

## Language economics: Overview, applications and recent methodological developments

### Abstract (Italian)

L'espressione "economia della lingua" ("language economics" in inglese) compare per la prima volta nel 1965 in un articolo di Jakob Marschak, in cui l'autore discute la natura economica dell'ottimizzazione della lingua e i vari processi che la caratterizzano. In breve, Marschak sostiene che il funzionamento delle lingue sia frutto della continua ricerca di un compromesso tra "chiarezza" e "brevità" del messaggio. In altre parole, le lingue (o, più precisamente, il modo in cui esse funzionano) sono il risultato di un problema di ottimizzazione in cui il parlante cerca di massimizzare la quantità di informazioni che può trasmettere, e di contenere allo stesso tempo lo sforzo. Per capire perché tale problema può essere considerato "economico" è necessario andare oltre la comune ma parziale idea che l'economia si interessi esclusivamente al denaro e ai mercati. L'economia è un ambito disciplinare molto ampio e si occupa principalmente, come scienza sociale, del comportamento delle unità decisionali quando devono allocare risorse scarse (tra cui il denaro, ma anche il tempo o vari beni simbolici) aventi usi alternativi. Alla luce di ciò, risulta evidente come l'espressione orale o scritta, un problema che implica l'impiego di tempo e di facoltà cognitive, possa essere trattata da un punto di vista squisitamente economico.

Fin dagli anni '60, la ricerca nel campo dell'economia della lingua ha esteso costantemente il suo campo di applicazione. I ricercatori hanno iniziato a studiare la relazione tra lingua ed economia da prospettive più varie. Gli argomenti di interesse per gli studiosi di economia linguistica includono, tra gli altri:

- 1) l'impatto delle competenze linguistiche individuali (intese sia come attributo etnico che come forma di capitale umano) sulla remunerazione;
- 2) le cause e le conseguenze delle dinamiche linguistiche (come l'evoluzione della lingua, il declino e la tutela delle lingue, ecc.);
- 3) le strategie di assunzione del personale secondo le esigenze linguistiche delle imprese e delle istituzioni pubbliche.

I risultati degli studi di economia linguistica sono spesso utilizzati per orientare le decisioni in materia di politica linguistica, poiché aiutano a spiegare i processi alla base di tali fenomeni. La ricerca in economia linguistica si è spesso appoggiata alle metodologie convenzionali della ricerca economica, quali lo sviluppo di modelli matematici e il ricorso a test statistici, con tutte le ipotesi e semplificazioni che ne conseguono. Tuttavia, recenti lavori di ricerca nel campo delle politiche linguistiche trattano la complessità delle questioni linguistiche da un punto di vista alternativo. Partendo dall'osservazione che tali questioni coinvolgono numerosi agenti e variabili, e che i nessi causali tra queste variabili sono spesso non-lineari, un numero crescente di ricercatori passa da approcci puramente analitici (ovvero

matematici), che spesso cercano di trovare una cosiddetta “soluzione in forma chiusa” a un problema, ad approcci basati sul calcolo, che ricorrono ad algoritmi e simulazioni.

In questo capitolo introduciamo brevemente il campo dell’economia linguistica, discutiamo alcune delle sfide attuali e presentiamo alcuni recenti sviluppi metodologici.

## **1. Introduction**

Language is an outstanding manifestation of human cognition and it is key to human existence in many different ways. One of the key functions served by language is communication. An organized system of sounds and symbols whose interpretation is shared by a community represents a very efficient way to convey a message. This is especially true when the message to be conveyed is elaborate and rich in information, as such messages can hardly rely on non-verbal forms of communication. However, this is only one use of language. Language pervades countless aspects of human existence. A language provides a way to structure one’s thinking, so much so that some have argued that different languages can shape thoughts in different ways. One’s language can be associated with one’s cultural background and, therefore, can signal that one belongs to a specific social group or sub-group. Languages can be seen as a form of human capital, that is, professional skills that can have an impact on one’s job opportunities and remuneration. Against this backdrop it is easy to see how language-related matters can attract the interest of economists, as well as social scientists in general. Besides, not only can (and should) these matters be studied from several disciplinary perspectives but they also call for genuinely interdisciplinary research efforts able to address their complexity at one and the same time.

