Colonization, institutions and development in the former French West Africa

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Abstract
This paper evaluates the impact of the colonial times on current development in French ex-colonies of West Africa. It uses differences in development outcomes across areas of the former French West Africa to show the existence of long term historical and institutional effects on development paths. Nevertheless it is difficult to distinguish between different types of long term effects: geographical effects, pre-colonial effects and colonial effects themselves. This paper tries to identify the impact of the colonial era taking into account its potential links with geography and previous historical times, more precisely the pre-colonial economical and political development and the characteristics of the colonial conquest.

Results show that colonial history is a strong determinant of current development of West Africa through two different ways: public investments in education, health and infrastructures on the one hand, and local chiefs’ implication in the colonial administration on the other hand. Firstly, colonial public investments explain much of current inequalities between West African districts, particularly those concerning secondary school attendance, health and infrastructures. Secondly, the more involved local chiefs were in colonial administration, the more educated people are now. There also appears evidence of the impact of pre-colonial political development on education: areas that were integrated in a centralized political entity (an empire or a kingdom) before colonial times have worse performances in education nowadays. Finally, the length of the resistance opposed by African people against the colonial power has an interesting non-linear impact on development paths.

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1. Introduction

West Africa’s economic performances since the independences in the 1960’s have been strikingly low in comparison with the rest of developing countries in general and, for example, former French Asian colonies in particular. That is what makes many observers talk about the “African tragedy”. Obviously, explanations of this tragedy must be looked for so as to identify the institutional factors that obstruct the development of African countries. Economic historian Paul Bairoch\(^1\) writes: “There is no doubt that a large number of negative structural features of the process of economic underdevelopment have historical roots going back to European colonization”. This idea is largely shared but has remained for a long time mainly informal.

Since the 2000’s, a growing literature focuses on the link between colonialism and development. A number of studies have empirically tested this link, starting with Acemoglu, Johnson & Robinson (2000). This paper shows that the type of colonialism (extraction colonialism or settlement colonialism) had an important impact on the current development of former colonies through the quality of the institutions: the more Europeans settled in a colony, the better the quality of the institutions became, and the more the colony is developed now. Another interested paper written by Banerjee & Iyer (2002) studies the impact of the colonial rule (indirect rule versus direct rule) on the development of Indian districts. They provide evidence that the districts that were under the direct rule, that is to say administrated directly by the British, have now better economical performances than the districts that were administrated by an Indian landlord.

This literature compares all former colonies between them, except the paper of Banerjee & Iyer that compares the Indian districts only. It is actually quite difficult to make some comparisons between countries that have radically different historical, geographical, cultural backgrounds and, what’s more, radically different colonial history. That is why I decided to study the link between colonialism and current development only in the former French West Africa: the region has an important homogeneity regarding its geographical, anthropological, cultural and historical characteristics. Moreover, the whole region was colonized by only one European country, France, which allows us to avoid the debate on French versus British colonization. The colonial experience took place at the same period in West Africa, the last quarter of the nineteenth century, and all former colonies attained independence between 1958 and 1960. The comparability between the districts of the former French West Africa is therefore much higher than between all former colonies.

The colonial experience introduced important sources of differentiation between the districts of the former French West Africa. The public colonial policy was indeed very unequal from a district to another regarding at least two aspects: the colonial investments in education, health and infrastructures on the one hand, and the “indigenous policy”, which is the colonial attitude toward local chiefs, one the other hand. The question is whether the investment and the indigenous policies during colonial times have had a long-term impact on the development paths.

Even if the pre-colonial context was quite homogeneous in the former French West Africa, we can not suppose that differences in colonial policy were totally random. We can just more easily identify the differences between the districts that could have influenced the colonial policy. What is indeed necessary to identify are the districts’ pre-colonial characteristics that could have influenced both the colonial policy and the current development, otherwise the measure of the impact of the colonial policy on the current development of the districts would

\(^1\) Paul Bairoch, …., 1993
be biased. I classify the potential sources of endogeneity of the colonial policy in three groups: the geography, the pre-colonial level of political and economical development, and some characteristics of the colonial conquest. These characteristics will be taken into account in our econometric specification so as to test the impact of colonial policy itself on current development.

To test this impact, I collected original data about French colonization’s history. I use first of all the colonial budgets that provide many data about colonial investment and indigenous policy. These data have been collected at the level of the “cercle” (circle) that was the main geographical entities in the French West Africa. The territory was organized as follows: there were 8 colonies (Senegal, Guinea, Mauritania, Mali, Upper-Volta, Niger, Ivory Coast and Benin), each of which entails between 8 and 20 “circles”. The following map illustrates this organization, excluding the Benin (this colony had to be excluded of the whole study because of the lack of current data on it).

I also collected political data about pre-colonial history and about the colonial conquest in various historian documents. Current data about these former colonial districts come from national households surveys of the 1990’s. I used the geographical coordinates of the locality of the households to reconstitute the same districts than those existing in the colonial times. The paper is organized as follows: I will first in section 2 provide a description of current inequalities of development in the former French West Africa. Then in section 3 I will give the main aspects of the French colonization in West Africa. In section 4 I focus on the potential sources of endogeneity of the colonial policy: the pre-colonial history and the colonial conquest. Section 5 is devoted to a presentation of the data and the empirical strategy. Section 6 reports the econometrical results and section 7 concludes.
2. Description of current inequalities of development in the former French West Africa

Although West Africa counts among the poorest regions of the world, there is an important heterogeneity between the countries of this region, even between the French-speaking countries. In 2000, the Ivory Coast’s GNP per capita was for example four times higher than the Niger’s one. The primary net enrolment rate varied in 1995 from 25% in Niger to 75% in Benin. The literacy rate in 1995 amounted to only 13.5% in Niger, around 20% in Mali and Upper-Volta, 32% in Senegal and Benin, 38% in Mauritania, and reached 44% in Ivory Coast. Such inequalities can’t be considered as insignificant.

But the greatest inequalities in the former French West Africa do not appear at the national level. The inequalities within countries are in fact much higher than the inequalities between countries. Using the colonial maps and the locality where surveyed households live, I was able to reconstitute the former colonial districts (called circles) and to look at the development level of each district in the 1990’s. I retain the development indicators that were measured by every national households surveys, what was obviously a bit restrictive. They can be classified in two groups: indicators of the human development of the district, and indicators of the development of the infrastructures in the district. Unfortunately, I could not use any survey for Benin, so this country will not be included in my study.

The objective of the section is to give evidence of the existence of important inequalities at the district level in former French West Africa. I want also underline the primacy of the heterogeneity between districts in comparison to the heterogeneity between countries. That is partly what legitimates the choice of studying inequalities in West Africa at an infra-national level. Moreover, I want to show that the inequalities between border districts are often significant. This raises the following question: what happened in the districts so that border districts, similar at many levels, had such different development history? The following sections will try to answer this question. Let us describe inequalities in West Africa first.

2.1. The human development inequalities

I constructed 3 human development indicators from the national households surveys: two indicators related to educative performances, one concerning the enrolment in the primary school and the other the enrolment in the secondary school, and one indicator related to health performances, concerning children’ anthropological measures. I will report here descriptive statistics on each of those human development indicators.

2.1.1. The primary school enrolment

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\(^2\) Sources: World Bank statistics. The Ivoiry Coast’s GNP was in 2000 690$ per capita, whereas the Niger’s one was 190$ per capita.

\(^3\) World Bank Data.

\(^4\) Idem.

\(^5\) I use the territorial divisions of 1925. At this time, there were 8 colonies and 120 districts (circles) in French West Africa, 102 excluding Benin’s districts.

The indicator of performance related to the primary school is the rate of more than 7-year old people that attended the primary school at least one year in their life. I will call this rate the primary school attendance rate. The mean of the primary school attendance rate over all the districts is 17%. It means that, on average, only 17% of more than 7-year old people of a district attended the primary school at least one year. This gives us evidence that the educative performances in West Africa are on average very bad. But the dispersion of this indicator is important. The standard error of the variable is equal to 58% of its mean. The means of this indicator by terciles are respectively 9%, 15% and 29%. The lowest primary school attendance rate is 2% in the district of Kouroussa (in the middle of Guinea), whereas the highest one is 61% in the district of Dakar, the capital of Senegal.

