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Adopting Local Languages as Official Languages: Effect on Women and Rural Individuals' Labor Force in Burkina Faso†

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This study investigates the impact of the use of the main local languages in Burkina Faso (Moore, Dioula, Fulfulde) on labor force participation. Using Ethnologue language data, I compute the relative language distance reduction index, after which I use a probit/logit model and instrumental variable approach to account for language use policy endogeneity. This study finds that the use of the Moore language increases the likelihood of labor force participation by 36 percent, with a strong impact on women at 59 percent, nine times higher than men, and 38.3 percent for rural individuals, five times higher than individuals living in urban areas. The Dioula language exhibits comparable trends, while Fulfulde has a negative impact on individuals. The study recommends the use of local language(s) as official language(s) to improve labor force participation. However, a bilingual approach combining local and international language(s) will be of use to account for globalization and international competitiveness. The findings here may be of use to researchers and policymakers as part of their effort to increase the labor force participation rates of women and rural individuals. Moreover, this research has significant implications with regard to the implementation of language use policies in a variety of postcolonial language contexts.

Key Word: Language and ethnicity, Labor and participation, Institutions, Globalization, Rural and women
JEL Code: D90, J71, J78

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I. Introduction

Language-related human capital matters in that is affects individuals' socioeconomic outcomes (Isphording, 2014; Seid, 2017). Language is a means of communication between individuals, allowing interaction and strengthening the social fabric. From a sociolinguistic perspective, a language is a vehicle of national identity and cultural identification. That is why language use policy has been a very sensitive issue throughout time and within countries (Hamel, 2013; James and Lambert, 2009; Yameogo, 2019). Why is language use policy so important? Language issues are important: first, for multicultural and multilingual countries that seek to implement a language use policy in their country, taking into account ethnic diversity and sometimes different antagonisms between ethnic groups. Second, for monolingual countries, such as South Korea, which use their mother-tongue as the official language, while also implementing an international language as a second official language for international competitiveness, and economic purposes is necessary (Chang, 2018; Lee, 2018). Finally, for immigrants who must learn the host country's language to ease integration and participate efficiently in the labor market (Dustmann and Fabbri, 2003). For these and other reasons, the importance of language affects many aspects of life and is straightforward.

Over the past few years, a growing body of work has closely investigated the impact of language skills on individuals' outcomes, and economic growth (Hall and Jones, 1999; Crystal, 2003; Chong, Guillen, and Rios, 2009; Lee, 2012; Laitin and Ramachandran, 2014; 2015; Seid, 2017; Chang, 2018; Di Paolo and Tansel, 2019; Yameogo, 2019). These studies shed light on the importance of language not only for economic growth but also for individual-level outcomes. Although most of these studies find that language proficiency is a key determinant of country-level or individual-level outcomes, they only focused on the use of English as an international lingua-franca. Many of them failed to take into account single country characteristics, such as a country's local languages in a multilingual country and the ability of individuals in the country to speak English or any other international languages and how this may affect the country's overall efficiency. Laitin *et al.* (2014; 2015) provide an interesting framework with which to analyze the relationship between local languages and economic outcomes in multilingual countries by computing an index, known as the language distance between two languages. Using this index, I investigated the relationship between the official languages used in African countries and their impact on industrialization in Africa (Yameogo, 2019). I found a negative, significant and strong impact of the non-indigenous languages when they are used as the official languages on African industrial performance outcomes. If these studies helped us to understand the impact of non-indigenous languages on economic outcomes, apart from Laitin *et al.* (2014; 2015), none of them have yet to predict the impact of the use of local languages on individuals' outcomes, and how the local language use policies may affect the entire society. This study seeks to address this research gap and provide a firm foundation on which to study the socioeconomic effects of adopting a local language as a national language. Although the focus of this study is Burkina Faso, the findings here may be generalized and applicable to other contexts. Certainly, the methodological

approach taken in this paper can be applied to other language groups. The relative language distance change index developed in this study can be computed for all language groups.

This article seeks to extend the reach of previous studies by providing empirical evidence of the importance of using the local language(s) as the official language(s) in the labor market in Burkina Faso. For this purpose, the article presents the following questions: how will the use of one or more local language(s) spoken in Burkina Faso, instead of French, as the official language affect individual access to the labor market, particularly for women and rural individuals? Because Burkina Faso has more than 60 different ethnic groups, how will the choice of the official language(s) be made and how could this choice reinforce the social fabric instead of tearing it? What initial condition(s) should be met to allow the development of a sound local language use policy in Burkina Faso?

To answer these important questions, I hypothesize that (1) the use of local language(s) as the official language, because it will reduce the language distance between the chosen official language(s) and other local languages, will have a positive effect on labor force participation in Burkina Faso; (2) given that most local languages belong to the Niger-Congo language family, the choice of the official languages should be based on the magnitude of the impact of each language on access to the job market and the proportion of individuals speaking the local language(s); (3) local language use policymakers in Burkina Faso could conduct deep institutional reforms in the country to reinforce the trust between ethnic groups and encourage and incentivize exogamy (marriage between different ethnic groups) to increase interaction between ethnic groups at all levels. Additionally, the use of French and English in early childhood education will improve proficiency, as long-term exposure to only one's mother tongue can hinder foreign language learning and proficiency acquisition (Isphording, 2014; Seid, 2017). To the best of my knowledge, no previous studies have attempted to predict the outcome of the use of a local language as the official language in Burkina Faso, nor indeed in most African countries. Accordingly, this study will provides researchers and policymakers with an empirical framework to develop a sound and useful language use policy in Burkina Faso and in other multilingual countries looking to implement such a policy.

This article utilizes a logit method with data from IPUMS and the language family classification from Ethnologue (Lewis, 2009); the study also uses labor force participation data from Burkina Faso for individuals between 15 and 64 years old as a dependent variable, with the relative language distance reduction as the main variable of interest. Furthermore, to account for potential endogeneity and measurement error in the language use policy, an instrumental variable approach is adopted.

The remainder of this article is structured as follows: the next section discusses theoretical and empirical studies of languages and labor force participation; section 3 presents the empirical strategy, section 4 the findings and discussion, and section 5 the summary as well as recommendations related to this study.

II. Language Distance, Labor Market Institutions, and Economic Outcomes

A. *Institutions and Economic Outcomes*

Institutions matter (North, 1991; Acemoglu, Johnson, and Robinson, 2005; Acemoglu and Robinson, 2012). Since the study of North (1991), institutions have gained importance and the roles played by institutions in explaining socioeconomics outcomes have become a matter of debate. Indeed, the contentious debate between those holding institutionalist and distortionist views about the roles and places of institutions are ongoing. For institutionalists, institutions are important because they reduce transaction costs, allow equity in the distribution of revenue, moderate crises and protect economic agents (e.g., workers, investors). Conversely, for distortionists, "institutions impede economic efficiency" (Betcherman, 2013, p.3). Betcherman (2013) highlighted the main difficulties in considering the impact of institutions on socioeconomic outcomes. The first problem is how to measure institutions, as they are qualitative entities and measurement error can easily occur. The second problem relates to the endogeneity of institutions given that they can affect socioeconomic outcomes through local average effects of certain other factors. With regard to such cases, Betcherman (2013) argues that the effects of institutions may be ambiguous and hence not directly captured. These problems related to institutional variables have also been discussed by Thomas (2010), who reached the conclusion that researchers should use institutional variables, particularly, World Governance indicators, cautiously when drawing policy recommendations. Surely, we are far from the day economists reach a unanimous position on how best to measure institutions and how to present compelling results. Betcherman (2013), however, recognizes that the use of new empirical methodologies can help to resolve the problems mentioned above and that sound results can be obtained with these new tools. In the same vein, Portes (2006) argued that institutions are important for fostering growth, though the concept of an institution remains complex and economists should work closely with sociologists and historians for a better understanding of what institutions really are. Despite these controversies, one can agree with North (1991) that institutions matter and that countries which exhibit high economic performance are those which have good institutions (Acemoglu *et al.*, 2005; Acemoglu and Robinson, 2012). The next question to ask is how labor market institutions affect socioeconomic outcomes.

Labor market institutions play a key role in the functioning of labor markets. According to Betcherman (2013, p.2), the "laws, practices, policies, and conventions that fall under the umbrella of 'labor market institutions' determine inter alia what kind of employment contracts are permissible; set boundaries for wages and benefits, hours, and working conditions; define the rules for collective representation and bargaining; proscribe certain employment practices; and provide for social protection for workers." This definition clearly highlights formal institutions, instead of informal institutions, which are the "invisible" unobservable values and norms and culture and social ties that have a deep impact on economic outcomes. It clearly appears that while previous studies demonstrated the importance of institutions on

labor markets or on the overall economy, most failed to provide an in-depth analysis of the importance of informal institutions, considered by North (1991) to be much more important than formal institutions. Betcherman (2013) also recognized that informal institutions are not well investigated; hence one cannot assess how informal institutions affect the labor market. However, language-related human capital, an informal institution, is said to play a key role in economic growth and individuals' socioeconomic outcomes.

