CHAPTER 7

7 INSTRUMENT CHOICE AND ENERGY-EFFICIENCY IMPROVEMENT BY FIRMS: AN EMPIRICAL ANALYSIS

7.1 Introduction

Environmental quality and resource management has become a prominent challenge in a modern economy. The complexity involved has prompted a series of diverse policy initiatives, ranging from market oriented instruments (like taxes, subsidies and tradeable permits) to command and control measures (ranging from voluntary agreements to standards). Some of these instruments were illustrated in Chapters 3-6 of this book and discussed in terms of their effectiveness and desirability when considered in isolation (see Tietenberg et al., 1999, for a general overview). In practice, many policy initiatives are hindered by much uncertainty (see, for example, Roberts and Spence, 1976, and Adar and Griffin, 1976), so that a clear choice for price-based instruments – as opposed to quantity-based instruments – is difficult to make.

Against this background, the aim of this chapter is to investigate how investment behaviour, responsiveness and attitudes towards environmental policy, as well as barriers to the adoption of readily available energy-efficient technologies, vary over sectors and with firm characteristics. The results are based on a survey among Dutch firms. Detailed systematic empirical studies at a sectoral or firm level are rather scarce in the Netherlands. Some years ago, Velthuijsen (1993) and Gillissen et al. (1995) performed a questionnaire among firms, in which they also focused on energy use and related investments. Our research broadens their scope in that we do not only focus on investment behaviour, but also on the stated response to and attitudes towards a set of specified policy instruments. Our new data set allows in addition for a more detailed analysis of the role of various types of uncertainty in investment decisions, which, according to investment theories as developed by, for example, Dixit and Pindyck (1994), may be a major explanatory factor for seemingly irrationally high revealed internal discount rates in investment evaluation (see, for example, Johnson, 1994, and Chapter 2). It thereby aims at broadening our understanding of decision-making on energy use in companies and energy gaps as have been widely documented in the literature (see Chapter 2 for a review).

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1 This chapter is based on De Groot, Verhoef and Nijkamp (1999). Research assistance by Caroline Rodenburg is gratefully acknowledged.
The survey was held in the spring of 1998 among Dutch firms. These firms were randomly selected from the register of the Chambers of Commerce and were more or less equally distributed among the most energy-intensive sectors of the Dutch economy, namely the chemical industry, basic metals, metals and machinery, food, paper, horticulture, construction materials, and textiles. The extensive survey contained a detailed set of questions about energy use, investments, the firm’s competitive position in the market, internal decision making, its attitude towards and adoption of energy-efficient technologies, as well as its attitude towards and responsiveness to Dutch environmental policy. The statistical results also incorporate a body of empirical knowledge on the expected effects and social acceptability of energy policies, two major determinants for the choice of environmental and energy policies.

Our analysis is presented in five separate sections. Section 7.2 discusses the survey and gives a description of the firms and sectors included in the sample. Section 7.3 considers the investment behaviour of firms, along with the perceived barriers to investing in cost effective energy-efficient technologies (in the context of the so-called energy-efficiency paradox). In Section 7.4, attention is shifted to the firms’ stated reactions in response to an increase in energy taxes on a national level (with no rebatements). Section 7.5 discusses the attitudes towards environmental policies in the Netherlands. Section 7.6 contains an evaluation of the results and presents the policy conclusions emerging from our empirical analysis.

### 7.2 The survey

The survey resulted in a data set of 135 companies (i.e., plant locations) established in the Netherlands. Firms in nine sectors of the economy were randomly selected, and received a 15 page survey in May 1998. Confidentiality was guaranteed. The survey asked firms about their characteristics (such as size, profitability, sector to which it belongs, number of employees, and export share), their energy use (in monetary and volumetric equivalents), their investments (in general, and purely aimed at energy-efficiency improvements), their position in the market (measured by, for example, strength of competition, location of competitors, how the firm compares to competitors in terms of size, sales, profitability), their focus in policy making (importance of short- and long-run profitability, reduction of labour and energy costs, improvement of environmental image, increase in sales, etc.), their expectations about the development of costs of inputs, their knowledge, implementation and use of energy-efficient technologies, their attitudes towards and willingness to accept energy policies of various types (such as voluntary agreement, taxes at national...