This map represents the geographical distribution of the terciles associated with the primary school attendance rate. It shows that the north-west of West Africa is much more educated than the middle-west. Despite of these geographical tendencies, it appears that there is a significant geographical heterogeneity.

The total variance of this variable can be decomposed in two parts: the variance within countries and the variance between countries. The variance “within” amounts to 60% of the total variance. The districts of a country are then more heterogeneous than the countries themselves.

2.1.2. The secondary school enrolment

The indicator of performance related to the secondary school is the rate of more than 13-year old people that attended the secondary school at least one year in their life. I will call this rate

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7 The variance within countries is the mean of the variances of the districts’ values in a country.
8 The variance between countries is the variance of the countries’ means values.
the secondary school attendance rate. The mean of the secondary school attendance rate over all the districts is 7.7%, what is again very low. The dispersion of this indicator is more important than primary school attendance rate’s one. The standard error of the variable is in fact equal to 83% of its mean. The means by terciles are respectively 2.4%, 5.6% and 15.2%. The lowest and the highest secondary school attendance rate are located at the same places than previously: 0% in the district of Kouroussa and 29.5% in the district of Dakar.

![Secondary school attendance rate](image)

The map represents the geographical distribution of the terciles associated with the secondary school attendance rate. It appears radically different to the map of the geographical distribution of the primary school attendance rate. The two indicators do not therefore represent the same development dimension. The advantage in terms of secondary school attendance is now located in the south of West Africa and in its coastal areas. But the geographical distribution of the terciles does not reflect the great heterogeneity within districts: the variance “within” amounts to 76% of the total variance, which shows evidence that the districts of a country are much more heterogeneous than the countries themselves.

2.1.3. The children health performances

The indicator used to reflect the children health performances is the rate of less than 5-year old children who suffer from stunting. I used international standards associated to each age (measured in months) to calculate the rate of stunting children of each district. A child is said to suffer from stunting if his height is less than two standard errors under the median of the
height at his age\textsuperscript{9}. The Mauritanian survey does not contain information about the weight and the height of the children, so Mauritania can not be included in these statistics.
The mean rate of stunting children across all districts is 37\%. The dispersion of this indicator is less important than the dispersion of educational performances: the standard error amounts to 32\% of the mean. The mean by terciles are respectively 24\%, 36\% and 50\%. By the whole, this represents very high rates. The children health performances are then quite bad even in the third tercile.
But the inequalities are not insignificant. The lowest rate of stunting children is 7\% in the district of Hombori (in the north-east part of Mali). The highest one is 58\% in the district of Bafoulabe (in the west part of Mali).

\textit{Children stunting rate}

Niger is evidently the area that has on average the highest rate of stunting children. The mean rate of stunting children for Nigerien districts is 50\%. On the opposite, Guinea’s districts have on average the lowest rate of stunting children: 29\%. The rest of the region exhibits an important heterogeneity from a district to another. This is confirmed by the fact that the variance “within” amounts to 79\% of the total variance.

To conclude on the human development in French-speaking West Africa, educational and health performances are on average quite bad, but there is a significant heterogeneity between the districts. Even if some areas are sometimes more homogeneous, the heterogeneity affects also border districts.

\textsuperscript{9} The median of the height for a given age is calculated from international data, not regional ones.
2.2. The infrastructures’ development inequalities

Infrastructures are an important dimension of development because they affect directly the standard of living of the households. That is the reason why I want to focus on three indicators reflecting the level of infrastructures’ equipment: access to electricity, access to running water and the type of combustible used for cooking.

2.2.1. Access to electricity

To represent the accessibility to electricity in the districts, I use the share of the households of the districts that are equipped with electrical supplies. On average, 14% of the households of a district have electrical supplies. This does not obviously take into account the non-official electrical supplies that could yet amount to an important number. The distribution of electrical supplies is very unequal. The standard error of the share of households equipped with electrical supplies represents 135% of the mean of this variable. The means by terciles are very different: 1%, 6% and 34% of the households. The share of equipped households is more than 50% in only 5 places: Dakar, Saint-Louis, Conakry, Abidjan and Daklet Nouadhibou (in Mauritania). The highest rate of electrical equipment is 90% in the district of Daklet Nouadhibou.¹⁰

Ivory Coast and Senegal are obviously more equipped with electrical supplies than the other countries. The average share of equipped households is 28% for Ivorian districts and 26% for Senegalese ones, what is much higher than for all the districts (14%). Conversely, the average share is 3.4% for Malian districts and 4% for Nigerien ones. Differences between countries are then very important.

¹⁰ This district was called « Baie du Lévrier » in the colonial times.
Nevertheless differences between districts of a country are much more important: the variance “within” represents 75% of the total variance. Inequalities affect therefore districts more than countries.

2.2.2. Access to running water

The supply of running water in a district will be estimated by the share of the households of the district that have a private water tap. The average share for all the districts is only 11%. 89% of the households of a district use thus public sources of water like fountains or natural sources like streams.

But the distribution of this indicator is once again very unequal. The standard error represents 136% of the mean of the variable. 13 districts have no surveyed households equipped with a private water tap. On the contrary, 73% of the Dakar’s households are equipped with private water tap. The means by terciles are then very different: 0.6%, 6% and 26%.

Except for the north-west of the region, the geographical distribution of the share of the households equipped with a private water tap show an important heterogeneity from a district to another. The existence of geographical discontinuities is confirmed by the fact that the variance within the districts of a country amounts to 86% of the total variance, which is very huge. Inequalities are therefore a matter of districts rather than a matter of countries.

2.2.3. Type of combustible used for cooking

The last indicator of the infrastructures’ development that I want to present is the share of the households of a district that use a modern combustible, for example gas, coal or electricity,
rather than a natural one, wood for the most part. On average for all districts, only 15% of the households use a modern combustible for cooking.

Like the two previous indicators of the level of infrastructures’ development, this one is a lot dispersed. Its standard error represents 133% of its mean. The means by terciles amount respectively to 0.7%, 7% and 38%. The inequalities are one more time very important. 11 districts have no surveyed households using a modern combustible. Conversely, the share of the households of the district of Daklet Houadhibou using a modern combustible is 91%.

**Share of the households using a modern combustible**

The geographical distribution of the share of the households using a modern combustible by terciles shows that the Ivorian districts have a great advantage: the average share of households using a modern combustible for the Ivorian districts is indeed 32%, in stand of 11% for all districts. The Mauritanian districts have also better performances: their average share of households using a modern combustible is 28%. On the opposite, this average share amounts to only 2.7% for the Nigerien districts and 5% for the Malian ones.

Even if the inequalities between countries are very significant, the inequalities within countries are much more important again: the variance “within” represents 75% of the total variance.

To conclude the description of the infrastructures’ development inequalities, it is clear that they are higher than the human development ones. The global level of infrastructures’ development is very low and the distribution of the infrastructures’ equipment is very unequal. Some countries exhibit advantages for some indicators, but the inequalities between districts of a country are always much higher than the inequalities between countries.

What happened to the former colonial districts so that such inequalities appeared? The potential sources of formation of these inequalities are obviously of multiple kinds. They
could be geographical, cultural, anthropological, political, and so on and so on. I do not argue to identify all of them, far from it. But I propose to identify some of them related to the colonial history. The following sections will therefore focus on the colonial history and on its potential determinants so as to measure its impact on current inequalities between the former colonial districts of the French West Africa.
3. Historical background: the French colonisation

This section aims to describe some aspects the French colonisation, in particular those that could have influenced the formation of the current inequalities in French-speaking West Africa. It will be necessary to begin this section with a more general description of the colonial administrative and financial organisation so as to understand the way colonial decisions were undertaken and how the colonial policy was framed. Then I will focus on what appears like the two main sources of differentiation between districts: the public investment policy on the one hand and the indigenous policy on the other hand.

