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Matthew Effect and Achievement Gap in Rwandan Basic Education

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Abstract. Education is considered a vital cog in a country's economic engine in terms of training, research and development. Accordingly, a formal education system remains a mode of rationing opportunities, differentiation and the allocation of individuals into various positions within a society's social stratification structure. Certainly, the obtainment of educational credentials has been linked to occupational, trajectory, income, and attendant life chances. In light of this, the achievement gap remains an important issue since an education provided in a more equal and equitable manner could be an important tool to bridge the gap between the rich and poor citizens within a country. This study aimed to ascertain the Matthew effect and its contribution to students' academic achievement gap in the basic education schools of Rwanda. The study was guided by descriptive and correlational research design, stratified and systematic random sampling as well as purposive sampling were

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used to select 350 participants, including 51.4% males and 48.6% females, mostly aged 30 to 40 years. Quantitative and qualitative data were collected through questionnaire and interviews. The collected data were descriptively analysed using IBM-SPSS 21. The study established that socio-economically disadvantaged students mostly enrol in under-resourced and low-performing schools i.e. public and government-aided schools. Furthermore, the study identified that private and international school students outperform their counterparts enrolled in public or government-aided schools. Moreover, a significant (p-value .011) low degree of positive correlation (r= .159) was established between the students' academic achievement and their parents' socio-economic category. In conclusion, the Rwandan aim of ensuring access to quality, equitable and effective education for all is facing a bleak foreseeable future due to the existing academic achievement gap influenced by the Matthew effect. Recommendations were therefore formulated with a view to eradicating the Matthew effect in the basic education schools of Rwanda.

Keywords: Matthew effect; academic performance; achievement gap; high achievers and low achievers; basic education schools; socio-economic status; government spending in education

1. Introduction

The Matthew effect refers to a popularised gospel verse from the bible (see Matthew 25:29 and Matthew 13:12 in the King James version), which states that those who are richer than others will get richer and the poor will get poorer. The paraphrased verse says: "to everyone who has, much will be given to him and he will be given abundantly. However, for the one who has less, it will be taken from him." This was adopted by Robert Merton in his 1968 publication titled The Matthew effect in Science, in which he discusses the concept through a scientific lens. For example, he observed that a scientific contribution is paid more attention when it is introduced by a renowned scientist, whereas it would be given less value or attention if it was introduced by a junior scientist, despite the fact that the contribution might be more worthy than the one introduced by a renowned scientist. In the scientific reward system, much more awards and accolades are given to famous scientists compared to up-and-coming scientists, regardless of the particular value of their contribution to science or research (Merton ,1968). Similarly, it has been noted that parents' financial ability to get their children enrolled in advantageous schools corresponds to their children's high academic achievement, leading to the added value of entering white-collar jobs in a global economy, a fact that is conversely applied to their counterparts from poor households.

Moreover, the term 'Matthew effect' was adopted for use in education by an American psychologist, Keith Stanovich, who confirmed that children who easily acquire basic early reading skills more easily acquire advanced reading skills in the future. He found that children who perform well in reading at a young age also perform well in reading as adults. Differences in children's reading ability at an early age signal negative consequences for slow learners, since both teachers and parents tend to give more opportunities to quick learners, thereby enhancing

their phonological awareness (Stanovich, 1986). This argument has lately been discussed by various researchers (Walberg and Tsai, 1983; Romeo et al., 2018; Huang et al., 2014; Rigney, 2010; Van, 2021; Ergül et al., 2022), who found that the Matthew effect may exist in any educational system, school and classroom if it is not well understood and controlled during the education process. As a case in point, Herbert Walberg and Shiow-Ling Tsai, in their publication titled Matthew Effects in Education, found that certain factors may influence academic performance in science or mathematics; those factors include ethnic and socioeconomic groups, environment, prior education and motivation. Perhaps surprisingly, one who is advantaged in one specific factor may be advantaged in another one, with those having a high quality prior education performing well in their current educational activities (Walberg & Tsai, 1983). In the current study, the achievement gap, influenced by the Matthew effect, was not only examined in students' reading skills but across the entire subjects of literacy, numeracy and all learning attainment expected from school leavers in the national examinations undertaken at the end of elementary and secondary schools.

An in-depth analysis of the above quoted gospel shows that the Matthew effect is a cross-sectional applied concept in people's lives around the globe, which promotes inequalities between countries, communities and individuals living apart or together. One example might be seen in the education systems of different countries, whereby policy makers introduce policies and programmes that benefit already advantaged schools and communities instead of uplifting the disadvantaged. A similar analysis may be taken on the most harnessed 21st century ICT skills that have been translated into education policy across the globe while less consideration and emphasis have been given rural-remote disadvantaged schools with untrained teachers, without access to electricity or the basic skills to operate the computers and other ICT tools that are dumped in their schools (Hashakimana et al., 2022). Such education policies have been identified as exemplifying the Matthew effect as less is being done to advance the overall teaching and learning conditions in disadvantaged schools, particularly in rural areas, reflecting a serious gap in education policy implementation.