This chapter should be seen as a very succinct introduction to language economics, the branch of economics that studies the many interactions between languages and economics. The rest of this chapter is organized as follows. Firstly, we present the economic paradigm with a view to justifying the economic treatment of language-related matters. Then, we discuss the specific field of language economics and how it relates to language policy, referring to some previous studies. Finally, we discuss some recent methodological developments in language economics research stemming from the acknowledgment of the complex nature of language-related issues.

## **2. What is economics and how does it relate to language?**

Far from being concerned exclusively with money and markets, economics is a very broad social science. It is chiefly concerned with studying the behaviour and decision-making processes of humans when they have to allocate scarce resources (including money but also time or various symbolic assets) that have alternative uses. Therefore, virtually any aspect of human behaviour can be studied from an

economic perspective. Applying an economic approach implies revisiting various facets of human behaviour in a social and political context, and analysing it through the lens of the economic paradigm – that is, the judicious use of scarce material and symbolic resources. This often translates into the application of mathematical and statistical modelling to these matters. Backhouse and Medema (2009) provide an in-depth review of the various definitions of economics that were brought forward between the 19th and 20th centuries. They suggest that the definition proposed by Robbins is perhaps the currently most accepted definition of the discipline:

Economics is the science which studies human behavior as a relationship between ends and scarce means which have alternative uses.” (Robbins 1935, 15)

Robbins elaborates further on the interests of an economist by adding that:

[e]conomics is entirely neutral between ends; [...] in so far as any end is dependent on scarce means, it is germane to the preoccupations of the economist. Economics is not concerned with ends as such. (ibid., 24)

It is easy to see why economics is not just interested in matters such as the production and consumption of goods and services, traditionally at the core of the discipline, but in all the dynamics that imply divesting oneself of scarce resources to reach an end. Therefore, economists investigate the optimal allocation of the limited resources available to humans throughout their existence. Every time individuals are faced with a choice that implies a trade-off between two or more options (such as spending money to buy clothes or food, or spending time reading a book or going to the cinema), the economic paradigm can be applied to investigate how they reach their optimal allocation. Becker (1974) goes so far as to say that economic theory may even provide a unified framework for all behaviour involving scarce resources. Therefore, numerous applications of economic theory have appeared over time, such as the economics of religion, identity economics, cultural economics and, of course, language economics. Applications of non-mainstream branches of economics include, for example:

- 1) investigating different wealth redistribution mechanisms in countries with similar economic characteristics as a function of different social identities (Shayo 2009);
- 2) studying how different psychological frameworks across nations influence investors' behaviour (Taillard 2017) and how cultural differences affects inter-country investments (Xu et al. 2009);
- 3) explaining how different religious beliefs affects individual microeconomic behaviour (Stark/Finke 2000);
- 4) an analytical (mathematical) discussion of the choices underlying marital patterns (Becker 1974).

Concerning the specific relation between economics and languages, we can identify three different types of connections (Grin 2003). Firstly, we observe a connection going from traditional economic variables, such as prices and trade flows, to linguistic variables. An example of such relations could be the influence of patterns of international trade on the space devoted to various languages in the school curriculum. Secondly, we observe a reciprocal connection between linguistic and economic variables, asking, for example, how individuals' language skills may affect their job opportunities and remuneration. Finally, we can observe a third type of connection, somewhat less direct than the other two but no less important. When discussing the processes affecting language matters, we may consider the role of variables that are not traditionally considered "economic". However, a policy maker faced with the decision of implementing a policy with instruments that are not particularly "economic" will still need to go through some form of cost-benefit analysis (or a variant thereof), and therefore reason economically. This third type of connection, then, proceeds from the economic treatment of the relation between non-traditional economic variables and linguistic variables.

In the rest of this chapter we will explore the field in greater detail. We will also discuss some examples of relations between economics and language issues.