B. *Language and Labor Force Participation*

The languages spoken by a community or ethnic groups in a given geographical region play a crucial role in enabling interactions between individuals. Most importantly, language is said to foster individuals' creativity and to strengthen their national identity. In contrast, when a society fails to keep its identity, it leads to acculturation by individuals. Diop (1974) and Thiong'o (1986) used the concept of cultural alienation to qualify the situation that arises in African countries when they use foreign language(s) too distant to the most commonly spoken local languages. They argue that it is difficult and even impossible for Africans to innovate and develop their creativity because they are not thinking in a language which captures their reality, their environment, and their history. This can explain why the authors supported the argument that "decolonizing the mind" is the key to improve individuals' creativity and efficiency. In the same vain, Chong *et al*. (2009) find that "commonality in spoken language elicits cultural identification" (p.2), with cultural affinity reflected in the strengthening of the social fabric. A society or community where this exists thus exhibits a high level of trust. The resulting effects of high trust among individuals are low transaction costs and fewer disputes, helping "operate markets and other economic and social institutions" (Chong *et al*. 2009, p.3). The link between language and economic performance through the effect of trust is interesting and may explain the low economic performance of African countries (Nunn and Wantchekon, 2011). Nunn and Wantchekon (2011) find that the slave trade has created high mistrust among ethnic groups in Africa and has led to low economic growth.

Language-related human capital and ethnic fragmentation are informal institutions which play a key role in multilingual countries. Easterley and Levine (1997) and Nunn *et al*. (2011) found, respectively, that ethnic fragmentation has a significant, negative impact on economic growth, and high mistrust within ethnic groups in Africa - due to the slave trade - has a negative impact on current African economic growth. Thus, the relatively weak economic performance of African countries is due to ethnic fragmentation and mistrust among ethnic groups. Therefore, an analysis of the impact of language in a multicultural and multilingual country is crucial. The importance of language use policies has been advocated by history, and countries all over the world have sought to implement language use policies which can ease policy implementation, bolster human capital accumulation, and strengthen the social fabric (James and Lambert, 2009; Záhořík and Teshome, 2009; Laitin and Ramachandran, 2014, 2015; Marwa, 2014; Hamel, 2013; Yameogo, 2019). James and Lambert (2009) presented an insightful historical analysis of language policies in France. They argued that France has approximately 70 ethnic groups and that during the

French Revolution, the French language was imposed on the population. Non-acceptance of the French language was considered to be a denial of French national identity and was severely punished. The French language use policy in France was coercively introduced, and coercive language use policies were also used in Spain under Franco. Thus, non-democratic regimes imposed monolingual language use policies in France and Spain, and debates over language use policies in France and the issue of minorities are still ongoing and strong. James and Lambert (2009) cited a survey that estimated the number of languages spoken in France in 2009 to be 400. In this case, national identity appears to be the main argument for monolingualism. Other countries have different language use policy histories. Hamel (2013) examined language use policies in Latin America. After a coercive attempt to impose an international language (Spanish) on a monolingual basis, Latin American countries had to change their language use policies from monolingual to multilingual considering minorities present within their borders. Hamel's (2013) study sheds light on the ideological and political biases in language use policies. The roles played by elites and politics are crucial for a proper identification of proper language use policies.

An identical situation arose in Ethiopia (Záhořík and Teshome, 2009), where the official language, Amharic, is considered to be the language of the King. However, after 1994 the country found it necessary to consider minorities' will to use their mother tongue in schools. Ethiopia shifted from a monolingual language use policy for Amharic to a multilingual language use policy, with Amharic as the official language and other languages, such as Oromo, as regional languages. Seid (2017), analyzing the use of mother-tongue languages in later labor market outcomes in Ethiopia, finds a statistical and positive relationship. Schooling in the mother tongue increases the likelihood of later labor market participation, with a language use policy favorable to the use of local language providing better outcomes as well. The idea is that individuals with better language skills are likely to have jobs and better wages. Here, one should consider the structure of the labor market of the chosen country; proficiency in a language is conducive to a better employment outcome when this language is the language used in the labor market. If the labor market is controlled by foreign companies, where the use of an international language is mandatory for employment, being proficient in the local language will clearly play a marginal role in accessing the labor market and in some cases may have a negative impact on individual employment. This is the case of Morocco, where Angrist and Lavy (2018) find that the change of the official language from French to Arabic led to reductions in earnings. Therefore, a language use policy is also a labor market reform. This can explain why immigrants must learn the host country's language. Immigrant case studies in the United Kingdom showed that immigrants with proficiency in English are more likely to participate in the labor market than others, as the labor market language is English (Dustmann and Fabbri, 2003). In the same vein, Di Paolo and Tansel (2019) find a positive and significant impact of English proficiency on women's employment in Turkey.

The use of local language(s) may be a barrier to some when they attempt to access the labor market. Indeed, Seid (2017) highlighted the fact that long-term exposure to one mother tongue may hinder the acquisition of proficiency of other national and international languages and may have a negative impact on the labor market for

sectors in which international languages are needed. International competitiveness is reduced and individuals in these situations are less likely to enter the international labor market. Countries such as Burkina Faso have a small private sector, and multinational companies using international languages are dominant; consequently, the shift from French to a local language should take into account international competitiveness. Lee (2018) showed that the South Korean government, although it failed to use English as the second official language (Choe, 2016), implemented English language reforms in order to increase the international competitiveness of Koreans. Therefore, the use of local languages should occur simultaneously with international languages at an early age to simplify make the learning process (Isphording, 2014).

Having highlighted the importance of language in labor force participation and summarized the main ideas in relation to institutions and economic outcomes at the country or individual level, let us now review the empirical strategy used in this study to analyze the impact of the local language use policy in Burkina Faso and its effects on labor force participation.

III. Data analysis and empirical strategy

A. *Overview of Labor Market and Language Issues in Burkina Faso*

Table 1 presents the descriptive statistics of the data. In the dataset, 74.8 percent of the individuals surveyed were in the labor force as of 2006, with 84.3 percent on average having less than a primary school education, 26.1 percent at the primary school education level, 5.3 percent at the secondary school level and 1.97 percent at the university level of education. The labor market in Burkina Faso is dominated by the informal sector, which hires the least educated individuals and pays them lower salaries. Correspondingly, given the difficult access to schooling, numerous individuals must be involved in the labor market while also lacking a higher level of education. The dataset shows that around 72.92 percent of individuals live in rural

TABLE 1— DESCRIPTIVE STATISTICS

Variables	(1) N	(2) mean	(3) sd	(4) min	(5) max
Labor Force Participation	606,701	0.748	0.434	0	1
Relative language distance reduction to Moore	606,701	0.979	0.0400	0.845	1
Relative language distance reduction to Fulfulde	606,701	0.963	0.0296	0.877	1
Relative language distance reduction to Dioula	606,701	0.936	0.0433	0.791	1
Male	606,701	0.457	0.498	0	1
Less than primary school	606,701	0.843	0.363	0	1
Primary school	606,701	0.261	0.674	0	2
Secondary school	606,701	0.0530	0.395	0	3
University	606,701	0.0197	0.280	0	4
Number of children	606,701	1.789	2.169	0	9
Age 15-64	606,701	31.31	12.97	15	64
Living in urban area	606,701	1.271	0.444	1	2

TABLE 2— LABOR FORCE PARTICIPATION BY GENDER IN BURKINA FASO, 2006

Moore	All		Female		Male	
Labor force participation	Total	Percentage	Total	Percentage	Total	Percentage
No	83,520	24%	62,437	34%	21,083	13%
Yes	269,784	76%	131,753	67%	138,031	87%
Dioula	All		Female		Male	
Labor force participation	Total	Percentage	Total	Percentage	Total	Percentage
No	15,602	40%	11,486	59%	4,116	22%
Yes	23,063	60%	8,108	41%	14,955	78%
Fulfulde	All		Female		Male	
Labor force participation	Total	Percentage	Total	Percentage	Total	Percentage
No	22,675	35%	20,718	63%	1,957	6%
Yes	41,595	65%	12,158	37%	29,441	94%
Total labor participation	456,239	100	246,660	100	209,583	100
No	121,797	27%	94,641	38%	27,156	13%
Yes	334,442	73%	152,019	62%	182,427	87%

areas; due to difficult access to education in such areas, lacking sometimes the basic infrastructure, the school dropout rate is generally higher.

Table 2 presents the labor force participation by ethnic group and gender in Burkina Faso for the three main spoken languages. The overall labor force participation rate of individuals for these languages is high (73 percent), with 76 percent for Moore, 65 percent for Fulfulde and 60 percent for Dioula. Moreover, 87 percent of males and 62 percent of females are in the labor force. Although a cross-ethnic group analysis appears to show an advantage for those who speak the Moore language (76 percent), while a cross-gender analysis indicates a higher rate for males (87 percent), it is difficult to assert that the differences in labor force participation according to ethnic group and gender are based on ethnicity. It is important to note that labor market access may require proficiency in French and local language(s) depending on factors such as the location of the jobs and firm targets. Due to the particular labor market conditions in multilingual countries with low proficiency in the official language (French), such as Burkina Faso, a local language-based premium is more reliable than an ethnicity-based perspective. Consequently, the ethnic advantage is indirectly related to the use of this particular ethnic group's language, and any individual proficient in this language, native or not, enjoys an increased likelihood of being in the labor force. Therefore, proficiency in the labor market language should be mainly considered during recruitment as compared to an individual's ethnic background. One's ethnic background should be analyzed from the perspective of how it affects their language proficiency.

