The Pure Theory of Language Conflict

Jonathan Pool

Department of Political Science
University of Washington
Seattle, Washington 98195, U.S.A.

Prepared for delivery at the 1986 Annual Meeting of The American Political Science Association, Washington, D.C., 28–31 August, 1986.

Abstract

In a multilingual world, one subject for public choice is the selection of common languages and decisions on who learns which ones. In a simplified model of the "common-language problem", persons incur costs when they learn languages other than their native ones, and they benefit when anyone's language learning expands their set of potential communication partners. The "outcome" (who learns what) depends on how many languages are competing, who makes the choices, whether negotiation and transfer payments are allowed, how the choices are sequenced, and what criteria the choosers adopt. These parameters are the "procedure". A simple procedure is first defined, and its outcome discovered. Then its elements are altered, and it is shown that different procedures produce different outcomes.

The simple procedure prescribes a single common language; the only choice is whether each non-native-speaker learns it. An "efficiency"-motivated dictator makes the choices simultaneously without negotiation or transfer payments. It is shown that a simple rule yields an efficient outcome. To select among the (in general) several efficient outcomes, the dictator can add a criterion of either "nondeprivation" or "total-utility maximization" (but not both) to the efficiency criterion; either addition limits the outcome to one and only one solution.

When efficiency-oriented dictatorship is replaced with egoistic, security-maximizing "anarchy", the outcome is nondeprivational but not necessarily efficient. To promote efficiency under anarchy, one can introduce sequential choice and assume that all persons trust one another's egoism, but these procedural changes fail to guarantee efficiency. What does guarantee it is a "backward" sequential procedure, in which learners are permitted to unlearn the common language. But under all these procedures total utility is not maximized. Nor would it be maximized even if all persons chose altruistically.

When transfer payments are permitted, a dictator can achieve efficiency, total-utility maximization, nondeprivation, and "equity". A "democratic" choice of transfer payments in a 2-language system where the common language is the majority's language produces a per-person payment to all learners that varies in size directly with the size of the minority.

When 2 languages compete, apparently superfluous language learning may be efficient. A new rule simplifies a dictator's choice of an efficient outcome. Under anarchy, trust in one another's egoism won't promote an efficient outcome in 2-language competition, as it does with 1 common language; in fact, trust may prevent efficient outcomes that would emerge without trust. Introducing sequential choice, we find egoists learning first, then altruists, the opposite of the order in which they learn in the 1-language case. A "plural democratic" procedure can be modeled as a 2-person game, whose payoff rankings depend on the 2 groups' learning costs. "Low" costs produce a Chicken game and "medium" costs produce a Prisoner's Dilemma game, with an inefficient outcome. Unequal costs generate outcomes consistent with the claim that the more powerful group acts as if its learning costs were higher.

Different procedures lead to quite different interactions among language choices, making them resemble coordination problems, total conflicts, public-goods issues, and other choice situations. The variety of plausible models calls into question the search for universal generalizations about the nature of language conflict.

The common-language problem

When individuals or organizations want to communicate with one another but don't know any common language, what should they do, and what will they do? Learn a language? Hire a translator? Do without communication? The need to choose among such alternatives appears to be growing, because technical improvements in communication and attitudinal changes favoring international contacts are facilitating attempted interactions among speakers of the world's several thousand languages. The growing share of the information sector in the world economy is also raising the importance of all choices—including language choices—that influence the exchange of information.

Language choices are not merely personal; they are also political. Whatever one communicator does about language affects the welfare of others, and a language choice that serves one party may injure another party. These external effects even take the form of legal obligations, since the law of some jurisdictions requires governments and private persons in certain contexts (such as elections, education, criminal trials, commercial transactions, and work safety programs) to communicate with others in a language that they can understand.

This paper examines a recurrent problem of language choice, abstracting it from the peculiarities of any country or period. The problem can be called the *common-language problem*. It is the issue of which language or languages will serve as media of communication among persons with different native languages, and how many and which of these languages each person will learn. The purpose of the analysis is to learn how procedures for making these choices affect the resolution of the common-language problem.

General assumptions of a model of language choice

To produce general and deductive conclusions, I shall model the common-language problem by assuming simplified and idealized conditions. The problem is set in a *system*, containing a set of *persons*, who neither enter nor exit the system. (In fact, the entities that learn, use, and choose languages are often organizations, so "person" in the model should be understood to correspond to any individual or organization, and "he" should be understood as "he", "she", or "it", accordingly.) The ordered set of languages each person has ever learned (with his native language the first element of the set) is his *language repertoire*. He also has a *utility reservoir*, an account whose balance represents his level of well-being. The *state* of the system at any time is completely describable by a listing of each person's language repertoire and utility balance at that time.

The system has an *initial state* and an *outcome* (or final state). In the initial state, each person has a language repertoire, consisting only of his native language, and an initial utility balance. When a person adds a language to his language repertoire, an amount is drawn from his utility reservoir. This amount (reflecting time, effort, tuition fees, etc.) is a *learning cost*. A language repertoire never loses a language. Thus, a language once learned is never forgotten.

Each person can partition all other persons in the system into three categories. His *native-language knowers* (*NLKs*) are those who know (natively or as a second language) his native language. His *second-language knowers* (*SLKs*) are those whose language repertoires share at least one language with his, but not his native language. His *nonknowers* (*NKs*) are those whose language repertoires and his do not share any language. He can communicate with NLKs in his native language, with SLKs in a second language, and with NKs only through a translator. His NLKs and SLKs together constitute his *any-language knowers* (*ALKs*). The numbers of persons in these categories is represented by N_{NLK}, N_{SLK}, N_{NK}, and N_{ALK}, respectively. From the above assumptions it follows that only three transitions are possible between these categories. A person can change (with respect to some other person) from NK to SLK, from NK to NLK, and from SLK to NLK. Any of these transitions will be called a *recruitment*.

Three kinds of transactions can take place on a person's utility reservoir. First, as stated above, a learning cost is drawn whenever he adds a language to his repertoire. Second, amounts can be drawn or deposited to execute transfer payments, if the choice procedure permits. Third, each recruitment causes an amount to be deposited. This amount is the benefit a person enjoys from an increase in the number of his potential communication partners and from an increase in the proportion of those partners with whom he can use his native language. The balance in a person's utility reservoir at any time, minus his initial utility, is his *relative utility*.

The assumed benefits of language learning

To translate recruitments into utility deposits, let us define a person's *total communicability* (*TC*) as a weighted sum of his NLKs and SLKs. His NLKs are weighted by 1, and his SLKs are weighted by a weight *W*, such that 0 < W < 1, which is constant for all persons in the system. W reflects an assumed preference for communicability in one's native language. Thus, $TC = N_{NLK} + (W \times N_{SLK})$.