### **3. Language economics and language policy**

Many of the non-mainstream (or heterodox) applications of economics are often located on the fringes of the discipline with an important degree of overlap with other sciences. In the case of language economics, the centre of gravity of this discipline most likely spreads over numerous disciplines, i.e. economics, policy analysis, the sociology of language, sociolinguistics and the education sciences (Grin 2003). The expression "language economics" was first used by Jakob Marschak in 1965 to refer to some characteristics of language and communication that he had observed. He argued that languages worked as a continuous optimization process whereby speakers try to find an optimal trade-off (hence the reference to the economic paradigm) between maximizing the information content and precision of a message and minimizing effort. It is clear to see that these two objectives are somewhat hard to reconcile. On the one hand, greater precision is reached by increasing the number of words in a sentence. At the same time, this works against the objective of keeping effort to a minimum. Therefore, Marschak goes on to argue that certain traits of languages have more chances of surviving in the long term because they represent a solution to such a trade-off, while others tend to disappear over time.

Ever since its first use, the expression "language economics" went on to describe different types of applications that were developed over the second half of the 20th century. In particular, the field of language economics moved away

from strictly linguistic matters, like the one discussed by Marschak, and started focusing more on the role of languages in society. Three main waves of research efforts have characterized the economics of language:

- 1) during the 1960s, researchers in this domain used language as an ethnic attribute (i.e. as an indicator of belonging to a certain ethnic group) and focussed on the identification of factors that determine differences in labour income;
- 2) during the 1970s, possibly under the influence of the theory of human capital put forward by Becker (1964), languages came to be seen as a form of human capital, and research efforts focussed on the econometric estimation of the return (that is, profitability) on language skills;
- 3) finally, from the 1980s onwards, these two views on language were combined in what we could consider today's paradigm of language economics, which treats languages simultaneously as an ethnic attribute and as a form of human capital.

From this short discussion, it should be clear that language economics, despite being only a branch in a much wider discipline, is a substantial field in itself, and one that it has proved challenging to define concisely for a long time. Grin (2003) proposes the following definition:

The economics of language refers to the paradigm of mainstream theoretical economics and uses the concepts and tools of economics in the study of relationships featuring linguistic variables. It focuses principally, but not exclusively, on those relationships in which economic variables also play a part. (ibid., 16)

One of the reasons why it can be useful to study language matters from an economic perspective, alongside others, is that such an approach, thanks to its modelling-driven insistence on internal consistency, can make valuable contributions to the political debate in the formulation of language policies, particularly when the variables involved can be expressed in quantitative terms.

In the following sections we will discuss a few examples of applications of economic analysis to language issues with a view to clarifying the way economic thinking can be applied to language-related matters and the links between language economics and language policy.

#### **4. Language skills and wages**

As mentioned in the previous section, language skills can be treated as a form of human capital, that is, a form of knowledge that can be employed to perform labour and, consequently, generate economic value. The study of the relationship between human capital and economic value is at the core of a branch of economics called "education economics". Like any other form of human capital, language

skills tend to be rewarded proportionally to the additional economic value that they produce. Therefore, a worker with an additional skill will generally be paid more than another worker without that skill, everything else being equal – as long as that skill does contribute to the creation of value. The acquisition of skills will, more often than not, provide a certain return over time. Obviously, though, it also entails cost. This cost consists not only of the actual cost of acquiring a certain skill (for example, buying books, paying tuition fees, etc.), but also of the opportunity cost of the time spent learning instead of working and the related forgone salary. Figure 1 (Grin 2002) shows two very simple education scenarios, long (A) and short (B). It displays the education-related earnings and costs of two individuals throughout their lives. On the x-axis there is time in years and on the y-axis there are earnings (positive semi-axis) and costs (negative semi-axis) for both individuals. Neither A nor B bears a cost between the age of 0 and 7. Between the age of 7 and 15, assumed to be the years of compulsory schooling, both individuals bear a cost that consists mostly in the opportunity cost (usually approximated by forgone salaries),<sup>1</sup> in that it is fair to assume that education is provided free of charge by the government. After the age of 15, the two patterns diverge. Individual A goes on studying (that is, acquiring further knowledge) until the age of 25, which implies costs such as tuition fees, in addition to the usual opportunity cost of forgone salaries. At the age of 25, individual A starts working with an entry salary that is in line with her level of knowledge and increases as she acquires experience until she retires at the age of 65.<sup>2</sup> Conversely, individual B starts working at the age of 15 with an entry salary commensurate with her level of knowledge (which is obviously lower than the knowledge of individual A at the age of 25). Areas FE (forgone earnings) and SE (schooling expenditure) represent the total cost incurred by individual A as a consequence of her choice to go on studying. Area GH (gains resulting from higher education) represents the additional earnings acquired by A for the same reason. Intuitively, pursuing higher education proves to be a profitable strategy if  $GH > FE + SE$ , that is, if higher earnings more than compensate for additional expenditures and forgone earnings. For a more accurate evaluation, one should also account for the fact that these costs and earnings accrue over time and not at once. Indeed, one could, for example, invest money in profitable opportunities other than education and enjoy the returns in future periods. The same applies to forgone salaries. Therefore, one should look at the *net present value* of the investment in education (but the corresponding technical procedure will not be presented here).

