



## Chapter XIV

# Standardization and Network Externalities

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## ABSTRACT

*The standardization issue in the ICT industry is mainly compatibility in the presence of network externalities. The compatibility in Economics usually means interoperability between competing products. For instance, the VHS VCRs and the Betamax VCRs are incompatible in the sense that tapes recorded in one format (e.g., VHS) could not be played in the other format (e.g., Betamax). Hence, in the ICT industry, standardization mainly signifies achieving compatibility. Standards can be achieved by mandatory or voluntary measures as well as by de facto standardization. It is an important policy issue whether the government should mandate a standard (or impose compatibility), let the stakeholders (especially, firms) decide a standard, or enforce sponsoring firms to compete in the market, which has substantial impacts on consumer (or end user) well-being as well as business strategies in R&D, technology sponsorship, and competition in the product market. Ultimately, the impacts of standardization policies should be analyzed in terms of costs and benefits of firms (i.e., profit analysis) and the society (i.e., welfare analysis). In this chapter, we suggest an analytical framework to provide a consistent review of theoretical and empirical models of firms'*

*and consumers' (or end users') incentives and behavior under different standardization policies. The chapter is organized as follows. In section 2, we will discuss the Katz and Shapiro model which analyzes how compatibility (or standardization) affects firms' optimization behavior in the product market and whether private incentives for compatibility are consistent with the social incentive. Section 3 will shift our focus onto the consumer's adoption decision of new technology over old technology. We will discuss the pioneering Farrell and Saloner model which studies whether consumers' adoption decision of incompatible new technology is socially optimal. Then we will proceed to introduce several important extensions of the model. The dynamics of standardization process will be explored in section 4. Based on the empirical study of Park (2004a), the de facto standardization of the VHS format in the U.S. home VCR market will be analyzed and further utilized to understand strategic aspects of standardization. Despite recent economists' attentions to the issue of standardization and network externalities, the literature itself still lags behind reality. In section 5, we will examine ongoing and future research issues requiring further cost-benefit analyses based on economic models. Section 6 will conclude.*

## INTRODUCTION

### Basic Concepts

The functionality of standards may be specified in two different contexts. In many cases, standards are a way of certifying product quality in the presence of asymmetric information between buyers and sellers. Examples include processed food and health drugs, professional services, and complex electronic products. As discussed in Akerlof (1970), only "lemons" (bad-quality goods) will be sold in the market with the extreme asymmetric information about the quality of goods. Standards certified by a trustworthy third party will mitigate this problem. In many other cases, standards mainly signify *interoperability*. We can further consider two types of interoperability: interoperability among the components of a product (e.g., the interface between speakers and the CD [compact disc] players of an audio system) and interoperability between competing products. The second type of interoperability is usually called *compatibility* in economics. For instance, the VHS VCRs (videocassette recorders) and the Betamax VCRs are incompatible (or not interoperable) in the sense that tapes recorded in one format (e.g., VHS) cannot be played in the other format (e.g., Betamax). From the viewpoint of social welfare (i.e., the sum of all the stakeholders' net benefits), a trade-off exists between the degree of interoperability and the variety of different products (or systems).<sup>1</sup> On top of this

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