

Outstanding Performance or Reversal of Fortune in Burundi's Education System?

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1. Introduction

Since the success of the Millennium Development Goals to get children into school, the focus of the international community has been reoriented towards the quality of schooling. The fourth goal of the Sustainable Development Goals set by the UN targets exactly that. It wants the global community not only to make sure that children attend school, but that schools also offer adequate training in reading and mathematics, tools that form the basis for all further cognitive development of a child (UNESCO 2017).

Burundi forms an interesting case study, as it experienced a massive increase in enrolment in primary school, but access to good quality education was not equally distributed over the country. The capital and the southern provinces were privileged by former presidents who came from the south and belonged to the Tutsi minority. Since his ascent to power, President Nkurunziza, a Hutu from the northern province of Ngozi, during his first mandate (2005–2010) heading a coalition government, and after a landslide victory in his second (2010–2015) and third mandate (2015–2020), has directed public funding to the northern provinces, Ngozi province in particular. Recent work has demonstrated that the population in the north benefits at multiple levels. Jadin (2020) uses household panel data with three waves (1998–2007–2012) and shows how income from agricultural activities as well as from coffee harvest increased in the north after the second wave, but not in the south, whereas both parts were on a parallel trend prior to the second wave. Verwimp (2019) highlighted the strong increase in school test scores obtained by schools in the north in the Concours National from 2010 onwards.

Education data worldwide are the product of an administrative process aggregating pupil-, teacher-, school- and district-level data as well as data from countries' national budgets. Researchers, donors, agencies and policymakers rely on the accuracy of these data to inform future policies, to draw a picture of the current state of affairs, to compare the performance of their country with neighbors and so on. Moreover, even the availability and accuracy of education data does not mean that national policymakers will take the evidence to heart. While, generally speaking,

there are no grounds not to have confidence in a country's education data, it often takes an outside look or evaluation to wake up national policymakers. This is all the more evident in the reactions to the results of the Program for International Student Assessment (PISA) in the national press, in particular when the results show that one's country is lagging behind compared to others.

In this study, we use an independent source of information on school quality and school test score data produced by the CONFEMEN (Conférence des ministres de l'Éducation des États et gouvernements de la Francophonie) Program for the Analysis of Education Systems (PASEC), in 2009 and in 2014, to find out if we are indeed witnessing a reversal of fortune in Burundi's northern versus southern provinces (see PASEC 2010, 2015, in the corresponding order). At the same time, we scrutinize Burundi's overall exceptional performance compared to other countries tested in PASEC (Programme d'Analyse des Systèmes Éducatifs de la Confemén). This allows us not only to compare test score data over time, but also between countries, making these data a valuable source for the analysis of educational performance.

2. Burundi's Education System

The report issued by PASEC after the first collection of test score data (PASEC 2010) lists many constraints and deficiencies in Burundi's education system, including the small tax base to finance educational expenses as a result of the high level of poverty in the country, the high birth rate that puts pressure on the educational system, the lack of adequate infrastructure and educational material, and the low qualification of teachers. As a result of the presidential decision to abolish school fees in primary school a major step towards realizing universal access as stipulated in SDG 4—the school population increased from 1,000,000 pupils in 2004 to 1,800,000 in 2008 (PASEC 2010, p. 29), a massive increase for which the school system was unprepared and under resourced. Nevertheless, the number of teachers and schools in that period also increased by 50%, keeping pace with the increase in pupils.

In Burundi, the first four years (out of six) of primary school are taught in Kirundi, the national language, a policy that has positively affected the retention and promotion of children in those grades. This can also be witnessed in the results of the PASEC tests run for literacy in Kirundi in the second grade. In fifth and sixth grade, however, all teaching is done in French, posing a strong hurdle for pupils and resulting in very high repetition and dropout rates.