The data shows that 94 percent of Fulfulde males are in the labor force compared to 37 percent of females. This ethnic group exhibits the highest male participation rate in the labor force and the lowest female participation rate. This higher level of labor market activity by males in the Fulfulde group may be explained by the pastoralist nature of this ethnic group. Males are active and self-employed early. In contrast, females engage more in house and family work. Table 3 sheds light on the share of inactive females involved in domestic tasks across ethnic groups, alongside the literacy rate in each group. Among the 37 percent of inactive Fulfulde females,

TABLE 3— LITERACY AND INACTIVE FEMALES ENGAGED IN DOMESTIC WORK

(UNIT: %)

	Literate Males	Literate Females	Inactive Females in Domestic Work
Moore	33	17	23
Fulfulde	7	4	56
Dioula	60	44	40

56 percent are engaged in domestic tasks. Compared to Moore and Dioula speakers, one can assert that the labor of Fulfulde females is home-oriented; therefore, schooling is not seen as valuable.

Also, as expected, the literacy rate of the Fulfulde ethnic group is very low. As nomads, school attendance is negatively affected, with most of them outside the formal education system. As a result, individuals' levels of proficiency in the labor market language (French) are lower. A change in the language policy from French to a local language will lead to a withdrawal of many active Fulfulde (both males and females) from the labor force, as compared to other ethnic groups. The changes in education programs induced by such a language policy are likely to increase job opportunities in local languages. Thus, the strong return of education in local languages will mainly affect the Fulfulde ethnic group, who are mostly outside the formal education system, as compared to the Moore and Dioula. Consequently, in the short term, labor force participation may be reduced for the Fulfulde, as literacy in French will be important to read and write in local language(s) and, as literate Francophones, most of whom are from the Moore and Dioula ethnic groups, will be able to acquire literacy in local languages more easily than Fulfulde individuals.

The difference in literacy between the Dioula and Fulfulde is high and may be significant in explaining the difference in the impact of the language use policy on the labor force participation rate.

Burkina Faso has more than 60 ethnics groups, with local languages belonging mainly to the Niger-Congo language family. Only a few of them, located in the northern part of the country are from the Nilo-Saharan language family. In the dataset, there are 13 most commonly spoken languages in the country (see Table 4). The most commonly spoken language is Moore, spoken by around 58 percent of people, followed by Fulfulde with 11 percent native speakers and then Dioula with 7 percent being native speakers. These numbers from the dataset mirror the country's language representation. These three languages are therefore used as official language candidates in this study.

Combining Tables 1 and 4, the shift from French to the local language as the official language shows that the language distance reduction is greater when using Moore, followed by Fulfulde and then Dioula. This means that if the country uses, for instance, Moore as the official language instead of French, the relative language distance reduction from French to Moore will be on average 98 percent: 96 percent for Fulfulde and 94 percent for Dioula. The higher the relative language distance reduction to Moore, Fulfulde and Dioula, the shorter the language distance from the local languages to Moore, Fulfulde and Dioula. The language distance reduction indexes all exceed 90 percent, which means that the cost of using a non-indigenous language is higher and that this cost may be reduced by changing the policy adopted in relation to the use of local language(s). Note that the distance from each local

TABLE 4—LANGUAGE SPOKEN IN BURKINA FASO (SPOKEN BY AT LEAST 1% OF THE POPULATION)

Language Spoken, Burkina Faso	Freq.	Percent	Cum.
Bissa	20,584	3.39	3.39
Bobo	10,054	1.66	5.05
Bwamu (or Bwamou)	14,569	2.40	7.45
Dagara	13,598	2.24	9.69
Dioula (or Bambara)	38,655	6.37	16.07
Fulfulde (or Peulh)	64,274	10.59	26.66
Goulmancema (or Gourmanché)	39,990	6.59	33.25
Lyele	11,058	1.82	35.07
Lobiri	11,033	1.82	36.89
Moore	353,304	58.23	95.13
Nuni (or Nounouma)	7,776	1.28	96.41
San (or Samogho, Samo)	12,652	2.09	98.49
Senoufo	9,144	1.51	100.00
Total	606,701	100.00	

language to French is 1, as the local languages and French belong to different language families. Certainly, it is difficult for individuals speaking local languages in Burkina Faso to speak French. Less than 20 percent of Burkinabe speak, read and write in French, despite the fact that the country has long been under France control and was eventually influenced by the language and culture of France. In the next section, the article discusses the empirical strategy utilized here.

B. *Empirical Strategy*

In this article, I investigate the importance of a local language use policy with regard to labor force participation in Burkina Faso. In Burkina Faso, the formal labor market language is French, the official language of the country. It is important to note that because the most commonly spoken languages in Burkina Faso belong to the Niger-Congo family and that the current official language, French, belongs to the Indo-European language family, it is difficult for individuals in Burkina Faso to learn the French language. The underlying idea behind this strategy is that if the country reduces the distance between individuals' mother tongues and the language of administration, education, and the labor market, one can expect a considerable improvement in individuals' outcomes, such as a high labor force participation rate, high education levels, good health, and longer life expectancies. For this purpose, I compute the relative language distance reduction from French to the three local languages which serve as candidates for the official language. Of course, if the computed relative language distance reduction index increases, the distance between the most commonly spoken language in the country and the local language candidates for the official language will be reduced. This will therefore improve individuals' outcomes. This study borrows the concept of the language distance index from previous studies (Laitin and Ramachandran, 2014; 2015; Yameogo, 2019), as expressed below,

$$d_{ij} = 1 - \left(\frac{\#\ of\ common\ nodes\ between\ i\ and\ j}{\frac{1}{2}\left(\#\ of\ nodes\ for\ language\ i + \#\ of\ nodes\ for\ language\ j\right)} \right)^{\lambda},$$

where the index d_{ij} computes the distance between two languages i and j, and the value λ shows how rapidly the distance between the two languages declines as the number of shares increases. The idea is that when individuals speaking different languages interact, they are likely to share some words. Fearon (2003) suggested a value of 0.5. The language distance index is between 0 and 1. A distance of zero means that the two languages belong to the same family and sub-family group. Thus, they share numerous common words and the language structures bear many similarities. In such a case, it is easier for two individuals who speak these languages to interact and to learn one another's language. Conversely, when the distance equals 1 or is closer to 1, the two languages do not have common nodes or share few common words, and they have different structures. In such a case, learning one another's language can be challenging. We can consider a South Korean learning English and a French speaker learning English. Obviously, it will be easier for the French speaker to learn English than for the Korean speaker to learn English. French and English belong to the same language family (Indo-European) while Korean belongs to the Koreanic language family.

Figure 1 presents the method used to compute the number of nodes. For example, for the two languages spoken in Burkina Faso (Moore and Birifor), there are 11 nodes from Moore to Niger-Congo and 12 from Birifor to Niger-Congo. There are thus 11 common nodes between them. Additionally, the two languages of Moore and Farefare belong to the same sub-group. However, the ethnic group that speaks Farefare lives generally in Ghana, a country neighboring Burkina Faso. Theoretically, it should be easier for an individual who speaks Moore to speak Farefare, spoken in Ghana, than for such an individual to speak Birifor in Burkina Faso. However, because Birifor and Moore are generally spoken in the same country, where speakers

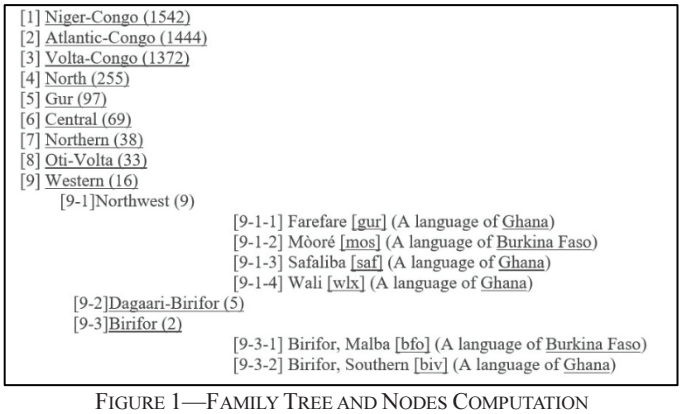

FIGURE 1—FAMILY TREE AND NODES COMPUTATION

are more likely to interact, the number of common nodes may increase more rapidly than that associated with the language in Ghana. Moreover, due to the fact that the two countries have been separated by a language barrier (Burkina Faso uses French as an official language while Ghana uses English), the populations in both countries are less likely to interact compared to a country such as Cote d'Ivoire, which shares French as an official language with Burkina Faso. The official languages inherited from colonial countries have created barriers between individuals whose official languages are different.

