SPATIAL AND TEMPORAL PRICE VARIATIONS OF SAWN WOOD UTILIZED FOR FURNITURE MAKING IN SELECTED CITIES IN NIGERIA

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ABSTRACT

The spatial and temporal price variations of sawn-wood used for furniture making in Lagos, Ibadan and Benin were studied and evaluated. Four wood species popularly used for furniture making in the cities were studied. They are: Mansonia altissima (Mansonia), Khaya ivorensis (Khaya), Cordia millenii (Cordia) and Tectona grandis (Teak). A total of 193 furniture factories comprising of 154 small, 28 medium and 11 large scale were selected in the three cities through stratified random sampling technique. Structured questionnaire was used to generate data from 2001 to 2008 on the dimensions of various planks, their prices, sources and their availability. Further confirmation of the prices of the four wood species and their availability was carried out using sales receipt of sawnwood sellers, sawmillers, and timber contractor in the study area. Data collected were collated by species and analysed using Randomized Complete Block Design to test for the significant differences in price variation among the cities over a period of eight years. The model specification is $Y_{ijk} = \mu + b_i + t_j + e_{ijk}$. The results showed that the mean annual price of the wood species varied significantly (P< 0.05) in the three cities between 2001 and 2008. The mean annual price variation of the wood prices was also significant (P<0.05) for the eight years of study. Ibadan had the lowest mean price for the wood species. This was followed by Lagos, while Benin had the highest mean price. The percentage annual price changes were inconsistent and tend to be in decreasing order from 2005 to 2008 for most of the species. Teak had the highest and the lowest percentage annual price changes in 2003 and 2006 respectively in the three cities. To curb the high spatial and temporal price differences in wood producing areas, it is recommended that suitable policies that will ensure market integration through proper fixing of forest tariff and regulations should be developed. The contribution of illegally sawn timber to the gross in-efficiency of sawn-wood pricing should also be prevented.

Keywords: Sawn-wood, Spatial, Temporal, Prices, Furniture

INTRODUCTION

In Nigeria, sawn-wood is used for various purposes across the country and its prices are fundamental pre–requisite for socio-economic development of the country. Of the semi-processed and processed wood categories, sawn-wood has the highest production and the highest demand and it is the most widely distributed in Nigeria (FAO, 1999) for construction purposes such as building and furniture. Thus, the importance of its price to the national economy cannot be over emphasized.

Understanding the price of a commodity from price theory point of view helps to: understand the working of a free enterprise economy; provides the analytical tools for

assessing the economic policies of a country; spells out the standards and norms of a welfare state; compare the actual economic condition with the ideal and reveals how far off the ideal state is with the economic conditions; analyze efficiency with which productive resources are employed and the efficiency of allocation of the output of productive efforts; maximize economic welfare from available resources and to stimulate production through appropriate pricing of resources and output (Jhinghan, 1973). The advantages of the above listed price theory can only be achieved through efficient pricing which invariably depends on the structure of the market. Goletti and Badiance (1994) reported that the specific role of markets in the determination of price efficiency is to signal the relative scarcity of goods and resources, guide decisions through economic agents and ensure the mobility of commodities over time and across space. The key determinants of market performance were also listed to be the cost associated with temporal and spatial transfer; the extent to which prices generated through the market process reflect the relative scarcity of goods and the quality of the transmission of price signals across markets.

Of all the multifaceted uses of sawn-wood in the wood-based industries the furniture industry is strategic for greatest demand elasticity (General Woods and Veneers Consultants Ltd, 1994) . This is due to large variety of furniture used by different classes of people. Furthermore, various factors such as increase in population and population mobility, availability of credit facilities, high level of literacy, increase in the number of households, and increase in the number of high income earners have led to increase in demand of various furniture items. This in turn led to the expansion of the industry especially in the Southern part of Nigeria which has the highest forest reserve (Olorunnisola, 2000). The report of Abdullahi (1999) indicated that the furniture industry is one of the ten major wood based industries in Nigeria and it represents about 80% of the wood-based industries in the country as well as been the most widely distributed of all the wood-based industries. They formed the major market for wood products in Nigeria and thus protects the continued existence of the primary wood processing industries such as sawmills and plywood mills. The total wood consumed in Nigeria is estimated at over 200,000m^3 per annum, while the utilization and further processing of the wood provides employment to numerous people and thus contributes to the local and national economy. Uzowulu (1990) in the study of the effect of labour productivity in the furniture industry in Ibadan revealed that the furniture industry is a major contributor to the national economy, and that only a few other industrial sectors contributes more than the furniture industry in terms of generations of local funds as well as in employment of labour.