On top of nationwide deficiencies in the education sector, Burundi is plagued by ethno-regional favoritism. At the end of the sixth grade, the Ministry of Education organizes a national test, the Concours National. Each year, the Ministry of Education

sets a threshold depending on the number of seats available in the country's secondary school system. Even before the start of the civil war, much fewer seats were available annually than pupils competing for a seat in the *Concours National*. This was a very competitive and merit-based system in which only a select few would attend secondary school. Dunlop (2015), who interviewed Hutu and Tutsi adults on their school career for her MA thesis, writes that the *Concours National* favored Tutsi pupils because the latter were better prepared for the exam in better-funded schools. The 'objective' outcome of the exam made Tutsi pupils believe that Hutu were not interested in pursuing secondary education and preferred to stay on farms. When he came into power, president Nkurunziza was determined to change this.

While the Ministry uses the *Concours National* to regulate access to secondary school, it can be usefully employed to monitor deficiencies in learning and to follow-up policies that improve the quality of education. The test measures the abilities of pupils in 4 domains: mathematics, French, Kirundi and environmental science. The maximum one could obtain was 200 points, with 80 for the math part, 70 for French, 30 for Kirundi and 20 for environmental science. The latter was conceived as a combination of biology and geography. As Ntwari (2016, p. 19) points out in his doctoral dissertation there is no separate training offered in Burundi for science teachers, in contrast to math. This may limit adequate teaching and curriculum development in the domain of sustainable development.

3. Data

We are using two PASEC data collection efforts in this chapter,¹ the first PASEC wave we use was implemented in more than 10 countries in the first decade of the new millennium (in Burundi in 2009). The PASEC is an international program that measures the academic performance of children attending primary school in French speaking Sub-Saharan African countries. In each country, PASEC surveys a nationally representative sample of schools randomly selected from active primary schools. To represent the variety of schooling environments available in the country, each sample is stratified by regions and types of school (e.g., private and public schools). Once a school is sampled, one class of second grade and one class of fifth grade students are randomly selected, and 15 students are randomly drawn from each class to take the test. Since primary school across sub-Saharan Africa are organized around six grades, surveying pupils from the second and fifth grades is expected

¹ PASEC. Available online: <http://www.pasec.confemen.org/> (accessed on 29 April 2020).

to yield a balanced image of numeracy and literacy skills near the entry and exit of primary education, while avoiding the peculiarities of the first and last grades.

Each student is assessed in language, arts and numeracy at the beginning and at the end of the academic year, using standardized tests made of multiple items in line with official curricula. At the end of the academic year, a teacher questionnaire provides further information on classroom organization and infrastructure, teacher characteristics, training, remuneration and literacy skills for each teacher. Similarly, the headmaster of each school is interviewed and provides detailed information on his/her characteristics, training, school infrastructure, pedagogical practices, and human resource practices.

The second PASEC test was done for all countries a few years later (in 2014). Three major modifications were applied. First, students were not sampled at the beginning of the school year anymore, but only at the end of the year instead. Second, students were tested in grade 6 instead of grade 5. Finally, the nature of the test itself changed: following the PISA methodology, the tests were designed to assess pupils' ability to achieve general objectives. For literacy, for instance, a general understanding of text and reading are tested. The methodology used to measure proficiency is based on Item Response Theory and uses plausible values. Consequently, PASEC 2014 tests are not directly comparable to PASEC 2009.

For the sake of comparability, we only used the end-of-the-year test in the first wave of PASEC. In the following, we refer to the tests implemented in grade 2 as "early primary" and those implemented in grade 5 (first wave) or grade 6 (second wave) as "late primary". Since the results of the two waves are not directly comparable, we first compare the relative performance of countries. Later in this chapter, we will use standardized test scores to compare different regions within Burundi.

In our analysis, we compare the following countries between the two waves: Burundi (2009 and 2014), Benin (2005 and 2014), Cameroon (2005 and 2014), Côte d'Ivoire (2009 and 2014), Senegal (2007 and 2014) and Tchad (2009 and 2014).