Each person's unit of utility is standardized as the amount deposited for a given increase in TC. This amount is a function of the old and new levels of TC. It is not the arithmetic difference or the proportional increase, but the continuously compounded growth rate represented by the change in TC. A pair of examples will clarify the motivation of this definition. A person would presumably perceive more utility in (and thus be willing to invest more effort in language learning for) an increase in TC from 100 to 200 than from 1100 to 1200. The arithmetic difference would not distinguish these, so it is unsatisfactory. If a person's TC rose from 20 to 160, the added utility would presumably be the same as if it rose from 20 to 40, from 40 to 80, and then from 80 to 160. But the proportional increases are not additive, since 3 × 100% ≠ 700%. The continuously compounded growth function treats cases of both kinds appropriately. This function is operationalized as the natural logarithm ($\log_e$) of the ratio of the new TC to the old TC. For example, if a person's TC increased from 1,500 to 4,500, or from 10 to 30, or from 5 to 10 and then from 10 to 15, the amount deposited into his utility reservoir would be $\log_e 3$, or 1.10. This definition has the disadvantage of yielding an infinite increase in utility when a person's TC increases from 0, but the phenomenon of languages known by only one person is insignificant enough to be ignored.

When a person learns a language, several things happen. His learning cost is drawn from his utility reservoir. If any others know the language and do not know any other language that he knows, these persons become his SLKs. His TC rises by the discounted increase in his SLKs ($W \times \Delta N_{SLK}$), and his utility balance is incremented by $\log_e (TC_{new} \div TC_{old})$. We can call this added utility his *reward*. It may be greater or less than his learning cost.

Beyond a reward, a language learner may receive further utility deposits if others learn the language at the same time as, or after, he does. As long as these new learners were previously his NKs, each of them will give him one more SLK, increasing his TC by W and causing a deposit to his utility reservoir. These additional deposits will be called *windfalls*.

Not only may a learner receive rewards and windfalls, but he may also affect the utilities of other persons. When he learns a language, he is recruited from NK to SLK for others who have learned (or simultaneously learn) it, if they did not already share some other language with him. He raises their TCs by W. He is also recruited from NK or SLK to NLK for each native speaker of the language, and their TCs rise by 1 (NK→NLK) or 1 - W (SLK→NLK). These TC additions confer windfalls on them. In addition, persons who *subsequently* learn the language will receive rewards that are increased in size because of his learning, if they previously shared no language with him.

Procedural effects on language choice

In addition to the general assumptions described above, there is a *procedure* which prescribes how the state of the system may change. The procedure, if fully described, suffices to determine the outcome or a set of possible outcomes. Each possible outcome in such a set will be called a *solution*. Five procedural variables appear significant in this context. They are (1) domain of choice, (2) locus of control, (3) negotiability, (4) schedule, and (5) orientations. The *domain of choice* is the set of language-learning alternatives among which choices are assumed possible. Is there just one legitimate or obligatory common language, or are several languages competing for the role? Must each person learn exactly one language, making the only question which language, or is the number of languages also open to choice? *Locus of control* is who has the power to make the choices in the domain of choice. Does each person decide whether and what he will learn, does the system collectively make the choice for everyone, or do certain persons have power to dictate choices to others? *Negotiability* refers to the opportunities in the procedure for the exercize of influence over the choices of others. Can decision-makers discuss their tentative choices? Can persons make enforceable promises to other persons? Can transfer payments take place? The *schedule* is the sequence of choice opportunities. Are all choices simultaneous? Do persons have more than one opportunity to choose? Are choosers allowed to choose when to choose? The *orientation* of a person is the rules he follows in making his choices. Whose utilities does he consider? How does he weight utilities? How does he evaluate uncertain utilities? Orientation would normally be called an element of personality rather than procedure, but it should make no difference if we define "procedure" more broadly for theoretical convenience.

It is obviously impossible here to work out the implications of more than a few of the many procedures that these variables could generate. Let us begin, then, with the simplest procedure we can think of and then consider the impact of incremental complications.

Solutions under a unilingual dictatorship

To create the simplest imaginable version of this model that may still hold some interest, let us make the following procedural assumptions:

(1) The domain of choice is limited to whether each person who does not speak the unique common language learns it.

(2) The locus of control is a dictator.

(3) There is no negotiability. Pre-choice messages (threats, promises, offers, etc.) and transfer payments are excluded.

(4) The schedule is that all choices are simultaneous.

(5) The orientation is to achieve an efficient outcome in terms of the utilities of all persons, ignoring any uncertain utility effects.

So our first question is: In a system with an already selected unique common language, whom would an efficiency-oriented dictator command to learn that language if the commands were simultaneous and there could be no negotiation or transfer payments?

An *efficient* outcome, in terms of utilities, is one that could not (given the procedure) be changed to increase one person's utility without decreasing somebody else's utility. If the outcome were *inefficient*, some other outcome would *dominate* it, namely give more utility to at least one person without reducing anyone else's utility.

There is at least one efficient solution, because dominance is a transitive and asymmetric relation: if A dominates B and B dominates C, then A dominates C; and if A dominates B, B does not dominate A. If no solution were efficient, each solution would be dominated by another solution, and this would imply a cycle of dominance, violating the intransitivity condition. Efficiency does not, however, always yield a unique solution. Two or more solutions, all undominated, can exist at once.

There is a simple rule whereby the dictator can discover one efficient solution. The dictator can consider just two solutions: (A) requiring everyone to learn the common language except its native speakers, and (B) leaving the initial state of the system unchanged. If the common language has any native speakers, solution A is always efficient. If the common language has no native speakers, the dictator determines whether solution B dominates solution A. If it does, solution B is efficient. If it doesn't, solution A is efficient.

Let us see why this rule works. If the common language has any native speakers, compare solution A with any other proposed solution. The learners in the other proposed solution must be a proper subset (i.e. some but not all) of the learners in solution A, since the latter are the set of all possible learners. A proper subset of learners must give each native speaker of the common language a smaller TC than the full set. Since the relative utilities of native speakers of the common language vary only with their TCs, the other solution must give each of them a lower utility than solution A. So no other solution can dominate solution A, and that makes solution A efficient.