According to Bush (2013), access to technology in education is causing a digital divide in some parts of the world, including Asia and Africa, where policy makers refer to the best schools that are already advantaged with trained teachers, students from wealthy, educated families and other beneficial resources instead of emphasizing measures that could improve the potential of schools in remote areas. To implement the policies, Bush quoted a biblical passage which says that all things are possible, but – he added – for education, they are possible when the elephant's ability is not tested in competing with a monkey to climb a tree. This means that policy makers should not expect the magic to happen in schools or in any education system when computers are dumped in schools without considering their connectivity to electricity, internet, teacher training and other factors that may boost technology inclusion in education. The Matthew effect in this study will therefore be characterised by parents' socio-economic category (UBUDEHE categories) and the types of schools enrolling their students. Bush (2013) advises policy makers to think of the Matthew effect that may come with the implementation of each policy during the policy design stage to ensure that

the policy does not advantage the advantaged and disadvantage the disadvantaged.

Relevant to the above research topic, the terminology referred to as achievement is students' attainment against pre-set ultimate goals of education at a specific educational level and this is scientifically proven through a course of systematic assessments and/or examinations (Education Evolving, 2016). Thus, an achievement gap in education is confirmed when a specific group of students outperforms another group during their levelled systematic assessment intending to weigh the two groups' performance against that assessment (Steinmayr et al., 2014).

The ultimate goal of education is to equip all people, regardless of gender, age or circumstances, with the knowledge, skills and values necessary to develop their talents and for them to participate fully in the life and work of their society (Power, 2015). Thus, the most obvious and important consideration is the overarching goal of post-2015 education agenda, which aims at achieving equitable and inclusive quality education and lifelong learning for all by 2030 (UN, 2015). Similarly, Rwandan education aims at ensuring access to quality, equitable and effective education for all Rwandans (Ministry of Education [MINEDUC], 2010).

Unfortunately, the citizens' ability to pay tuition fees and other related costs of education in a given school determines the extent of achievement available to their students. In this regard, Mbabazi (2020) and Nzabihimana (2015) reported that students enrolled in private schools perform better than their counterparts in public schools. In this specific instance, it was also noted that almost all of the top 10 excellent primary schools in terms of national examination attainment, as recognised by the national board in charge of national examinations, were private schools (Nzabihimana, 2015).

Consequently, this pushes a big number of citizens into extreme poverty and insecurity. In essence, Power (2015) ascertains that viewing education and knowledge as a private good weakens the foundations of democracy and international solidarity. With that, the hopes and expectations of the millions of people who cannot afford to pay for an empowering education of good quality vanish, along with any pretence that human rights or the common good matter. Therefore, there is an urgent need to conduct the current study to explore the contribution of the Matthew effect to students' achievement gap in Rwandan basic education schools.

There was little existing data regarding student's achievement gap in the region or in Rwanda, where the research was being conducted, but the world Bank group confirmed a Matthew effect in education and the economy that remains the main cause of social inequality. Indeed, 90% of children from the top 10% poorest families attend primary school compared to 99% of children from the top 10% richest families, whereas attendance in secondary school remains low and is highly influenced by family living conditions, with only 11% of children from the 10% top poorest families attending secondary school compared to 78% children from the 10% top richest families (World Bank, 2015). The achievement gap in this study was characterised by high achievers (students who had passed the national

examination with the highest aggregate i.e. 5-30 classified under Division 1&2) and low achievers (students who had passed or failed the national examination with a low aggregate i.e. 31-45 classified under division 3&4 or Unclassified).

The theoretical basis of this study was derived from Maslow's theory of motivation, which emerged as an important descriptor of factors influencing success at school. Its founder, Abraham Harold Maslow (1954), an American psychologist, introduced the idea of a strong correlation between effort and motivation while discussing human behaviour. Maslow's theory of motivation was adopted in this study due to its significant applicability in addressing the contribution of parents' socioeconomic categories determining the provision of required needs (physiological needs, cost of education, safety needs, etc.) to their children and the level of the students' attention/effort in the classroom, which in turn determines academic achievement. In essence, the immediate needs determine the immediate action of the students. To clarify, when students become worried about their basic needs, such as food, sleep, health and clothing, their focus/attention is directed to such distractions and studying and accomplishment lose their importance. In the context of this study, the theory is therefore that parents' ability to pay school fees and other related hidden costs in a given type of school determines the degree of achievement of their children, a contention that correlates to the Matthew effect and its contribution to students' educational achievement gap.

As far as Ubudehe is concerned in Rwanda, Ubudehe refers to the economic-based culture of categorising Rwandan citizens into different categories according to their current economic standards. It has largely modernised and introduced social protection policies and programs in Rwanda since 2002 (Local Administrative Entities Development Agency [LODA], 2016). According to LODA (2016), there are four categories expressed in terms of the numbers 1, 2, 3 and 4, which remain valid to date.

Thus, category 1 represents those citizens without a residential house or who have proved unable to rent a home. The ability of such citizens to find food and satisfy other basic needs remains quite perplexing (LODA, 2016). Following this is the second category, representing those citizens who seldom eat twice a day and often depend on temporary wages. More advantaged is the third category, representing those who are employed or employers, and businessmen, while the fourth category includes the highest earners from big companies, industries, and those in high public and private positions. To clarify the close link that exists between students' academic achievement and the economic level of their parents, UNESCO (2002) substantiates that academic performance is strongly correlated with the occupations and economic status/category of the students' parents, irrespective of differences in the extent of such a relationship between countries. However, 16%, 29.8%, 53.7% and 0.5% of Rwandans are still categorised under Ubudehe categories 1, 2, 3 and 4, respectively (LODA, 2016). Thus, there is a need to explore the academic achievement of students from all these categories.