The strategy in this article is first to use the indicator described above to compute the language distances between the 13 most commonly spoken languages in Burkina Faso and the three local languages candidate as official language Moore, Fulfulde, and Dioula (d_{iJ}); and second to compute the distance between the most commonly spoken languages in Burkina Faso and French (d_{iF}). Then, the relative language distance reduction index (Rd_{ij}) is computed as follows: $Rd_{ij} = \frac{d_{iF} - d_{iJ}}{d_{iF}}$, where d_{iF} is the language distance from local language i to French (F), and d_{iJ} is the language distance from local language i to the local language used as the official language instead of French ($J = Moore, Fulfulde, Dioula$). The relative language distance reduction indexes from French to the three local languages are computed as follows:

For Moore: $Rd_{im} = \frac{d_{iF} - d_{im}}{d_{iF}}$; Fulfulde: $Rd_{if} = \frac{d_{iF} - d_{if}}{d_{iF}}$;

and Dioula: $Rd_{id} = \frac{d_{iF} - d_{id}}{d_{iF}}$.

Here, [1] represents the distance between the different local languages used in the country and the current official language, French. In addition, [2] is the distance between the local language candidates for the official language in the country and other local languages spoken in the country. The use of these local languages reduces the language distance from [1] to [2], making it shorter. The relative language distance reduction index captures the distance [3], computing it using the following formula ([1]-[2])/[1]). This relative language distance reduction index captures the gain in distance, [3], when using local languages instead of an international language as the official language. [4] measures the effect of the increase in the distance [3] on the labor force participation rate in Burkina Faso. This effect is assumed to be positive, as the reduction of the distance between the languages spoken in the country and the local official language is shortened to [2]. An increase of [3] reduces [2]. In other words, the distance [3], the relative language distance reduction index, measures the effect of a change in the language policy.

After computing the relative language distance reduction index, this study uses the probit/logit model to measure the impact of the language distance reduction (Rd_{ij}) on labor force participation in Burkina Faso. Moreover, due to the potential

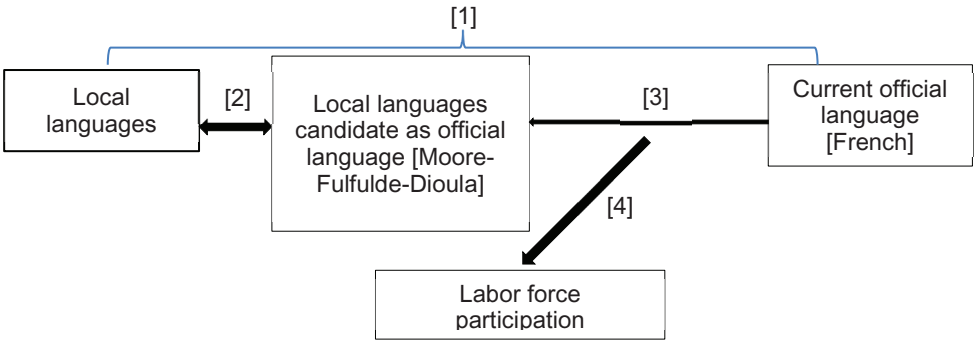

FIGURE 2—THEORETICAL FRAMEWORK

endogeneity of the language use policy and the potential for measurement errors, an instrumental variable is used to tackle these problems (Adkins and Hill, 2008; Cameron and Trivedi, 2010; Greene, 2012; Wooldridge, 2013).

The theoretical model is based on Bowen and Finegan (1969), who developed a comprehensive framework for modeling and regressing labor force participation (LFP). Bowen and Finegan (1969) analyzed labor force participation under the General Theory of Choice. In their detailed study, they found that the decision to be part of the labor force depends on "four broad classes of variables: (1) tastes, (2) expected market earnings rates, (3) expected non-market earnings rates, and (4) the household's total source constraint" (p.16). In other words, the decision to be part of the labor force depends on individual characteristics and market conditions. (Sackey, 2005), using population census data instead of labor data, focused more on rich demographic information to highlight female labor force participation in Ghana. Due to the lack of labor survey information in Burkina Faso, the approach developed by Sackey (2005) will be of great importance to capture the key determinants of labor force participation using demographic characteristics. Clearly, the lack of data relative to the market conditions is a limitation of this study. However, the results will provide us with a comprehensive understanding of the labor force dynamics in Burkina Faso using cell phone possession and electricity availability as proxies of individual income, though they could be enriched further with labor data.

This regression model is based on work by Laitin and Ramachandran (2014) on the effect of the local languages on Indian individuals' employment prospects.

The regression model is as follows:

The outcomes variable (y = labor force participation) takes one of two values:

$$Laborforce\ (y) = \begin{cases} 1 & \textit{if the individual participate to the labor market} \\ 0 & \textit{if the individual does not participate to the labor market} \end{cases}.$$

The latent-variable:

$$Laborforce_i = X_i\beta + u_i,\ \ i = 1, 2, \cdots, N \text{ and } \Pr(y = 1 \mid x) = X_i\beta + u_i$$

Because the model is not linear, OLS cannot be used to estimate the coefficient β. The maximum likelihood estimation of logit and probit models is used. To interpret the coefficient, the marginal effect at the mean is used to compare the variable to the average individual in the population. The robust standard error is used to address the heteroskedasticity issue. In this study, standard errors should be clustered by ethnic groups; however, given that the number of groups is small (13 ethnic groups in the dataset) the cluster standard error (CSE) does not provide a sound standard error. According to the rule of thumb, the number of groups should be higher than or equal to 50 to allow for clustering (Wooldridge, 2013).

Having stated the empirical framework of this study, let us now turn to the regression analysis of this article. Equation (1) is the main equation of this regression, where the dependent variable is the labor force participation rate in Burkina Faso.

$$(1) \qquad Laborforce_i = \beta_0 + \beta_J Rd_{iJ} + \beta X_i + u_i, \quad i = 1, 2, \cdots, N$$

Here, the index Rd_{ij} represents the relative language distance reduction from French to the targeted local official language J for individual i speaking his/her local language. β_J is the coefficient of the language distance reduction of each local language used as the official language. Because this study focuses on the three most widely spoken language in the country (Moore, Fulfulde and Dioula), $J = 3$, and the model regresses three different equations. β_J is expected to have a positive sign. An increase in the distances between Moore, Fulfulde and Dioula and the current official language French, means a reduction in the distances between the local languages and the local language used as the official language. This reduction in the distance reduces the transaction costs and facilitates access to information necessary to gain a job; moreover, the reduced language distance provides opportunities to people excluded from the labor market due to the language barrier, allowing them to increase their language-related human capital and bolster their competitiveness in the labor market.

The covariates X_i represent the set of explanatory variables having an impact on labor force participation. Educational attainment, the number of children, gender, age, age square, marital status, religion, place of birth and living areas are the main individual characteristics I controlled for. To capture the market conditions, cell phone possession and electricity availability are used as proxies for income/wage. A good market condition should allow an individual to be able to afford a cell phone and electricity. As mentioned earlier, the standard errors are heteroskedastic-robust. The results are summarized in Tables 5 and 6. Tables A1, A2, and A3 present the regression tables for the main control variables.

In this study, I also utilized an instrumental variable approach due to the potential endogeneity of the language use policy and due to the possible measurement error which can arise when reporting and computing the different language distance reduction indexes. The language use policy is said to be endogenous. According to Hamel (2013), language use policies are strongly dependent on the factors of

political will and ideology, as seen in France, Spain, Japan, and Ethiopia, among other countries. The historical background of the country also factors into the choice of language use policy. Nunn and Wantchekon (2011) clearly highlighted that countries which have historically experienced high mistrust between ethnic groups, mostly African countries, find it difficult to choose a local language as an official language in the country. Individuals in such countries may prefer a foreign language to other local languages.

An instrumental variable is thus necessary to address these main empirical issues. The idea is to find an instrument which does not belong to the main equation (1) [instrument exclusion: $\text{cov}(z,u)=0$] but which is strongly correlated with the main variable of interest [instrument relevance: $\text{cov}(z,x)\neq 0$]. In this article, for each local official language, I use a dummy variable as an instrumental variable.