<sup>1</sup> In real life, these costs are virtually non-existent in that most countries provide free education and do not, in principle, allow children below a certain age to work.

<sup>2</sup> The slight concavity of the curve captures the fact that skills tend to become obsolete over time.

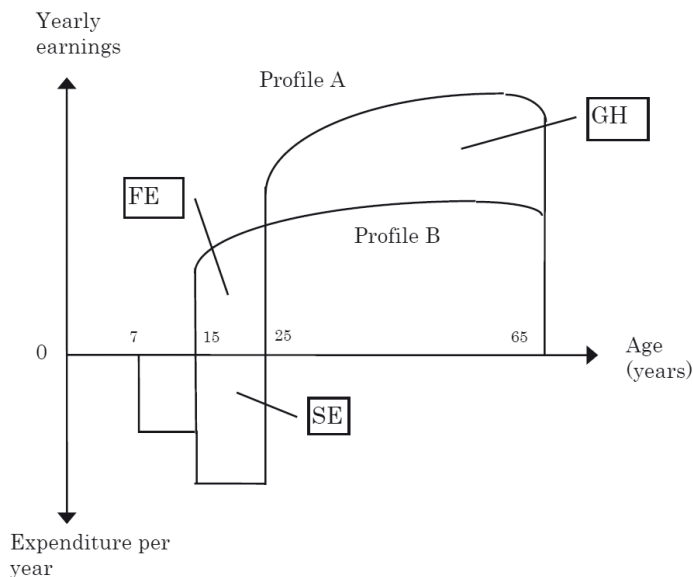


Fig. 1: Long (A) vs. short (B) education scenarios

This discussion considers education in general, but it is possible reapply it to specific skills, such as language skills. Learning a language requires time and money. Therefore, it implies an opportunity cost (time spent learning instead of working or performing leisure activities that accrue non-monetary benefits to an individual) and other expenses (such as language books and classes) that will be compensated for by employers who value language skills. If this additional return more than compensates for the investment in time and money, learning a language can be considered a profitable choice.

Grin (1999) studied the return on various levels of proficiency in High (Standard) German and Swiss German in French-speaking and Italian-speaking Switzerland. Figure 2 reports the return on language skills for men in the two regions. We immediately notice that learning High German always pays off, with greater returns associated with higher proficiency. This is true in both regions. Note that this analysis controls for education and work experience. As an example, let us consider the case of two men living in French-speaking Switzerland, having comparable levels of education and work experience. Let us further assume that one has very good skills in High German while the other does not have any knowledge of it. This analysis suggests that, on average, the former will earn 23.17% more than the latter. The same discussion applies to Swiss German, although the returns seem to be more modest; besides, some of the results for Swiss German are not statistically significant (striped bars in Fig. 2).

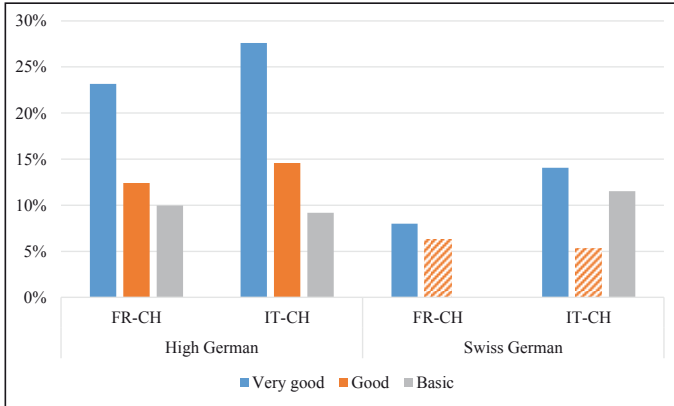


Fig. 2: Returns on speaking High German and Swiss German in French-speaking and Italian-speaking Switzerland (control variables: education, experience and experience squared)