Thus the furniture industry is an important sector of the Nigeria economy in terms of annual wood consumption, employment generation and socio-economic development. However, the furniture industry is currently constrained with the escalating prices of the wood used for furniture making. The escalated prices were noted by Adeyoju and Enabor (1995) when they observed that prices of wood species kept rising geometrically over the years both within producing and consuming areas. Olorunnisola (2000) also identified the rapidly escalating cost of sawn wood as the major problem facing furniture manufacturers in Ibadan, Nigeria. The few previous studies on forest pricing system show that forest pricing system in Nigeria is inefficient; while the forest product market is bereft of good performance due to the existence of structural and institutional weakness in the market

which has prevented the market from operating efficiently (Enabor and Popoola, 1994; Adeyoju and Enabor, 1995; Popoola *et al.,* 2001). This structural and the institutional deficiencies are reflected in high distribution costs, distorted market prices and inadequate price transmission (Beak Consultants, 1999). The broad objective of this study is to evaluate the spatial and temporal price variations of sawn wood used for furniture making in Nigeria with a view to stimulating furniture production through appropriate pricing of sawnwood from place to place over a period of time.

METHODOLOGY

Average annual prices (₦/m³) of *Mansonia altissima* (Mansonia), *Khaya ivorensis* (Khaya), *Cordia millenii* (Cordia) and *Tectona grandis* (Teak) were collected from Lagos, Ibadan and Benin metropolitan areas of Nigeria. These four wood species formed the top four of the rated wood species commonly used for high class furniture in the study area (Arowosoge, 2008). They are classified as high grade wood species of class A (Beak Consultants, 1999).

Lagos, Ibadan and Benin cities where the study was carried out are in the rainforest zone where wood utilized for furniture industry is obtained in varying degrees. The cities also represent areas with relative abundance of furniture industry in the country (Raw Materials Research and Development Council, 2001). They have common forest regulations and were originally under the western regional government up till 1964 when the mid-western region, later Bendel State and now Edo and Delta States were created.

Stratified random sampling technique was used to select 35% of the 551 registered furniture factories in the cities. This made a total of 193 furniture factories comprising of 154 small, 28 medium and 11 large scale. Structured questionnaire was used to generate data on the dimensions of various planks, their prices, sources and their availability from 2001 to 2008. Further confirmation of the prices of the four wood species and their availability was carried out using sales receipt of sawnwood sellers, sawmillers, and timber contractor in the study area. Data collected were collated by species and analysed using Randomized Complete Block Design to test for the significant differences in price variation among the cities over a period of eight years. The model is as stated below:

$Y_{ijk} = \mu + b_i + t_j + e_{ijk.}$ …………………………………… Equation 1

Where: μ = General mean

   b_i = Effect of ith city (i=1- 3)

   t_j = Effect of jth year (j=1-8)

   $e_{ijk.}$= Experimental error containing all uncontrolled sources of variation

   $Y_{ijk.}$ = Individual observation made in cities (i), and year (j)

RESULTS

Price structure

For pricing purpose, the volumes of planks used for furniture were standardized into cubic meters. The various dimensions of planks that were found in the market include the following:

Thickness		**Width**		**Length**
0.0254m	x	0.1524m	x	3.66m

0.0254m	x	0.3048m	x	3.66m
0.0508m	x	0.3048m	x	3.66m
0.0508m	x	0.0508m	x	3.66m
0.0508m	x	0.0762m	x	3.66m
0.0762m	x	0.0762m	x	3.66m

The planks' dimensions were similar in the study areas except in Benin where the planks length was found to be 5.49m. The thickness and width of the Benin planks were however the same with those of Lagos and Ibadan.