In terms of types of schools (basic education schools), there are four types of schools in Rwanda: public schools, government-aided schools, private schools and international schools. In this study, these four types were summarised into two main groups: public and government-aided schools, which are mainly public,

free and compulsory; as well as private and international schools, which are mainly private and fee-paying. Generally, public schools aim at increasing academic achievement for public benefits; particularly, preparing youth for active citizenship in a democratic society. Conversely, private schools emphasise individual or private economic benefits, such as preparing youth for good jobs in a global economy (Centre on Education Policy [CEP], 2007). At the same time, it is important to note that when the government of a given country loosens its efforts in maintaining public education, this favours the emergence of many types of private schools. This situation leads to great inequities and the exclusion of disadvantaged families from education (CEP, 2007). There is a claim that students enrolled in private and international schools outperform their counterparts in public and government-aided schools (Damien, 2015; Joan, 2020). Given that there are 3931 public and government-aided basic education schools, compared to 706 private and international basic education schools in Rwanda (NISR, 2019), there is a rationale for this current study to explore the degree of achievement provided by each type of Rwandan basic education school.

The existing literature related to variables of the Matthew effect and students' achievement has been reviewed. The arguments of various scholars and researchers' findings report a significant relationship that exists between the two variables (Islan & Khan, 2017; Chandra & Azimuddin, 2013) but, to the best of our knowledge, no study has yet established the level of such a correlation. Despite such a relationship existing between the two variables of this current study, the previous studies have revealed socio-economic category (UBUDEHE) as being a main factor contributing to the decision of parents regarding the type of basic education school in which to enrol their children. The evidence suggests that socio-economically disadvantaged students are mostly enrolled in low performing schools (OECD, 2017; World Bank, 2011; Boyd and Macneill, 2020, Weber, 2018), which are also under-resourced, a fact indicating the presence of the Matthew effect in education. Due to the paucity of literature on the variables of this current study in Rwanda, a conclusion that the Matthew effect exists in Rwandan basic education schools should not be drawn. Therefore, this current study ascertained the relevant information on the impact of the Matthew effect on educational attainment in Rwanda.

Based on a review of the existing related literature, the degree of correlation between parents' socio-economic category (UBUDEHE) and students' achievement in Rwandan basic education schools remains unstudied. Furthermore, no research has yet been conducted to determine students' educational attainment compared to their parents' socio-economic category (UBUDEHE) and their related basic education schools. Rather, only the claims of parents and the wider community in Rwanda suggest that there are privileged basic education schools enrolling students from privileged families whose performance in national examinations outshines economically those disadvantaged students who end up graduating from under-resourced schools with low achievement. Moreover, this problematic situation has been identified as perpetuating inequality through the allocation of individuals into various positions within the social stratification structure, thereby decelerating fairer socio-economic development across the country. The aim of this study was therefore to shine a new light on these debates through an examination of existing

Matthew effects in terms of students' achievement gap in basic education. This study aimed to answer three questions of particular concern: a) What kind of schools enrol students from each socio-economic category (UBUDEHE) in Rwanda? b) What is the degree of educational attainment provided by the different types of Rwandan basic education schools? c) What is the relationship between parents' socio-economic categories (UBUDEHE) and students' educational achievement?

2. Methods

This study was guided by a descriptive research design that involved: a) cross-sectional research design (Aleksandar et al., 2021; Wang and Cheng, 2020; Zangirolami-Raimundo et al., 2018) to explore the first and second objectives and b) correlational research design (Khidhir, 2021) to describe the degree to which the Matthew effect correlates to students' educational achievement gap. Stratified random sampling technique and purposive sampling were used to select a total of 20 schools across the country for data collection in this study i.e. five strata containing all basic education schools across four provinces and Kigali City were formed. From these five strata, four schools were selected from each province and Kigali City. In each province one district was purposively selected; that is to say, five districts in total. In each selected district, two primary schools and two secondary schools – one representing public and government-aided schools and another representing private and international schools – were purposively selected, respectively.

With respect to participants, a systematic random sampling technique was used to select a total of 350 participants, i.e. 70 participants; 38, 6, 21, and 5 from primary public and government-aided schools; primary private and international schools; secondary public and government-aided schools; and secondary private and international schools, respectively, were proportionately selected according to the number of schools and candidates enrolled therein from the school year 2018 (MINEDUC, 2019; NISR, 2019; MINEDUC, 2018a). Ultimately, however, 257 (51.4% males and 48.6% females) participated in this study due to some respondents being exempt from the study.

The sampled population was comprised of the parents of children enrolled in sixth grade from both elementary and secondary education. The parents were selected for data collection due to their possession of accurate data (family socio-economic category, academic performance of their children i.e. academic performance in national examination). Head teachers of selected schools were selected to participate in this study because they were in a good position to provide the researchers with accurate information concerning students' academic performance and the contact information of their parents for further information. District Directors of Education (DDE) from the selected districts were selected to supply additional information complementing the quantitative data. On the other hand, the students were not selected for data collection because they are entering different schools across the country and, in the case of secondary school leavers, are engaging in different sectors of work or entering different universities across the country or abroad, meaning that it could be difficult to reach them given the time and financial constraints of this study.

Additionally, it is important to note that the class of 2018 was selected due to its normal teaching and learning process before the COVID-19 pandemic led to education processes becoming significantly hampered. To complement the quantitative data collected from the class of 2018, qualitative data was recently (from 16th -20th Jan. 2023) collected from five District Directors of Education purposively selected from the selected districts.