The discussion on language skills and wages focused on the case of individuals. However, it can be extended to society as a whole by taking into consideration aggregate costs and earnings. Such an extension is crucial when, for example, policy makers need to consider whether language education should be provided by the government or not. In short, if the (present) cost borne by society to provide language education results in (future) higher productivity and, therefore, in greater economic activity, implementing a policy that introduces, for example, compulsory language courses in school curricula would prove to be a profitable choice.

## 5. Language skills and hiring strategies

In the previous section, we discussed how the offer of employees' language skills is usually rewarded by a higher salary. In this section, we switch the focus to the demand side of this relation, that is, the interest in language skills displayed by employers. Grin et al. (2010) studied the case of foreign language requirements and use across the three language regions of Switzerland. In particular, the study focused on the systematic under-requirement of foreign language skills (in a language other than the one of the employees' region of residence). Indeed, the authors found that there was a systematic mismatch between the frequency with which language skills were explicitly requested of employees when they were hired and the frequency with which these employees ended up using these skills in their jobs. These figures are reported in Table 1. Even if we look exclusively at the sign of these differences, we immediately notice that there seems to be a constant underestimation of the actual need for foreign language skills. Indeed, these data suggest that employees end up using foreign language skills even



though such skills were not requested when they were hired. The authors provide two interpretations for this phenomenon. On the one hand, this mismatch could be due to the fact that employers are simply short-sighted, that is, they are not aware of the actual need for foreign language skills. On the other hand, it might be the case that employers take skills in a given foreign language for granted. This interpretation is supported by another pattern displayed by the data. The under-requirement of Italian in German- and French-speaking Switzerland is lower than the other values. At the same time, the under-requirement of German and French in Italian-speaking Switzerland is higher. This seems to suggest that skills in German and French are taken for granted, possibly as a consequence of the dominant position of these two languages in Switzerland. Conversely, Italian is more frequently requested when needed. This might be due to the fact that employers do not generally take it for granted that employees are able to speak Italian, which is a minority language.<sup>3</sup>

Language region	Language			
	<i>German</i>	<i>French</i>	<i>Italian</i>	<i>English</i>
<i>German-speaking</i>	–	18.2	14.7	17.6
<i>French-speaking</i>	14.9	–	10.9	12.3
<i>Italian-speaking</i>	28.2	36.3	–	13.3

Table 1: Difference between actual use and requested skills (%) (Grin et al. 2010, 126)

How does this relate to language policy? The discussion above probably relates better to a private language policy put in place by businesses (as opposed to public language policy implemented by public institutions). Paired with further analysis of the precise reasons behind the systematic under-requirement of foreign language skills and a detailed identification of the units and divisions that experience more pressuring needs, the findings by Grin et al. (2010) justify the implementation of language audits to assess precisely the linguistic profile of the business with a view to adopting enhanced management practices. On a higher level, one could also think of the long-term implications for the government. Indeed, a thorough assessment of the needs for foreign language skills in the private sector can certainly help education departments develop better school curricula in terms of consistency between the competences obtained through formal schooling and the ones actually needed in the job market.

<sup>3</sup> For an in-depth discussion on the role of Italian in Switzerland, see Civico (2018).

