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# On the trend and variability of 18<sup>th</sup> century British Transatlantic slave prices

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## Abstract

The purpose of this shorter paper is to estimate the trend of 18<sup>th</sup> century British slave prices. We apply robust econometric procedures on slave price data constructed by Whatley (2018) over the period 1699 to 1807 and find evidence of a structural break in 1740, thereby advocating a broken trend. We estimate the trend over two regimes demarcated by the structural break, concluding there is no significant trend in the first regime prior to 1740. However, in the second regime, slave prices show a significant positive trend increasing annually at around 2.4%. Since 1740, the slave prices are close to constant variance, lending support to the tighter confidence intervals that we obtain in the second regime. We document various accounts by historians that can help explain this steady increase, focusing on supply and demand side arguments.

**Keywords:** Transatlantic slave trade, Slave prices, Structural breaks, trends, Britain, Africa,

**JEL Codes:**

## I: Introduction:

The purpose of this study is to estimate the trend of British slave prices and its variability over the 18<sup>th</sup> century. The question that we address is how did slave prices evolve over the 18<sup>th</sup> century? During this period of British dominance in the Transatlantic slave trade, we aim to determine whether slave prices were characterised by a secular trend, or a broken trend, where the trend may have changed slope and/or magnitude.

The British merchants' foray into slave trading was relatively late compared to her Portuguese counterpart. Indeed, Britain's importance in the Transatlantic slave trade was only established in the mid and late-18<sup>th</sup> century (Williams, 1944, pp. 29-31). Notably during this period 'the (British) slave trade was more than a means to an end; it was also an end itself.' (Williams 1944, pp. 29). The size of the British slave trade grew with the increasing demands from the West Indian sugar plantations. In addition, the Treaties of Utrecht (1713-14) following the War of Spanish Succession gave the British traders privileged access as suppliers of slaves to the Asiento trade<sup>1</sup>.

As the dominance of British traders increased, large supplies of slaves were sourced from new regions such as the Bight of Biafra, the Windward Coast and Sierra Leone in the mid-18<sup>th</sup> century. This was enabled by associating with the reputed and skilful Aro traders who had established themselves in these areas almost a century earlier. Also, the Asante and Dahomey gained control of the important ports of Accra and Quidah respectively and increasingly dominated the slave trade.

Economic historians have debated extensively on slave price trends. At one extreme there are the traditionalists<sup>2</sup> (for example, Phillips 1918) who argued that the upward trend in

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<sup>1</sup> Edwards (1801) records that throughout the 18<sup>th</sup> century British slave traders supplied half a million African slaves to French and Spanish sugar planters establishing themselves as 'the foremost slave trading country in the world' (Williams, 1948, pp. 30). The relative position of the British in the slave trade was best captured by the growth and importance of Liverpool. Towards the end of the 1700s, the city of Liverpool alone controlled upwards of 40% of the entire European slave trade.

<sup>2</sup> The traditionalists considered slaves to be sub-human as a race, and that slave-owners-maintained slavery as a conceivable system of race relations.

slave prices is due to speculation on part of the slave owners and their ‘peculiar culture’ of the desire to hold slaves for power and status (Yanochik et al. 2003). In contrast, the new economic historians (for example, Fogel and Engerman, 1974) argue that it was the productivity of slave labour that led to high slave prices. Intuitively, one would generally take the view that slaves were profitable. After all they are unpaid, the slave owners reap the benefits of their labour and therefore, slavery should have been a lucrative business for the plantation owners. However, these debates have centred on the antebellum South of America, focused on one region and during a period after the abolition of slave trade by the British.

During the eighteenth-century there was a growing demand for slaves in the Americas. This may have been due to the rising real price of sugar, thereby exerting an upward pressure on the prices of slaves. Other factors such as the cost of acquiring slaves from the interiors of African nations and marching them to the coast may have also played a significant role. There is no reason to believe that the upward pressure on slave prices was constant over time. During this period there were possible improvements in the productivity of plantation labour. The increase in land devoted to the production of sugar may have increased the productivity of slave labour and therefore slave prices (Gemery and Hogendorn 1979). Other factors that may have caused the trajectory of slave prices to change could be the high death rates in slaves combined with newly arrived captives.

In the present analysis, we test whether there is any change in this trend, that is the direction and/or magnitude of slave price changes with time. Thereby, we investigate whether structural breaks exist and, if they do, we measure the underlying trends in regimes demarcated by the breaks. We examine the period from 1699 to 1807, which covers the eighteenth century to the point when slave trading was eventually abolished by the British. A problem with estimating structural breaks and the underlying deterministic trend is the issue

of dealing with unit roots<sup>3</sup> in the data. Hence, we apply robust econometric procedures that allow us to be agnostic to the presence of unit roots. The significance of the trend can be affected by the large variability around it. A companion to estimating a significant trend is assessing the presence of time varying variance, which we also do in the present analysis.