A questionnaire for parents and an interview for the District Directors of Education were used to collect quantitative and qualitative data concerning the participants' socio-economic categories, the types of schools in which their children were enrolled for the 2018 national examinations in primary and secondary schools, and their academic achievement (national examinations results). Descriptive and correlational analysis through IBM-SPSS 21 was performed to analyse the collected data.

In view of establishing the validity of the parents' questionnaire used for data collection in this study, the expert-judgement technique was used. The questionnaire was given to two experts in the field of education to evaluate the relevance of each item and rate each item on a 4-point Likert scale of very relevant (4), quite relevant (3), somewhat relevant (2), and not relevant (1) (Wynd et al., 2003). Validity was established using the Content Valid Index (C.V.I.)(C.V.I. = Item rated 3 or 4 by both judges divided by the total number of items in the questionnaire (n/N)) (Zamanzadeh et al., 2015). Therefore, since the C.V.I. was 0.81, the validity of questionnaire was assured provided that C.V.I. > 0.79 (Zamanzadeh et al., 2015).

To establish the reliability of the research instrument, the test-retest technique (Weir, 2015) was used, whereby the research questionnaire used in this study was twice used for 30 subjects purposively selected from a district that was not included in the study sample. In the first instance, the research instrument was used for these subjects and their answers were recorded. After a period of six weeks, the research instrument was also used with the same respondents and their answers were again recorded. Having collected this data, the Spearman rank order correlation coefficient was computed to measure the correlation of results from the data collected in two different time intervals. The formula of the Spearman rank order correlation coefficient used to calculate the coefficient is $R=16\Sigma d2/ (n (n2-1))$, where R: Spearman's correlation coefficient; n: size of the sample; Σd: the sum of the difference between ranks. Thus, based on the reliability of the questionnaire for parents being 0.78, the research instrument was deemed to be reliable provided that the Spearman rank order correlational coefficient was not less than 0.75 (Orodho, 2009).

3. Results

This research study sought to ascertain the Matthew effect and its influence on the students' achievement gap in Rwandan basic education. To answer the three main questions of the study, both quantitative and qualitative data were collected. The results are therefore presented in tables, indicating the responses to the questions asking participants' social economic categories, the type of schools in which their children were enrolled and their corresponding academic attainment.

3.1 The Matthew effect and the achievement gap in the basic education of Rwanda

3.1.1 The type of schools and the students with their corresponding socio-economic category

The first objective of this study was to determine the schools' enrolled students from each socio-economic category (Ubudehe) in Rwanda. To achieve this objective, quantitative data were collected from 257 respondents (parents of the elementary and secondary school students completing these levels). A research questionnaire was used to collect data, presented in Table 1. This shows that the majority of the students were enrolled in public schools (206/257) at either the elementary (118) or secondary (88) level.

Table 1. Schools' enrolled students from each socio-economic category in Rwanda

		Socio-economic category				**Total**
		Category 1	Category 2	Category 3	Category 4	
Schools' enrolled candidates in the school year 2018	Primary public school	8	48	54	8	118
	Primary government - aided school	0	3	5	0	8
	Primary private school	0	2	27	11	40
	Secondary public school	2	28	46	12	88
	Secondary government - aided school	0	0	0	2	2
	International secondary school	0	0	0	1	1
Total		10	81	132	34	257

With respect to the type of basic education schools and students enrolled therein with their corresponding socio-economic category, the results shown in Table 1 establish that the majority of students (candidates entered for national examinations i.e. primary leaving examinations and senior six national examinations) were from the third category (132/257). A particular concern was the fact that 126 elementary school candidates were enrolled in either public schools or government-aided schools, with 59 i.e. 46.8% from the first and second categories while 67 i.e. 53.2% came from the third and fourth categories. Furthermore, of the 90 candidates sitting secondary examinations enrolled in public and government-aided schools, 30 i.e. 33.3% came from the first two categories compared to 60 i.e. 66.7% from the last two categories. The results of Table 1 also show only two i.e. 5% primary leaving examination candidates from the first two categories compared to 38 i.e. 95% from the last two categories who were enrolled from primary private schools and only one candidate from fourth category enrolled from a secondary international school. In a similar vein, of the results collected from DDEs through interview, all five i.e. 100% confirmed that the parents' socio-economic category determines the schools enrolling their children. For example, one interviewee said:

> "*There is no basis of UBUDEHE category while enrolling students but what is practically observed is those from rich families attend private schools and those from poor families attend government and government-aided schools from pre-primary to primary schools and the children from poor families attend day schools (9-12YBE) and the rich attend boarding (school of excellence) in secondary schools as observed…*"

A possible explanation for this is that students from socio-economically disadvantaged backgrounds attend under-resourced schools while the rich ones attend schools equipped with adequate resources that can facilitate their learning even though no formal regulation dictates this phenomenon.

3.1.2 Degree of academic achievement from basic education schools in Rwanda

The second objective of this study was to assess the degree of academic achievement provided by the various types of basic education schools in Rwanda. To achieve this objective, a questionnaire was used to collect data on academic performance (national examinations results), considering the different types of basic education schools that exist in Rwanda, from 257 respondents. The results obtained are summarised in Table 2. This result clarifies that 147/257 i.e. 57% of candidates passed their national examinations with excellence (classified in the first or second division).