Instrumental exclusion or instrumental exogeneity is difficult to prove; hence, a researcher should rely on intuition and theory (Wooldridge, 2013). The second assumption means that the first stage exists. In addition, a weak instrument test is used to ensure that the instrument is good enough to capture the local average effect. Because this study uses one instrument per interest variable, there is no need to test for over-identification; accordingly, the F-statistic of the first stage is sufficient to use to test whether the instrument is weak or not. The F-statistic value of ≥ 10 shows that the instrument is good and not weak.

$$ivrd=\begin{cases}1 & \textit{if the individual speaks the local language used as the official language}\\ 0 & \textit{if the individual does not speak the local language used as the official language}\end{cases}$$

For instance, if assuming that Moore is the local language used as the official language in Burkina Faso, the instrumental variable consists of the native speakers of Moore. The idea is that if Moore is used as the official language and has a positive impact on labor force participation, then its native speakers should benefit from labor market access. It can therefore be asserted that there is a strong correlation between belonging to the Moore ethnic group and the use of Moore as the official language in the country. Instrument relevancy then is expected to hold. For instrumental exclusion or exogeneity, this article assumes that there is no direct link between the ethnic group and labor market access. There is no ethnic premium in the labor market in Burkina Faso; however, this study assumes that the only ethnic premium in the labor market should be through the use of the particular ethnic group's language in the labor market. For example, for some jobs, proficiency in a particular local language, along with French, increases the chance of getting hired. Even if in some cases certain individuals may be likely to hire workers from the same ethnic group, these cases are marginal and may not be significant enough to guide labor market trends. Thus, for the purposes of this study, it is assumed that there is not an ethnicity-based premium and that ethnic group origin does not determine hiring in Burkina Faso unless the labor market language is this ethnic group's language or requires this language along with French. Moreover, being part of a certain ethnic group is exogenous. Instrumental exclusion therefore holds here. The underlying intuition is that if individuals whose mother tongue is used as the official language are more likely to participate in the labor force, then those who are not natives but could easily

speak this language will also easily enter the labor market. The IV probit model is used to perform the regression, as IV logit does not exist.

Although it is important to investigate the potential endogeneity of the language use policy and how it may affect labor force participation, this article follows the hypothesis of Laitin and Ramachandran (2014). In their study of the impact of local languages on Indians' employment, upon which approach my paper is based, endogeneity is not an important factor. They state "[We] …omitted variable bias and reverse causality in our setting is not likely to be an important factor" (p. 36).

The next section presents and discusses the results

IV. Results and discussion

Table 5 summarizes the main findings of this study. This study measures the impact of Moore, Fulfulde and Dioula on labor force participation. For each language, the table shows an overall effect, a gender-specific effect and a living area effect. Table 6 presents the instrumental variable results.

For the Moore language, the study found a positive effect of a relative language distance reduction on labor force participation for the population. These results are statistically significant at the 1 percent level. The overall model regression results show that the relative language distance reduction index is positively correlated with labor force participation. A 1 percent increase in the relative language distance reduction index improves the chance of labor force participation by 36 percent. Moreover, being in a rural area increases the likelihood of labor force participation by 16.1 percent. Considering the gender and living area effects, the study found that the use of Moore as an official language has a greater impact on females than on males; in addition, rural individuals are more strongly affected than those living in urban areas. In general, the chance of being part of the labor force in Burkina Faso for females is 58.9 percent, against 7 percent for males. The outcome for female participation is approximately nine times greater than that for males. Rural individuals' labor force participation likelihood is around five times higher compared to the result for urban individuals (38.3 percent for rural individuals against 8.7 percent for those in urban areas). In addition, we note that the urban effect is not significant. Citizens in urban areas are bilingual in French and local languages. A change of the official language from French to a local language is not expected to have a strong or significant impact on their labor force participation rate. In contrast, rural individuals, mostly monolingual in local languages, are significantly and positively affected by the language change from French to a local language.

The use of the Dioula language as an official language in Burkina Faso increases the labor force participation likelihood by 32 percent. Again, the impact of the use of a local language on the likelihood of labor participation by females is higher than that for men, at 50.7 percent to 4.4 percent, respectively, a difference of more than tenfold. Additionally, 25.3 percent of rural individuals are likely to participate in the labor force, against 12.2 percent for urban people. These results are in good agreement with several previous studies (Chong, Guillen, and Rios, 2010; Laitin and Ramachandran, 2014; 2015; Seid, 2017; Yameogo, 2019). The use of the two local languages (Moore and Dioula) reduces transaction costs and importantly increases

TABLE 5—LOGIT AND PROBIT REGRESSION RESULTS (MARGINAL EFFECT AT THE MEAN)

Interest variables	Logit					Probit				
	All	Male	Female	Rural	Urban	All	Male	Female	Rural	Urban
Relative language distance reduction index [*Moore]*	0.357*** (0.019)	0.067*** (0.010)	0.589*** (0.032)	0.383*** (0.018)	0.079 (0.051)	0.371*** (0.019)	0.106*** (0.014)	0.577*** (0.031)	0.414*** (0.019)	0.075 (0.048)
Relative language distance reduction index [*Fulfulde*]	-0.472*** (0.025)	0.066*** (0.013)	-0.994*** (0.044)	-0.509*** (0.025)	0.004 (0.066)	-0.465*** (0.026)	0.091*** (0.019)	-0.974*** (0.042)	-0.519*** (0.026)	0.003 (0.063)
Relative language distance reduction index [*Dioula*]	0.322*** (0.016)	0.044*** (0.008)	0.507*** (0.027)	0.253*** (0.015)	0.122** (0.040)	0.327*** (0.016)	0.070*** (0.012)	0.492*** (0.026)	0.272*** (0.017)	0.117** (0.038)
Other Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	598,629	273,492	325,137	436,554	162,075	598,629	273,492	325,137	436,554	162,075

Note: Robust-standard errors in parentheses, *p<0.05, **p<0.01, ***p<0.001.

TABLE 6—INSTRUMENTAL VARIABLE REGRESSION RESULTS (MARGINAL EFFECT AT THE MEAN)

Interest variables	IV-Probit- First stage [*First-stage independent variable: Dummy variables]**					IV-Probit - Second stage				
	All	Male	Female	Rural	Urban	All	Male	Female	Rural	Urban
Relative language distance reduction index [*Moore]*	0.054*** (0.000)	0.053*** (0.000)	0.055*** (0.000)	0.051*** (0.000)	0.061*** (0.000)	3.563*** (0.110)	0.841*** (0.212)	4.832*** (0.132)	6.078*** (0.143)	-0.140 (0.172)
Relative language distance reduction index [*Fulfulde*]	0.039*** (0.000)	0.039*** (0.000)	0.039*** (0.000)	0.038*** (0.000)	0.043*** (0.000)	-12.44*** (0.184)	-1.646*** (0.484)	-16.73*** (0.219)	-14.32*** (0.197)	-2.298*** (0.581)
Relative language distance reduction index [*Dioula*]	0.083*** (0.000)	0.083*** (0.000)	0.083*** (0.000)	0.093*** (0.000)	0.075*** (0.000)	0.909*** (0.113)	0.319 (0.192)	0.766*** (0.145)	-0.753*** (0.178)	0.408* (0.161)
Other Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	598,629	273,492	325,137	436,554	162,075	598,629	273,492	325,137	436,554	162,075

Note: Robust-standard errors in parentheses, *p<0.05, **p<0.01, ***p<0.001.

labor force participation likelihood of individuals with a great and positive impact on women and rural individuals.

Fulfulde provides contradictory results. The use of Fulfulde, while reducing the language distance between the ethnic languages in Burkina Faso and the official language, has a negative effect on labor force participation likelihood with a 47.2 percent reduction for all. Moreover, the results show that Fulfulde impacts females and males differently. While men are positively affected by the use of Fulfulde, with a 7 percent increase in labor force participation likelihood; women are negatively affected, with a 99 percent reduction in the chance of their being a part of the labor force. Seid (2017) noted that the use of one's mother tongue may have a negative effect on later labor force participation if the individual is overly exposed to the mother tongue and is not exposed enough to other languages. However, in this study, this explanation does not hold because males are positively affected and females are not. Moreover, in contrast to Moore and Dioula, rural individuals are less likely to join the labor force than urban individuals. The likelihood of labor participation for rural people is negative, and a reduction of approximately 50 percent in their chance at participation is observed, while the urban effect is not statistically significant for the above-mentioned reason. Given that the natives of Fulfulde are nomadic people and historically pastoralist and that they have less schooling and lower literacy rates, the use of a local language, reducing the learning cost and increasing job opportunities, may increase the number of Fulfulde individuals in the formal education system, thus increasing the number of inactive people and then reducing labor force participation. Indeed, Fulfulde exhibits the lowest level of literacy (for both males and females). The high impact on females can be explained by the fact that the small number of active females may be attracted to wage/paid work and be involved for a while in schools/literacy programs and therefore leave the labor force. One can expect a negative effect in the short term followed by a positive effect on the labor force in the mid and long term.

Another interesting finding is that animists have a greater opportunity to participate in the labor force than Protestants, Catholics and Muslims. This result is predictable because animism, as an endogenous religion, shapes the society's identity, culture and codifies interpretations of the universe. The local languages' effects along with the endogenous religion therefore develop and strengthen individual identities.

Table 6 summarizes the instrumental variable results. The instrumental variable approach shows that the impact of the use of Moore and Dioula is positive and statistically significant at the level of 1 percent. Additionally, the test of the weak instrument shows that the dummy variables for Moore, Dioula and Fulfulde are good instruments with which to test the relative language distance reductions for these three languages. The first-stage F-statistic exceeds 10 in all cases. The gender-specific and living area trends remain the same, except for Dioula, where rural areas become negatively affected; women and rural individuals are strongly affected by the language change policy, and Fulfulde exhibits the same contrary results due to the pastoralist and nomadic nature of this ethnic group.