Our quantitative analysis provides two key findings that are important to the ongoing debate. In the first instance, we establish a broken trend in slave prices over the period considered by detecting a significant structural break in the trend in 1740. Our results indicate that prior to 1740, no significant trend is found in slave prices; however, after 1740, we report that slave prices show a significant positive trend increasing annually at around 2.4%. This has implications for slave traders and owners as they anticipated capital gains, especially as they accumulated slaves, who were deemed as ‘human chattels’ and, thereby, assets<sup>4</sup>. Secondly, our analyses also detect a change in price variability around this period. Prior to 1740 there is time varying variance, whereas in the post-1740 regime, prices are close to constant variance. We argue that this is due the demand and supply interaction that takes place from the mid-18<sup>th</sup> century resulting in an increased importance of ‘guns for slaves in exchange’ (see Whatley 2018). We conclude that 1740 would appear to be a significant year for the British African slave trade. Several demand and supply factors come to bear around this period that can provide an explanation to a steady upward trend in slave prices and the interaction of demand and supply that may have contributed to the time varying variance. This study is delimited as the model and analysis provided is based on tentative explanations to which further historical detail can be appended, for the purpose of empirical testing.

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<sup>3</sup> In other words, the error term of the trend regression is serially correlated with a unit coefficient on its lagged term, thereby making the data series a non-stationary integrated process, or I(1) process in this case.

<sup>4</sup> In a recent study González et al (2017) argued that slave property rights, or wealth, were not only as source of coerced labour but also an important a source of collateral.

The remainder of the paper is organised as follows: Section II outlines the data and methodology, while Section III focusses on the empirical findings and discussion of these results. Finally, the summary and concluding remarks are considered in Section IV.

## II: Data and Methodology.

### *II.1: Data*

Quantitative analysis of the general trend in slave prices is possible with recently discovered and compiled data. Most of the past studies have discovered new data in its original sources (e.g., Bean (1975) on British Atlantic Slave Trade and Curtin (1975) on prices of slaves in the lower Gambia between 1683 to 1688 and 1727 to 1741). Likewise, using original sources, Whatley (2018) compiled annual slave prices from 1699 to 1807. The slave price is constructed by taking the ratio of cargo exported to African traders, to number of slaves imported by British traders. As documented by Whatley (2018), this ‘cargo’ is equal to the total exports of British traders less the total commodity exports of African traders, which then comprises of what is used to purchase slaves. This included items that were anticipated to be demanded by African traders, such as textiles, iron bars, metal containers, glassware, cowrie shells, beads, firearms and alcohol (Alpern 1995). The data is measured annually, and the subsequent analysis is conducted using logarithms of the data.

### *II.2: Methodology: Structural Break and Trends:*

In this section we highlight the importance of robust procedures to estimate the trend and a possible structural break. Perron (1989) highlighted that the correct specification of the trend function could be affected by the presence of a unit root<sup>5</sup>. The trend estimation is further

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<sup>5</sup> For example, if the data series contains a unit root, (or in other words the data is  $I(1)$ ), then severe size distortions could occur when using ordinary least squares to test for the presence of a trend. Conversely, if the data does not contain a unit root (or the data is  $I(0)$ ), but is modelled as a unit root process, then the tests for the presence of a trend will be inefficient and lack power relative to the trend stationary process (Perron and Yabu 2009b).

complicated if structural breaks are present in the data. For example, if a structural break is ignored, one can incorrectly conclude the series to be a unit root process, when actually the series is trend stationary with a structural break (Perron 1989). Alternatively, in a difference stationary series, neglecting a trend break can lead standard unit root tests to incorrectly suggest the presence of stationarity (Leybourne, et al. 1998). Further, on one hand, the inference on structural breaks applied on data measured in levels, is dependent on the presence of a unit root, while on the other hand, the test based on first differenced data can have very poor properties when the data is stationary (Vogelsang 1998). This circular testing problem leads us to employ robust procedures developed by Perron and Yabu (2009a,b) to detect structural breaks and estimate trends allowing us to be agnostic to whether the data is I(1) or I(0).