The rule also works when there are no native speakers of the common language. Consider solution B. In this solution, the initial state is preserved (i.e., nobody learns the common language), and everyone's relative utility is therefore 0. Solution B either does or doesn't dominate solution A. If it does, then in solution A every person's relative utility must be either 0 or negative, and at least one person's must be negative. Now consider any other solution. It must, as above, contain a proper subset of the learners in solution A. The utility of each person in that subset can be no higher than the same person's utility in solution A, because the subtraction of one or more other learners from solution A can not raise the utility of those who remain learners. (This statement is equivalent to saying that when one person learns the common language he cannot thereby lower anyone else's utility.) And the relative utility of the subtracted persons is 0, since all nonlearners have a relative utility of 0. The proper subset of learners and the subtracted learners constitute all persons in the system. Thus, the other solution has no one with a relative utility greater than 0 and, therefore, cannot dominate solution B. Since neither solution A nor any other solution dominates solution B, solution B is efficient.

Finally, solution B may fail to dominate solution A. If so, either all relative utilities in solution A are 0 or at least one relative utility in solution A is positive. As shown above, any other solution contains nonlearners with relative utilities of 0 and learners with relative utilities no greater than the same persons' relative utilities in solution A. If all relative utilities in solution A are 0, then all relative utilities in the other solution must also be 0, and it cannot dominate solution A. If one or more relative utilities in solution A are positive, then the only way another solution might dominate solution A is to subtract from solution A all learners who have negative relative utilities and not to subtract any learners who have positive relative utilities. The resulting solution would dominate solution A only if the subtractions of learners did not reduce the utility of any remaining learner. For that condition to be met, all subtracted learners would have to have the same native language as all the remaining learners. But that would require that all persons in the system have the same native language, and then there would be no common-language problem in the first place. Therefore, if solution B doesn't dominate solution A, solution A is efficient.

To illustrate this situation, consider Example 1, a 6-person system where W = 0.7, meaning that each person values a communication partner with whom he must use a second language 30% less highly than one with whom he can use his native language. The persons in the system have these characteristics:

Table 1. Example 1: A Common-Language Problem.

ID Number	Native Language	Learning Cost
1	C	N/A
2	C	N/A
3	1	0.5
4	1	1.0
5	2	1.5
6	2	1.7

The common language is designated "C". The speakers of language 1 have lower average learning costs than the speakers of language 2; such differences can arise from unequal linguistic proximity. With 4 native speakers of non-common languages, there are 16 possible solutions for the dictator to choose from. Inspection reveals that 5 of these are efficient, and, as proved above, one of the 5 is the solution in which everyone except native speakers learns the common language (solution 5).

Table 2. Efficient Solutions to Example 1.

	ID:	Solution				
		1	2	3	4	5
Learns Common Language?	3	Yes	Yes	Yes	Yes	Yes
	4	No	Yes	Yes	Yes	Yes
	5	No	No	No	Yes	Yes
	6	No	No	Yes	No	Yes
Relative Utility	1	0.693	1.099	1.386	1.386	1.609
	2	0.693	1.099	1.386	1.386	1.609
	3	0.375	0.375	0.631	0.631	0.835
	4	0	-0.125	0.131	0.131	0.335
	5	0	0	0	-0.165	-0.165
	6	0	0	-0.365	0	-0.365

Variation 1: the nondeprivational criterion

When there are several efficient solutions, as in Example 1, the question arises whether they are all equally good. If the dictator's only concern is efficiency, then (from his perspective) they are, and he can select a solution from the set of efficient ones by the above rule, by lot, or by any other arbitrary method. But a perusal of the utilities in Table 2 suggests at least two components a dictator might add to his efficiency orientation. One component is a *nondeprivational criterion*. This is a requirement that the outcome must give each person a nonnegative relative utility. As we have seen, efficient solutions do not necessarily satisfy this criterion, and the all-or-nothing rule given above may select a deprivational solution (one yielding at least one negative relative utility) even when there is another efficient solution that is nondeprivational.

The nondeprivational criterion is a feasible adjunct to the efficiency criterion in the dictator's orientation only if there is always at least one nondeprivational solution among the set of efficient ones. In fact, there is always one and *only* one efficient nondeprivational solution. In Example 1, it is solution 1. Why can't several such solutions exist? Suppose two existed (call them "A" and "B"). If a person is a learner in one or both of these, then the greater of his utilities in A and B is in a solution in which he is a learner (this follows from the fact that A and B are nondeprivational). Now consider another solution, C, that combines the learners from A and B. Each nonlearner in C is a nonlearner in A and B, and his relative utility in C equals his relative utility in A and B (0). Each learner in C has a utility at least as great as the greater of his utilities in A and B, because in C he is accompanied by a superset of the learners that accompanied him in A or B (whichever gave him his greater utility), and the added learners cannot have reduced his utility. Therefore, C must dominate both A and B; A and B are *not* efficient. The nondeprivational criterion, added to the efficiency criterion, thus yields a unique solution.

Variation 2: the criterion of total utility

Another possible criticism of the efficiency criterion is that it permits ineffective outcomes. An ineffective outcome is one which fails to maximize some criterion variable. From a dictator's perspective, a likely criterion variable would be the total utility in the system, since it is conceptually related to things, like gross national products, that rulers tend to care about. One possible meaning of "total utility" is the sum of the relative utilities of all persons in the system. Using this definition, the dictator would be treating a unit of utility as interpersonally comparable. Let us assume that such a criterion of effectiveness is added to the criterion of efficiency.

Since the criterion of total utility is a maximizing criterion, it obviously yields a unique solution, unless two or more solutions happen to be tied in the ranking on total utility. Two other observations about this criterion of effectiveness are of interest, however. First, there is no incompatibility between efficiency and effectiveness under the assumptions of this model. The most effective solution among the entire set of possible solutions will always be one of the efficient solutions. If it were inefficient, a solution (one dominating it) would exist with at least one greater utility and no lower utilities, and therefore with a greater total utility. So the allegedly most effective solution would not in fact be most effective.

There is, however, an incompatibility between this effectiveness criterion and the nondeprivational criterion. Systems can be described in which these criteria yield the same solution, such as a system all of whose members have low learning costs and in which everyone has a positive relative utility when everyone learns the common language. Systems can also be described in which the two criteria yield different solutions, such as Example 1, in which Solution 5 is the most effective but Solution 1 is nondeprivational. In such cases, some people who learn the common language add to total utility, but subtract from their own utility.

Solutions under unilingual anarchy

Of course, not every regime is a dictatorship. The extreme opposite locus of control is the autonomous individual. Instead of one person telling everybody whether to learn the common language, let us assume that each person makes that choice for himself. Let us also replace the dictator's efficiency criterion with an *egoistic security criterion*. This is a rule that says: I shall learn the common language if doing so will necessarily increase my utility regardless of the as yet unknown results of the choices of any other persons.