Table 2. Academic achievement from basic education schools in Rwanda

		Results obtained from national examinations in 2018					**Total**
		Division I (Agg 5-15)	Division II (Agg 16-30)	Division III (Agg 37-37)	Division IV (38-41)	Unclassified (42-45)	
Type of school enrolled by child in the school year 2018	Primary public school	32	34	50	1	1	118
	Primary government - aided school	0	6	2	0	0	8
	Primary private school	19	15	3	1	2	40
	Secondary public school	6	32	36	14	0	88
	Secondary government-aided school	2	0	0	0	0	2
	International secondary school	1	0	0	0	0	1
Total		60	87	91	16	3	257

In terms of identifying the level of academic achievement from the basic education schools of Rwanda, the results shown in Table 2 illustrate that of the 126 candidates from primary public and government-aided schools, 72 i.e. 57.1% candidates passed with excellence (classified in divisions I and II), whereas among 40 candidates from primary private schools, 34 i.e. 85% passed with excellence (classified in divisions I and II). As far as secondary schools are concerned, the results in Table 2 show that 90 candidates were enrolled from secondary public and government-aided schools, with 40 i.e. 44.4% scoring high marks and classified in divisions I and II. Furthermore, the results in Table 2 show that one candidate i.e. 100% from an international secondary school scored high marks i.e. classified in division I. Further analysis showed that all five DDEs participating in the interviews validated that private schools outperform public and government-aided schools. Talking about this issue, an interviewee said:

> "*The public and government-aided schools perform less than private primary schools according to the previous national examinations results, [and] the private and government-aided (day schools) perform less than boarding schools (schools of excellence). The achievement in private primary schools is higher than the rest, while the achievement in boarding schools (government or government-aided boarding schools) achieve higher than the rest...*"

A recurrent theme in the interviews was a sense amongst interviewees that primary private schools outperform the public and government-aided schools but

the most striking result to emerge from the interview data was that public or government-aided boarding schools (schools of excellence) outperform the private and public day secondary schools. One possible reason behind this finding is that the majority of the best performers come from private primary schools who are financially able to afford the high cost of education from those boarding schools.

3.1.3 Relationship between parents' socio-economic categories and students' academic achievement

In order to establish the relationship between the parents' socio-economic category and their children's academic achievement, as outlined in the third objective of this study, the Pearson correlation coefficient was computed. The results obtained are summarised in Table 3.

Table 3. Relationship between parents' socio-economic category and their children's academic achievement

Correlations

		Socio-economic category	Results obtained from national examinations in 2018
Social economic category	Pearson Correlation	1	.159*
	Sig. (2-tailed)		.011
	N	257	257
Results obtained from national examinations in 2018	Pearson Correlation	.159*	1
	Sig. (2-tailed)	.011	
	N	257	257

*. Correlation is significant at the 0.05 level (2-tailed).

The results in Table 3 show that the Pearson correlation coefficient (r) between parents' socio-economic category and their children's academic achievement from basic education schools is r = 0.159, with a significant level p-value of 0.011; this remains < 0.05 level (2-tailed). This reveals that a significant weak degree of positive relationship exists between the parents' socio-economic category and their children's academic performance in the basic education schools of Rwanda. Increasing evidence for this correlation was found from the DDEs interviewed, who confirmed that such a relationship exists. One interviewee, when asked about this relationship, said:

> "*There is a significant relationship between parents' socio-economic relationship and their [children's] achievement because the schools that require much fees and materials (expensive) are the ones performing well at all levels of education in our district and they are only joined by students from families that are financially able*."

A common view amongst the interviewees was that the schools that are fee-paying with a high tuition cost are those using adequate teaching and learning materials, infrastructure, well-paid competent teachers and therefore these schools perform better than the public ones providing free and compulsory

education. This therefore indicates an apparent relationship between socio-economic background and academic performance.

4. Discussion

The overall purpose of this study was to ascertain the Matthew effect and its impact on students' achievement gap in the basic education schools of Rwanda. To answer the three guiding questions of this study, both quantitative and qualitative data were collected and descriptive analysis was carefully computed using IBM-SPSS 21. The findings of this study therefore revealed the type of schools enrolling students considering their socio-economic category, the students' academic performance achieved from different types of basic education schools and finally the correlation that exists between students' academic achievement and the socio-economic category of their parents was established. The synthesis of such findings justified the contribution of the Matthew effect to the achievement gap in Rwandan basic education schools.

The first set of analysis determined the type of schools enrolling students from each socio-economic category in Rwanda; it was found that 53.2% of candidates from socio-economic categories 3 and 4 were enrolled in primary public schools compared to 95% of the candidates from 3 and 4 socio-economic categories enrolled from primary private schools. Similarly, 66.7% of senior six examination candidates were from socio-economic categories 3 and 4 whereas one i.e. 100% of candidates enrolled in a secondary international school was classified in socio-economic category 4. This finding reveals that the majority of students from the disadvantaged socio-economic categories rely on public and government-aided schools while their counterparts from socio-economically advantaged backgrounds enroll in private or international schools. Further analysis of the interview data showed two additional themes emerging: public secondary day schools enroll students from economically disadvantaged families and public/government-aided boarding schools (schools of excellence) mostly enroll students from economically advantaged families. A key fact is that the former are free and under-resourced while the latter are fee-paying and equipped with the necessary resources. In accordance with the present findings, previous studies have demonstrated that students from disadvantaged socio-economic categories are more likely to be enrolled in schools with a lower level of self-regulation and with a negative association to school outcomes (Miech et al., 2001). This finding is also consistent with the contention articulated by OECD (2017), which asserted that students from low socio-economic categories attend lower quality schools. Since the majority of students depend on public or government-aided schools purporting to increase academic achievement for public benefits, with a particular concern of preparing youth for active citizenship in a democratic society (CEP, 2007), it is hereby recommended that the government of Rwanda should empower public and government-aided schools' capacity in terms of acquiring sufficiently qualified and competent human, material and financial resources to effectively serve their purpose.