Prices increased over the period of study for all the wood species. The average prices of the wood species per cubic meter are as presented in Tables 1 to 3. However, the percentage annual price changes were inconsistent in the area of study and tend to be lower from 2005 to 2008 for the wood species with the exception of Mansonia in 2006 at Ibadan (Figures 1-4). The percentage annual price changes observed for all the wood species was also lower than what Popoola *et al.* (2001) observed between 1991 and 1994 where an abrupt high percentage of about 1000% and 1395% were obtained for T*erminalia ivorensis* and *Triplochyton scleroxylon* respectively. Teak had the highest and the lowest percentage annual price changes in 2003 and 2006 respectively across the study area (Figure 4).
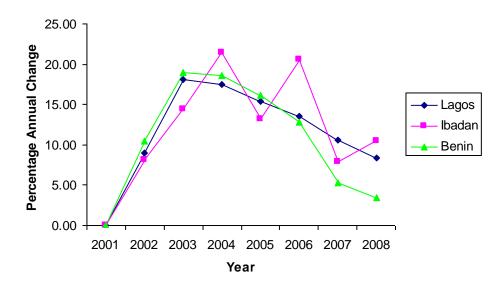

Figure 1: Percentage annual change in prices of *Mansonia altissima* in the study area.
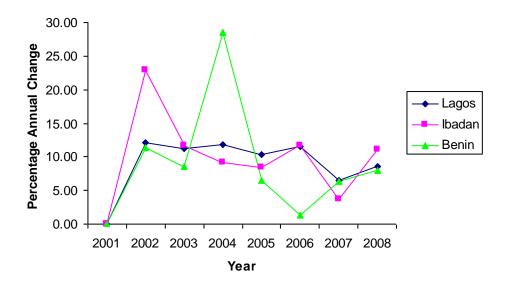
Figure 2: Percentage annual change in prices of *Khaya ivorensis* in the study area.
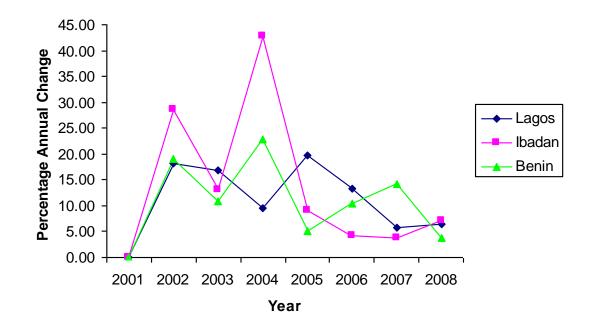

Figure 3: Percentage annual change in prices of *Cordia millenii* in the study area.
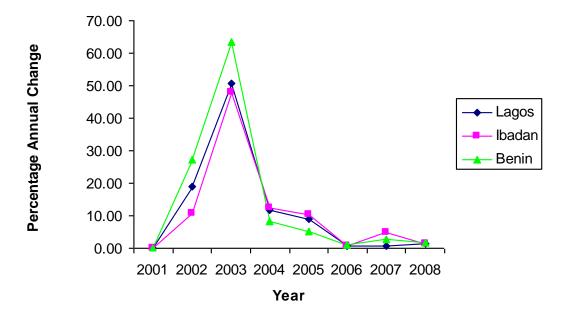
Figure 4: Percentage annual change in prices of *Tectona grandis* in the study area.

Table 1: Average prices of wood species in ₦/m^3 and annual percentage price changes from year 2001 to 2008 in Lagos

Wood Species	Year/ Average Price (₦)							
	2001	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**
Mansonia altissima	40919.2 (0.0)	44590.3 (8.9)	52685.9 (18.2)	61888.0 (17.5)	71401.4 (15.4)	81083.7 (13.6)	89721.1 (10.7)	97246.0 (8.4)
Khaya ivorensis	24337.2 (0.0)	27284.2 (12.1)	30342.2 (11.2)	33947.2 (11.9)	37436.1 (10.3)	41765.2 (11.6)	44507.9 (6.6)	48315.6 (8.6)
Cordia millenii	27275.1 (0.0)	32251.6 (18.3)	37667.2 (16.8)	41241.0 (9.5)	49387.1 (19.8)	56007.2 (13.4)	59275.2 (5.8)	63145.1 (6.5)
Tectona grandis	33952.0 (0.0)	40412.4 (19.0)	60837.1 (50.5**)	67881.9 (11.6)	74025.0 (9.1)	74480.8 (0.6*)	74985.7 (0.7)	76002.9 (1.4)