The egoistic security criterion under anarchy bears a resemblance to the nondeprivational criterion under dictatorship. Each one prevents any outcome that would give any person a negative relative utility. An individual applying the egoistic security criterion has a relative utility of 0 in the initial state of the system, will retain that utility if he does not choose to learn the common language, and will learn the common language only if he knows that doing so will increase his utility. If his reward exceeds his learning cost, he will meet this criterion and choose to learn the common language.

Although the egoistic security criterion under anarchy always yields a nondeprivational outcome, this outcome is not necessarily efficient. Because a person ignores windfalls when deciding whether to learn the common language, he may refuse to learn it even under conditions when learning it would raise his utility. The paradigm situation is one of several persons whose learning costs exceed their rewards, so they all choose not to learn. But each would, by learning, generate a windfall for each of the others. And the combined windfalls would, when added to the rewards, produce sums greater than the learning costs. So if all learned all would get increased utilities.

The special case of a system with no native speakers of the common language makes this result even clearer. Regardless of how low anyone's learning cost it, if the common language has no native speakers it will never have any learners. The first learner—if there were one—would incur a learning cost but would not add anything to his TC, so he would lower his utility from 0 to negative. It should not be assumed that this situation is completely unrealistic. Common languages with no or almost no existing speakers within the target society have often been proposed, including languages of colonialists and missionaries and designed languages proposed for international use. So, too, have components of languages, such as alphabets and technical terms, whose adoption may be amenable to the same analysis as the adoption of whole languages. So the "I won't be first" problem has real analogues.

Variation 3: sequential choice

If persons making choices under the anarchic procedure had the opportunity to reconsider their decisions not to learn the common language, they might change their minds and avoid making choices that produce inefficient outcomes. Persons who would benefit from learning the common language in the initial state of the system would learn it first. They would thereby add to the size of the group knowing the common language, making it more attractive for others to learn. In effect, each learner would convert an uncertain windfall into a certain reward for those who had not yet learned.

To consider this possibility, let us change the assumed schedule to *sequential choice*: a schedule that lets each person choose to learn the common language at any time, but not to revoke that choice once made (i.e., not to unlearn the common language). This freedom of the time of choice seems more fitting than regimented choice in an anarchic regime, anyway.

Under some conditions, sequential choice will produce the efficient nondeprivational outcome when simultaneous choice will not. In Example 2, a system with W = 0.5, Persons 3, 4, and 5 learn the common language in the efficient nondeprivational outcome. Under simultaneous choice only Person 3 chooses to learn, while under sequential choice Persons 3, 4, and 5 all do so. Person 3's choice is necessary to raise Person 5's reward above his learning cost. And Person 5's choice is necessary to raise Person 4's reward above his learning cost. So Persons 3, 5, and 4 choose to learn the common language in that sequence.

Table 3. Example 2: A Sequence-Conducive System.

ID Number	Native Language	Learning Cost
1	C	N/A
2	C	N/A
3	1	0.5
4	1	0.8
5	2	0.8
6	2	1.2

Table 4. Example 3: A Non-Sequence-Conducive System.

ID Number	Native Language	Learning Cost
1	C	N/A
2	C	N/A
3	1	0.8
4	1	0.8
5	2	0.8
6	2	1.2

Sequential choice does not, however, guarantee an efficient outcome under all conditions. In Example 3 Person 3's learning cost is 0.8 instead of 0.5, but Examples 2 and 3 are otherwise identical. In Example 3, no one chooses to learn the common language under sequential choice, but the efficient nondeprivational solution still includes Persons 3, 4, and 5 as learners. And regardless of learning costs a system with no native speakers of the common language will never generate learners under sequential choice, just as it doesn't under simultaneous choice. Some systems, which we may call *sequence-conducive*, will have efficient outcomes under sequential choice and others will not. Except for the fact that all systems without native speakers of the common language are non-sequence-conducive, there does not appear to be any simple criterion for distinguishing sequence-conducive from all other systems.

Variation 4: egoistic trust

The apparent obstacle to reaching the efficient nondeprivational outcome under sequential choice is the inability to take one's windfalls into account when making choices. This inability was part of the definition of the egoistic security criterion. In fact, however, some windfalls can be assumed to be certain if a person is willing to make an assumption about the orientation of other persons. Everyday behavior is hard to interpret unless this is true; people commonly rely on others' self-interested motives. (If they didn't, nobody would dare to drive a car, for example.) So it would be reasonable to change the assumed orientation to replace the egoistic security criterion with an *egoistic trust criterion*. Under this criterion, each person relies on the windfalls that all others will generate for him if they use the egoistic security criterion. What happens if we make this change?

Examples prove that the egoistic trust criterion, if everyone adopts it, may produce or not produce an efficient outcome. In Example 3, Persons 3, 4, and 5 will all learn the common language in the initial state of the system, and this outcome is efficient. As noted above, none of them will learn under the egoistic security criterion. But now consider Example 4, a system with W = 0.5. In this system nobody will learn the common language under the egoistic trust criterion. A first learner would get no reward. To determine whether he could rely on any windfall, we calculate the prospective rewards others would have after his learning. The prospective reward for a member of the other language group would increase from 0 to 0.405 (i.e. $\log_e 1.5$), but this would fall short of the latter's learning cost. So the outcome would be the initial state of the system. But a solution in which everyone learns dominates the initial state, because it gives each person a reward plus windfall of 0.693, in excess of his learning cost.

Table 5. Example 4: A System Unconducive to Egoistic Trust.

ID Number	Native Language	Learning Cost
1	1	0.5
2	1	0.5
3	2	0.5
4	2	0.5

Variation 5: the backward schedule

Strangely enough, there is a simple way to guarantee an efficient solution under anarchy, but one must alter some of the model's general assumptions and suspend some knowledge about the world. Suppose that, instead of choosing whether to learn the common language, everyone knew it in the system's initial state and then chose whether to *unlearn* it. Let us call this the *backward schedule*, since it resembles running history backwards. Although it seems unrealistic, it can be defended as a model for intergenerational language loss or for a bargaining process in which people may revoke an assumed (but not yet fulfilled) initial commitment to learn the common language. It is also analogous to situations of defection or secession, in which the assumed initial condition is universal membership and the choice is whether to exit.