In terms of the second objective of this study, which assessed the degree of academic achievement provided by Rwandan basic education schools, the findings established that 85% of candidates enrolled from primary private schools scored high marks qualifying them in the 1st and 2nd divisions, while 57.1% of their

counterparts enrolled in primary public or government-aided schools qualified for the same divisions (1st and 2nd). Further analysis concerning secondary level also revealed that one candidate i.e. 100% enrolled in secondary international school scored high marks, qualifying him/her for the 1st division, compared to 44.4% of students in free education who qualified for the 1st and 2nd divisions. One of the more significant findings to emerge from the interview data is that students from secondary public/government-aided boarding schools (schools of excellence) perform better than their counterparts from secondary day schools (Twelve Years Basic Education [12YBE]). This finding indicates that students enrolled in prestigious schools perform better than those in free and under-resourced schools in Rwanda. It is important to note that this current finding is consistent with the results of a previous study undertaken by Nzabihimana (2015), which found that students enrolled in private and international schools outperform their counterparts enrolled in public and government-aided schools. Increasingly important, this finding is consonant with the previous report of MINEDUC (2018b) which substantiates that 99% of private school candidates scored highest marks that qualified them in 1st and 2nd division while only 12% from public and government-aided schools were qualified in the 2nd division. Certainly, this finding supports the previous study of Kerckhoff and Glennie (1999), which reports that American students from high school curricular gain higher academic attainment, while students from low school curricular gain lower achievements than those from middle school curricular.

This current finding could indicate that the Rwandans' ability to pay school fees and additional costs such as meals, transport, books, etc. in certain private or international schools determines the degree of academic achievement provided to their children. The increasing evidence upon which this assertion is based is the fact that public and government-aided schools in Rwanda are free and compulsory while those entering private and international schools pay tuition fees and other related costs of education that are not affordable for the majority of citizens (LODA, 2016). In pursuit of this fund collected from parents, competent teachers are hired; they are well paid and provided with adequate teaching and learning aids as well as an infrastructure that can motivate both teachers and students (Mbabazi, 2020). Despite the recent slight increase of basic education teachers' salary, it is recommended that the government of Rwanda should further increase its spending on education as a percentage of total government expenditure and GNI to the recommended figures that can help in improving the public school infrastructure, teachers' motivation, teaching and learning materials and Continuous Professional Development (CPD) for in-service teachers, particularly in areas other than Kigali City (Habyarimana et al., 2022), which have proven to be lagging behind in terms of quality education.

In the last instance, this study sought to establish the relationship between parents' socio-economic categories and their children's academic achievement. The findings identified a significant weak degree of positive relationship between these two factors. This implies that the influence of the Matthew effect on students' academic achievement in Rwandan basic education schools continues to be low. Consequently, the achievement gap in terms of high and low achievers, given their socio-economic status in Rwanda, is low. This finding is congruent with the findings of a study conducted by Vanneman (2009), which identified an

achievement gap of 23% in Mathematics between white and black students due to various factors, including parents' literacy level, income, and the poverty level of such households. These findings also support the report of World Bank (2015), based on EICV 2015, which reveals a 9% and 67% difference in school attendance between the top 10 poorest families and the top 10 richest families in primary and secondary education, respectively. However, the current finding is in contrast with the previous report published by UNESCO (2002), which declared a strong relationship between students' academic achievement and their parents' economic status, irrespective of the different levels of such a correlation among countries. This last exception could therefore be applied to the current situation of Rwanda. The government of Rwanda is therefore recommended to exert a full effort in all projects purporting to increase citizens' socio-economic status in order to provide students with the necessary basic needs that influence students' attention and effort in learning, thereby ultimately determining their academic achievement, as Maslow (1954) suggested that immediate need determines the immediate action of the students.

5. Conclusion

This study ascertained the Matthew effect and its contribution to students' academic achievement gap in the basic education schools of Rwanda. The findings established that the majority of students who enter public and government-aided schools, which afford them little opportunity to access enhanced educational and economic/job opportunities or attendant life chances, are those from disadvantaged socio-economic families, while private and international schools enroll students from socio-economically advantaged backgrounds. The findings revealed at the same time that students enrolled in private and international schools achieve higher scores in national examinations than their counterparts from public and government-aided schools. Finally, the study established that a significant weak positive relationship exists when assessing students' academic achievement compared to their parents' socio-economic status, a fact indicating a low positive contribution of the Matthew effect on students' academic achievement in Rwandan basic education schools. In view of these findings, a conclusion was therefore drawn that the Rwandan aim of ensuring access to quality, equitable and effective education for all Rwandans is facing a noticeably bleak foreseeable future due to the existing academic achievement gap, influenced by the Matthew effect. Thus, recommendations were suggested with the aim of eradicating the Matthew effect from the basic education schools of Rwanda.