4. Descriptive Statistics

We start by plotting the results for the language and mathematics scores for PASEC 2009 in the second and fifth grades in Burundi and the other countries (Figure 1). In grade 2, compared to the other countries, Burundi has a low mean and low standard deviation on the French language test, meaning that practically everyone performs badly in the test. This comes as no surprise as the language of instruction in Burundi is Kirundi, the national language. French is not on the curriculum in grade 2. When we look at scores for the Kirundi test in grade 2,

the mean improves but the standard deviation is much larger, meaning that some pupils do well and other do not. For the mathematics test, the mean is high and the standard deviation low, a situation that we term “Scandinavian type”, as it means that everyone is doing well. The fact that mathematics is taught in Kirundi in the second grade may be the main explanation, as pupils are better able to understand the teacher.

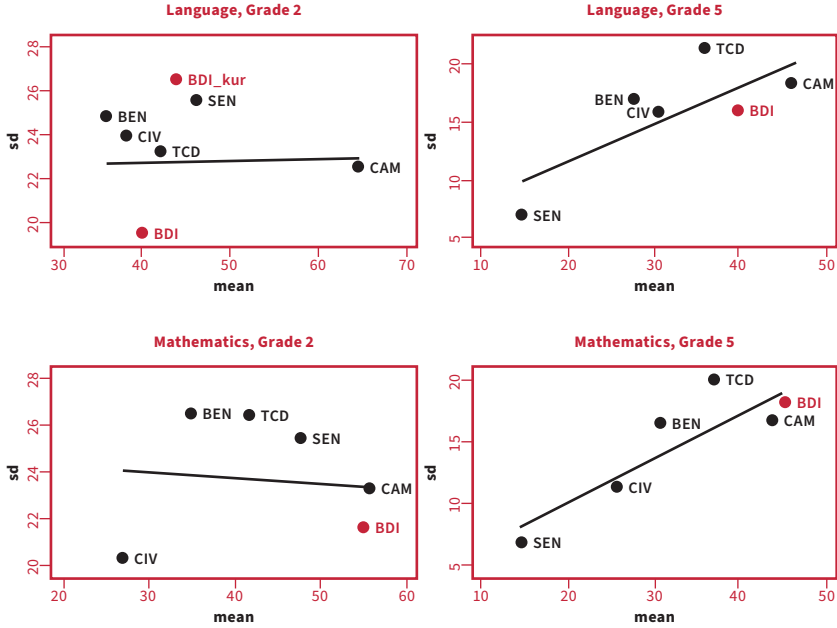


Figure 1. Mean and standard deviation for mathematics and language Program for the Analysis of Education Systems (PASEC) tests (2000s). Source: PASEC data for Burundi (2009), Benin (2005), Cameroon (2005), Côte d’Ivoire (2009), Senegal (2007) and Tchad (2009).

In grade 5, the mean and the standard deviation are both high, for mathematics as well as for language (which is solely French here), meaning that some but not all students do well. Importantly, we believe, in regard to the PASEC 2009 results for other countries, that the scores for Burundi cannot be considered outliers, neither for grade 2 nor for grade 5. In both grades, the combination of the mean and standard deviation for Burundi is in the proximity of the linear fitted line, albeit more obvious in grade 5 compared to grade 2, with the caveat that the linear fit is performed only on a very small sample of countries.

Turning our attention to PASEC 2014 (Figure 2), we notice the extremely positive scores for Burundi compared to other countries, meaning a very high mean and a low standard deviation. This is the most obvious in grade 6, but also in grade 2, as can be witnessed in Figure 2, for language as well for mathematics. The scores for Burundi are so exceptional that the country is situated far from the linear fit—an outlier, in other words.