Note: Figures in brackets are the annual percentage price changes

* : Lowest % annual change

** : Highest % annual change

Table 2: Average prices of wood species in N/m^3 and annual percentage price changes from year 2001 to 2008 in Ibadan

Wood Species	Year/ Average Price (₦)							
	2001	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**
Mansonia altissima	32769.2 (0.0)	35450.6 (8.2)	40570.0 (14.4)	49240.7 (21.4)	55740.3 (13.2)	67218.8 (20.6)	72513.7 (7.9)	80142.0 (10.5)
Khaya ivorensis	18664.1 (0.0)	22950.6 (22.9)	25635.7 (11.7)	28000.5 (9.2)	30340.1 (8.4)	33876.8 (11.7)	35107.2 (3.6)	38982.2 (11.0)
Cordia millenii	20121.6 (0.0)	25870.5 (28.6)	29240.6 (13.0)	41740.7 (42.8)	45520.0 (9.1)	47473.9 (4.3)	49216.2 (3.7)	52707.6 (7.1)
Tectona grandis	33109.2 (0.0)	36700.1 (10.9)	54342.9 (48.1**)	61050.7 (12.3)	67430.5 (10.5)	67910.6 (0.7*)	71210.7 (4.9)	72148.1 (1.3)

Note: Figures in brackets are the annual percentage price changes

* : Lowest % annual change

** : Highest % annual change

Source: Field work, (2008)

Table 3: Average prices of wood species in N/m^3 and annual percentage price changes from year 2001 to 2008 in Benin

Wood Species	Year/ Average Price (₦)							
	2001	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**
Mansonia altissima	44578.4 (0.0)	49250.1 (10.5)	58564.9 (18.9)	69450.0 (18.6)	80675.0 (16.2)	91006.4 (12.8)	95810.8 (5.3)	99115.0 (3.5)
Khaya ivorensis	27608.3 (0.0)	30740.2 (11.3)	33357.4 (8.5)	42850.4 (28.5)	45648.1 (6.5)	46282.3 (1.4)	49227.1 (6.4)	53185.2 (8.0)
Cordia millenii	30742.3 (0.0)	36575.1 (18.9)	40512.4 (10.8)	49745.3 (22.8)	52245.2 (5.0)	57654.2 (10.4)	65785.2 (14.1)	68215.1 (3.7)
Tectona grandis	36008.2 (0.0)	45775.1 (27.1)	74845.1 (63.5**)	81050.3 (8.3)	85150.4 (5.1)	85936.0 (0.9*)	88270.9 (2.7)	89680.2 (1.6)

Note : Figures in brackets are the annual percentage price changes

* : Lowest % annual change

** : Highest % annual change

Source: Field work, (2008)

Spatial price variations of planks used for furniture making in the study area

The mean annual price in N/m^3 for the four wood species (Mansonia, Khaya, Cordia and Teak) varied in the three cities between 2001 and 2008 (Tables 1-3). Ibadan had the lowest mean annual price. This was followed by Lagos while Benin had the highest price for the four wood species. The results of the analysis of variance show that the price variations between the cities were significant ($P< 0.05$) for the four wood species. (Table 4). The follow up test further reveals that the lowest mean annual price

obtained for the wood species in Ibadan was significantly different from that of Lagos and Benin (Table 4). Similarly, the highest mean annual price obtained for Benin was significantly different from that of Lagos except for Cordia. This observation is consistent with the findings of Popoola *et al.* (2001) for sawn-wood prices in some producing states of south western Nigeria.

