On the distance dependence of the price elasticity of telecommunications demand; review, analysis, and alternative theoretical backgrounds

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Abstract. The positive correlation between the absolute price elasticity of telecommunications demand and the distance of the calling relation is often suggested and presented as an empirical regularity. In this paper we first present an overview of existing studies to buttress the distance dependence empirically. A statistical analysis of the results confirms the existence of distance dependence, and gives insight into the size of the effect: doubling the distance leads to an increase of the elasticity of 0.07.

Next we look for various explanations of the distance dependence. We analyze the roles of the functional form of demand functions in conjunction with the dependence of price on distance, and consider whether spatial interaction theory can provide an explanation. One of the interesting findings is that the price effect may explain the distance dependence, but that this explanation is not unequivocal. In addition we show that incorporating spatial interaction theory elements in a quite basic utility maximization model of information demand also leads to distance dependent telecommunications demand.

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1. Introduction

The field of telecommunications demand is well documented, due to the seminal works of Taylor (1980, 1994), at least until the mid-1990s. One of the most intriguing points which emerges from this work is the “finding that the absolute value of the toll price elasticity increases with length-of-haul” which is “probably (...) the best-established empirical regularity in telecommunications demand” (Taylor 1994, p. 260). In this paper we study this positive distance dependence effect, to which we will simply refer as the DD effect or DD property. Moreover we will follow the convention to speak of greater elasticities when we mean greater in absolute terms of the elasticity.

The purpose of this paper is to seek an explanation for this thus far not yet convincingly explained phenomenon, making use of spatial interaction modeling theory. Understanding this DD effect of the price elasticity in telecommu-
nifications is of both theoretical and policy interest. Theoretically it is an illustration of how economic principles may be influenced by other domains, in this case spatial interaction theory. Understanding such mechanisms may help us in explaining observed idiosyncracies, or, on the other hand, in developing more comprehensive models.

The policy interest may even be greater. Elasticities play an important role in regulating the telecommunications sector, see for example Taylor (1994) who devoted a chapter to the topic of “Price elasticities in the hearing room”. Even though in many countries state monopolies have been transformed into private companies, reminiscences of the former system, in particular the monopoly pricing principles are still encountered. In the Netherlands, for example, the local networks are still served by the former incumbent, now KPN-Telecom. Reasons for this apparently ambiguous policy are basically found in the universal service principle. This principle, which was already formulated in the early twentieth century by former AT&T president Theodore Vail (Snow 1994), holds that from a social viewpoint, access to the telephone network should be available to everyone at reasonable costs. The low price for local telephony, contradicting the principle of Ramsey pricing which states that in a monopolistic setting with efficient pricing, the mark up over marginal cost is inversely related to the price elasticity (see for example Varian 1984), can be directly traced back to this universal service principle. Other pricing strategies as well can often be defined in terms of price elasticities (Tirole 1988). Hence, prices and price elasticities are still important in regulation, which again is still a hot topic in the telecommunications industry. Understanding why price elasticities rise with the distance of the calling relation may help in evaluating the arguments raised in the hearing room.

We will show in the next sections that although the DD property of telecommunications price elasticities is often mentioned in the literature, there are two basic deficiencies:

1. The DD property has not really been the subject of focussed empirical research.
2. Theoretical justifications for the DD property are somewhat ad hoc.

The aim of the present paper is to address both issues. It does not make sense to bother about theoretical backgrounds of a phenomenon if this phenomenon is not observed in the real world. Therefore we have decided to discuss theoretical aspects of the DD property only after an empirical test of its occurrence. This explains the somewhat unusual structure where theories are discussed after an empirical test of the subject of study.

Our theoretical analyses start with a discussion of current explanations. An often-made argument is that since price is included in the definition of the elasticity, DD is a naturally arising property. We will show that this argument greatly depends on the functional form of the demand function involved. As an alternative, and this is our contribution to the theory surrounding the DD property, we analyze the price elasticity that results from a simple utility maximization model that recognizes the derived demand nature of telecommunications. This approach is inspired by spatial interaction theory.

In Sect. 2 we review the evidence of the DD effect by a selective literature review, resulting in a quantitative analysis of the elasticities reported. In Sect. 3 we provide a critical discussion of current explanations of the DD effect. This