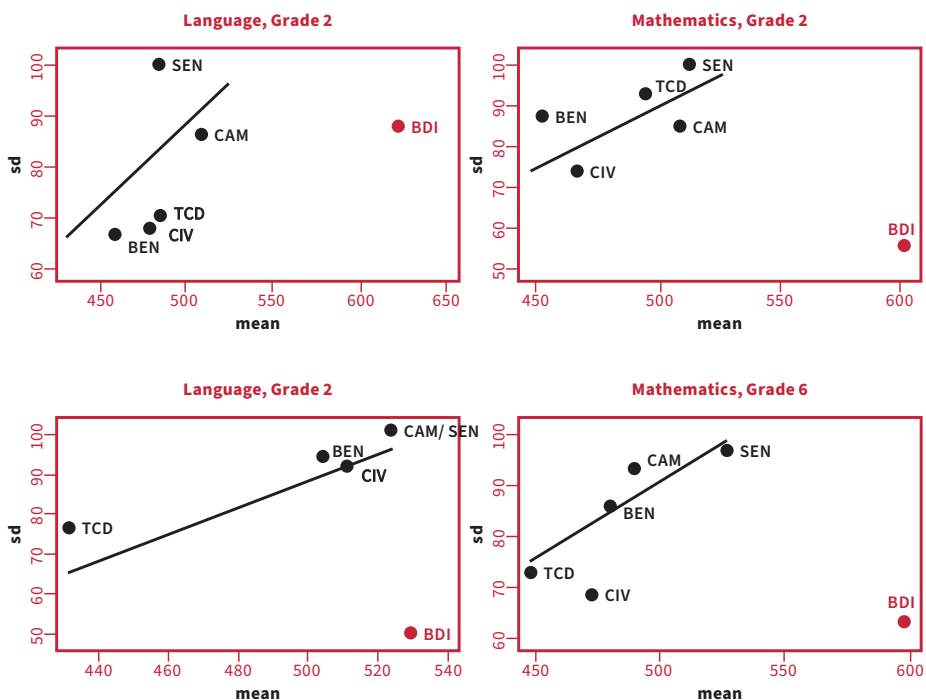


Figure 2. Mean and standard deviation for mathematics and language PASEC tests (2014)². Source: PASEC 2015.

² The linear prediction lines does not include Burundi.

When we compare test scores for grade 5 in PASEC 2009 with those for grade 6 in PASEC 2014 for those countries which took part in the test in both years, we notice that Cameroun, Benin and the Ivory Coast do not change much (meaning they demonstrate the same combination of mean and standard deviation), whereas the test scores for Chad deteriorate along the 45-degree axis (meaning that all students do worse in 2014 compared to 2009) and Senegal improves along the 45-degree axis. Burundi stands out as the only country that improves outside the 45-degree axis, meaning the mean score increases and the standard deviation decreases. For the language test, Burundi has the highest mean score combined with the lowest standard deviation of all countries. Since the test is testing the knowledge of French, and since French is the language of instruction only in the final two years of Burundi's primary school, this is an extraordinary performance. This is also the case for mathematics: the mean score for Burundi is also the highest of all countries, by a large margin, and Burundi also has the lowest standard deviation.

5. Difference in Differences Analysis

Upon disaggregating the test scores for Burundi for northern provinces versus southern provinces, we notice that the strong improvements for Burundi (higher mean and lower standard deviation in 2014 compared to 2009 compared to other countries) are mainly driven by the outstanding performance in the northern provinces. This can be witnessed in Figure 3.

Taking the analysis a step further, we perform a difference in differences analysis whereby the PASEC test score results for 2009 serve as the baseline, where we compute the changes with 2014 in the north and in the south of the country. Later, we discuss the parallel trends assumption that we are making here and demonstrate that both parts of the country were indeed on a parallel trend prior to 2009.

The results in Table 1 show that pupils in the northern provinces of Burundi, in general, perform worse compared to the southern provinces and that the test scores in 2014 were lower compared to 2009. However, compared to the south, northern test scores improve much more in 2014, which we demonstrate with the statistical significance of the interaction effect (even if the proportion of the variance described by this model, represented by the R-squared statistics, is very low).