Nevertheless, the study experienced four major limitations within data collection which could affect its results: a) some respondents were not prepared to indicate their socio-economic category (UBUDEHE); b) a small number of private or international schools were found from rural areas (provinces) whereby some children from advantageous families are displaced to find those schools in Kigali City, a challenge therefore to find data related to these schools considering zoning factor; c) some respondents opted not to offer information about their schools, particularly those in private and international schools; d) some respondents were not prepared to offer responses for data collection unless they were paid for so doing. Further studies on this topic should therefore find another research method that can help in collecting data on socio-economic categories, which seems to be matter of secrecy for Rwandans, as well as a method that can help in increasing

respondents' consent to participate in order to acquire the required information from private and international schools. Additionally, further studies on the same topic should explore the Matthew effect on students' academic achievement by ascertaining other influencing factors beyond parents' socio-economic status; these could include, for example, the parents' literacy level, or prior education.

Conflict of interest

The Authors declare no conflict of interest.

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Appendix

APPENDIX I: Questionnaire for parents

SECTION 1: Background information

1. Gender of respondents (Tick with √)

Male ☐

Female ☐

2. Your age group

20-30years old ☐

30-40years old ☐

40-50years old ☐

Above 50yers old ☐

3. Your status

Parent by blood ☐

Parent as your adopted child ☐

Guardian

4. Your living province ☐

North ☐

South ☐

West ☐

East ☐

Kigali City ☐

Section II: Indicate your socio-economic category and the school which has been enrolling your child, his/her examination grade, and his/her results obtained in school year 2018 (Tick with √)

5. What is your category of UBUDEHE?

Category 1 ☐

Category 2 ☐

Category 3 ☐

Category 4 ☐

6. Which kind of school was enrolling your child in the school year 2018?

Primary public school ☐

Primary government aided school ☐

Primary Private School ☐

International Primary School ☐

Secondary Public school ☐

Secondary government aided school

Secondary private school

International secondary school

7. Which level of examination did your child sit for in the school year 2018?

Primary Leaving Examination

Senior Six National Examination

8. **What was his/her results obtained from Primary leaving examinations in 2018?**

Division I (Aggregate 5-15)

Division II (Aggregate 16-30)

Division III (Aggregate 31-37)

Division IV (Aggregate 38-41)

Unclassified U (Aggregate 42-45)

9. What was his/her results obtained from senior six national examinations in 2018?

Grade	Point value	Aggregate
A	6*3	18
B	5*3	15
C	4*3	12
D	3*3	9
E	2*3	6
S	1*1	1
F	0	0

Maximum aggregate: 73

Minimum aggregate: 0

Please indicate his/her aggregate in the box provided

APPENDIX II: Interview guide for district directors of education

Describe your perception about the types of schools enrolling the basic education students from four different categories of UBUDEHE in your district/province.

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…….....

How do you judge the degree of achievement provided by different types of Rwandan basic education schools in your District/province?

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……

Describe the existing relationship between the parents' socio-economic status (Ubudehe category) and their students 'achievement in your district/province.

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…….....

What measures do you intend to initiate in the types of basic education schools proven low achievement from their graduates in your district/ province?

……
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……
……

Thank you so much!

Respondent: DDE A. District

Describe your perception about the types of schools enrolling the basic education students from four different categories of UBUDEHE in your district/province.

In our District we are having private schools and public schools and among the public schools we have the full public schools that are owned by the government and the Government aided schools that owned by Churches and Non-Government organisations in partnership with Government, in regard to the enrolment according to their UBUDEHE category, there is no basis of UBUDEHE category when in enrolling students but what is practically observed is those from rich families attend private schools and those from poor families attend government and government aided schools from pre-primary to primary schools and the children from poor families attend day schools (9-12YBE) and the rich attend the Boarding (schools of excellence) in secondary schools as observed.

How do you judge the degree of achievement provided by different types of Rwandan basic education schools in your District/province?

The public and government aided primary schools perform less than private primary schools according the previous national exams whereas the private and Government aided (Day schools) perform less than Boarding schools (schools of excellence). The achievement in private primary schools is higher than the rest whereas the achievement in Boarding schools (government and Government-aided Boarding schools) achieve higher than the rest.

Describe the existing relationship between the parents' socio-economic status (Ubudehe category) and their students 'achievement in your district/province.

There a tangible relationship between parents'socio-economic relationship and their achievements because students from poor families usually join primary schools that performing less within the national examination and this degrade their chances of joining the Boarding schools which can help them to well at the end the national exams in senior six.

What measures do you intend to initiate in the types of basic education schools proven low achievement from their graduates in your district/ province?

- *We have started emphasizing on the school feeding program to ensure all students in primary schools are fed at school to improve students 'concentration and retention in times of studies to help those from poor families benefiting from the school feeding program.*
- *We will put much energy in controlling and monitoring within the government and government aided schools to the teaching and learning processes are standardized as required*
- *We are recommending the central government to let all the primary education be owned by the government so that all the efforts can be put together to ensure equity and quality is provided to the poor and the rich.*

Thank you so much!

Respondent: DDE B. District

Describe your perception about the types of schools enrolling the basic education students from four different categories of UBUDEHE in your district/province.

Those of category one and two attend less performing schools, there is no basis of UBUDEHE category when enrolling students but what is observable is that those from rich families attend private schools and those from poor families attend government and government aided schools from pre-primary to primary schools and the children from poor families attend day schools (9-12YBE) and the rich attend the Boarding (schools of excellence) in secondary schools which are highly performing at the end of national examinations.

How do you judge the degree of achievement provided by different types of Rwandan basic education schools in your District/province?