Additional results show that when the local language effect is parsed out, first, the number of children in a family has a negative effect on the likelihood of labor participation, though the result is different between genders. Indeed, the number of

children increases the likelihood of males' participation in the labor market, while females are negatively affected by the number of children. Males in Burkina Faso are expected to work in order to provide for their families with sufficient financial support, while females are expected to stay home and take care of the family. Second, labor participation is affected differently depending on the education level. Those with less education and individuals with a university-level education are positively affected and are more likely to enter the labor force, whereas individuals with a primary school education and secondary-school education are less likely to participate in the labor force.

Moreover, the findings of this article show that the use of local languages (Moore and Dioula) has a positive and significant impact on labor force participation; women are most affected by the use of a local language, and their participation in the labor force is increased. Additionally, rural individuals are more likely to participate in the labor force than those living in urban areas. The use of an official language close to the most commonly spoken language in a country improves economic outcomes, particularly the labor force participation of individuals. Conversely, the use of Fulfulde has a negative effect on women and rural individuals, while men and urban individuals are positively affected.

V. Summary and recommendations

In this article, I investigate the impact of the use of local languages as official language(s) in Burkina Faso on labor force participation. The country has approximately 60 ethnic groups and local languages, and less than 20 percent of the population can speak French, the current official language. According to previous studies, the use of a language as an official language has an impact on socio-economic outcomes; the impact is negative when this official language is too distant to the most commonly spoken language in the country (Laitin and Ramachandran, 2014; 2015; Yameogo, 2019). Based on the language distance index developed by Laitin *et al*. (2014), this article develops and computes the relative language distance reduction index to take into account a language use policy change from a remote official language to a closer local language when used as an official language. The data was sourced from the IPUMS survey and from the Ethnologue language classification. A probit/logit model and an instrumental variable approach were used to measure the impact of the use of the three main local languages (Moore, Fulfulde and Dioula) as candidates for the official language on labor force participation in Burkina Faso.

The findings are consistent with those from theoretical and empirical studies; the use of local languages has a positive and significant impact on labor force participation by individuals in Burkina Faso. An unexpected result came from the female and rural individuals' labor force participation rates when using Fulfulde as the official language. Thus, to be precise, the study finds that if Burkina Faso changes it language use policy by adopting Moore as the official language instead of French, the language distance will be reduced by more than 98 percent, and this reduction will in turn have a positive impact on labor force participation (nearly a 40 percent increase). From a gender-specific perspective, the impact is nine times higher for

females than for males. Individuals living in rural areas will see their chance of participating in the labor force increased by nearly five times than urban individuals. The use of Dioula led to a language distance reduction of 93.6 percent; a 1 percent increase in the language distance reduction index improves labor force participation likelihood by around 32 percent. Again, the impact of the use of a local language on the labor participation rate for women is higher than that for men by more than ten times. The likelihood of entering the labor force for rural individuals is two times greater than it is for those living in urban areas. Regarding the case of Fulfulde, although the language distance is reduced by 96.3 percent, the language effect on labor force participation is negative. A 1 percent increase in the language distance reduction decreases the labor force participation likelihood by 50.9 percent. However, a gender-specific analysis shows that the impact of Fulfulde is positive on men and negative on women. Rural individuals are negatively affected by the use of Fulfulde as the official language. The negative effect in the short term may be due to the pastoralist and nomadic nature of this ethnic group, where males are active and self-employed earlier and females are engaged in housework. The use of a local language will lead to an increase of inactive individuals due to greater involvement in formal education. However, this study predicts a positive effect on labor force participation in the mid and long term.

Finally, the overall positive effect of the local language on females is explained by the fact that women in Burkina Faso are less educated than men. Additionally, rural individuals compared to urban individuals are less favored with regard to access to education and to basic infrastructure. In fact, there is a gender gap and geographical discrimination that affect access to education; therefore, the removal of the language barrier will strongly and positively affect females and rural individuals' access to the labor market.

The instrumental variable approach shows statistically significant results at the level of 1 percent. The coefficients are higher than in the probit/logit estimation.

The study also shows that among the three languages, Moore exhibits the shortest language distance to the other local languages, followed by Fulfulde and then Dioula. Moreover, the contribution to the labor force is higher when using Moore. Dioula has the second highest impact on individuals' labor force participation rates. We also note that the most commonly spoken language in the country is Moore, spoken by more than 50 percent as native speakers. If one considers labor force participation, the language use policy should stipulate the use of Moore as the official/national language in the country. However, the strategy suggested by this study is to use the other languages as regional languages given findings that show that the use of a mother tongue has a positive impact on labor force participation (Seid, 2017). Nevertheless, since Seid (2017) argued that extended exposure to one's mother tongue can hinder the acquisition of proficiency in other languages, this study suggests the use of French and English as foreign languages, with these languages to be taught at an early stage along with regional and local official languages (Isphording, 2014).

One precondition when implementing a language policy is to build strong institutions in the country to accommodate ethnic diversity and reduce mistrust between ethnic groups (Karnane and Quinn, 2017; Nunn and Wantchekon, 2011; Yameogo, 2019). Encouraging exogamy and protecting endangered languages will

be of great importance to create social links and strengthen the social fabric. Moreover, the country should clearly amend the constitution to protect the status of all languages, as in Ethiopia (Záhořík and Teshome, 2009), and to promote minorities as a foundation of a strong society. The language policy should be implemented with the acceptance and participation of the population, meaning that a national consensus is needed. This topic is sensitive and should be implemented in different steps and on a mid- to long-term basis, as failure can lead to ethnic conflicts. A stakeholder analysis is crucial to draw a map of the interests and powers involved in the policy implementation process.

This study did not consider whether it is easier to standardize certain languages for education purposes, particularly in relation to the links (historical and current) between ethnic groups in the country. Further work should focus on these characteristics and should also increase the number of dependent variables to measure the impact of language reduction on the socioeconomic outcomes of various groups.

Lastly, because this study has shown that the adoption of a local language has the potential to increase labor participation by women and rural individuals substantially, the findings here may have some far-reaching implications for governments and organizations seeking to broaden labor participation. Moreover, the methodology presented in this article may be generalized and applied to multilingual contexts where policymakers are seeking to make changes in language policies. The language distance reduction (change) index developed here, based on the language family classification method (Lewis, 2009) and the language distance index of Laitin and Ramachandran (2014), will be of significant use for policymakers looking to implement language use policy changes.

APPENDIX

TABLE A1—LOGIT RESULT (MARGINAL EFFECTS AT MEAN)