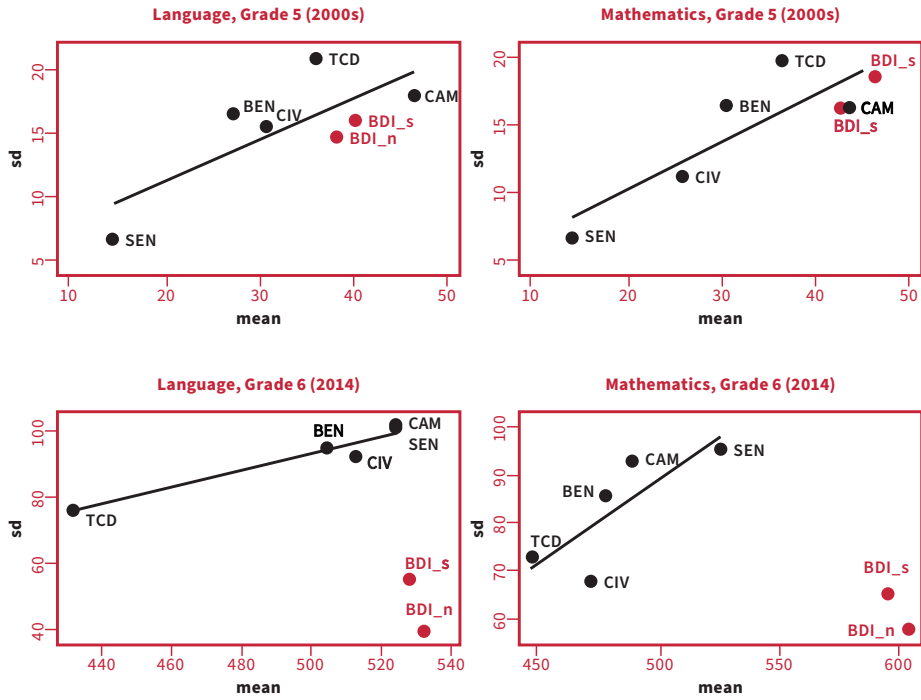


Figure 3. Mean and standard deviation in PASEC tests in late primary (for the 2014 results, the linear prediction line does not include Burundi). Source: PASEC data for Burundi (2009 and 2014), Benin (2005 and 2014), Cameroon (2005 and 2014), Côte d’Ivoire (2009 and 2014), Senegal (2007 and 2014) and Tchad (2009 and 2014).

Table 1. Difference in difference estimation, late primary (standardized scores).
Source: PASEC data for Burundi (2009 and 2014).

	(1) Total Score	(3) Language	(3) Mathematics
North * year 2014	0.30 ** (0.13)	0.25 *** (0.06)	0.30 *** (0.06)
North	-0.17 * (0.10)	-0.16 *** (0.04)	-0.16 *** (0.04)
Year 2014	-0.09 (0.09)	-0.08 ** (0.03)	-0.09 *** (0.03)
Constant	0.05 (0.07)	0.05 ** (0.02)	0.05 ** (0.02)
Observations	5804	5804	5804
Adjusted_R-squared	0.00	0.00	0.00

Note: regression of PASEC test scores on a constant, a dummy variable equal to 1 if the school of the student is located in the North region, a dummy equal to 1 if the student was studied in 2014 and a variable for the interaction of those 2 dummies. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

6. Parallel Trends before 2009

Figure 3 depicts the evolution of test scores between 2009 and 2014 in Burundi, separated between northern and southern provinces. Before discussing the mechanisms behind this reversal of fortune, we want to point out that this is a particularity of this period, meaning that, before 2009, both parts were on a parallel trend and there was no sign of reversal. We demonstrate this in two graphs, depicted in Figure 4 where panel (b) depicts the PASEC scores for the north and south and panel (a) depicts the success rate in the Concours National for the years 2006, 2007 and 2008 in the schools sampled by PASEC during the 2009 test. Indeed, part of the data collection in 2009 by PASEC included the success rate of pupils in each sampled school in the three years prior to the test. The Concours National is a nationwide test, consisting of mathematics, French, Kirundi and environmental science that each pupil has to take if she/he wants to continue into secondary school. Hence, this constitutes an administrative source of information that is independent of PASEC and which allows us to corroborate the parallel trend in the north and the south before 2009.