The backward schedule lets each person choose at any time to unlearn the common language. If he does, he recoups his learning cost and gives up his reward/windfall of $\log_e (TC_{old} \div TC_{new})$. Anyone whose utility would be thereby increased, if everything else remained unchanged, chooses to unlearn. Thus, the first unlearners are those with negative relative utilities (under the backward schedule, a person's relative utility is his actual utility minus the utility he would have if he didn't learn). The withdrawal of the first unlearners may decrease others' utilities, and any whose relative utilities become negative unlearn next. The unlearning choices continue until everyone has unlearned or all remaining learners have positive relative utilities.

The outcome under the backward schedule is the unique nondeprivational efficient solution. No other solution dominates it because any solution removing learners from or adding learners to it would give a smaller relative utility to at least one person. A solution removing learners would lower their relative utilities to 0. A solution adding learners would make the relative utility of at least one of them (the one who first unlearned) negative. He would be in a situation identical to or worse than the one he was in when a negative relative utility made him unlearn. In effect, the backward schedule yields efficient solutions because it permits each person to rely on all windfalls that will accrue to him if he knows the common language, not only on windfalls forecastable before a learning choice.

Variation 6: the altruistic criterion

Even if the backward schedule is feasible, the outcome it guarantees, while efficient and nondeprivational, is not necessarily effective. As discussed in the analysis of dictatorship, various criteria of effectiveness may exist, including total utility. It seemed plausible that a dictator might promote total utility, since he might benefit in direct relation to the average well-being of his subjects. It is not so clear why an individual might do so, especially since, as Persons 5 and 6 in Example 1 show, individuals may have to give themselves negative relative utilities in order to promote an increase in total utility. But even when individuals pursue their own interests, governments often arrange incentives so as to make individual interests covary with what are regarded as collective interests. By providing subsidized language instruction, for example, governments reduce the cost to individuals of learning common languages. Such subsidies can be interpreted as methods of inducing individuals to make language-learning choices that promote the total utility in the system.

If everyone adopted, instead of the egoistic security criterion, the *altruistic criterion*, he would choose to learn the common language if and only if his reward *plus everyone else's windfall* from that choice is greater than his own learning cost. Let us assume that, for whatever reasons, this is everyone's orientation. Will total utility be maximized? A dictator can simply select the solution that maximizes total utility, but an individual determines only a part of the solution.

The altruistic criterion can, indeed, help increase total utility. Under some conditions this criterion will lead a person to learn the common language when the egoistic security criterion and the egoistic trust criterion will not. In Examples 1 and 2, if all persons chose under the altruistic criterion they would all learn the common language (and in the initial state of the system).

Typically, altruism promotes total utility early in a system's process, if the schedule is sequential. As more people learn the common language, rewards rise and total windfalls fall, so the added incentive to learn that the altruistic criterion provides becomes smaller. A process may have a "take-off threshold", a state which is unreachable without at least some learning choices by altruists, but after which the solution that maximizes total utility can be reached without any altruists. Such a system "needs a few good men" to reach the threshold.

But altruism will not always maximize total utility. As shown above, when no one knows the common language in the initial state, a learner generates no reward for himself and no windfall for anyone else. So an altruist would not become the first learner, even if the solution that maximizes total utility required everyone to know the common language. If we further amend the orientation to combine the altruistic criterion with the egoistic trust criterion, so each person adds his own forecastable windfalls to the benefit relied on, a system with no native speakers of the common language still remains static.

To guarantee an outcome with the maximum total utility under anarchy we could, however, make a drastic but simple change in the orientation. We could assume that everyone follows a *rule-altruistic criterion*. This criterion dictates that its user make whatever choice the total-utility-maximizing outcome requires. If everyone were a rule altruist, total utility would be maximized.

Solutions with transfer payments

The foregoing variations on the model of the common-language problem have generated efficient outcomes, nondeprivational outcomes, and total-utility-maximizing outcomes under some conditions, but in general they could not generate outcomes that had these three characteristics all at once. The conflicts among these three goals are inevitable when the negotiability assumptions exclude transfer payments. When transfer payments are permitted, each solution has a *learning component* and a *payment component*.

Let us assume the equivalence of one unit of utility for different persons not only for the purpose of determining total utility, but also in determining the conversion of utility when transfer payments are made. When one person's utility reservoir is depleted by n units of utility to make a transfer payment to another person, the latter person receives n units of utility.

Under this assumption of transferable utility, transfer payments do not affect total utility. The only thing that does is the learning of the common language. Therefore, if total utility is to be maximized then the unique solution that maximizes it without transfer payments must be the learning component of the solution with transfer payments. With no transfer payments, this solution is, as noted earlier, necessarily efficient, but not necessarily nondeprivational. Any transfer payments will preserve the efficiency of the solution. Some of the resulting solutions may, however, be deprivational, so the payment component can be used to make the outcome nondeprivational.

For a dictator, using transfer payments to achieve these three goals is straightforward. He finds, by inspection, the solution that maximizes total utility. He determines the relative utility of each person under that solution. If anyone has a negative relative utility, the dictator transfers utility from one or more persons with positive relative utilities until all relative utilities are nonnegative.

This prescription still leaves the dictator with an infinite number of acceptable solutions, except in cases where total-utility maximization requires that nobody learn the common language. It seems reasonable, then, for the dictator to seek some supplemental criterion that would select the most effective solution from the set of acceptable ones.

It is possible to use the flexibility still remaining to make the outcome more equitable than it would be if one of the acceptable solutions were chosen arbitrarily. An *equity criterion* could be defined as the distribution of the total relative utility in the system so as to to make each person's relative utility equal. This criterion constrains the outcome to a unique solution.

Variation 7: transfer payments under democracy

In regimes of the "liberal democratic" type, language-learning choices are often made somewhat anarchically but transfer payments are decided somewhat democratically. Where there is a single common language, the government often does not truly require persons to learn it. Parents who wish to educate their children in schools where other languages are used and taught are more or less free to organize and use such schools. But the government subsidizes the schools that teach the common language, thus executing a transfer payment to each person (of school age) who chooses to learn the common language (in public schools). In addition, governments organize adult courses, courses for immigrants, and other services that subsidize the learning of the common language.

Simplifying this semi-democratic and semi-anarchic situation, we can imagine a change in the locus of control and in the negotiability of the procedure. Let us assume that the persons in the system choose simultaneously and freely whether to learn the common language under the egoistic security criterion, with one modification: persons add to their reward a *net transfer payment*. This is a fixed utility deposited to the reservoir of every learner of the common language and drawn in equal shares from the reservoirs of all persons in the system. Thus, a learner's net transfer payment is the amount of the transfer payment, less the share of that amount that he himself contributes to it. Let us further assume that the payment is fixed at the median of the levels that maximize the utilities of the persons in the system. This *democratic transfer procedure* simulates the presumed result of a majority-rule vote on how high the payment should be. Finding the outcome of the process under this procedure models the question, "How much is it worth to the public to pay persons who don't yet know the common language to learn it?"

