

Socioeconomic Constraints to Tea Productivity: A Case of Small-Scale Tea Farmers in Burundi

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Abstract:

The article identifies and discusses the socio-economic factors that constrain the productivity of the tea bush of the small-scale tea farmers who supply most of the green leaves to the state-owned factories in Burundi. Despite technical support and fertilizer subsidies from Burundi Tea Board (OTB), the productivity of small-scale tea farmers is still lower than the productivity of state-owned plantations. To investigate the cause of this low productivity, a survey was carried out on a sample of 120 small-scale tea farmers in two communes (Mugongomanga and Bukeye) located in two tea-producing areas (Ijenda and Teza) in Burundi.

The results show that the low level of education has a considerable negative impact on the maintenance of plantations in good condition. In addition, the problems of availability of family labour and the high cost of hired labour, the variety and age of the tea bushes and the customs of the country are hindrances to the productivity of smallholder tea growers. In order to maintain the tea as a strategic sector for the country, there should be close and sustained supervision of smallholders and investment in research and development.

Keywords: Burundi; productivity; tea plant.

JEL Classification: O1; Q1.

Introduction

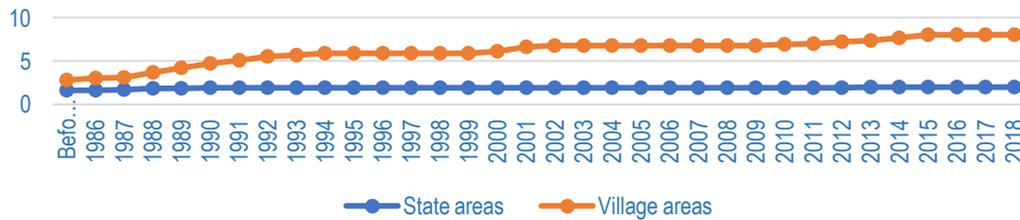
The tea plant was introduced in Burundi in the 1930s and was cultivated in five zones (Tora, Ijenda, Teza, Rwegura and Buhero) of the Mugamba natural region thanks to studies carried out at the agricultural research centre (ISABU) in Gisozi (Flémal 1986). The tea plant is a crop of great importance for the country. It is the third most important sector (after coffee and gold) for the country in terms of export earnings and represents on average 11.8% of the value of exports for the year 2017 (OBR 2018). The tea bush sector is very labour-intensive. The tea bush provides regular income for tea farmers and employment opportunities: 60,000 rural farmers have tea plantations, nearly 4,000 laborers pluck tea from state-owned plantations and worked in factories, and more than 1,000 employees are permanently employed in the OTB.

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Mostly cultivated (more than 80%) in village areas, the tea plant has experienced little expansion over time (Figure 1). Until 2018, the area under small tea farmers covered a total of 8,005 ha. State owned plantations are very small and have not expanded over a period of several years. In 2018, they represented an area of 2,000 ha. The small extensions carried out in village areas from 2010 to 2015 are of the order of 1% to 3% per year. Until 2018, the tea plant covered a total area of 10,005 ha. Land availability and financing problems are the main factors in the lack of extension.

Figure 1. Area extension (in thousand ha) of tea plant in Burundi



Source: OTB, 2019

In order to maintain the strategic sector for the country, the entire sector is under the control of a single state structure - the OTB. The OTB buys the green leaves (GL) from the tea growers, and processes them to obtain black tea (BT) in association with the leaves from the state plantations. The BT is sold to the auction markets in Mombassa (80%), to direct and foreign markets (15%) and to local markets (5%). BT from Burundi is of the best quality in Africa. After beating the record in 2015, it ranked third in 2016. To encourage tea farmers to grow tea, some services are offered free of charge, including young tea plants, technical support and fertilizers are granted at a rate of more than 70% of the total market value. Thanks to small extensions of the plantations, the production of GL has continuously increased from 18,728 tons in 1990 to 50,820 tons in 2018 (Figure 2).

Figure 2. Green leaf production (in thousand tons) in Burundi



Source: OTB, 2019

More than 80% of the production are from village areas. Overall productivity per hectare has increased from 3.7 tons/ha in 1990 to 6.9 tons/ha in 2018. Productivity in village areas is lower than in state areas (Figure 3).