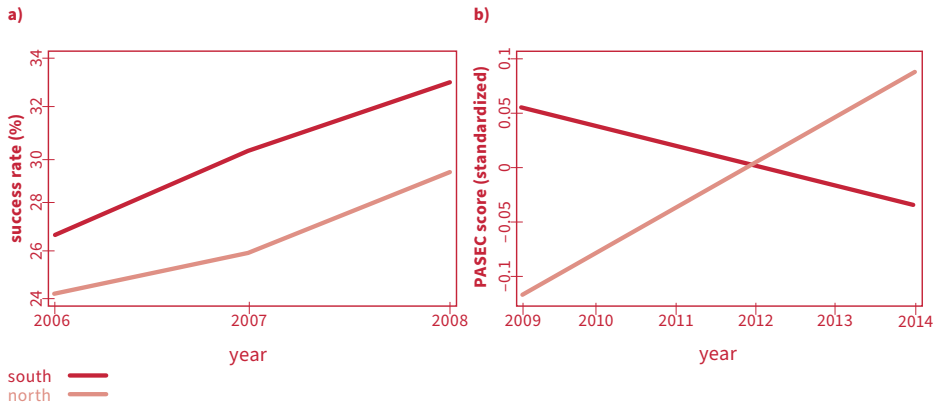


Figure 4. (a) Success rate in the Concours National, Burundi; (b) PASEC scores (2009 and 2014) in Burundi. Sources: PASEC data for Burundi (2009 and 2014) and results of the Concours National (Ministry of Education).

7. Potential Mechanisms

A number of reasons can explain the reversal of fortune of northern versus southern schools in Burundi's education system. As mentioned in the introduction, the north has been disadvantaged for several decades under the Tutsi-led regimes who favored their own southern region. By ending advantage and disadvantage, we could thus witness a return to long-term mean performance on both regions. Searching for variables that capture potential advantages and disadvantages, the PASEC data allows us to test several potential pathways. We introduce them one by one in the subsequent analysis. In Table 2, we first add school budgets, in nominal terms as well as on a per pupil basis. As expected, we find a small and statistically significant effect (at the 10% level) of this variable, meaning that increases in school budgets play a role in test score performance. However, after controlling for this, neither the magnitude nor the statistical significance of our variable of interest (the interaction between the north and the 2014 test year) changes. This pattern is repeated when we control for two other variables which can be leveraged by educational policymakers in Burundi: the size of classes (again in nominal terms and per teacher), as well as school and class infrastructure. Both variables have the expected effect on test score performance (meaning negative for the effect of size and positive for the effect of infrastructure), but their inclusion does not change the effect of our variable of interest.

Table 2. Difference in difference estimation mechanisms, late primary (standardized scores). Source: PASEC data for Burundi (2009 and 2014).