## 6. Complexity and languages

The above considerations illustrate the well-known fact that language-related issues are virtually never *just* about languages. They can (and should) be studied from several disciplinary perspectives. However, while many disciplines have approached, at various moments, the study of language matters, most research work has been confined to the boundaries of one discipline at a time. In the past few years, more and more scholars have concluded that language matters have so many non-trivial causes and consequences that only a genuinely interdisciplinary approach can address them effectively. This philosophy is echoed in recent research on multilingualism in Europe, in which the perspectives of more than ten disciplines are combined (Grin et al. 2018). In other words, an increasing number of scholars have acknowledged the intrinsic *complexity* of language matters.<sup>4</sup> Indeed, language matters happen within systems that display a high level of complexity. An in-depth description of complexity and complex systems is well beyond the scope of this chapter.<sup>5</sup> Without burdening this discussion with technical details, suffice it to say that complex systems display a number of recurring traits, including: a large number of heterogeneous, interacting components, a marked non-proportionality between causes and effects (the so-called “butterfly effect”), a general difficulty to make sense of the situation, and a lack of central control replaced by a mechanism of self-regulation. Besides, complex phenomena often develop on various scales. For example, the dynamics observed at a macro level might be rooted in agents’ micro-level behaviour, or the other way around. The fact that the macro system displays properties that result exclusively from the interaction between micro agents but that do not belong to any of them is often referred to as “emergence”.

Keeping the above considerations in mind, it should be evident that language-related phenomena are no exception. Let us consider the case of a large multinational company. Corporations whose activities stretch over several countries often have multilingual personnel. In many cases this represents a hindrance to smooth communication. At the micro level, employees will often agree to communicate in a shared language, regardless of other considerations, such as the language of the place where their subsidiary is located. At the macro level, multinational companies often face a trade-off between prioritizing the use of a single language and continuously adapting to the local context. On the one hand, unrestricted multilingualism might lead to severe inefficiencies, although it would more easily accommodate individual employees’ preferences. On the other hand, a one-language policy, though potentially boosting cross-border collaboration, can come

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<sup>4</sup> See, for example, Beckner et al. (2009) for an in-depth discussion of the complexity of language matters.

<sup>5</sup> Interested readers can refer to Mitchell (2009).

at a very high price, such as eclipsing talented workers who are not proficient in the common language selected. Eventually, it can even generate misunderstandings, quite ironically. Therefore, it is easy to see that this language issue unfolds at different levels. Micro-linguistic behaviours and needs can differ significantly from macro-level ones.<sup>6</sup>

## 7. Agent-based modelling as a tool to study complexity

The study of complexity and complex systems is known as “complexity theory”, a research paradigm that starts from the assumption that many natural and social phenomena are intrinsically complex and that traditional approaches based on reductionism and simplification are unable to explain them satisfactorily. Over time, complexity theory scholars have developed a number of methodologies that should better capture such complexity and, consequently, have greater explanatory power. In the case of complexity economics (the application of the ideas and methods of complexity science to economic matters), an increasing number of researchers have transitioned from purely analytical (that is, mathematical) approaches (which often attempt to find a so-called “closed-form solution” to a problem), to computation-based approaches, which rely on algorithms and simulations. One of these methodologies is *agent-based modelling*, a computational modelling method that simulates interactions among micro-level agents with a view to reproducing (and, therefore, explaining) observed macro-level dynamics.

Agent-based models (ABMs) usually reproduce an environment which includes the agents involved with a phenomenon under study. These agents are then provided with behavioural and learning rules. Once the model is launched, agents interact based on the rules with which they were provided. The modeller observes “from the outside” and keeps track of what happens with the community of agents at a higher level. In general, if the agents were provided with actually observed micro-level properties and their interaction accurately reproduces the higher-level dynamics actually observed (that is, if the model is validated), a sensitivity analysis can be performed to study how changes at the micro-level translate into macro-level effects. It should be noted that ABMs can result from a genuinely interdisciplinary approach in that they can be informed by knowledge drawn from many disciplines. In the next section we will present an example of an application that draws on both economics and sociolinguistics.

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<sup>6</sup> For more on the complexity of communication in multilingual corporations, see Civico (2019a).

## 8. An application of agent-based modelling to language matters

Civico (2019b) developed an application of complexity theory to a traditional language issue, i.e. language contact, defined as “the use of more than one language in the same place at the same time” (Thomason 2001). In particular, the study focuses on the case of those communities where two groups co-exist and two languages, a majority and a minority one, are spoken. One group is monolingual in the majority language and the other is bilingual in the majority and the minority language. As a real-world example of such a configuration, the author proposed the case of Romansh in Switzerland, a minority language spoken by roughly 0.5% of the population and whose native speakers are more often than not perfectly bilingual in German or Italian. This analysis argues that the declining trend experienced by minority languages can be traced back to a number of individual variables that affect the behaviour of micro-level agents, i.e. minority language speakers. The variables considered are (i) the tendency of individuals from the minority group to pair up with individuals from the majority group; (ii) the tendency of minority language speakers to address people directly in the minority language or not; (iii) the presence of education programmes in the minority language; and (iv) the number of minority language students who are involved in such programmes.