The tea plant exploitation is very resource-intensive. From the nurseries to the production of BT, the ground is prepared, the tea plant is cultivated, pruned and cared of (weeding, fertilization, etc.), GL are harvested and transported to the collection hangars. At the collection hangars, the GL are sorted, weighed, packed in special bags, loaded into trucks and transported to the factories. At the factory, the GL are weighed and controlled again. The processing starts with the withering of the leaves and then moves on to the cut tear curl stage. This is followed by fermentation, drying, grading, weighing, tasting, packaging and storage before being sold abroad.

Figure 3. Productivity evolution (in tons per ha) in Burundi



Source: OTB, 2019

Productivity in the tea bush industry depends on several factors. Climate change (drought, hail) affects the tea sector the most with a direct impact of reducing revenues to upstream and downstream actors in the chain (FAO 2016). In Burundi, climate change is not a major threat to tea productivity. However, some factors are hidden sides to low productivity of the tea plant. This paper aims to analyze some of these factors and discuss ways and means to mitigate their negative impact on the tea productivity of smallholder tea farmers in Burundi.

1. Literature Review

Productivity is a broad, multi-faceted term. Therefore, it is difficult to conceptualize productivity, even though it represents one of the most important basic measures of economic activity (Tangen 2002, Kodithuwakku and Priyanath 2007). The concept of productivity has evolved over the years to represent more than just efficiency ratios. From cost and quality issues, its scope has expanded to embrace social concerns - such as job creation, job security, poverty alleviation, resource conservation, social responsibility - to business excellence, governance, and environmental protection. Nowadays, the term evolves towards other concepts of productivity such as social productivity and knowledge productivity (Kalaw 2015).

In general, productivity is often defined in relationship between the output and the input of a production system. The output can be a product or a service, while the inputs are resources (human, physical, financial) used in the production process. Physical resources include land, infrastructure, machinery and equipment, raw materials or other current assets and financial capital can be own capital or borrowed capital. For human capital, particular emphasis is focused on human health, especially in developing countries where manual labour is crucial for productivity and capital accumulation (Nuttee, Thamma-Apiroam and Santipolvut 2019, Tran, Alauddin and Do 2019). Producing more or high-quality goods/services from the same resources increases productivity. Similarly, producing the same quantity of goods/services with fewer resources increases productivity (Pekuri, Haapasalo and Herrala 2011, Bernolak 1997, Salehi, Shirouyehzad and Dabestani 2013). Productivity means a real increase in the output/input ratio and differs from a nominal or monetary increase. The increase in turnover due to an increase in the unit price (in the case of inflation) is not synonymous with productivity. The same applies if the sales volume increases proportionally with the resources used. The improvement in productivity is measured only by the increase in the production of goods/services in relation to the resources used (Bernolak 1997). Authors as Misterek, Dooley and Anderson (1992) distinguish five cases of productivity improvement:

- the increase in output and input, but the increase in input is less proportional than the increase in output;
- the output increases while the input remains the same;
- the increase in output while the inputs are reduced (greater efficiency);
- the output remains the same while the input decreases;
- the output decreases less proportionally than the input.

These five cases can be explained by the managerial and technical dimension that underpins the production activities in a referential of efficiency and effectiveness. Productivity is therefore closely linked to the availability and above all to the use of resources (Tangen 2005). Dey and Gupta (2010) postulate that productivity is a key to a company's success insofar as a company's performance is driven by certain criteria including efficiency, effectiveness, product quality, productivity, workforce quality, innovation, etc.

In the agricultural sector, productivity is measured by the output obtained for a given amount of input or set of inputs. By convention, productivity is measured by the ratio of the quantity produced per unit of input - e.g. tones of potatoes per hectare of arable land (Mozumdar 2012). This measure is very simplified since the factors influencing productivity are multiple: physical capital (soil structure, water, fertilizers, etc.), human capital, technology transfer, research and development, etc. Neglecting to take these different factors into account when assessing productivity makes it less robust. Ideally, the measurement of aggregate productivity would capture the impact of each input in production, but measuring it is not easy in practice. The major problem is that the impact of some factors in production is difficult to quantify or to sum up. Besides, productivity measures are difficult to interpret when the quality of output or input changes (Misterek *et al.* 1992). Measuring productivity in the agricultural sector is made more complex by natural and social phenomena. Pinnawala and Herath (2014) postulate that efficiency in the process of converting inputs into outputs is influenced by external natural phenomena (rain, temperature, wind, etc.) and social phenomena such as attitudes, beliefs, behavior, friendship, etc. The authors argue that the use of sorted seeds, pesticides and fertilizers can only improve productivity to the extent that farmers decide to use them. For him, inputs are necessary but not a sufficient condition for productivity.