	Moore					Fulfulde					Dioula				
	All	Male	Female	Rural	Urban	All	Male	Female	Rural	Urban	All	Male	Female	Rural	Urban
Relative language distance reduction indexes (RdiJ)	0.357*** (0.019)	0.067*** (0.010)	0.589*** (0.032)	0.383*** (0.018)	0.079 (0.051)	-0.472*** (0.025)	0.066*** (0.013)	-0.994*** (0.044)	-0.509*** (0.025)	0.004 (0.066)	0.322*** (0.016)	0.044*** (0.008)	0.507*** (0.027)	0.253*** (0.015)	0.122** (0.040)
Male	0.307*** (0.001)			0.249*** (0.001)	0.433*** (0.003)	0.308*** (0.001)			0.250*** (0.001)	0.433*** (0.003)	0.307*** (0.001)			0.250*** (0.001)	0.433*** (0.003)
# of Children	-0.004*** (0.000)	0.002*** (0.000)	-0.003*** (0.001)	0.001* (0.000)	-0.018*** (0.001)	-0.004*** (0.000)	0.002*** (0.000)	-0.003*** (0.001)	0.001* (0.000)	-0.018*** (0.001)	-0.004*** (0.000)	0.002*** (0.000)	-0.003*** (0.001)	0.001* (0.000)	-0.018*** (0.001)
Less than primary	0.030*** (0.009)	0.025*** (0.005)	0.025 (0.015)	0.026** (0.008)	0.025 (0.024)	0.030*** (0.009)	0.025*** (0.005)	0.024 (0.015)	0.027** (0.008)	0.025 (0.024)	0.030*** (0.009)	0.025*** (0.005)	0.025 (0.015)	0.026** (0.008)	0.025 (0.024)
Primary	-0.084*** (0.004)	-0.028*** (0.003)	-0.069*** (0.008)	-0.095*** (0.004)	-0.092*** (0.012)	-0.085*** (0.004)	-0.028*** (0.003)	-0.072*** (0.008)	-0.097*** (0.004)	-0.092*** (0.012)	-0.084*** (0.004)	-0.029*** (0.003)	-0.070*** (0.008)	-0.096*** (0.004)	-0.092*** (0.012)
Secondary	-0.034*** (0.003)	-0.022*** (0.002)	0.011 (0.006)	-0.020*** (0.004)	-0.061*** (0.008)	-0.035*** (0.003)	-0.022*** (0.002)	0.010 (0.006)	-0.021*** (0.004)	-0.061*** (0.008)	-0.035*** (0.003)	-0.022*** (0.002)	0.010 (0.006)	-0.021*** (0.004)	-0.061*** (0.008)
University	0.057*** (0.004)	0.004* (0.002)	0.120*** (0.007)	0.009 (0.007)	0.085*** (0.008)	0.057*** (0.004)	0.004* (0.002)	0.119*** (0.007)	0.009 (0.007)	0.085*** (0.008)	0.057*** (0.004)	0.004* (0.002)	0.119*** (0.007)	0.008 (0.007)	0.085*** (0.008)
Age	0.025*** (0.000)	0.017*** (0.000)	0.021*** (0.001)	0.011*** (0.000)	0.070*** (0.001)	0.025*** (0.000)	0.017*** (0.000)	0.021*** (0.001)	0.010*** (0.000)	0.070*** (0.001)	0.025*** (0.000)	0.017*** (0.000)	0.021*** (0.001)	0.010*** (0.000)	0.070*** (0.001)
Age square	-0.033*** (0.000)	-0.022*** (0.000)	-0.029*** (0.001)	-0.014*** (0.000)	-0.087*** (0.001)	-0.032*** (0.000)	-0.022*** (0.000)	-0.029*** (0.001)	-0.014*** (0.000)	-0.087*** (0.001)	-0.032*** (0.000)	-0.022*** (0.000)	-0.029*** (0.001)	-0.014*** (0.000)	-0.087*** (0.001)
Muslims	0.016 (0.010)	0.013 (0.007)	0.002 (0.017)	0.019* (0.009)	-0.050 (0.032)	0.017 (0.010)	0.013 (0.007)	0.004 (0.017)	0.022* (0.009)	-0.050 (0.032)	0.015 (0.010)	0.013 (0.007)	0.000 (0.017)	0.019* (0.009)	-0.052 (0.032)
Catholics	0.041*** (0.010)	0.009 (0.007)	0.059*** (0.017)	0.053*** (0.009)	-0.052 (0.032)	0.042*** (0.010)	0.009 (0.007)	0.061*** (0.017)	0.054*** (0.009)	-0.051 (0.032)	0.041*** (0.010)	0.009 (0.007)	0.059*** (0.017)	0.053*** (0.009)	-0.052 (0.032)
Protestants	0.032** (0.011)	-0.003 (0.007)	0.057*** (0.017)	0.051*** (0.009)	-0.079* (0.033)	0.034** (0.011)	-0.003 (0.007)	0.060*** (0.017)	0.053*** (0.009)	-0.078* (0.033)	0.032** (0.011)	-0.003 (0.007)	0.057*** (0.017)	0.052*** (0.009)	-0.079* (0.033)
Animists	0.074*** (0.010)	0.020** (0.007)	0.107*** (0.017)	0.067*** (0.009)	0.017 (0.034)	0.072*** (0.010)	0.020** (0.007)	0.104*** (0.017)	0.067*** (0.009)	0.017 (0.034)	0.074*** (0.010)	0.020** (0.007)	0.106*** (0.017)	0.067*** (0.009)	0.018 (0.034)
Rural areas	0.150*** (0.002)	0.035*** (0.001)	0.249*** (0.003)			0.150*** (0.002)	0.035*** (0.001)	0.249*** (0.003)			0.153*** (0.002)	0.035*** (0.001)	0.253*** (0.003)		
Electricity	0.009*** (0.002)	0.004*** (0.001)	0.023*** (0.004)	0.051*** (0.005)	0.034*** (0.003)	0.012*** (0.002)	0.004*** (0.001)	0.028*** (0.004)	0.052*** (0.005)	0.034*** (0.003)	0.013*** (0.002)	0.005*** (0.001)	0.028*** (0.004)	0.053*** (0.005)	0.035*** (0.003)
Cell phone	0.021*** (0.002)	0.003*** (0.001)	0.043*** (0.003)	0.017*** (0.002)	0.023*** (0.003)	0.022*** (0.002)	0.003*** (0.001)	0.045*** (0.003)	0.020*** (0.002)	0.023*** (0.003)	0.021*** (0.002)	0.003*** (0.001)	0.043*** (0.003)	0.018*** (0.002)	0.023*** (0.003)
Other Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	598629	273492	325137	436554	162075	598629	273492	325137	436554	162075	598629	273492	325137	436554	162075

Note: Robust-standard errors in parentheses, *p<0.05, **p<0.01, ***p<0.001.

TABLE A2—PROBIT (MARGINAL EFFECTS AT MEAN)

	Moore					Fulfulde					Dioula				
	All	Male	Female	Rural	Urban	All	Male	Female	Rural	Urban	All	Male	Female	Rural	Urban
Relative Language distance reduction indexes (RdiJ)	0.371*** (0.019)	0.106*** (0.014)	0.577*** (0.031)	0.414*** (0.019)	0.075 (0.048)	-0.465*** (0.026)	0.091*** (0.019)	-0.974*** (0.042)	-0.519*** (0.026)	0.003 (0.063)	0.327*** (0.016)	0.070*** (0.012)	0.492*** (0.026)	0.272*** (0.017)	0.117** (0.038)
Male	0.319*** (0.001)			0.267*** (0.001)	0.422*** (0.003)	0.320*** (0.001)			0.267*** (0.001)	0.422*** (0.003)	0.320*** (0.001)			0.267*** (0.001)	0.422*** (0.003)
# of Children	-0.004*** (0.000)	0.002*** (0.000)	-0.003*** (0.001)	0.001* (0.000)	-0.016*** (0.001)	-0.004*** (0.000)	0.002*** (0.000)	-0.003*** (0.001)	0.001* (0.000)	-0.016*** (0.001)	-0.004*** (0.000)	0.002*** (0.000)	-0.003*** (0.001)	0.001* (0.000)	-0.016*** (0.001)
Less than primary	0.033*** (0.009)	0.033*** (0.007)	0.024 (0.015)	0.029** (0.009)	0.027 (0.022)	0.033*** (0.009)	0.033*** (0.007)	0.023 (0.015)	0.030** (0.009)	0.027 (0.022)	0.033*** (0.009)	0.033*** (0.007)	0.024 (0.015)	0.029** (0.009)	0.027 (0.022)
Primary	-0.086*** (0.005)	-0.039*** (0.004)	-0.069*** (0.008)	-0.102*** (0.005)	-0.086*** (0.011)	-0.087*** (0.005)	-0.039*** (0.004)	-0.071*** (0.008)	-0.103*** (0.005)	-0.086*** (0.011)	-0.087*** (0.005)	-0.039*** (0.004)	-0.070*** (0.008)	-0.103*** (0.005)	-0.086*** (0.011)
Secondary	-0.036*** (0.003)	-0.027*** (0.002)	0.010 (0.006)	-0.023*** (0.004)	-0.058*** (0.008)	-0.036*** (0.003)	-0.027*** (0.002)	0.009 (0.006)	-0.024*** (0.004)	-0.058*** (0.008)	-0.036*** (0.003)	-0.028*** (0.002)	0.010 (0.006)	-0.024*** (0.004)	-0.058*** (0.008)
University	0.054*** (0.004)	0.008*** (0.002)	0.114*** (0.007)	0.008 (0.007)	0.074*** (0.007)	0.054*** (0.004)	0.008*** (0.002)	0.113*** (0.007)	0.007 (0.007)	0.074*** (0.007)	0.054*** (0.004)	0.008*** (0.002)	0.113*** (0.007)	0.007 (0.007)	0.074*** (0.007)
Age	0.026*** (0.000)	0.020*** (0.000)	0.021*** (0.001)	0.012*** (0.000)	0.067*** (0.001)	0.026*** (0.000)	0.020*** (0.000)	0.020*** (0.001)	0.012*** (0.000)	0.067*** (0.001)	0.026*** (0.000)	0.020*** (0.000)	0.020*** (0.001)	0.012*** (0.000)	0.067*** (0.001)
Age square	-0.034*** (0.000)	-0.027*** (0.000)	-0.028*** (0.001)	-0.016*** (0.000)	-0.084*** (0.001)	-0.034*** (0.000)	-0.027*** (0.000)	-0.028*** (0.001)	-0.016*** (0.000)	-0.084*** (0.001)	-0.034*** (0.000)	-0.027*** (0.000)	-0.028*** (0.001)	-0.016*** (0.000)	-0.084*** (0.001)
Muslims	0.021* (0.011)	0.022* (0.009)	0.004 (0.016)	0.025* (0.010)	-0.046 (0.031)	0.023* (0.011)	0.022* (0.009)	0.006 (0.016)	0.028** (0.010)	-0.046 (0.031)	0.020 (0.011)	0.022* (0.009)	0.003 (0.016)	0.025* (0.010)	-0.047 (0.031)
Catholics	0.046*** (0.011)	0.017 (0.009)	0.060*** (0.016)	0.060*** (0.010)	-0.048 (0.031)	0.047*** (0.011)	0.017 (0.009)	0.061*** (0.016)	0.062*** (0.010)	-0.047 (0.031)	0.046*** (0.011)	0.017 (0.009)	0.060*** (0.016)	0.061*** (0.010)	-0.048 (0.031)
Protestants	0.037*** (0.011)	0.001 (0.010)	0.058*** (0.016)	0.058*** (0.010)	-0.073* (0.032)	0.039*** (0.011)	0.001 (0.010)	0.061*** (0.016)	0.060*** (0.010)	-0.072* (0.032)	0.037*** (0.011)	0.002 (0.010)	0.059*** (0.016)	0.059*** (0.010)	-0.074* (0.032)
Animists	0.080*** (0.011)	0.031** (0.009)	0.106*** (0.016)	0.076*** (0.010)	0.020 (0.033)	0.078*** (0.011)	0.031** (0.009)	0.102*** (0.016)	0.075*** (0.010)	0.019 (0.033)	0.080*** (0.011)	0.031** (0.009)	0.105*** (0.016)	0.076*** (0.010)	0.020 (0.033)
Rural areas	0.156*** (0.002)	0.049*** (0.001)	0.248*** (0.003)			0.155*** (0.002)	0.048*** (0.001)	0.249*** (0.003)			0.158*** (0.002)	0.049*** (0.001)	0.252*** (0.003)		
electricity	0.010*** (0.002)	0.006*** (0.001)	0.023*** (0.004)	0.056*** (0.005)	0.032*** (0.003)	0.013*** (0.002)	0.006*** (0.001)	0.027*** (0.004)	0.057*** (0.005)	0.032*** (0.003)	0.013*** (0.002)	0.007*** (0.001)	0.028*** (0.004)	0.058*** (0.005)	0.033*** (0.003)
Cell phone	0.022*** (0.002)	0.004*** (0.001)	0.042*** (0.003)	0.019*** (0.002)	0.021*** (0.003)	0.023*** (0.002)	0.004*** (0.001)	0.044*** (0.003)	0.022*** (0.002)	0.021*** (0.003)	0.022*** (0.002)	0.004*** (0.001)	0.042*** (0.003)	0.020*** (0.002)	0.021*** (0.003)
Other Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	598629	273492	325137	436554	162075	598629	273492	325137	436554	162075	598629	273492	325137	436554	162075

