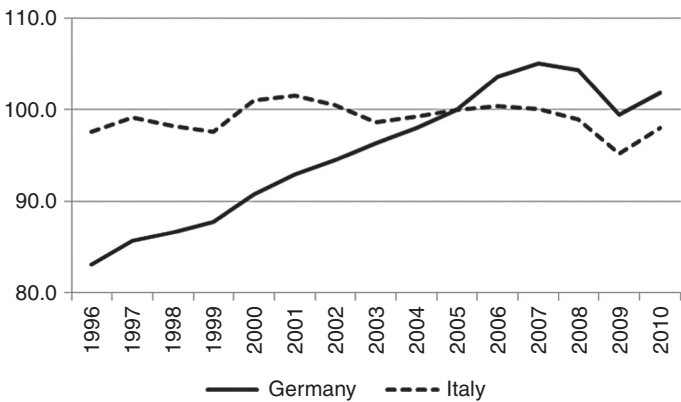


Figure 1.3 Labor productivity in Germany and Italy

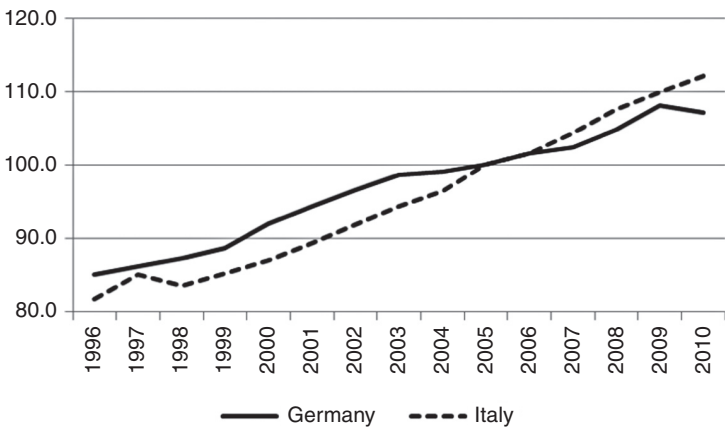


Figure 1.4 Wage rates in Germany and Italy

since 1996 in two countries seemingly headed in opposite directions. Figures 1.3, 1.4, and 1.5 tell the story, with one qualification. Each country's data are indexed separately, allowing a comparison of trends between countries but precluding a comparison of levels between countries. Nonetheless it is clear that labor productivity has grown much faster in Germany and wages have grown faster in Italy, with the inevitable consequence that unit labor cost has grown far faster in Italy, by over 37% compared to just 2.5% in Germany. Italy's international competitiveness has suffered as a result. We study labor productivity and its cost consequences in Chapter 7.

US airlines

The US Bureau of Transportation Statistics groups US airlines into three groups, low-cost, regional, and network. Figure 1.6 tracks operating expenses per available seat mile, the industry measure of unit cost, for each group quarterly from 2007/1 through 2011/2. Low-cost carriers do indeed have the lowest unit costs, although the regional carriers have managed to reduce unit costs since 2008/2 to a point where the two groups

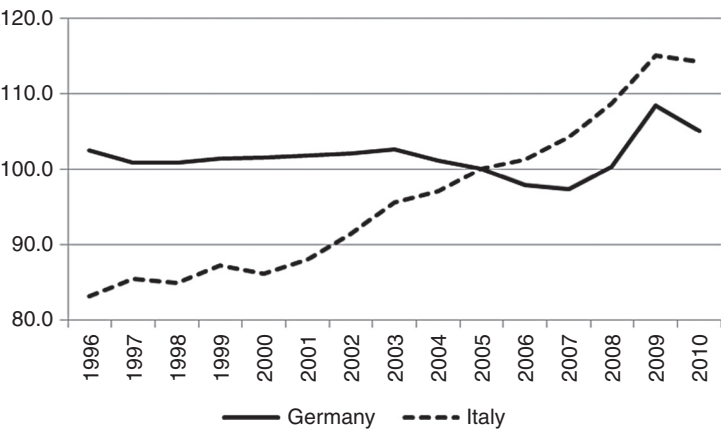


Figure 1.5 Unit labor cost in Germany and Italy

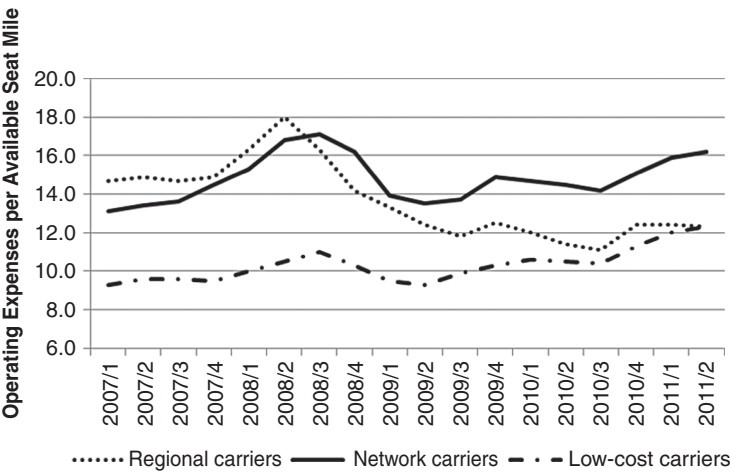


Figure 1.6 Unit costs in US airlines