To employ the methods of Perron and Yabu (2009a,b) on the slave price data compiled by Whatley (2018), we estimate the trend function based on the general model given by:

$$p_t = \mu_0 + \beta_0 t + \sum_{i=1}^2 \mu_i DU_{it} + \sum_{i=1}^2 \beta_i DT_{it} + u_t, \quad t = 1, 2, \dots, T \quad (1)$$

$$u_t = \rho u_{t-1} + A(L)\Delta u_{t-1} + \varepsilon_t, \quad t = 2, 3, \dots, T, \quad u_1 = \varepsilon_1 \quad (2)$$

Where  $p_t$  denotes the logged price of slaves,  $T$  is the sample size  $DU_{it} = I(t > T_i)$ , and  $DT_{it} = (t - T_i)I(t > T_i)$ , are level and slope dummies, where  $i = 1, 2$  are the maximum number of breaks allowed. A break in the trend occurs at time,  $T_i = [T\lambda_i]$ , where  $\beta_i \neq 0$ , and  $\lambda_i$  is the break fraction. The date(s) for any break(s) in the series and the number of breaks ( $i = 1, 2$ ) is unknown. We first allow for a single break  $i = 1$  in (1), and if we find evidence of a break, we proceed using a sequential test developed by Kejriwal and Perron



(2010) to test for two breaks  $i = 1, 2$  in (1)<sup>6</sup>. No assumptions are made with regards to the nature of the error term, that is,  $u_t$  can be either  $I(0)$ , where  $|\rho| < 1$ , or  $I(1)$  where  $\rho = 1$ . To determine whether structural breaks exist we test the null hypothesis  $H_0: \beta_i = 0$  against the alternative  $H_1: \beta_i \neq 0$ . Perron and Yabu (2009a) propose a robust method to detect a break in the trend function based on a Feasible Quasi Generalized Least Squares (FGLS) method. We test for a single structural break in the slope of the trend function using the procedure of Perron and Yabu (2009a), which constructs an exponential Wald test statistic  $ExpW$  to test this hypothesis. A rejection of the null hypothesis of no break by this test is evidence in favour of a break.

We assume the error term in (2) to follow an autoregressive process where the lag is determined according to the Modified Akaike Information Criterion (MAIC). A bias corrected version of the autoregressive parameter is created to improve the finite sample properties of the test. Using this a quasi-differenced regression is estimated (see Perron and Yabu 2009b for details). From the estimated  $\hat{\beta}_0$ , we construct the associated confidence intervals. This is valid for either  $I(1)$  or  $I(0)$  errors and denote the corresponding t-statistic as  $t_{PY}$  (see Perron and Yabu (2009b)).

Since several factors can cause shifts in the demand and supply of slaves over a century, it would not be surprising to find changing variance over the sample period. To detect the presence of changing variance, we follow the procedure by Cavaliere and Taylor (2007) where a measure given by the variance profile  $\hat{\eta}_s$  is determined by:

$$\hat{\eta}_s = \frac{\sum_{t=1}^{\lfloor sT \rfloor} \hat{v}_t^2 + (sT - \lfloor sT \rfloor) \hat{v}_{\lfloor sT \rfloor + 1}^2}{\sum_{t=1}^T \hat{v}_t^2} \quad (2)$$

Here  $\hat{v}_t$  is the estimated residual of the error term of the trend function given by equation (1) on its own lag,  $T$  is the sample size and  $\lfloor \cdot \rfloor$  denotes the integer part of the argument. Note that

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<sup>6</sup> We do not allow for more than two breaks in the trend function given the sample size (see Kejriwal and Perron 2010).

the variance profile satisfies  $\hat{\eta}_s = s$  under constant variance and deviates from  $s$  under heteroscedasticity. This volatility is unconditional, often referred to as nonstationary volatility<sup>7</sup>. This is an important consideration if the slave price show relatively higher variability that can affect the estimation of the trend (Yang and Wang 2017).

### III: Empirical Results and Discussion:

Before considering the estimation of a secular trend, we test for a structural break to ascertain the need for estimating broken trends.<sup>8</sup> We apply the structural break test using the exponential Wald *ExpW* test statistic due to Perron and Yabu (2009a) on the slave price data and obtain:  $ExpW = 1.47$  which is greater than the tabulated critical value of 1.13 at the 10% significance level. Therefore, we reject the null hypothesis of no break and conclude the presence of a single trend break in the data. According to the procedure we find the endogenously determined trend break to occur in the year 1740. Given our location of the break point, we proceed to estimate whether a significant trend exists before and after this break date. We demarcate the sample period into two regimes. We assign the period 1699 to 1740 as Regime I; and 1741 to 1807 as Regime II. Figure 1 shows the location of the break point in the slave price data series, and thereby the demarcation of the two regimes before and after the break.

[Figure 1 about here]

Table 1 below reports the results of robust trend estimation. The estimated Regime I trend coefficient is insignificant for the slave price data; we find a positive sign to the trend,

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<sup>7</sup> Not to be confused with non-stationary integrated I(1) process.

<sup>8</sup> As mentioned before, we also consider the sequential procedure due to Kejriwal and Perron (2010) that allows for more than one break (i.e.,  $i = 1, 2$ ). The results show that allowing for the maximum possible breaks to be equal to two, the sequential test settles on the number of breaks to be equal to one. We do not report the results for brevity but are available from the authors on request.