Table 4: LSD results for spatial price variation of wood species studied in the study area

Study Area ANOVA/LSD	*Mansonia altissima*	*Khaya Ivorensis*	*Cordia millenii*	*Tectona grandis*
Lagos	62822.22 $_b$	35991.93 $_b$	46781.18 $_b$	61547.22 $_b$
Ibadan	57987.85 $_a$	29194.62 $_a$	38986.38 $_a$	53787.83 $_a$
Benin	73339.52 $_c$	41112.37 $_c$	50184.32 $_b$	73252.02 $_c$
F Cal	47.51	33.02	18.85	39.45
Prob. Level	P<0.05	P<0.05	P<0.05	P<0.05

Note: Wood species with the same letters in the same column are not significantly different.
Source: Field work, (2008)

Temporal price variations of planks used for furniture making in the study area.

The variation in prices of the four wood species was significant (P<0.05) for the eight years (Table 5). The follow up test however shows that only the mean prices of Mansonia was significantly different over the eight years. For Teak, the mean prices of Teak from 2001 to 2004 were significantly different from each other and from that of 2005 to 2008 while 2005 to 2008 were not significantly different from each other. The mean prices of Khaya and Cordia tend to follow the same trend whereby the mean prices were not significantly different for the eight years with the exception of Cordia in 2004 that was significantly different (Table 5).

Table 5: LSD results for temporal price variation of wood species studied in the study areas

Years ANOVA/LSD	*Mansonia altissima*	*Khaya ivorensis*	*Cordia millenii*	*Tectona grandis*
2001	39422.25 $_a$	23536.52 $_a$	26046.33 $_a$	34356.46 $_a$
2002	44096.97 $_b$	26991.61 $_{ab}$	31565.74 $_{ab}$	40962.55 $_b$
2003	50606.95 $_c$	29778.42 $_{bc}$	35806.71 $_{bc}$	63341.69 $_c$
2004	60192.93 $_d$	35932.65 $_d$	44242.33 $_d$	69994.30 $_d$
2005	69272.28 $_e$	37808.06 $_{de}$	49050.75 $_e$	75535.31 $_e$

2006	79769.67$_f$	40641.42$_{ef}$	53711.72$_{ef}$	76109.13$_e$
2007	86015.20$_g$	42947.41$_{fg}$	58092.18$_{fg}$	78155.76$_{ef}$
2008	92167.68$_h$	46827.64$_{gh}$	61355.92$_{gh}$	79277.05$_{ef}$
F Cal	167.32	63.68	74.27	100.36
Prob. Level	P<0.05	P<0.05	P<0.05	P<0.05

Note: Wood species with the same letters in the same column are not significantly different.
Source: Field work, (2008)

DISCUSSION

The highest and the lowest percentage annual price changes obtained for teak in 2003 and 2006 respectively in the three cities were due to the dwindling availability of the wood species. In other words, when the wood was available in standard plank size, the price was high. On the other hand, the price of the wood declined when the available wood was of substandard planks obtained from short rotation timber which furniture makers claimed had been in the market in recent years and which they were skeptical to purchase.

Reason that could be adduced for the lowest price obtained for the four wood species in Ibadan is the relative availability of lumber. This is because it is close in distance to Osun State which according to Popoola *et al.* (2001) and Umeh (2005) is now arguably the richest in timber within the south western zone of Nigeria.

The higher price observed in Lagos, next to Ibadan further attests to the findings of Akintola-Arikawe (1995) that Lagos is no longer a wood producing area as its forest has been cleared for settlement and industrialization. Hence, the woods used in Lagos come from other wood producing states.

The highest price obtained in Benin could be due to the high level of demand which has outstripped the level of available resources, moreso that they are conservative in their use of wood species for furniture making. Benin City is known to have developed a scale of preference for few popular wood species for furniture making. In prioritization of wood species used for furniture making Arowosoge, (2008) identified 18 wood species in Benin while 33 and 28 wood species were identified in Lagos and Ibadan respectively. The high level of uncontrolled harvesting of these few wood species used for furniture making in Benin could have reduced their availability in the forest. As a matter of fact, the Okomu forest reserve in Edo State which had hitherto been regarded as one of the richest in West Africa now has dwindling timber, due to high demand for industrial grade timber and illegal logging (Umeh, 2005). According to Umeh (2005) this is no APA format), the Edo State forest declined sharply from 310,800ha in 1978 to 21,900 hectare in 1995. This dwindling availability of wood is further revealed in the closure of African Timber and Plywood Industry, which is one of the biggest wood industries in Africa.