3.1. The financial and administrative organisation

The French West Africa was one of the important pieces of the French colonial empire. It was officially created in 1895 as the federation of the colonies of West Africa. But the conquest was not sufficiently achieved in 1895 to consider this year as the real beginning of the colonial experience in West Africa. The federal government of the French West Africa became effective in 1904, and the civil administration took place in the whole territory in the place of the military troops during the 1900’s and 1910’s. I will therefore describe the financial and administrative organisation as it was during the actual colonial era, that means between 1910 and 1960.

3.1.1. The administrative organisation

The colonial administration is organised as a pyramid: at the top of the pyramid chairs the General Governor of the federation. At the second stage stands a Governor for each of the 8 colonies. At the third stage stand the districts’ administrators, around 15 by colonies. In 1925, the territory counts 115 districts. The largest districts were divided in subdivisions that were also managed by administrators, constituting the fourth stage of the pyramid. In 1925, the number of subdivisions (or districts when the districts have no subdivision) amounts to 164. The last stage of the pyramid is occupied by African chiefs. They received from the colonial administration the status of “village’s chiefs” so as to limit their influence to small areas. In this pyramidal organisation, the effective power was concentrated at the third stage: the districts’ administrators were “the real chiefs of the French empire”. Everything matches to make impossible the definition of a real colonial policy at the top of the pyramid: the physical distances between the various levels of the colonial hierarchy, the small number of inspectors of the colonies, the lack of knowledge of the ground hold by the Governors. The privileges of the districts’ administrators are very important:

- oversee the tax collection
- represent the Governor in all official cases
- count his territory and draw up the map
- steer elementary schools and watch the Koranic schools
- plan and supervise the building of roads, bridges, wells and tracks
- arrest the criminals and judge them according to the “code of the native population”1

The official tasks of the African chiefs were to collect tax, to recruit the workforce for the hard labour and to recruit the military reservists. The number of people to recruit was defined by the district’s administrator. African chiefs were therefore quartered to auxiliaries of the colonial administrators.

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1 Called in French the « code de l’indigénat ». This code was exclusively devoted to African people.
The administrative organisation was thus officially centralized but effectively decentralized. The districts’ administrators could manage their policy in an almost independent way. This point is very important because it enables the existence of differences between border districts.

3.1.1. The financial organisation

The colonial financial system was based on 3 budgets: the budget of the French Ministry of the Colonies, the French West Africa federal budget and the colonies’ budgets. The budget of the French Ministry of the Colonies was fed with metropolitan taxes. It was entirely devoted to the military expenses. 80% of its resources were expended in the colonies, 20% were expended by the Ministry itself. Since the resources were allocated to the military charges, we can say that the budget of the French Ministry of the Colonies had in fact no linkage with the districts’ development.

The French West Africa federal budget was fed by the customs duties generated by the trade between the federation and the rest of the world. This budget had to cover three expenses: the running expenses of the General Government and its central services, large-scale public works related to several colonies (railway works for the most part), and subsidies to in deficit colonies (Mauritania was the only one colony receiving subsidies from the federal budget because its tax revenues were structurally smaller than its expenses).

Finally, the colonies’ budgets were fed by local taxes. The collected taxes must cover all the expenses except for military expenses and some of the biggest large-scale public works. And that is what happened effectively for all colonies but Mauritania. I calculated some descriptive statistics on the expenses of the colonies from 1907 to 1930\(^2\). The central services and the Government of the colony expended 30% of the colony’s resources and the districts received then the 70% remaining. The 70% of the total budget devoted to the districts are divided as follows: 40% represent the administration expenses, 10% represent the public works, 15% represent the education and health expenses (personal and material). The 5% left are miscellaneous expenses. The administration running expenses represented thus a big part of the expenses. The long-term investments, those that concern infrastructures, health and education, amounted together to 25% of the colonies’ budgets.

Let us now look at the tax revenues. In 1900 was adopted the rule of the financial autonomy for all the French colonies. Each colony must then use its own resources so as to finance the French colonisation. In fact the cost of colonisation was mostly supported by the African people: 60% of the colonies’ budgets came from the capitation tax between 1907 and 1930. The direct taxes (the capitation tax, the trading tax, the property tax and later the revenue tax) represent all together 89% of the total colonies’ resources. The charges of the first half of the colonial era were therefore mostly endured by local populations themselves.

Since this subject of this paper is the colonial determinants of the current inequalities between former West African colonial districts, the interesting budgets are the colonies’ ones. This is actually here where development expenses were located. The only development expenses carried out by another budget are some large-scale public works, in particular railway works. This study does thus not include these investments. This exclusion produces actually an understatement of inequalities during the colonial era: the large-scale public works financed by the federal budget were mostly devoted to the main towns and main axes of each colony, which were already advantaged by the colony’s budget. The real inequalities in infrastructures’ colonial investment were therefore probably bigger than measured in this paper.

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\(^2\) I used 71 budgets covering the 8 colonies.
I will now present the data about investment policy then about indigenous policy, which are according to me the two main aspects of colonial history that could have had a long-term impact on the districts development paths.

3.2. The public investment policy

The colonial administration invested in three spheres: education, health and infrastructures. The investments entailed two aspects: the personal expenses and the material expenses. I can’t consider both of them because the budgets’ data are not always presented at the district level. For example, personal expenses related to public works are always aggregated at the colony’s level. Concerning education and health investments, material expenses are also often aggregated. I therefore only take into account personal expenses related education and health and material expenses related to public works. Fortunately, these expenses are the more important for both type of investment: personal is bigger than material in education and health’s fields, as material is bigger than personal in infrastructure’s field. The purpose of this section is to describe the investment policy: how investments’ expenses were allocated? How much was expended? Where?

3.2.1. Were investment expenses in the districts linked to their tax revenue?

Since the colonial administrators were almost independent and managed their district according to their own vision of colonialism, financial resources were centralised at the colony’s level. Resources are collected at the district’s level and then merged in the colony’s budget. That is why an obvious question is: how were the colony’s resources allocated between the districts? I have not found in any budget the exact rule of resources allocation. There was for the rest probably no exact rule. I guess that the resources allocated to each district were a compromise between the administrator and the Governor’s wishes. Each administrator built up its own list of expenses, after what the Governor compiled all together to frame the whole budget. He had certainly to arbitrate between the administrators’ wishes according to his own political project. But the public investments were drafted by the administrators themselves. A question rises: since the districts brought different levels of tax revenue to the colony’s budget, did they receive proportional investments? This would imply that richer districts received more investments and vice versa. To answer this question, I calculated the ratio between the share of investments received by each district and the share of the resources it brings to the colony.

Concerning the number of teachers attributed to each district, the ratio varies from 0.12 to 48! The districts of the inferior quartile receive on average a share of the colony’s teachers equal to 0.37 times their share of the colony’s tax revenue. On the opposite, the districts of the superior quartile receive on average a share of the colony’s teachers equal to 4.65 times their share of the colony’s tax revenue. It is also clear that the public policy in education is not driven by the rule of proportionality between resources and expenses.

Concerning the medical staff, the correspondent ratio varies from 0 to $10^3$. The districts of the inferior quartile have an average ratio equal to 0.22 whereas the districts of the superior quartile have an average ratio of 3.8.

Concerning the public works, the ratio is once again a lot dispersed: it varies from 0 to 30. The inferior quartile has an average ratio equal to 0.3 as the superior one has an average ratio equal to 4.3.

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3 This statistic does not take into account the district of Bilma, whose ratio is equal to 156, because this district is a complete outlier regarding the rest of the distribution.
The resources allocation was then completely disconnected from the districts’ contribution to the colony’s revenue. Some districts brought many resources to the colony and received few investments; other districts brought few resources and received a lot of investments. But this is only one of the possible cases. We can also imagine that some of the richest districts received a so big part of the investments that their ratio was very high. The conclusion is thus that there was a very important redistribution between the colonial districts, but not necessary from the richest towards the poorest.

