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Learning foreign languages: Theoretical and empirical implications of the Selten and Pool model☆

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Abstract

In this paper we adopt the Selten–Pool [Selten, R., Pool, J., 1991. The distribution of foreign language skills as a game equilibrium. In: Selten, R. (Ed.), Game Equilibrium Models, vol. 4. Springer-Verlag, Berlin, pp. 64–84] framework of language acquisition based on "communicative benefits" derived from the ability to communicate with other speakers of an acquired language, and "learning costs" incurred by acquiring a foreign language. We show that, under some mild conditions, there exists a unique interior linguistic equilibrium. We then derive demand functions for foreign languages, that we estimate for English, French, German and Spanish in 13 European countries and demonstrate that the properties of these functions are consistent with our theoretical results.

JEL classification: C72; O52; Z13

Keywords: Languages; Communicative benefits; Learning costs; Linguistic distances; Estimation of demand functions for languages; European Union

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1. Introduction

The reasons that induce inhabitants of a country to learn other languages can be analyzed by examining the benefits and the costs that learning generates. The benefits of acquiring an additional language are often linked with the increased earning potential,[3] especially in the case of immigrants who acquire the native language of the country in which they live. A different approach has been pioneered by Selten and Pool (1991) who introduce a general model of language acquisition that does not limit the analysis to "earnings as a mechanism and to firms as a milieu of the incentive to learn languages" (Selten and Pool, p. 66). In their model every individual derives a gross benefit from the knowledge of a foreign language and incurs a cost of learning it. The "gross communicative benefit" is positively correlated with the number of other individuals with whom an individual can communicate by sharing at least one common language. Naturally all languages are assumed to be "communicative substitutes," and communication between two individuals can take place in any common language they share. Selten and Pool show that an equilibrium of the multi-country multi-lingual language acquisition model exists. The characterization of an equilibrium is studied by Church and King (1993). They examine "corner" equilibria in a bilingual setting with two populations, i and j, where all citizens of one population, say i, learn the language of j, whereas no citizen in population j learns the language of i. Gabszewicz et al. (2005) examine the case of linear communicative benefit functions that do not distinguish between communication in the native and the non-native language. Assuming that learning costs are individual-dependent, their paper provides a characterization of linguistic equilibria that include interior equilibria.

The focus of our paper is two-fold. One is a characterization of a linguistic equilibrium in a non-linear setting and the second is the estimation of demand functions for languages. We consider a variant of the Selten–Pool model with two populations i and j. Each population speaks its native language and may learn the other one. If the population that speaks i is large relative to the other one, the incentive of an i-citizen to learn the other language is likely to be quite low since she can trade and communicate with enough citizens in her own country, but a large population that speaks j may also attract citizens who speak i.[4] The substitution between the languages, however, is imperfect, and we assume that the benefits of communication are larger when the languages are native for both sides. We also assume that the benefits of learning the other language are positively correlated with its linguistic proximity to the individual's native language. Indeed, for a native speaker of Portuguese the benefits of learning Spanish is quite limited given the fact a native Portuguese can understand some Spanish without actually learning it. Thus, for any individual t we represent the gross communication benefit by means of an increasing function with three arguments: the number of individuals who share a common native language with t, those who speak a language known by t but do not share her native language, and the linguistic proximity between the two languages. We assume that the benefit functions are *supermodular* in the first two variables. This condition implies that an increase in the size of one of the populations raises the marginal communicative benefit of members of the other population to learn the foreign language. We also show that supermodularity is indispensable for our results to hold. Finally, we impose cross-country "learning cost heterogeneity": the difficulty, and thus the cost, of learning a new

[3] See e.g., MacManus et al. (1978), Grenier (1985), Lang (1986), and Chiswick (1998).

[4] See Lazear (1999, p. 124). who points out that "the incentives are greater for any individual to learn the majority language when only a few persons in the country speak his or her native language".