2. Materials and Methods

The analysis was carried out as part of a study of the tea sector on various aspects, particularly its importance in the livelihoods of tea farmers in Burundi. Thus, interviews from several aspects were carried out with the different directors of different departments of the OTB as well as with the different managers of the factories processing GL into BT. In addition to these interviews with these authorities, we were provided with essential data in our research. Before taking a position on a choice of sample, we visited in 2017 the rural areas of Ijenda and Teza by simple scientific curiosity to familiarize ourselves with the field and to be aware of the different daily activities of tea farmers, especially those related to the tea plant. During these visits, conversations allowed us to familiarize ourselves with the community, and the farmers were very happy to share with us their know-how in the agricultural field, which they considered unusual in our eyes. The choice of these two areas was motivated by their proximity to the country's capital. The commune Mugongomanga is located 42.8 km away from the capital by taking the RN7 and the commune Bukeye is located 54.9 km away from Bujumbura by taking the RN1. Both sites are located on the hillsides of the Congo-Nile Rift massif with abundant rainfall (average 1400-1500 mm) and temperature is between 15°-21°C (Flémal 1986). The rural farmers of these two sites live mainly on subsistence agriculture. Food crops in these areas are rainfed and marshland cultivation. In Mugongomanga commune, crops are less diversified than in Bukeye commune because of the absence of marshlands. Thus, the food crops are: potato, maize, beans, sweet potato, cassava, wheat, peas, vegetables (cabbage, carrot, leek, onions, squash, etc.). Livestock consists of large livestock (cattle) and small livestock (goats, sheep, pigs and chickens and rabbits).

In 2018 and 2019, surveys were conducted among a random sample of 60 tea farmers in each of the communes of Mugongomanga and Bukeye located in the Ijenda and Teza tea complexes respectively. The socio-demographic data of the sample showed that the tea growers farmed small areas (more than 80% farmed less than 10 ares). Our sample is made up of tea farmers with a very low level of education (more than 95% have basic training) and most of them can neither read nor write the local language. For the present analysis, we have constructed a semi-structured questionnaire based on the socio-economic aspects deemed constraining to the productivity of the tea plant. Interviews and focus groups were organized with the sample. Given the objective of the article, the bibliographical review focused on the key word - productivity. We used qualitative methods for the analysis of the collected data (Hsieh 2006, Gheyle and Jacobs 2017).

3. Results

3.1. Technical Support

The technical supervision of tea farmers is provided by the plantation department, mainly through extension workers. These are the agents who regularly visit the plantations of the small tea growers in order to find out whether or not the plantations are well maintained. Data show that the ratio of extension staff to the area under tea cultivation is low - one extension worker for every 300 tea farmers, or one extension worker for roughly 35 ha, which implies a partial visit to the plantations. Some activities are therefore the total responsibility of the tea growers. Weeding, fertilizer application and plucking are some of the compulsory activities for the tea growers. A tea field requires two weedings per year otherwise the tea plant gives a lower production in quality and quantity. Mulching the tea plant is not a compulsory activity. It is not practiced in the commune of Mugongomanga. In Bukeye commune, only 78% of the tea farmers bring mulch to the tea plant. Mulching is integral. The training on pruning and plucking techniques is done on the spot by the workers' instructors and the authorities in charge of the plantation service in the factories. Remarks for a non-fine plucking are constantly given at the collection shed so as not to be refused the totality of the GL sold. 87% and 90% of tea growers in Mugongomanga and Bukeye respectively are satisfied with the supervision.