3.2.2. What, where, how much?

I already collected the data from the budgets of the first part of the colonial era: 1907-1930. The following statistics concern therefore only this period. I show here for each district its average investment data over this period. Concerning the investment in education, the more reliable data in the colonial budget are the numbers of teachers in each district. I divided the average number of teachers of each district by the number of people living in the district in 1925 to control the colonial educational policy by the district’s population. I find that the districts had on average between 1907 and 1930 one teacher for 14 000 persons. If I use the number of schools in each district, I find that there was on average one school for 1 000 km². The education investments for the first colonial period were then very limited. They are also very unequal: the standard error of this variable amounts to 300% of its mean. Dakar and Saint-Louis were in fact a lot advantaged with respectively 62 and 202 teachers for 100 000 habitants, what is to say one teacher for respectively 1500 and 500 habitants. If I do not take into account those two districts, the average number of teachers in the districts is one teacher for 22 000 habitants.

The number of teachers for 100 000 habitants

The geographical distribution of the number of teachers (per 100 000 capita) by terciles shows the heterogeneity of the education investment policy.
Concerning the health investment policy, I collected the number of persons working in the medical staff and I use this number divided by the population of the district in 1925. The result is that on average the districts had a medical staff of 12 persons per 100,000 capita, 9 if I do not take into account Dakar and Saint-Louis. This medical staff, as the teaching staff as well, included many African people. The Europeans were in fact a minority.

The medical staff (per 100,000 capita)

The geographical distribution of the medical staff per 100,000 capita by terciles exhibit once more time an important heterogeneity from a district to another. If we look at the two previous maps, it is actually visible that Upper-Volta and the south-east of Niger have been disadvantaged by the colonial human capital investment policy.

Finally, concerning the investments in infrastructures, I collected the amounts of public works yearly invested in each district, whatever the type of works (roads, wells, tracks, buildings, bridges), and I divided the corresponding average over 1907-1930 by the area of each district. The investments in infrastructures were the more concentrated: on average the districts received every year 54 Fr per km², but this average falls to 1.5 Fr per km² if I drop the districts of Dakar, Saint-Louis, Conakry and Bassam. Those 4 districts were in fact a lot advantaged in comparison to the rest of the districts. The annual investments in infrastructures amounted to, on average over 1907-1930, 66 Fr in the district of Bassam, 107 Fr in the district of Conakry, 1176 Fr in the district of Saint-Louis and 3970 Fr in the district of Dakar! One more time Saint-Louis and Dakar appear like the obvious main outsiders. Nevertheless the heterogeneity between the other districts was important since the standard error of the variable was still equal to 2.4 times its mean without the 4 advantaged districts.

The following map shows that the geographical distribution of the investments in infrastructures was less heterogeneous than for education and health. Investments were apparently more concentrated in the coastal areas of Senegal, Guinea and Ivory Coast. This fact could reflect the structure of the colonial economical system, which was based on exportations and importations with European countries.
To conclude on the colonial investment policy, it is important to remember two things. First, investments were almost low at least until 1930. If I totalise the average number of teachers of every district, I find that there were 700 teachers on average in the whole French West Africa, including many African teachers. Similarly, I find 1,230 persons in the medical staff. This is obviously not insignificant, but the investment effort was not massive. Secondly, these investments were very unequally distributed. The colonial investment policy was thus a source of discrimination between districts. Are the current inequalities linked to these colonial discriminations?

3.3. The indigenous policy

The former colonial districts’ development could have been influenced by a completely different colonial policy which is the indigenous policy, what means the attitude of the colonial administration towards the African chiefs. The French colonisation is often pictured as the example of the “direct rule” colonisation in comparison to the English colonisation which stands as the example of the “indirect rule” colonisation. Since African chiefs actually never kept their entire power on their kingdom, they were nevertheless less or more associated to the colonial administration. What impact could potentially have had the participation of the local chiefs in the colonial administration? What was exactly the status of the African chiefs during the colonial experience? This section wants to answer to these questions.

3.3.1. The potential role of the African chiefs

There are at least three channels through which the participation of the African chiefs to the colonial administration could have influenced the districts’ development. First, the participation of the African chiefs could have allowed a better appropriation of the colonial institutions by the African people. We can imagine that it is easier to accept new rules and new ways of living from a stranger power if the local legitimate chiefs are part of the power than if not.

Secondly, the participation of African people in the colonial administration could have facilitated the transmission of the power at the independence. The power exercise over the colonial era, even if this power was subordinated to the French power, could have then made the transition easier.

Thirdly, the participation of the African chiefs, when those chiefs came from the traditional powerful families, could have prevented the district from a complete destruction of its traditional political and social structures. As I think that reform is better than revolution, I imagine that the political and social continuity could have generated more positive long-term effects than the destruction of the traditional political system. But it is hard to know a priori if the chiefs who participated to the colonial administration had been considered rather as legitimate chiefs⁴ or as traitors⁵ by the populations. In fact both cases occurred.

The participation of local chiefs to the colonial power, even if some aspects are ambiguous, had probably a rather positive impact on the districts’ development. It is at least unreasonable to suppose that it had no impact. That is why I wanted to include this characteristic of the colonial experience in my study.

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⁴ This has been the case for Félix Houphouët-Boigny, baoule chief, member of the colonial administration and later the father of the Ivory independence.

⁵ This has been the case for the chiefs of the Mossi kingdom in Upper-Volta: they were excluded of the building of the independent State because of their participation to the colonial power.
3.3.2. The status of the local chiefs in the colonial history

The status of the African chiefs varied several times during the colonial history. 3 periods can be distinguished. The first period lasted from the conquest to the beginning of the twentieth century. At the earliest times of the colonial experience, several factors encouraged the French administrators to rely on the traditional African chiefs: the administrative employees were indeed too scarce to physically occupy all the territories, and it was easier to conquest territories by the diplomatic way than by the military way. Many treaties (“protectorate treaty”, “friendship treaty”) were signed between the French officials and the African chiefs. This first period was really an indirect rule experience. From the 1900’s to the 1920’s, the French colonial ideology moved to the famous direct rule. The African chiefs were exiled, sometimes killed, when they opposed too much resistance to the colonial power. In most of the cases, their status was reduced to a symbolic and religious status. The African chiefs were nevertheless tasked to help the administrative tax collectors. This was their only official role. After 1920, some influent French colonial ideologists like Henri Labouret and Robert Delavignette generated a second change in the indigenous policy. The diplomatic context after the World War I and the debate on the French versus English colonial empires promoted a new attitude towards the local chiefs: no more assimilation but association. The idea consisted in enhancing the status of the African chiefs and in associating them in the colonial administration so as to make profit from their knowledge of the social and cultural environment. The colonial administration was moreover still too small to be effectively present over all territories, so the association policy was also a pragmatic response to a logistical problem. This change was not yet a revolution: the districts’ administrators could fire any African chief if one of them was not as obedient towards the French power as he should.

3.3.3. Descriptive statistics on the local chiefs’ association

The association of local chiefs can be measured by the wages paid by the colonial administration to its “indigenous chiefs”. The apparition of these wages coincides with the change in the indigenous policy. Until the end of the 1910’s, African chiefs received indeed only retribution on the tax revenue they collected. The association policy has been explicitly concretised by a new status and a new salary corresponding to the acknowledgement of their actual role. Before the change in the indigenous policy, the local chiefs were indeed classified in the category “Tax collectors” and were paid with variable retribution on the tax collected. After the change in the indigenous policy, they were classified in the category “Administrative employees” and were paid with a fixed wage in addition to the tax retribution. This reform did not occurred at the same time in the different colonies. Senegal was the first colony to fulfil the reform in 1912. Benin did it in 1916, then Mali and Upper-Volta in 1917, then Mauritania in 1918, Niger and Guinea in 1919 and finally Ivory Coast in 1933 (much later than the rest of the federation!).

To measure the degree of association of the African chiefs, I calculated the mean of the wages paid in each district by year between 1910 and 1930. This measure takes into account two differentiating factors: the time the reform was achieved and the amount of the wages paid to the local chiefs. The wages paid to the African chiefs depends actually on their importance, what means their lineage, their influence, their territory for example.
The average annual amount of indigenous chiefs’ wages is 3,500 Fr per district. As this average takes into account the years when the association policy was not yet achieved, it is interested to look at the mean of this variable over the association period only. If I keep only the years of association policy in each colony, I find an average annual amount of indigenous chiefs’ wages of 16,000 Fr, and an average number of chiefs of 9 (by district). The association policy was not then just a theory! It was also a financial and administrative reality.