For any person in the system, one can determine the utility-maximizing level of transfer payments by comparing his utility at all possible levels. If the native speakers of the common language constitute a minority of the persons in the system, the procedure leads to a perverse result: the transfer payment is set at infinity. This is because the median person is one of the non-native-speakers. To illustrate, if there are 50 native speakers and 150 non-native-speakers of the common language, setting the transfer payment at 1,000,000 units of utility induces each non-native-speaker to learn the common language and gives him a net deposit of 250,000 units.

The result is not extreme, however, when the majority are native speakers of the common language. Since they have identical interests under all our assumptions and the median person is one of them, we need merely determine the level at which any member of this group—or the entire group treated as a single entity—most prefers to have the transfer payment fixed. The level of the transfer payment affects the group positively by recruiting learners, increasing their TCs. It affects them negatively by drawing from their utility reservoirs their shares of the payments, none of which they receive. Whatever payment level maximizes the positive effect minus the negative effect is the outcome under this procedure. To simplify this determination here, let us limit our attention to the special case of a system with only two native-language groups, one of which (the majority group) has the common language as its own. Let us further assume that the number of persons in the system is large, that learning costs have a minimum and a maximum, that the minimum is less than the initial-state reward, that the maximum is greater than the final-state marginal contribution to total utility, and that learning costs are distributed in equal density between these two levels. The assumed range of learning costs guarantees that all interesting kinds of cost/benefit relationships are represented in the minority language group.

Let us define the following terms:

P_{CL} = native speakers of common language as proportion of population

U_{CL} = relative utility of each native speaker of common language

$P_{NCL} = 1 - P_{CL}$ = native speakers of other language as proportion of population

LC_{min} = minimum learning cost

LC_{max} = maximum learning cost

TP = level of transfer payment (per recipient)

Under the assumption that the number of persons in the system is large, we can treat each person as a negligible fraction of his own language group. This assumption permits us to say that the reward to any member of the minority for learning the common language is $\log_e [(P_{NCL} + [W \times P_{CL}]) \div P_{NCL}]$. It also permits us to ignore the contribution a learner must make to the cost of his own transfer payment. The proportion of the minority that will choose to learn the common language is the proportion whose learning costs are less than their rewards plus transfer payments. Because of the equal-density assumption, this proportion, which shall be called P_L, is

$$\frac{\log_e [(P_{NCL} + [W \times P_{CL}]) \div P_{NCL}] + TP - LC_{min}}{LC_{max} - LC_{min}}.$$

At a given level of transfer payment, any member of the majority has $P_{CL} + (P_L \times P_{NCL})$ as his TC. His share of the system cost for making transfer payments is equal to the transfer-payment level weighted by the proportion of the population receiving transfer payments; this is $TP \times P_L \times P_{NCL}$. So

$$U_{CL} = \log_e \{(P_{CL} + [P_L \times P_{NCL}]) \div P_{CL}\} - (TP \times P_L \times P_{NCL}).$$

Whichever TP maximizes U_{CL} (let us call this value TP_{max}) will be the outcome. Assuming U_{CL} is differentiable at its maximum, we can find the outcome by differentiation. The result can be expressed with the aid of two constants:

$$C_1 = 2 \times P_{NCL} \div (LC_{max} - LC_{min})$$

$$C_2 = 2 \times \{1 + [P_{NCL} \times («\{\ln [1 + (W \times «\{1 \div P_{NCL}\} - 1»)] - LC_{min}\} \div \{LC_{max} - LC_{min}\}» - 1)]\}.$$

Using C_1 and C_2, it turns out that

$$TP_{max} = \frac{\sqrt{C_2^2 + 4C_1} - C_2}{2C_1}.$$

As the numerical dominance of the majority increases, the terms in TP_{max} change in conflicting ways, leaving a question as to whether TP_{max} will rise or fall. Inspection of various cases reveals, however, that TP_{max} consistently falls as P_{CL} rises. The mechanism apparently driving this relationship is the windfall that native speakers of the common language get when others learn their language. The larger the majority, the smaller the windfall each learner brings, and therefore the smaller the contribution a member of the majority is willing to make to induce others to learn. In addition, the larger the majority the greater the reward learners receive by learning the common language. To the extent that this greater reward suffices to induce members of the minority to learn without a subsidy, any subsidy by the majority is wasted from their perspective, and that waste is incorporated in the solution for TP_{max}.

Solutions with competing languages

The analysis up to this point has preserved the initial assumption that the domain of choice prescribes a single common language and that the maximum number of non-native languages anyone can learn is 1. This assumption simplifies the search for outcomes, but it is obviously unrealistic in a model of some arenas of language conflict. If in some cases, like those of the United States and the U.S.S.R., most linguistic disputants agree on which language the common language is, there are other cases, like those of India and Canada, where the identity or uniqueness of the common language is the principal question of language politics.

Where two or more languages compete, people who have one of them as their native language will benefit when others learn their language more than when they learn others' languages. The difference is due not only to the elimination of learning costs, but also to the greater value of native-language than of second-language knowers. In a nutshell, linguistic competition involves people saying to one another, "Let's use my language to communicate."

As Selten & Pool (1982) show, a reasonably detailed formal analysis of the competing-languages condition requires a full paper, but this one will end with a brief excursion in that direction. To minimize complexity, only systems with 2 native languages in which those and no other languages are in competition for the role of common language will be considered here.

The new assumption about the domain of choice is that each person in the system will either learn the other native language or not. The other four assumptions listed at the beginning of the paper are unchanged. The choice is made for all persons at the same time by a dictator, with utility-based efficiency as his sole criterion.

The possible solutions can be classified into nine categories according to whether none, some, or all native speakers of each group learn the other language. It might seem impossible for solutions in all nine categories to be efficient. For example, a solution in which everyone learns the other language would seem to involve superfluous learning; for communication between all pairs of persons it suffices for the speakers of either language to learn the other.

It is not possible, however, to exclude solutions of any one category a priori as inefficient. In particular, the solution in which everyone learns the other language may be efficient, because those with one of the native languages increased their utility by not learning they would decrease the utility of the native speakers of the other language by derecruiting themselves from NLKs to SLKs. Under the general assumptions of this model, a person prefers to be able to communicate with another person in the former's native language. Therefore, complete reciprocal language learning is not superfluous. Whether it is efficient depends on the group sizes and on the distribution of learning costs.