3.2. Efficiency and Effectiveness in Fertilizer Application

In village areas, surveys revealed that some tea farmers do not apply fertilizer or apply little fertilizer on their plantations for several reasons. Due to their low level of education, some tea farmers do not give particular importance to the recommended dosages for tea cultivation. Young plants are very intensively cared of. A young tea plant is only productive after a period of at least 3 years. This period for young plants is theoretical. It can be longer than expected if they are not well maintained - mainly by applying NPK mineral fertilizer and mulch in sufficient quantities. A new tea plant is very costly. It has significant opportunity costs for the land that could be exploited for a relatively short period (a few months) in a context of land scarcity. This may make it difficult for tea farmers to buy mineral fertilizer and to devote time to the maintenance of a plantation that will be productive for more than three years. Their level of education and their financial situation in the households means that they do

not buy fertilizer for new plants that are not yet productive. For tea farmers who are expanding their tea cultivation, the application of fertilizer does not meet the standards of 2.5kg/are or 2.5 kg per 120 tea plants. Failure to meet these standards affects productivity in terms of quality and quantity. Another difficulty in the complete application of mineral fertilizers is their reallocation to food crops. During our surveys, one of the tea farmers told us that he splits the fertilizer he receives in two parts, one part for the tea plant and another part for food crops, despite the OTB's recommendations for strict application. Probably this practice exists among some tea growers although they did not want to admit it. As mineral fertilizers are granted on credit, some tea farmers may sell them to traders to meet urgent needs. In addition, due to lack of firewood, branches and leaves that may constitute organic manure after pruning the tea plant are directly used in households for cooking.

It is difficult for tea growers to care for the tea plant in real time. The weeding period of the tea plant corresponds to the busy schedule of tea farmers who are concerned about not being late with the agricultural calendar of food crops. Thus, the weeding of the tea plant is delayed and the effort is mainly focused on food crop activities. During our field surveys in October 2019, field observation revealed a significant number of plantations that were not weeded to such an extent that they could be considered abandoned. Reasons given for not weeding were multiple: illness in the households, lack of time, lack of labor, etc.

3.3. Variety of the Tea Plant

Tea plantations in Burundi are made of *Camellia sinensis* variety *Assamica*. Field observation shows that some plantations are of a different variety and are less productive. The tea growers revealed to us that some plantations come from stumps that have been planted. Moreover, some plantations are getting older and older. These are tea plants that are more than 50 years old. They are becoming less and less productive. Some growers cannot realize that their plantations are getting older and older to be replaced by young plants or do not want to lose their regular income.

3.4. Inheritance

In Burundi, the heritage is patrilineal in rural areas. Upon the death of a family's parents, sons (if they do exist) inherit and share equitably the property left by their parents. This is usually livestock, land, sheet metal or tiles of the house, etc. If these parents were tea farmers, the plantation is not immediately shared between the heir sons or the assignees in the absence of the heir sons. In this case, the holding is common and the income is shared equitably. The result is poor exploitation of the plantation due to a lack of responsibility on the part of one or the other, especially for the pruning and mulching of the plantation. Surely, the heir sons would like the sharing to be immediate so that the question of responsibility is not raised. The custom in Burundi is opposed to this immediate sharing and two ceremonies of partial and final mourning must take place. The second ceremony may take place after more than a year. As soon as the plantation is shared, some sons may receive portions of land with better yields than others. Heirs or assignees who will receive less productive shares of the tea plant will put in less effort or may not maintain their respective shares. They may consider the allocation of labor to them as a loss and the productivity of the whole plantation is undermined.

3.5. Labor

3.5.1. Plucking Cycle

Plucking is a delicate and problematic task in the tea sector. Tea growers must strictly adhere to the GL plucking cycle. Failure to respect this cycle has a negative impact on the quantity of GL to be plucked for the next period. In Burundi, the rotational plucking cycle is the same throughout the country. It is one day out of 11 days in case of low production. In case of abundant production, it is one day out of 8 days. Generally, the harvest that is made and accepted is the pekoe+2 leaves. Plucking takes place throughout the year, but if all the ready shoots (leaves) are not plucked or if tea growers do not pluck due to lack of labor, disorderly overgrowth occurs. Under certain circumstances, pruning of the entire plantation must be done. This results in a loss of productivity. If pruning is carried out, plucking is resumed after six months, resulting in a loss of production over the six months.