The distribution of the African chiefs’ wages was very unequal. If we put aside the differences related to the time the association policy was fulfilled and then keep only the years after its achievement, the means by colonies are nevertheless very different: Senegal has the biggest mean with an average amount of 30,000 Fr by district, whereas Mali has a mean of 4,400 Fr by district (and the Ivory Coast a zero)!

As the need of African chiefs probably depended on the number of people living in the district, I divided the average amount of wages paid to African chiefs by the population of each district. Results show that the district paid on average 42 Fr per 1,000 capita to the local chiefs. This variable is a lot dispersed because its standard error represents more than 200% of its mean. The districts of the inferior tercile paid on average 0.4 Fr per 1,000 capita to their local chiefs, while the districts of the second tercile paid on average 6 Fr per 1,000 capita and the districts of the superior tercile 120 Fr per 1,000 capita. The differences are thus very significant.

The geographical distribution of the association policy shows that it was more important in Senegal, in the Saharan districts, in the Fouta-Djalon and in some of the Upper-Volta’s districts.
To conclude on the colonial policy, the colonial budgets’ data give evidence that both investment and indigenous policies were sufficiently unequally distributed to allow us to think that they may have had an impact on the districts’ development. The point is now to test and measure this potential impact. This would be easy if the colonial policy had not been influenced by any characteristics of the districts. But it is impossible that such policy was totally random. That is the reason why I will present in the following section the pre-colonial districts’ characteristics, more precisely those which could have had an influence on both colonial policy and development path. This is in fact those characteristics that could bias the measurement of the impact of the colonial policy on the districts’ long-term development.
4. The potential sources of endogeneity of the colonial policy

The purpose of this section is to identify the potential determinants of both the colonial policy and the development path of the former West African districts. The question is: what were the districts’ characteristics that influenced the colonial policy in a certain way and that also influenced the districts’ development independently to the colonial experience? These potential determinants can be classified in two groups: the determinants related to the pre-colonial history and those related to the colonial conquest history. I consider actually that the conquest history can not be integrated in the colonial era itself because the colonial power was not yet installed and the pre-colonial political structures were still intact.

As I said in the introduction of the paper, the great advantage of limiting the study to only one region of the world is that the historical and geographical characteristics are right away much similar. The sources of variation are thus much fewer and easier to identify than at the worldwide level.

4.1. The pre-colonial history

The pre-colonial history is the whole districts’ history until the arrival of the first French military troops. Information on this period was difficult to collect at the district’s level. I had thus to use few indicators of what appeared to me as the main characteristics of pre-colonial West Africa. As an introduction, let us look at the basic characteristics of the whole region itself: at the end of the nineteenth century, the future French West Africa is a vast territory with very few people on it. Its area amounts in fact to 4 800 000 km² for a total population of around 12 000 000 people. The density is therefore around 2.5 people per km².

I will here describe the districts’ pre-colonial political and economical situation with the few indicators that I could collect.

4.1.1. The pre-colonial political context

The pre-colonial political context can be synthesized in a simple picture on which there are two types of districts: those where was established a centralized political power (state societies) and those where did not exist any kind of centralized political power (stateless societies).

The nature of the political power in the districts could have influenced both the colonial policy and the districts’ development paths: the colonial policy because it was, for example, perhaps easier to build an important association policy in the districts where were present some important and influent chiefs. The existence of a centralized political power could also have encouraged the colonial administration to make more investments according to the fact that those investments were perhaps more profitable in this case. But the nature of the pre-colonial political power could also have influenced the development paths independently to the colonial experience: the state societies have a faster development than the stateless societies according to the Geneaioli & Rainer results.

I used several historian documents to determinate the “state” and the “stateless districts”. I just consider that there was a centralized political power in a district if it sheltered an identified kingdom which was not too much recent. The following map indicates the identified kingdoms.

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6 This amount is the French West Africa’s population around 1910. I calculated it from the census made by the districts’ administrators between 1906 and 1912. Those census are available at the National Archives in Paris.

at the end of the nineteenth century. Some of them, like the States of Samory, are not considered as real centralized political power states because of their instability and/or youth.

**Pre-colonial empires and kingdoms**

![Pre-colonial empires and kingdoms map](image)

4.1.1. The pre-colonial economical context

The second characteristic that seems to be very important to take into account is the pre-colonial economical development’s level. This aspect will be separated in two parts: the “agricultural development” on the one hand and the “commercial development” on the other hand. We have to remain first that West Africa was at the end of the nineteenth century a quasi-total rural area. The towns were scarce and almost small: the 5 biggest towns were Saint-Louis (around 24,000 habitants), Dakar (18,400), Rufisque (12,500), Conakry (8,200) and Cotonou (4,400). These figures come from census of the 1900’s so these towns were actually smaller than this at the end of the pre-colonial era. The quasi-totality of the population was then rural. That is why the “agricultural development” is the most important dimension of the economical development.

The agricultural development will be measured indirectly by the density of the population in each district around 1910\(^8\). The density is actually a good approximation of the agricultural development in a completely rural society. The average density of the French West African districts around 1910 amounted to 6.7 habitants per km\(^2\). But the density was obviously not equally distributed: the districts of the inferior tercile had an average density of 1 habitant per km\(^2\), 4 habitants per km\(^2\) for the second tercile and 14 habitants per km\(^2\) for the third one.

The following map presents the geographical distribution of the density of population by district. We can see that the pre-colonial agricultural development was concentrated in 5 places: first of all in the Upper-Volta, then on the coastal areas of Senegal, Guinea and Ivory Coast, and finally in the forest area of Guinea.

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\(^8\) This is the earliest period we can consider according to the available census data.
The population density at the beginning of the twentieth century

As for the commercial development in West Africa, it was in fact very concentrated in the European trading counters. These trading counters had created real discontinuities in the levels of development in West Africa. That is why I simply constructed a dummy variable indicating the existence of a European counter or not.

The pre-colonial economic development of the districts may have had a big influence on the colonial policy and the development path. Its influence on the development of the districts is quite obvious. Concerning the colonial policy, you need to remember that colonisation was partly motivated by economical profitability. The colonial policy could therefore have been oriented in favour of the more profitable districts.

4.2. The French conquest

The conquest history could have also influenced the colonial policy and the development of the districts. Some characteristics of the colonial conquest could be indeed the expression of particular characteristics of the districts themselves, which can be some important determinants of the districts’ development.

4.2.1. The beginning of the colonial conquest

The French conquest in West Africa began in 1854 in Senegal and ended in 1903 in Niger. The conquest has been almost as long as the colonial experience itself, which can be dated from 1900-1910 to 1960. The beginning of the colonial conquest is defined as the year of arrival of the first military troops in a district.

The colonial expansion began from the west of the region, the Senegalese and the Guinean coasts. The military troops went then in the east direction as far as the middle of Mali. A third attacking column went from the south of Ivory Coast to the north and joined the first two columns in the south of Mali. Then the last column started from this point towards the east, as
far as the Tchad Lake. Between the start and the end of the colonial expansion, 50 years have passed. This makes a big difference in comparison of the length of the colonial era itself.

The French colonial expansion through West Africa

This map represent in light purple the districts conquest before 1880, in middle purple those conquest between 1880 and 1890 and in dark purple those conquest after 1890. The time the districts were invaded could have mattered in their history. It could first have influenced the colonial policy because the earliest conquered districts could have been advantaged in comparison to the latest conquered ones due to the fact that the colonial power settled sooner. But the time the districts were invaded may also have influenced the development independently of the colonial policy because it can reflect some intrinsic characteristics like enclosing.

4.2.2. The resistance of the African people

The resistance of the African people against the colonial power may also be a determinant of the colonial policy as well as the districts intrinsic development. The resistance could indeed have had an impact on the volume of the colonial investments for example, like some rewards and punishments. Moreover, resistance was probably the expression of some cultural, anthropological or political characteristics of the districts which are obviously some determinants of their development too.