The public and government aided primary schools perform less than private primary schools according the previous national exams whereas the private and Government aided (Day schools) perform less than Boarding schools (schools of excellence). The achievement in private primary schools is higher than the rest whereas the achievement in Boarding schools (government and Government-aided Boarding schools) achieve higher than the rest.

Describe the existing relationship between the parents' socio-economic status (Ubudehe category) and their students 'achievement in your district/province.

There a remarkable relationship between parents'socio-economic relationship and their children's achievements because students from poor families usually join primary schools that performing less within the national examination and this degrade their chances of joining the Boarding schools which can help them to well at the end the national exams in senior six.

What measures do you intend to initiate in the types of basic education schools proven low achievement from their graduates in your district/ province?

- *We will put much energy in controlling and monitoring within the government and government aided schools to the teaching and learning processes are standardized as required*
- *We will encourage competition between public and government-aided schools by awarding the best performing.*

Thank you so much!

Respondent: DDE C. District

Describe your perception about the types of schools enrolling the basic education students from four different categories of UBUDEHE in your district/province.

what is on the ground is that those from rich families attend private schools and those from poor families attend government and government aided schools from pre-primary to primary schools and the children from poor families attend day schools(9-12YBE) and the rich attend the Boarding (schools of excellence) in secondary schools as observed.

- *Prob: do you have any international school within your District?*
- *R: No, we only have private and public schools but public schools are subdivided into full public and Gov-aided at all levels.*
- *Prob: what do parents base on when their enrolling the children.*
- *R: their financial capacity and schools 'academic performance.*

How do you judge the degree of achievement provided by different types of Rwandan basic education schools in your District/province?

The private primary schools perform better than public and government aided primary schools within all evaluations conducted while boarding schools in secondary levels perform better than day schools whether their owned by government or private.

Describe the existing relationship between the parents' socio-economic status (Ubudehe category) and their students 'achievement in your district/province.

There is significant relationship between parents' socio-economic relationship and their achievements because the schools that require much fees and materials (expensive) are the ones performing well at all levels of education in our District and they are only joined by students from families that are financially able.

What measures do you intend to initiate in the types of basic education schools proven low achievement from their graduates in your district/ province?

- *We will put much energy in controlling and monitoring within the government and government aided schools to the teaching and learning processes are standardized as required*
- *We are recommending the central government to let all the primary education be owned by the government so that all the efforts can be put together to ensure equity and quality is provided to the poor and the rich.*

Thank you so much!

Respondent: DDE D. District

Describe your perception about the types of schools enrolling the basic education students from four different categories of UBUDEHE in your district/province.

what is observed is that those from rich families attend private schools and those from poor families attend government and government aided schools from pre-primary to primary schools and the children from poor families attend day schools (9-12YBE) and the rich attend the Boarding (schools of excellence) in secondary schools as observed..

How do you judge the degree of achievement provided by different types of Rwandan basic education schools in your District/province?

The private and international schools perform higher than public and government aided schools at all levels and their graduates are easily employed than those graduates of public and government aided schools.

Describe the existing relationship between the parents' socio-economic status (Ubudehe category) and their students 'achievement in your district/province.

There a meaningful relationship between parents' socio-economic relationship and their achievements because students from poor families usually join primary schools that performing less within the national examination and this prevent them from joining best secondary schools.

What measures do you intend to initiate in the types of basic education schools proven low achievement from their graduates in your district/ province?

- *We will strengthen the school feeding program within public schools to sustain the attendance and concentration of children from poor families.*
- *We will put much energy in controlling and monitoring within the government and government aided schools to the teaching and learning processes are standardized as required.*

Thank you so much!

Respondent: DDE E. District

Describe your perception about the types of schools in which students have been enrolling within the basic education in relation to the four different categories of UBUDEHE in your district/province.

In our District we are having private schools , public schools and international schools From Pre-primary to secondary school, among the public schools we have the full public schools that are owned by the government and the Government aided schools that owned by Churches and Non-Government organisations in partnership with Government, in regard to the enrolment in relation to their UBUDEHE category, there is no basis of UBUDEHE category when enrolling students but what is practically observed is those from rich families attend private schools and those from poor families attend government and government aided schools from pre-primary to primary schools and the children from poor families attend day schools(9-12YBE) and the rich attend the private and international schools while the children from middle class families attend Boarding schools(schools of excellence in Secondary Schools)

How do you judge the degree of achievement provided by different types of Rwandan basic education schools in your District/province?

The public and government aided primary schools perform less than private primary schools and international schools according the previous national exams whereas the private and Government aided(Day schools) perform less than Boarding schools(schools of excellence) and international schools in secondary schools. The achievement in private primary schools is higher than the rest whereas the achievement in Boarding schools (government and Gov-aided Boarding schools) achieve higher than the rest. However, students from the international schools perform better and gain costly international scholarships than others.

Describe the existing relationship between the parents' socio-economic status (Ubudehe category) and their students 'achievement in your district/province.

It is typically related because the children from poor families join the pre-primary and primary schools with no adequate teaching and learning resources with less skilled teachers while their counterparts from rich families join well-resourced schools(private) and this create a long time negative impact because the first nine years of education are very important to boost future academic performance.

What measures do you intend to initiate in the types of basic education schools proven low achievement from their graduates in your district/ province?

- *We are currently focusing on professional teachers' development and recruitment.*
- *We will also focus on controlling, monitoring and evaluation within public and government-aided schools.*

Thank you so much!