3.5.2. Sharecropping System

In the area studied, tea leaves are essentially plucked by family labor, which is considered free of charge even though it has an opportunity cost. When family labor is scarce, small tea farmers use a system of sharecropping to keep the tea bush in productive condition. The sharecropper takes care of all the tasks related to the tea bush under conditions agreed with the tea farmer and shares the income with the owner of the tea bush. Generally, the sharecropper shares the income equitably with the owner. The practice of sharecropping has pros and cons. On

the one hand, the owner receives income without making any effort, even though his income decreases. On the other hand, the owners complain of a lack of responsibility for the maintenance of the plantation. In Mugongomanga and Bukeye, the tea growers strongly criticized the sharecropping system which ends up destroying the tea plantation and thus reducing the quantity to be plucked in the medium and long term.

3.5.3. Hired Labor

In Burundi, tea growers occasionally employ hired laborers in various activities related to the exploitation of the tea bush, particularly during the plucking process. Their remuneration is 2,500 BIF in Mugongomanga and 2,000 BIF in Bukeye per working day. The plucking day starts at 6 or 7 *a.m.* and ends around noon. Thus, in order for a tea grower to make a profit, the hired worker must pluck more than 10 kg of GL in Mugongomanga and 8 kg of GL in Bukeye (the selling price of the GL is 250 BIF/kg). This quantity is difficult to pluck during the period of low production. So, workers must be hired according to their performance. An efficient day laborer plucks a quantity ranged between 20 and 25 kg of GL during periods of abundant production. During the dry season (July and August), the quantity harvested is between 10 and 15 kg because the GL have no moisture content. With such plucking capabilities, tea growers realize lower margins.

The problem of the labor payable per working day is mitigated by a labor payable by the quantity harvested at a rate of 100 BIF/kg. The workers resist being paid per quantity plucked. They notice a loss of earnings especially during the period of lower production or if they have a lower performance. The commitment of paid labor per quantity harvested has disadvantages in terms of productivity in the absence of an owner to control the workers. Generally, these workers must perform additional activities (removing banjhi) to facilitate the formation of new leaves in addition to strict adherence to harvesting standards. In the absence of the owner, these additional activities may not be carried out either because of lack of responsibility or ignorance or because workers are interested in plucking large quantities, as this additional activity slows down the plucking process. The removal of banjis during plucking is an activity of significant importance. If such a task is not carried out, the productivity of the tea plant will decrease in the short and medium term.

4. Discussion

The results show that productivity in the culture is influenced by a range of socio-economic factors. Technical support is less effective due to the low level of education of tea farmers. This level of education results in little or no use of fertilizers by diverting them to food crops, a hindrance to tea plant productivity. The high level of education enables farmers to use existing resources effectively and efficiently and to imitate new innovative methods and technologies. It also helps to break down resistance to change (Hua 2005, Minani 2014). The tea growers have an embryonic level of organization to be able to integrate good practices in research and technology (Schuster and Ndimubandi 2018). Smallholders are not able to internalize and apply good practices that can boost productivity without access to services provided by downstream value chain actors. Better services would be essential for them to increase production. Thus, downstream actors need to regularly analyze the soil structure through research and development and adapt the NPK 20:10:10 mineral fertilizers used since the introduction of the tea plant in Burundi up to now. The state authorities could also subsidize the entire cost of fertilizer for young plants.

The natural region of Mugamba is the only region with natural conditions favorable to the cultivation of tea. In order to increase the productivity of the tea plant in this region, it is essential to regularly replace the plantations in village and state areas by more productive varieties (hybrids) with appropriate mineral fertilizers. Studies on varieties and their mineral fertilizer requirements should be undertaken at ISABU. To increase productivity, Vietnam replaced 49% of the plantation area with hybrid tea plants in 2009. While the PH1, TRI 777 and Shan varieties produce 10 tons/ha, 8 tons/ha and 6 to 7 tons/ha respectively, the LDP1 and LDP2 hybrid have a productivity of 15 tons/ha. The Vietnamese government wants to reach 90% of hybrid tea plants by 2030 to optimize productivity in terms of tea quantity and quality (Le 2018). In Kenya, the Tea Research Foundation has significantly contributed to increased productivity through selection of high yielding tea varieties and improving methods of cultivation (Mwangi 2014). Convincing small, low-income tea farmers to replace less productive tea plants - old or of poor quality - with more productive plants for a period of at least 3 years is not an easy task. The government must take the issue in hand to maintain the country's strategic sector and contribute to the well-being of its population. In 2016, Sri Lanka improved productivity amongst the smallholders who supplied the bulk of the country's green tea leaf. It approved a fertilizer subsidy for tea farmers with cultivated land of less than two hectares, and it offered a modest subsidy for replacing old tea bushes with new ones. As a result of these policies, Sri Lanka firms have built their competitiveness on value-added and high-quality tea exports (Mohan 2018). Since they could not pull up the tea plant to grow other crops, tea farmers had to make the tea plant's productivity optimal on the land being farmed