I collected two important dates to measure the length of the resistance: the arrival of the first military troops on the one hand and the last military intervention for a pacification purpose on the second hand. The difference between these two dates defines in our paper the length of the districts’ resistance. I find an average resistance of 22 years, what is much longer that we were used to be told about colonial history. But the variations of the resistance’s length are quite important: the standard error of this variable is equal to 15. No resistance was opposed to the colonial power in some areas like in the district of Indenié (Ivory Coast) or in the former
Europeans trading counters, whereas the resistance lasted 74 years in the district of Adrar (in the north of Mauritania).

4.2.3. The former African chiefs’ fate

When the French invaders arrived in West Africa, the African chiefs did not all have the same reaction: some of them accepted to signed some friendship or protectorate treaties as others decided to resist and then took the arms. The African chiefs’ reaction is not necessarily much correlated with the length of the resistance of the districts because the chiefs could have different reactions at different times: some chiefs for example began to collaborate then turned to resistance as others chose immediately to resist and were rapidly battled. Moreover, the resistance was also a reaction of the population and not only of the chiefs. Resistance and chiefs’ fate are thus two different things.

Two polar situations can be distinguished: the districts whose traditional chiefs were killed or exiled on the one hand and those whose chiefs dealt with the colonial power. This can be measured with an article in the colonial budgets devoted to the “former chiefs’ indemnities”. These indemnities were attributed to the chiefs who accepted the primacy of the colonial power. I consider then the amount of chiefs’ indemnities in each district as a measure of the collaboration between the traditional and the colonial power.

The degree of collaboration between the traditional and the colonial power could have been a determinant of the colonial policy, especially the indigenous policy. In the 1920’s, when the idea of association with the African chiefs was adopted by the colonial administration, it may have been easier to recruit traditional chiefs in the districts where former chiefs had
collaborated than in those where they were killed or exiled. But the degree of collaboration between traditional and colonial power may also reflect some characteristics of the traditional power or some characteristics of the political or cultural context of the districts, characteristics that can also affect the development of the districts.

4.2.4. The European settlement

The European settlement is often presented as an important determinant of the development of the former colonies. The first paper that gives evidence of this fact is the paper of Acemoglu, Johnson & Robinson (2002)\(^9\). According to the authors, the more the Europeans settled in a colony, the more the colony has developed, thanks to better institutions. The Europeans settlement may have been furthermore an important determinant of the colonial policy, because the colonial administration may have more invested in the districts where the more European people were living.

In West Africa, very few Europeans came to settle in comparison to other colonies like Australia, Canada etc. The European people represented in 1910 on average 0.2% of the districts’ population. This represents an average of 68 Europeans in each district. But the dispersion of this variable is very important as its standard error is equal to 167. The district of the lowest tercile counted on average 5 Europeans, those of the second tercile counted on average 16 Europeans, whereas those of the highest tercile counted on average 186. Differences are thus significant despite of the few European people present in 1910.

The number of European people in 1910

I consider the number of European people in the districts in 1910 as a part of the conquest history because 1910 is the beginning of the real colonial era and therefore the European settlement at this time could not be the result of the colonial policy. Inversely, the colonial policy could have been influenced by the European settlement and the European settlement

may have been the expression of the attractiveness of the districts, it is to say some intrinsic districts’ characteristics that have attracted Europeans here more than elsewhere. Given the fact that those characteristics are likely to influence the development path as well, the European settlement will represent an important source of endogeneity of the colonial policy.

4.2.5. The development of modern economical activities

The development of modern economical activities will play the same role in this paper than the European settlement: I want to construct some indicators of the development potentiality of the districts before the achievement of the colonial policy. I think that the districts where appeared very soon some modern economical activities had some intrinsic characteristics that other districts did not have. The earliest time at which I can measure the existence of modern economical activities is 1914. This year is too late to be considered as pre-colonial but also too soon to be considered as a pure product of the colonial policy. That is the reason why I use the existence of modern economical activities in 1914 as the expression of development potentialities.

The measure I use is the amount of the trading tax collected in each district. The trading tax was introduced few years after the settlement of the colonial administration. This tax concerns all secondary and tertiary activities. The tariff of the trading tax depends on the nature of the commercial activity and the number of employees of the firm. The average trading tax collected in 1914 in the districts amounts to 30 cents per capita. The standard error of this variable represents 200% of its means. The means by tercile are respectively 0.2, 6 and 83 cents par capita. Dakar and Saint-Louis are far form the rest of the districts with respectively 3.7 and 3.9 cents per capita.

The geographical distribution of the trading tax collection is apparently concentrated on the south-west areas: Senegal, Guinea and the south of the Ivory Coast. These areas were thus probably those which had the greatest development potential.
The pre-colonial characteristics of the districts are now roughly identified. All the factors presented in this section are serious sources of endogeneity of the colonial policy in the sense that they probably influenced both colonial policy and the districts’ development. The following sections will then try to identify the impact of the colonial policy on the current development taking into account these pre-colonial districts characteristics.
5. Data and empirical strategy

The objective is to identify the impact of the colonial policy on current development. I will start with a simple formalisation of the problem. I will then expose the econometric issues related to the identification problem. I will finally describe the data used to solve the problem.

5.1. Formalisation of the problem

The current districts’ development is the results of geographical and historical determinants. Among the historical determinants can be distinguished pre-colonial, colonial and post-colonial determinants. There are therefore four groups of determinants (geographical, pre-colonial, colonial and post-colonial). Those four groups of determinants are potentially linked all together, more precisely sequentially linked as follow:

5.2. Data

Many data used in this paper have already been presented in the previous sections. I just want to gather here all the variables that will be used in the empirical estimation of the impact of the colonial policy on current development. Data can be classified in 5 sets:

First, a set of geographical data:
- The altitude of the main town of the district\(^1\)
- The average latitude of the surveyed households of the district\(^2\)
- The average longitude of the surveyed households of the district\(^3\)
- The average annual precipitations in the main town of the district over the 1910-1970 period\(^4\)

\(^{1}\) I use information from the website rainingfall/directories of cities and towns in the world.
\(^{2}\) I use information from the website rainingfall/directories of cities and towns in the world.
\(^{3}\) I use information from the website rainingfall/directories of cities and towns in the world.
\(^{4}\) I use information from the website rainingfall/directories of cities and towns in the world.
- A dummy for coastal borders
- A dummy for important rivers

Secondly, a set of pre-colonial data:
- A dummy for the presence of a pre-colonial centralized political power (kingdom, empire etc.). This dummy reflects the districts’ political pre-colonial development. It has been constructed from several historian sources: Jean Suret-Canale, “Afrique Noire, l’ère coloniale, 1900-1945”, 1964; Denise Bouche, “Histoire de la colonisation française”, 1998; A. Adu Boahen, « L’Afrique sous domination coloniale », Histoire Générale de l’Afrique, tome VII, 1989; for the principal...
- The density of population in 1910 as an approximation of the level of pre-colonial agricultural development. This variable was constructed from the census of the colonial districts that contains the French West Africa archives (série G, sous-série 22).
- A dummy for former European counter as reflecting the level of pre-colonial commercial development constructed from the same historian sources than the dummy for centralized political power.

Thirdly, a set of conquest data:
- The beginning of the conquest: the sources are the same as for the presence of a pre-colonial centralized political power.
- The length of the resistance against the colonial power: I take the difference between the date of the last military intervention in the district and the beginning of the conquest. The information for these two date come from the historian books previously quoted.
- The former local chiefs’ indemnities, reflecting their reaction towards the Europeans invaders: these data come from the colonial budgets kept in the French West Africa archives.
- The number of settled Europeans in 1910, reflecting the development potentialities of the district (its attractiveness): this information comes from the colonial districts’ census.
- The collected trading tax in 1914, also reflecting the development potentialities: this information comes from the colonial budgets.

Fourthly, a set of data on the colonial policy, all coming from the colonial budgets:
- The average annual number of teachers per 100 000 capita over the 1910-1930 period, reflecting the colonial investment policy in education.
- The average annual number of persons working in the medical staff per 100 000 capita over the 1910-1930 period, reflecting the colonial investment policy in health.
- The average annual amount of public works per km² over the 1910-1930 period, reflecting the colonial investment policy in infrastructures.
- The average annual amount of the African chiefs’ wages per 1 000 capita over the 1910-1930 period, reflecting the colonial association policy.
- The average ratio between the share of the colony’s investments in education (respectively health, infrastructures) received by the district and the share of the colony’s tax revenue brought by the district the 1910-1930 period, reflecting the budgetary favouritism towards the districts in comparison to the other districts of the same colony.