A dictator's choices when there are competing languages closely follow the reasoning that applies to a unique common language. When efficiency is the sole criterion, he can arbitrarily choose either language and make every native speaker of that language learn the other language. This solution is always efficient, because it maximizes the utility of each speaker of the learned language, and every other solution fails to maximize his utility. This result relies, in part, on the fact that when the native speakers of S all know T, no native speaker of T gains anything by learning S. If the dictator wishes to apply the nondeprivational criterion or the criterion of total utility in selecting one among the efficient solutions, the conclusions reached earlier are not altered. There is still one and only one efficient nondeprivational solution and exactly one solution that is not only efficient but also maximizes total utility.

Variation 8: competing languages under anarchy

When the locus of control for each person's learning choice is the person himself and everyone is assumed to abide by the egoistic security criterion, the native speakers of each language behave exactly as if the other language were the unique common language of the original model. A person's reward in the initial state of the system is unaffected, because in either case it is based on the assumption that a learner will add all the members of the other group to his SLKs. In the unilingual case, it was noted above that the neglect of windfalls by persons making choices can cause inefficient outcomes to emerge. The same is true when there are competing languages. In Example 5, where W = 0.5, each person's reward is 0.69, and the outcome will leave the initial state unchanged. But the solution in which everyone learns the other language dominates the outcome, because it adds a windfall of 0.41 to each person's reward, yielding a positive relative utility.

Table 6. Example 5: A Case of Competing Languages.

ID Number	Native Language	Learning Cost
1	1	0.8
2	1	0.8
3	2	0.8
4	2	0.8

When languages are in competition, a choice to learn a language can both stimulate and discourage windfalls for the chooser. If a speaker of L learns M, he encourages a speaker of N to learn M too, and if N does this it generates a windfall for the speaker of L. But the same act by L *dis*courages a speaker of M from learning L. Before the L speaker learns M, he is available for recruitment from the NK to the SLK status for any M speaker who chooses to learn L. Once the L speaker learns M, however, he is an NLK for all M speakers, and no further recruitment is possible. This dual effect of language learning on windfalls is a new phenomenon that appears only when languages are in competition.

In the special case considered here there are only two language groups, so a decision to learn a language cannot bring its maker any benefits through windfalls. If it has any effect on the windfalls its maker gets, the effect will be to reduce them. Example 6, with W = 0.5, shows that the substitution of the egoistic trust criterion for the egoistic security criterion, a substitution which can increase language learning when there is a unique common language, can prevent learning when languages compete. In this example, the standard orientation would lead everyone to learn the other language, since each person's reward is 0.69, more than his learning cost. But the egoistic trust criterion requires taking into account windfalls from others whose learning can be predicted when one assumes that they are only reward-motivated. In this case, each person can predict that each other person will choose to learn, and therefore each person can count on getting 2 more NLKs and a windfall of 1.10. Relying on this expectation, he will then determine that if he incurred his learning cost he would get no reward or further windfall, but just waste his learning cost. So if everyone adopts the egoistic trust criterion no one will learn, and everyone, expecting a relative utility of 1.10, will in fact get no relative utility at all. When there is a single common language, the false belief that one is the only trusting egoist is a safe illusion; when languages compete, it can be a dangerous illusion.

Table 7. Example 6: A Case of Windfall-Suppressed Learning.

ID Number	Native Language	Learning Cost
1	1	0.6
2	1	0.6
3	2	0.6
4	2	0.6

As the preceding discussion suggests, a sequential rather than simultaneous choice schedule will generally have different effects on linguistic competition from its effects on a consensual common language. With a single common language, early learners may have to be altruists, and they make the common language more rewarding to learn for later learners. With competing languages, early learners make their own native language less rewarding to learn for the native speakers of the languages they learn. The role of altruists in reaching a take-off point when there is a single common language may be replaced, especially in the 2-language case, with a new role for altruists in linguistic competition. Here they will typically promote total utility by learning late, rather than early. Once the speakers of M have learned L, only altruistic speakers of L will reciprocate by learning M.

Variation 9: competing languages in plural democracy

Democratic loci of control can affect the outcomes of linguistic competition in various ways. Let us consider just one form of democracy here: *plural democracy*. This is a procedure in which each language group makes its own decisions, as a group, about the learning or nonlearning of its members. Whether or not formal constitutions define language groups as political subdivisions of states, there are often informal power relationships that make it realistic to pretend that each language group reaches autonomous decisions, reflecting the interests of the members of that group. The fact that people naturally find it difficult to deliberate in linguistically heterogeneous collectivities strengthens the tendency for language groups to function as de jure or de facto political subdivisions.

Let us make three further simplifying assumptions about language groups, namely (1) that all the members of one group have identical learning costs, (2) that any group makes identical choices for all its members, and (3) that the groups are large. These assumptions let us treat each group as if it were a single person, and a 2-group system becomes a 2-person system. Since learning costs are affected by a person's native language and by communicational and economic variables that tend to be associated with native language, the first additional assumption has some factual basis. The second assumption, too, may be taken as an idealization of a widespread tendency: the resistance of individuals to an attempt to deny learning to them which is believed beneficial to others whose interests are similar to theirs. The third assumption, also made above, lets us treat each person as a negligible proportion of his group.

The problem of 2 competing languages under plural democracy with simultaneous choice and homogeneous language groups can be modeled as a normal-form, 2-person, 2-by-2 game, in which each player's (i.e. group's) alternatives are *C* (to learn the other language) and *D* (not to learn it). There are four possible outcomes, each yielding two *payoffs*, namely relative utilities, one for each player. The outcomes can be called *CC*, *CD*, *DC*, and *DD*, as shown in Table 8.

Table 8. Form of a 2-Person Game of Linguistic Competition.

		Player 2: C	Player 2: D
Player 1	C	CC	CD
	D	DC	DD

Some predictions about choices in games of this form can be made on the basis of the ranks of each player's payoffs in the four outcomes, without taking account of cardinal payoff values. The model's assumptions allow us to specify these ranks, once we know something about each player's learning costs. Specifically, we can define low, medium, and high costs for a member of either group. A *low cost* is a learning cost that is less than the reward he would get for learning the other group's language. A *medium cost* is a learning cost that is less than the windfall he would get if all members of the other group learned his language, but greater than the reward he would get for learning theirs. A *high cost* is a learning cost exceeding the windfall he would get if all members of the other group learned his language. Formally, if we designate the size of his group as a proportion of the persons in the system by P_G, then

$$\text{low cost} < \log_e \{[P_G + W(1-P_G)] \div P_G\};$$

$$\log_e \{[P_G + W(1-P_G)] \div P_G\} < \text{medium cost} < \log_e (1 \div P_G);$$

$$\text{high cost} > \log_e (1 \div P_G).$$

Although these are called cost categories, they are really categories of relationship between cost and group size. Thus, a "low-cost" person can be interpreted as a person whose learning cost is low, a person whose native-language group is small, or both.