	(1)	(2)	(3)	(4)	(5)	(6)
	Total Score	Total Score	Total Score	Total Score	Total Score	Total Score
Year 2014	-0.16 *	-0.15 *	-0.21 **	-0.18 *	-0.7	-0.21 **
	(0.9)	(0.9)	(0.9)	(0.10)	(0.9)	(0.9)
North	-0.16	-0.15	-0.16	-0.10	-0.19 *	-0.13
	(0.10)	(0.11)	(0.10)	(0.10)	(0.10)	(0.9)
North * year 2014	0.34 **	0.33 **	0.24*	0.30 **	0.26 **	0.25 **
	(0.13)	(0.13)	(0.13)	(0.13)	(0.13)	(0.13)
School budget	0.00 ***					
	(0.00)					
Budget per student		0.00 ***				
		(0.00)				
Class size (dummy for above median)			-0.01 ***			
			(0.00)			
Student per teacher				-0.01 ***		
				(0.00)		
School infrastructure					0.19 ***	
					(0.06)	
Class infrastructure						0.06 ***
						(002)
Constant	0.06	0.05	0.53 ***	0.39 ***	-0.21 *	-0.31 ***
	(0.07)	(0.07)	(0.12)	(0.12)	(0.11)	(0.11)
Observations	5321	5281	5687	5732	5804	5804
Adjusted_R-squared	0.07	0.07	0.03	0.02	0.04	0.02

Note: regression of PASEC test scores on a constant, a dummy variable equal to 1 if the school of the student is located in the North region, a dummy equal to 1 if the student was studied in 2014, a variable for the interaction of those 2 dummies and a series of possible mediators. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

8. Political Economy

In Table 2, the interaction effect thus remains unexplained after the inclusion of a number of policy variables. We know, however, that the northern region is the area

of origin of president Nkurunziza. As discussed in Verwimp (2019), an explanation of this reversal of fortune may also be found in the political arena. He showed that success rates in the Concours National changed dramatically from one year to the next in northern schools, after the landslide victory of the president's party in the parliamentary elections in 2010. Schools in Nkurunziza's municipality, a very poor area, score as good in the Concours National in 2010, 2011 and 2012 (period under investigation in Verwimp's paper) as the best performing schools in well-off neighborhoods in the capital Bujumbura, whereas, before 2010, this was not the case.

Since the second test run by PASEC took place in 2014 and since this test is run by an independent, international body running these tests in dozens of African countries, it may be that school quality and pupil performance in the north indeed improved between PASEC 2009 and PASEC 2014, in which case the improvements in the north can be the result of large investments over the last few years, and these improvements need not be the result of tinkering or political manipulation.

We are not able to determine the exact mechanisms that explain Burundi's very favorable scoring in the PASEC in 2014. It may be that the investment policies directed to the school system in the north under president Nkurunziza (more classrooms, more teachers, etc.) started paying off, as is also witnessed in our analysis. This may not explain the favorable test scores in the north one year later (2010, as in Verwimp (2019)), but may offer a plausible explanation 5 years later, in PASEC 2014. The unexplained part (the interaction effect in our analysis) may be caused by a motivational component compared to baseline observations in 2009—the combination of material improvements and immaterial ones (proudness, motivation, etc.) in the northern population, given that their plight is finally being answered by the president's policies.

9. Discussion and Conclusions

In the context of the learning crisis observed in many developing countries, Burundi stands as an outlier. When it comes to international skills assessments, Burundi students perform far better than other sub-Saharan African students, in both mathematics and language. Quite surprisingly, this is only the case for the 2014 PASEC survey. In this chapter, we studied potential explanations for this evolution. We suggest that this outstanding performance may be driven by a reversal of fortune within Burundi between northern and southern provinces, whereby the northern provinces did exceptionally well in PASEC 2014. The northern provinces, home turf of President Nkurunziza, have received a lot of public goods since his ascent to power. School budgets, class sizes and teachers per student have the expected effect

in explaining the change in performance between PASEC 2009 and 2014. However, these elements do not seem to explain everything, as the northern dummy's interaction with the year 2014 dummy remains statistically significant after the inclusion of the above variables. This leaves the door open for other explanations of this progress, possibly related to the political economy or a motivational component.

As for the curriculum is concerned we recommend that Burundi builds on its experience with the inclusion of environmental science as a (small) part of the Concours Nationale. This offers a pathway to include sustainable development goals in the curriculum. It will require a strong effort on behalf of the teacher training institutes to educate future teachers who can build effective learning environments, another key element in SDG 4.

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Conflicts of Interest: The authors declare no conflict of interest.

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