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4 I use information from a database created by the ORSTOM.
5 I use the 1925 colonial official map.
6 I use the 1925 colonial official map.
Finally, a set of data on the current development, all coming from the national households surveys achieved in the 1990’s:
- The rate of more than 7-year old people having attended at least one year at the primary school, reflecting the educative performances.
- The rate of more than 13-year old people having attended at least one year at the secondary school, also reflecting the educative performances.
- The rate of less than 5-year old stunting children, reflecting the health performances.
- The rate of households equipped with electrical supplies,
- The rate of households equipped with a private water tap and
- The rate of households using a modern combustible, reflecting the level of current infrastructures’ development.

5.3. Econometric issues

There are two main econometric issues: the endogeneity issue and the multicolinearity issue. I will therefore expose each of these two problems and the solutions I chose to solve them.

5.3.1. The colonial policy endogeneity

The short formalisation of the problem above underlines the endogeneity of the colonial policy: some determinants of the colonial policy are also determinants of the current development. The estimators of the naïve regression of the current development on the colonial policy would then be biased. This issue has two main solutions: control variables and instrumental variable. The inconvenient of using control variables is that we are never sure that we control for every sources of endogeneity.

Nevertheless, I did not choose an instrumentation strategy. This would have implied to find a variable correlated to the colonial policy and not to the current development. A good candidate was the educational level of the districts’ administrators. It is indeed possible that the education’s level of the administrators influenced their financial and administrative decisions. Moreover, this variable may be not correlated to the districts’ characteristics because the administrators were affected to their district almost randomly. The federal Governor affected pragmatically an available administrator to an available district. The quality of the administrator did thus not influence the place he commanded. But I did not (yet?) achieve this idea because it would be a big work for an uncertain result. The most uncertainty comes from the fact that the administrators were in charged only tow or three years in a district. The accumulation of different administrators would then make it difficult to use the quality of the administrators as an instrumental variable for the colonial policy.

I use thus an OLS regression including the variables which represent the sources of endogeneity of the colonial policy, that is to say geographical variables, pre-colonial variables and conquest variables.

Another strategy can also be implemented thanks to the fact that the borders of the districts were defined at less partly randomly defined. The districts did actually not exist in the pre-colonial era. They were created by the colonial administration to control the whole territory. The borders between districts were not totally randomly defined but they often corresponded to natural borders (rivers). If they were not natural, we can see on the map that they were simply straight lines between two points. The aim of the colonial power was to build districts that represented approximately the same work for the administrators, either in terms of population or in terms of area. The pre-colonial kingdoms’ borders were not respected, neither the ethnic differences. Border districts had thus very similar geographical, pre-colonial and conquest’s
characteristics. I use this similarity between border districts to add a supplemental control to the colonial policy’s endogeneity. The idea is to construct a sub-sample with the districts that had a neighbour district in which the colonial policy was “sufficiently different”. I constructed a criterion that will allow us to identify the “sufficiently different districts” for all variables X reflecting the colonial policy: a district (with an X value equal to xi) is in the sub-sample for testing the impact of the variable X if at least one of its neighbour districts have an X value superior or inferior to \( xi^* (1 + \frac{\sigma(X)}{E(X)}) \), where \( \sigma(X) \) is the standard error of X and E(X) its empirical mean. The sufficiently different neighbour districts are then those whose X values xi and xj satisfy \( x_j > xi^* (1 + \frac{\sigma(X)}{E(X)}) \):

\[
x_j > xi^* (1 + \frac{\sigma(X)}{E(X)})
\]

What is equivalent to:

\[
x_j - xi > xi^* \frac{\sigma(X)}{E(X)}
\]

This criterion takes into account the dispersion of X, the level of the X’s values, and the position of the two values to compare in the range of the X’s values. The use of such sub-samples provides a supplemental control for the unobservable characteristics of the districts only if those characteristics are geographically distributed. On the contrary case, this strategy is useless.

5.3.2. The multicolinearity issue

The second econometric issue is related to the fact that the control variables are not independent. There are potentially many links between geographical variables: latitude is for example much correlated to the annual precipitations. The beginning of the conquest is also much correlated to the longitude since the Europeans started to conquer West Africa from the west to the east. There is not only colinearity much also multicolinearity. This constitutes a problem for the identification of the impact of the colonial policy on the current development because some coefficients could be insignificant because of the presence of control variables that are not themselves significant and that present multicolinearity. I use a forward method to solve this problem. I put the explicatory variables one by one, starting with a specification that contains only the geographical variables. I add the pre-colonial variables, then the conquest variables and finally the colonial policy variables. If the latest added variable do not have a significant coefficient, change a significant variable into a insignificant one, and have a high VIF (Volatility Inflation Factor), I isolate the two variables that are the most correlated and compare the \( R^2 \) statistics of the regressions with each of these two variables separately. I finally keep the variable that produces the higher \( R^2 \). In the econometric results presented in the next section, a blank will appear instead of the coefficient for the deleted variables. Only few variables have to be deleted.
6. Econometrical results

6.1. Did colonial policy influence the current educational inequalities?

The following table gives the results of the OLS regression of the educative performance indicators on the colonial policy and the other control variables. The first column reports the coefficients’ values, the second column reports the standardized coefficients’ values (dependent and independent variables are divided by their standard error), and the third column reports the t-statistic of Student.

When there are two values in the same cell, the first corresponds to the full sample regression while the second corresponds to the sub-sample regression, what means the regression with the neighbour districts that received a “sufficiently different” colonial treatment only. I use the sub-sample strategy only for colonial variables which have a significant impact on the current development indicators with the whole sample. In this case, I do a second regression with the sub-sample corresponding to the neighbour districts that received a “sufficiently different” treatment for this variable.

<table>
<thead>
<tr>
<th>Sector</th>
<th>Primary School Attendance Rate</th>
<th>Secondary School Attendance Rate</th>
</tr>
</thead>
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<tr>
<td></td>
<td>$\beta$</td>
<td>$\beta^*$</td>
</tr>
<tr>
<td>Colonial Policy</td>
<td></td>
<td></td>
</tr>
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<td>African chiefs’ wages per 100,000 hbt</td>
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<td>0.33</td>
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<td>-0.20</td>
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<tr>
<td>Dummy former European counter</td>
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<td>-0.13</td>
</tr>
<tr>
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<td>0.03</td>
<td>0.07</td>
</tr>
<tr>
<td>Geography</td>
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</tr>
<tr>
<td>Annual precipitations (1910-1960)</td>
<td>0.00</td>
<td>-0.25</td>
</tr>
<tr>
<td>Dummy coastal border</td>
<td>6.66</td>
<td>0.25</td>
</tr>
<tr>
<td>Altitude</td>
<td>0.00</td>
<td>0.03</td>
</tr>
<tr>
<td>Longitude</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Latitude</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dummy important river</td>
<td>1.12</td>
<td>0.05</td>
</tr>
<tr>
<td>Outliers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dummy Dakar</td>
<td>153.52</td>
<td>16.54</td>
</tr>
<tr>
<td>Dummy Saintlouis</td>
<td>25.79</td>
<td>2.76</td>
</tr>
<tr>
<td>Constant</td>
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<td>-21.99</td>
</tr>
<tr>
<td>-248.05</td>
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<td>-1.91</td>
</tr>
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<td>100</td>
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<tr>
<td>R-squared</td>
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<td>0.69</td>
</tr>
<tr>
<td>Adj R-squared</td>
<td>0.63</td>
<td>0.62</td>
</tr>
<tr>
<td>R-squared hors outliers</td>
<td>0.69</td>
<td>0.68</td>
</tr>
</tbody>
</table>
The current primary school attendance is not determined by the colonial investments in education but by the association policy: what explains the current inequalities is the implication of local chiefs to the colonial administration. The primary school attendance could have thus been favoured by the fact that African chiefs represented a relay between the colonial and the local institutions.