so as not to incur opportunity costs. Indeed, with population pressure making arable land scarce, any portion of land had to be optimally exploited regardless of the type of crop grown. Even if the land was vast, efficiency in the use of resources would limit arbitrary exploitation. In addition, mulching and weeding of the tea plant should be a rule in all areas of tea cultivation and in case of lack of mulch, organic manure (from compost and/or livestock) would supplement mineral fertilizers which must be strictly applied in their entirety. This will be made possible by periodic meetings of extension workers in collaboration with the grassroots authorities, the organization of training seminars and, where appropriate, the granting of incentives to tea growers on plantations that are better maintained than others.

Their culture is the most labor-intensive, especially during the plucking of GL from the tea bush. The use of family labor on the tea growers' plantations is not sufficient on its own during the period of high production, despite the small size of the areas under cultivation. The use of hired labor, which is becoming increasingly expensive, is necessary in all tea-producing countries, although it is less profitable in terms of output/input ratio. In Kenya, for example, the payment for pluckers' labor per kg has successively increased on average to 5.50 Kenyan shilling (\$0.06) in 2009, KSh7 (\$0.08) in 2010 and KSh8 (\$0.09) in 2012. On the other hand, one kg sold of GL is paid at 12 KSh (\$0.15), a labor remuneration at more than half the price/kg of GL sold. Workers consider the remuneration less attractive and solicit a continuous increase or leave the sector (Kagira, Kimani and Gthii 2012).

Plucking machines affect productivity in terms of quantity and quality. It leads to injuries on stems that prevent bud development. Moreover, the use of plucking machine results in coarse rather than fine and selective plucking - Pekoe+1 leave or Pekoe+2 leaves (Burgess and Carr 2018, Obanda and Owuor 1995). In order to cope with the constraints of paid labor, tea farmers had to group together in producer associations/cooperatives in small groups of 5 to 10 tea farmers for example. This would be a formalization of the mutual assistance that characterizes the African people. Some ancestral practices that are not favorable to productivity should be abolished. Andria *et al.* (2019) criticize the weakness of macroeconomic analysis which overestimates economic factor, the role of capital in development and neglects the role of non-economic factors. There is no analysis of influence of social conditions, social structures and the style of society's culture. Their analysis of factors affecting local own-source revenue (PAD) in 30 Indonesian Provinces (2010-2017) showed that non-economic (democracy, politics, corruption and governance) factors had a significant effect and explained PAD by 79.19% in comparison with economic (investment and development inequality) factors. The country's economy must also be analyzed in regard to social phenomena and State authorities would play a key role in changing people's mentalities by highlighting the issues of food insecurity and hunger among people in developing countries.

Conclusion

This paper identifies and discusses the factors that undermine the productivity of the tea plant of tea farmers compared to the productivity of state plantations. As the concept of productivity is very complex, we considered productivity as production (in tons) per unit of arable land (ha) for simplicity. Nevertheless, this paper shows that some socio-economic factors that influence productivity are just beyond quantification. The technical supervision is not effective in the village area and tea growers do not apply mineral fertilizers in their entirety (the recommended doses) due to their low level of education and/or their state of poverty. Moreover, small tea farmers give priority to food crops rather than to the maintenance of the crop (mainly weeding) due to the lack of sufficient labor. In the state-owned plantations there are sufficient and better-controlled hired workers. Sharecropping and inheritance, which alter production in the medium and long term, exist only in village area plantations. It would be reasonable to compare productivity either across sectors or across nations using the same indicators. This comparison would be simple by answering the question: Which input for which output? Our analysis shows that some practices, customs, etc. are of a different consideration in terms of input/output and therefore in terms of productivity. The inputs determining production remain strongly influenced by human beings in their individual and/or collective actions. This study is only an attempt to explore a few socio-economic factors. An in-depth investigation could enrich the subject.

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