Note: Robust-standard errors in parentheses, *p<0.05, **p<0.01, ***p<0.001.

TABLE A3—INSTRUMENTAL VARIABLE RESULTPROBIT (MARGINAL EFFECTS AT MEAN)

	Moore					Fulfulde					Dioula				
	All	Male	Female	Rural	Urban	All	Male	Female	Rural	Urban	All	Male	Female	Rural	Urban
Relative language distance reduction indexes (RdiJ	3.563*** (0.110)	0.841*** (0.212)	4.832*** (0.132)	6.078*** (0.143)	-0.140 (0.172)	-12.435*** (0.184)	-1.646*** (0.484)	-16.733*** (0.219)	-14.321*** (0.197)	-2.298*** (0.581)	0.909*** (0.113)	0.319 (0.192)	0.766*** (0.145)	-0.753*** (0.178)	0.408* (0.161)
Male	1.151*** (0.005)			1.205*** (0.006)	1.094*** (0.007)	1.132*** (0.005)			1.184*** (0.006)	1.095*** (0.007)	1.157*** (0.005)			1.213*** (0.006)	1.095*** (0.007)
# of Children	-0.015*** (0.001)	0.022*** (0.004)	-0.009*** (0.002)	0.004** (0.002)	-0.042*** (0.003)	-0.015*** (0.001)	0.022*** (0.004)	-0.006*** (0.002)	0.003 (0.001)	-0.042*** (0.003)	-0.015*** (0.001)	0.022*** (0.004)	-0.008*** (0.002)	0.003* (0.002)	-0.042*** (0.003)
Less than primary	0.117*** (0.034)	0.310*** (0.068)	0.064 (0.041)	0.125** (0.041)	0.071 (0.058)	0.123*** (0.033)	0.314*** (0.068)	0.058 (0.039)	0.136*** (0.041)	0.070 (0.058)	0.120*** (0.034)	0.311*** (0.068)	0.065 (0.041)	0.137*** (0.041)	0.071 (0.058)
Primary	-0.310*** (0.017)	-0.370*** (0.034)	-0.182*** (0.021)	-0.463*** (0.021)	-0.224*** (0.029)	-0.319*** (0.017)	-0.370*** (0.034)	-0.202*** (0.020)	-0.471*** (0.021)	-0.227*** (0.029)	-0.313*** (0.017)	-0.370*** (0.034)	-0.189*** (0.021)	-0.466*** (0.021)	-0.224*** (0.029)
Secondary	-0.128*** (0.012)	-0.260*** (0.023)	0.029 (0.016)	-0.108*** (0.019)	-0.150*** (0.020)	-0.135*** (0.012)	-0.260*** (0.023)	0.014 (0.015)	-0.120*** (0.018)	-0.151*** (0.020)	-0.130*** (0.012)	-0.260*** (0.023)	0.027 (0.015)	-0.101*** (0.019)	-0.150*** (0.020)
University	0.195*** (0.013)	0.076*** (0.021)	0.309*** (0.019)	0.030 (0.031)	0.191*** (0.018)	0.182*** (0.013)	0.075*** (0.021)	0.277*** (0.018)	0.023 (0.030)	0.189*** (0.018)	0.194*** (0.013)	0.076*** (0.021)	0.308*** (0.018)	0.042 (0.031)	0.191*** (0.018)
Age	0.096*** (0.001)	0.193*** (0.002)	0.057*** (0.001)	0.055*** (0.001)	0.175*** (0.002)	0.090*** (0.001)	0.193*** (0.002)	0.047*** (0.001)	0.050*** (0.001)	0.174*** (0.002)	0.095*** (0.001)	0.193*** (0.002)	0.056*** (0.001)	0.054*** (0.001)	0.174*** (0.002)
Age square	-0.124*** (0.001)	-0.256*** (0.003)	-0.077*** (0.002)	-0.074*** (0.002)	-0.217*** (0.002)	-0.117*** (0.001)	-0.255*** (0.003)	-0.066*** (0.002)	-0.069*** (0.002)	-0.216*** (0.002)	-0.123*** (0.001)	-0.256*** (0.003)	-0.076*** (0.002)	-0.074*** (0.002)	-0.217*** (0.002)
Muslims	0.070* (0.035)	0.184** (0.068)	0.008 (0.042)	0.094* (0.038)	-0.121 (0.084)	0.098** (0.034)	0.186** (0.068)	0.043 (0.040)	0.169*** (0.037)	-0.124 (0.084)	0.070* (0.035)	0.184** (0.068)	0.009 (0.042)	0.106** (0.038)	-0.127 (0.084)
Catholics	0.156*** (0.035)	0.136* (0.068)	0.152*** (0.042)	0.250*** (0.038)	-0.124 (0.084)	0.170*** (0.034)	0.139* (0.068)	0.161*** (0.040)	0.263*** (0.037)	-0.124 (0.084)	0.162*** (0.035)	0.138* (0.068)	0.164*** (0.042)	0.266*** (0.038)	-0.128 (0.084)
Protestants	0.120*** (0.036)	0.010 (0.070)	0.144*** (0.043)	0.239*** (0.039)	-0.189* (0.086)	0.147*** (0.035)	0.015 (0.070)	0.174*** (0.042)	0.262*** (0.038)	-0.185* (0.085)	0.128*** (0.036)	0.012 (0.070)	0.160*** (0.043)	0.252*** (0.039)	-0.194* (0.085)
Animisms	0.301*** (0.035)	0.274*** (0.069)	0.301*** (0.042)	0.350*** (0.038)	0.052 (0.089)	0.260*** (0.034)	0.269*** (0.069)	0.233*** (0.041)	0.315*** (0.037)	0.053 (0.089)	0.295*** (0.035)	0.273*** (0.069)	0.292*** (0.042)	0.339*** (0.038)	0.056 (0.089)
electricity	0.033*** (0.008)	0.057*** (0.012)	0.058*** (0.010)	0.261*** (0.024)	0.084*** (0.008)	0.086*** (0.008)	0.065*** (0.012)	0.122*** (0.010)	0.271*** (0.023)	0.091*** (0.008)	0.046*** (0.008)	0.061*** (0.012)	0.071*** (0.010)	0.248*** (0.024)	0.086*** (0.008)
Cell phone	0.078*** (0.006)	0.041*** (0.011)	0.111*** (0.008)	0.078*** (0.011)	0.055*** (0.008)	0.095*** (0.006)	0.042*** (0.011)	0.138*** (0.008)	0.150*** (0.011)	0.054*** (0.008)	0.079*** (0.006)	0.040*** (0.011)	0.114*** (0.008)	0.092*** (0.011)	0.056*** (0.008)
Rural areas	0.571*** (0.006)	0.461*** (0.011)	0.686*** (0.007)			0.578*** (0.006)	0.462*** (0.011)	0.677*** (0.007)			0.569*** (0.006)	0.462*** (0.011)	0.677*** (0.008)		
Other Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	598629	273492	325137	436554	162075	598629	273492	325137	436554	162075	598629	273492	325137	436554	162075

Note: Robust-standard errors in parentheses, *p<0.05, **p<0.01, ***p<0.001.

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