Concerning the secondary school attendance, the most important determinant is the colonial investment in education. The participation of the African chiefs to the colonial power does not make any difference. This seems to mean that the French investments in education had influenced the high levels but not low levels of schooling attendance. This is concordant with the classical opposition made about the French and the British colonial educational systems: the French educational system is said to be an elitist system whereas the British one is said to be a more democratic system.

The influence of the number of Europeans settled in the district in 1910 is also noticeable for both primary and secondary school attendance: the districts where many Europeans settled at the beginning of the colonial era have now higher primary and secondary school performances. There is another interesting result: the districts that resisted a very short or a very long time have now higher school attendance than those that resisted a middle long time. I would interpret this result on a cultural basis: the districts that did not oppose much resistance to the colonial power were more likely to adopt the colonial institutions (like educational system) than those that opposed much resistance. But up to a certain length of resistance, the sign of the relation changes, perhaps reflecting the fact that a very long resistance was the expression of a strong cultural identity which could have favoured the districts’ development in general and their educational development in particular.

Finally, the negative impact of the existence of a centralized political power in the pre-colonial era on the current educative performances tends to give evidence that the fraction of people that detain the political power in state society may have incentives to limit the access to education to the rest of the population so as to preserve their privileges. The “vested interest effects” can be more important that the “hold-up effects”, according to the terms employed in Geneaioli & Rainer (2003).

6.2. Did colonial policy influence the current inequalities in health development?

The following table gives the results of the OLS regression of the health performance indicator on the colonial policy and the other control variables. As the previous table, the first column reports the coefficients’ values, the second column reports the standardized coefficients’ values (dependent and independent variables are divided by their standard error), and the third column reports the t-statistic of Student. When there are two values in the same cell, the first corresponds to the full sample regression while the second corresponds to the sub-sample regression.

The results show that the colonial investments in health were an important determinant of the current inequalities of health’s development. The standardized coefficient tells that one standard variation of the number of persons working in the medical staff in the colonial era would have dropped the rate of stunting children 2.3 times its standard error. The colonial health investments had then a long-term impact on the districts’ development. I put the colonial investments in health and infrastructures in the regression to control the colonial investments in health for the other colonial investments. The result allows us to say that the main determinant of the current health development is precisely the colonial investment in health, not the colonial investments in general.

The budgetary favouritism has apparently been a negative determinant of the current health development. This can actually be understood as the expression of the fact that the colonial
health investments were in priority oriented towards the districts that had bad health characteristics.

<table>
<thead>
<tr>
<th>Stunting children</th>
<th>β</th>
<th>β*</th>
<th>t</th>
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</thead>
<tbody>
<tr>
<td>Colonial Policy</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>African chiefs' wages per 100 000 hbt</td>
<td>0.02</td>
<td>0.18</td>
<td>1.48</td>
</tr>
<tr>
<td>Personnel santé pour 100 000 hbt</td>
<td>-0.94/-0.78</td>
<td>-2.30</td>
<td>-3.29***/-2.93***</td>
</tr>
<tr>
<td>Budgetary favouritism in health</td>
<td>2.5/2.55</td>
<td>3.20</td>
<td>1.9*/1.88*</td>
</tr>
<tr>
<td>Teachers per 100 000 hbt</td>
<td>0.27</td>
<td>0.47</td>
<td>0.70</td>
</tr>
<tr>
<td>Public works per km²</td>
<td>-0.05</td>
<td>-1.56</td>
<td>-0.23</td>
</tr>
<tr>
<td>Conquest History</td>
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</tr>
<tr>
<td>Nb of Europeans in 1910</td>
<td>0.01</td>
<td>0.19</td>
<td>0.83</td>
</tr>
<tr>
<td>Trading tax revenue in 1910</td>
<td>-2.34</td>
<td>-0.12</td>
<td>-0.53</td>
</tr>
<tr>
<td>Beginning of the conquest</td>
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<td>-0.19</td>
<td>-0.94</td>
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<tr>
<td>Resistance's length</td>
<td>0.18</td>
<td>0.22</td>
<td>1.61</td>
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<tr>
<td>former chiefs' indemnities</td>
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<td>0.03</td>
<td>0.36</td>
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<tr>
<td>Pre-colonial History</td>
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<tr>
<td>Dummy centralized political power</td>
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<td>0.02</td>
<td>0.23</td>
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<td>Dummy former European counter</td>
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<td>0.69</td>
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<tr>
<td>Density of the population in 1910</td>
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<td>0.48</td>
<td>1.75*</td>
</tr>
<tr>
<td>Geography</td>
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<tr>
<td>Annual precipitations (1910-1960)</td>
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<td>Altitude</td>
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<td>Longitude</td>
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<td>3.02***</td>
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<tr>
<td>Latitude</td>
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<td>-3.01***</td>
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<tr>
<td>Outliers</td>
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<tr>
<td>Dummy Dakar</td>
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<tr>
<td>Dummy Saintlouis</td>
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<td>0.75</td>
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<td>Ind. Bafoulabe</td>
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</tr>
<tr>
<td>Adj R-squared</td>
<td>0.47</td>
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<td></td>
</tr>
<tr>
<td>R-squared hors outliers</td>
<td>0.37</td>
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<td></td>
</tr>
</tbody>
</table>

6.2. Did colonial policy influence the current inequalities in the development of infrastructures?

The current development of the infrastructures in the former French West Africa districts has two important colonial determinants: the colonial investments in infrastructures on the one hand and the budgetary favouritism on the other hand.

The colonial investments in infrastructures are actually a very important determinant of the current infrastructures’ development indicator. The standardized coefficients of the colonial amount of public works invested in the districts are very high, what expresses the fact that the differences in colonial public works investments created very important long-term differences
in infrastructures’ development. This result is just temporised by the fact that the coefficient of the colonial public works in the regression of the electrification rate is important and positive but not significant. The budgetary favouritism looks also as a great determinant of the infrastructures’ current development. The districts which had received a much more important share of the colony’s public works than their contribution to the colony’s tax revenue have now much more infrastructures than those which were budgetary discriminated. The standardized coefficients show that the impact of the budgetary favouritism is less important than the impact of the public works’ investments themselves.

The number of settled Europeans in 1910 exhibits a positive significant impact on the current development of infrastructures. But the significance of this coefficient, even if still remains, becomes weaker when I use the sub-sample of neighbour districts “sufficiently different”. This can be interpreted as the fact that the settlement of Europeans in 1910 could have been oriented towards the districts that have intrinsic characteristics enhancing the development of...
infrastructures. The coefficient nevertheless remains significant, so the presence of Europeans in the early times of colonisation had a positive significant impact on the development of infrastructures.

Finally, the resistance of the African people against the colonial power appears to have had the same non-linear impact on the current development of infrastructures than on the current educational development: the districts which resist a very short or a very long time have actually better infrastructures than those which resist a middle long time. My interpretation is obviously the same: the resistance’s length is first negatively correlated to the absorption of the colonial institutions until a minimum point up to which it becomes positively correlated to the development of infrastructures perhaps due to the fact that a strong cultural identity is a positive factor of development.
7. Conclusion

This paper was an attempt to evaluate the existence of long-term historical effects on development. The results exhibit in fact the influence of the colonial policy on the current development of the colonial districts of the former French West Africa. Three aspects of the colonial public policy produced long-term inequalities between the districts: first the colonial investments in education, health and infrastructures, secondly the African chiefs’ association policy and thirdly the budgetary favouritism. As the colonial public policy was not randomly defined and could have favoured the districts which had already better intrinsic characteristics, various controls and specific sub-samples have been introduced. The colonial experience was then an important source of formation of the current inequalities of development in West Africa. One question remains: is the impact of the colonial policy on the current development direct or indirect? The measured impact of the colonial policy could actually integrate the impact of the post-colonial experience as far as this experience has been influenced by the colonial policy. If these two periods are independent then what I measured is the direct effect of the colonisation on current development. Otherwise it is the indirect effect of colonisation through the post-colonial experience’s channel.