The variation in prices between the cities could however be argued from the point of view that the price of wood is a function of a number of factors such as cost of production, availability and demand. These factors vary with locations and they are inevitable. Cost of production, for example, depends on the prevailing cost of

transportation, labour, replacement and maintenance of equipment and machines, among others.

The significant variation in spatial prices at 5% probability level shows that the market price differences were high. This according to Serres *et al.* (2001) is abnormal under competitive market because the three cities are within the wood producing region of the country with no market barriers at least for the period of study. Thus, it is expected that the 'law of one price' should hold, whereby the prices between the cities will only vary by transfer cost. Popoola *et al.* (2001) are of the view that sawn-wood prices anywhere in Nigeria should ideally be integrated and vary only by the cost of delivery and marketing. This according to them is, however not so. This abnormality, therefore, shows that there are impediments to efficient marketing of these wood species. It has however been observed that the distorted market prices of sawn-wood are mainly transferred from the first two stages of timber marketing. At the initial stage of timber market the determination of tariff and the entry and exit into the forest reserves for operations vary from government to government and with constant changes in governments, there is unstable implementation of policies in the different states. Hence, prices are arbitrarily fixed from one state to another and this makes price determination complex as noted by Enabor and Popoola (1994). The second stage of the timber market also contributes substantially to market failure of sawn wood. The market structure is oligopoly and it involves the marketing of round log. The sellers who are licensed timber contractors are powerful and influential people who are able to act as monopolists and thus increasing prices (Beak Consultants, 1999). According to Adeyoju (1993), the variation in producing areas poses some constraints to vital aspects of sustainable development in the country such as the development of suitable policies capable of arresting the variation, planning of stock for domestic use and for export and determining project priorities that enhances socio economic development.

The yearly increase in the prices of wood species seems to portray the yearly inflation rates occasioned partly by the upward review of petroleum product prices, particularly diesel and the yearly increase in official fees/levies on forest products' transactions which on the long-run had direct effect on the cost of production. Variation in seasons is also a major determinant of wood pricing. This is because it is difficult to extract wood in forest reserves during rainy season and as such, wood are not harvested during rainy season except in few areas with good terrain. Thus, supply is generally low when compared to demand. The implication, therefore, is that in a year where rainfall is prolonged there would be scarcity, thus increasing the prices of the few available wood species.

A major driving force for the low percentage annual price changes of the four wood species studied as observed during the course of this study and which both the furniture makers and lumber sellers claimed had been on the increase in recent years, was illegal planks produced through illegal timber flitching which flooded the market. The flitched planks which were mostly of substandard sizes were sold at low prices when compared with planks obtained from the conventional sawmills. This reason could also be responsible for the non-variation in the mean prices of Khaya and Cordia observed for the eight years of study as timber of high grade economic species were mostly illegally flitched. The findings of Ogunsanwo *et al.* (2005) on timber flitching showed that trade in flitched lumber which has been in existence for years was significant in lumber market

and that there was a significant difference in the prices of the flitched lumber which were mostly high grade economic species.

CONCLUSION

The study showed a significant spatial and temporal price variation in the three cities over a period of eight years. The high market price difference is abnormal in a sawn-wood market that is competitive moreso that the cities are located in wood producing areas of the country with no market barriers. Considering the fact that sawn-wood prices are fundamental pre-requisite to the socio-economic development of the country it therefore becomes necessary to develop suitable policies capable of arresting the abnormality. There is the need to ensure proper fixing of forest tariff and regulations for the producing states. The contribution of illegal flitched timber to the gross in-efficiency of sawn-wood pricing should be prevented. Since timber flitching is an illegal activity, government should do everything possible to curb the illegality. The involvement of the stakeholders as well as enlightenment of the public on the disadvantages of illegal felling will go a long way in solving this problem. Alternatively; timber flitching could be legalized like it is being practised in other countries such as Cameroon. Moreover, it has benefits such as harvesting of timbers in difficult terrains and maximum returns to the ecosystem through in-situ conversion of timber. Legalizing the activities will also ensure better production of flitched timbers.

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