There are six possible relationships between the cost levels of the two groups. Three of these relationships can exist when the two groups' members have learning costs in the same category. In Table 9, each payoff matrix corresponds to the form in Table 8, and in each cell the two players' payoff ranks are given. The left number is the rank of the outcome for the row player (the one choosing between the two rows), and the right number its rank for the column player. Rank 4 represents the player's highest relative utility, rank 1 the lowest.

Table 9. Equal-Cost Games of Linguistic Competition.

Players' Learning Costs

	Low, Low			Med., Med.			High, High	
	C	D		C	D		C	D
C	**3,3**	2,4	C	3,3	1,4	C	2,2	1,4
D	4,2	1,1	D	4,1	**2,2**	D	4,1	**3,3**
	(Chicken)			(Prisoner's Dilemma)			(Game 9)	

The other three relationships between learning costs exist when one group's members have learning costs of a higher category than the other group's members. Differences in learning cost can be broadly interpreted. In most language conflict, one language and its speakers are regarded as more powerful than another language and its speakers. This inequality is often due to different group sizes or to different language or group statuses. A low-power group will generally "need" to know another language more than a high-power group and consequently show less resistance to learning a language. Low-power groups thus tend to act as if their language-learning costs were lower. The games for the three unequal-cost relationships are shown in Table 10.

Table 10. Unequal-Cost Games of Linguistic Competition.

Players' Learning Costs

	Low, Med.			Med., High			Low, High	
	C	D		C	D		C	D
C	3,3	**2,4**	C	3,2	1,4	C	3,2	**2,4**
D	4,1	1,2	D	4,1	**2,3**	D	4,1	1,3
	(Game 39)			(Game 11)			(Game 35)	

Each combination of learning-cost categories produces a different game. The games' conventional names are given below them, with their numbers according to Rapoport & Guyer (1966) where no common names exist.

If each player (as we have been assuming) maximizes his relative utility under the worst-case prospect for the other player's simultaneous choice, he makes the *maximin* choice. If both players do this, they produce the joint maximin outcome. In these six games the joint maximin outcome is always identical to what Rapoport & Guyer (1966) call the "natural outcome"—an outcome determined by four rules. The joint maximin outcomes are shown in Tables 9 and 10 in bold face.

The predicted outcomes show a regular association between language learning and learning cost. Low-cost groups always choose to learn the other language, while medium- and high-cost groups always choose not to learn it. The resulting outcomes are always efficient except in the medium/medium case, where both groups would have greater payoffs if they both chose to learn than they have in the predicted outcome.

The inefficiency of the medium/medium case results from the effects of those who learn on those whose languages are learned. Learners remove the incentive for learning in the opposite direction. I prefer that you learn my language, but if I know you will do so I have no incentive to learn yours. That is why the row player always prefers DC to CC. At medium cost levels, I also have no incentive to learn your language if I know you are *not* going to learn mine. As a result, at medium cost I have a *dominant alternative*, nonlearning, which, when both players choose it, yields an inefficient outcome.

The power interpretation given above for differences in learning cost is consistent with the outcomes in Table 10. In each game, the presumedly high-power player, namely the one with a higher cost category, gets a higher relative-utility rank from the outcome than does the low-power player, and the low-power player always gets his next-to-worst rank. The high-power player not only does better than the low-power player (in rank terms), but he also, in two out of three cases, does better than he would have if the low-power player had been equal to him in power (i.e. cost category).

The assumed intra-group democracy combined with inter-group anarchy in this procedure does not make bargaining tactics relevant. Were the two groups to negotiate about each group's members will learn the other language, the outcomes in Tables 9 and 10 could be changed in various ways. Several of the outcomes are vulnerable to agreements, threats, and force (see Rapoport & Guyer, 1966), generally to the advantage either of both groups or of the weaker group. In the low/high condition, however, the low-power group is truly powerless, because the outcome is vulnerable to neither threat nor force.

Conclusion

Choices between linguistic alternatives can be modeled as easily as choices on any other political issue. But the form of a model of language choice can vary greatly with different assumptions about the "procedure"—including the orientations of those making the choices.

Some commentators on language choice—I interpret O'Barr (1976) as one—have been tempted to generalize that it is inherently nonconflictual: a matter of convention, where there is a perfect solution that suits everyone's interests. Others, such as Rustow (1970), have interpreted language conflict as a matter of utmost conflict, so profound that there is little or no reason to expect hostility over language ever to abate. It may also be attractive to think about a common language as a "public good" in light of the external benefits that learners generate for others, and in this light to compare languages with such institutions as military defense, lighthouses, firefighting systems, property rights systems, noncommercial radio and television broadcasts, and clean air (Margolis, 1982, p. 19; Mueller, 1979, p. 12-13; Samuelson, 1976, p. 162). And, while it is often assumed that A benefits when B learns A's language, sometimes it is more realistic (e.g., Weinstein, 1983, pp. 120-131) to interpret language competence as a scarce basis for political power, and to assume that B's knowledge of A's language weakens, rather than benefits, A.

The deductions drawn here, from a small sample of assumptions about who makes linguistic choices for whom and how, suggest that there is some truth to be gleaned from all these and still other insights.

For example, the usual assumption about "public goods" is that everyone except the contributor benefits from a contribution to their provision. But it seems difficult to fit that assumption to at least an important segment of linguistic behavior. Instead, the more reasonable assumption is that only persons in certain linguistic circumstances benefit from the contribution made by a language learner, and that it is also important to distinguish realized benefits from prospectively contingent benefits. Thus, the description of the beneficial effects originating with a person's choice to learn a language is more complex than the one-shot, universal benefit that a contribution to a public good is usually assumed to produce.

Despite certain differences, models of the common-language problem and public-goods models arouse some similar concerns. An important question both inspire is whether people *will* contribute as much as they—in some sense—*should* contribute, either in their own or in some social interest. Relatedly, both are used for exploring the procedures that will lead to outcomes that satisfy certain criteria.

Depending on assumed motives and other conditions, the main problem in linguistic choice may be understood as coordination, or the division of scarce values, or the recapture of external benefits, or decisions under uncertainty, or (not discussed here) the expansion of value through technical innovation. Any blanket generalization about the kind of model that fits all linguistic choice would be baseless. With linguistic choice, as with other multiply motivated activities, choosing the right model is half the fun.

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