To address this question, an ABM was developed to replicate interactions between agents in the community. In essence, the model works as follows:

- the environment is a multilingual community in which two languages are spoken, majority language A and minority language B;
- every individual is fluent in the majority language;
- some individuals are also able to speak the minority language with varying degrees of fluency;
- speakers of the minority language can either be willing to *reveal* their linguistic background or to *hide* it;
- the minority language is *passed on to the offspring* only if both parents are minority language speakers;
- if the proportion of minority language speakers falls under a certain threshold, policies to provide *education in the minority language* might be implemented;
- when the simulation is launched, agents converse with one another, choosing to use either the minority language or the majority one. The consequence of such a choice is that *fluency in the minority language increases or decreases* as a function of the number of times agents end up using the minority or the majority language, respectively. When their fluency in the minority language reaches zero, the speaker is considered to have assimilated into the majority group.

In order to provide the agents with behavioural rules (justifying why some speakers prefer to address people in the minority language while others do not), traditional economic modelling can be combined with qualitative findings from the sociolinguistic literature. This analysis is a necessary step to argue that the attitude towards the minority language is largely a cultural matter and highly dependent on the social perception of the minority group. Therefore, this parameter can vary significantly across different communities.

The results of the long-term impact of the four variables mentioned above on the demographics of the minority language group lead to the following conclusions:

- 1) Exogamous pairing (that is, the frequency with which members of the minority form a family with a non-minority individual) seems to be the strongest predictor of the long-term decline of the minority language group. This is backed up by much sociolinguistic literature. Indeed, it was observed that the more an allophone community is integrated with the majority group, the quicker their language tends to disappear.
- 2) Decline can be slowed down by education policies but not stopped or reverted. This has also been observed in many contexts, such as the case of Irish and English in Ireland.
- 3) Any policy in support of minority languages is useless if not supported by the right attitude, confirming a result from early models on language dynamics and language shift (Grin 1992).

In the main, these ABM results dovetail with findings from earlier theoretical or empirical research. However, it should also be borne in mind that one of the most important functions of ABMs is testing and exploration. Often, modellers are interested in studying the behaviour of a system under different circumstances. This is crucial when the magnitude of the impact of a certain variable should be estimated. However, it is not always possible to collect sufficiently varied data and over a long period of time. This might be due, amongst other things, to ethical reasons or simply to the fact that the data do not exist. Computer-based simulations provide a natural solution to this problem. Therefore, the more an ABM resembles reality in its assumptions and its results, the more reliable its projections are. This makes it possible for policy makers to explore various scenarios and gauge the impact of policies without actually implementing them. For example, various institutions, such as the Swiss Confederation and the European Union, have an active interest in supporting linguistic diversity. Having even a vague idea of long-term trends of linguistic diversity and of the impact of potential policy measures can prove very useful.

## 9. Conclusions

Apart from the type of results that the models presented in this chapter can deliver, the most important conclusion is that the integration of different disciplinary perspectives is crucial for the study of languages and language-related issues. Language issues are never only *language* issues. Their causes and consequences are often found in many seemingly unrelated domains of society. Therefore, it is crucial to study language-related issues from various disciplinary perspectives with a view to spelling out all the variables and causal links involved. Only by acknowledging this fact will it be possible to develop effective language policy measures. Economics certainly represents an important ally in the study of language matters; indeed, recent methodological developments open up new ways in which economics can contribute to language policy formulation. However, economic modelling (whether computational or analytical) needs to be integrated with qualitative findings from other disciplines, otherwise it risks being nothing more than an elegant intellectual exercise of limited utility. At the same time, traditional language disciplines, such as sociolinguistics, can certainly benefit from the methodological rigour of economics and the flexibility of computational modelling, lest many of their findings be dismissed as mere anecdotes.

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