(that is 0.72%), but it is statistically insignificant (t-ratio 0.91)<sup>9</sup>. The insignificance of the trend is due to the wide confidence interval in the data in Regime I, as indicated by the range of the 90% confidence interval around the estimated trend coefficient. Between the lower bound and upper bound of the confidence interval, the trend estimate contains the value of zero, thereby rendering the estimate as being insignificant. In Regime II, however, the trend estimate is positive (2.4%) and statistically significant (t-ratio 9.59). The trend estimate in Regime II is relatively more precise with a tighter confidence interval compared to the trend estimate in Regime I. Therefore, we can conclude, the slave prices in the 18<sup>th</sup> century did not increase or decrease until 1740. Thereafter, the price of slaves increased at the rate of 2.4% every year until 1807. Our result of rising slave prices since 1740 lends support to the observations by Jones (1983), Johnson (1966) for West African slaves between 1762 and 1775 and Richardson (1991).

[Table 1 about here]

Richardson (1991) notes that the general trend in cargo outlays per slave varied between £4.4 to £6 over the first half of the 18<sup>th</sup> century. However, in the second half of the 18<sup>th</sup> century the outlays per slave increased to £11 and continued to increase further up to £21 per slave. This may have contributed to the rising price of slaves since 1740 onwards. Our finding of broken trends in the price of slaves supports Richardson's (1991) observation that the costs of acquiring slaves were relatively constant in the first half of the 18<sup>th</sup> century. Nevertheless, as further increases of slave exports took place, the latter half of the 18<sup>th</sup> century resulted in higher costs of slave acquisition.

As stated earlier, the steady increase in slave prices after 1740 could be due to the interaction between demand and supply shocks. The pertinent issues relating to supply and demand shocks are discussed respectively in subsequent sub-sections.

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<sup>9</sup> This estimate of the deterministic trend was re-estimated allowing for nonstationary volatility following the procedure by Yang and Wang (2017) and the conclusion is the same. The results are available from the authors on request.

### *III.1: Supply side arguments*

Manning (1990) documents that the rising slave exports during the eighteenth century was accompanied by a decline in the natural population growth of West and West-Central Africa. This decline was particularly acute during the latter half of the 18<sup>th</sup> century, between 1750 to 1790 (see Manning 1990, p.135); a time that is close to the structural break we find in the trend of slave prices. A detailed study of the impact of the slave trade on population decline was undertaken by Price and Whatley (2023). They found that the Transatlantic slave trade reduced African population around 25 percent in comparison with other Africa countries that were not subject to the trade<sup>10</sup>.

The continued capture of slaves in a single region could lead to a fall in population for that region, causing a negative shock in the supply of slaves. A King selling his own people to outsiders could threaten his rule. Since his military power is diminished by selling his own people (Thomas and Bean 1974), this would have led to the capturing of slaves becoming more difficult. The supply of slaves from any specific area was becoming increasingly inelastic with respect to price as the capture of slaves increased over time (Thomas and Bean 1974).

Furthermore, neighbouring areas with strong monarchies such as Asante and Oyo were able to gather significant numbers of slaves during this time to supply the New World with higher prices in exchange (Manning 1990 p. 135). Overall, there appears an overlap between internal conflict in these regions and the increases in slave exports with continuing high prices during the post-1740 period.

During the 18<sup>th</sup> century, Africa underwent a process of political consolidation, that is, the size of the state expanded<sup>11</sup>. While engaging in slave trade, African princes charged rent from the inland traders in the form of tolls. If the toll charge was high, the inland traders

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<sup>10</sup> They also report that the ensuing disruption constrained technological progress and living standards.

<sup>11</sup> It must be noted that African political consolidation did not imply political stability. Whatley (2020) argues that it did create both stability and instability.

would have to take a longer route to the coast to avoid paying the toll. Nevertheless, in the process higher transportation costs would be incurred, depending on the size of the state and its provisions. A case in point is the King of Whydah, who charged a port fee of approximately 20 to 30 slaves per slave ship (Astley 1968). In return for the payments, the King provided storage facilities and military protection. European slave traders would have preferred a quick turn-around time, to save the lives of both crew and cargo. Slave traders preferred to pay this port fee to minimise the time spent on the coast as they feared the outbreak of disease and uncertainty. If storage costs and military protection costs increased over time (post 1740), this would have contributed to the increasing trend in the price of slaves.

From 1750 onwards, there was an increase in the demand for guns manufactured in England for European traders travelling to West Africa. This demand was largely due to the strong preference of slave sellers, intended to capture slaves and march them to the coast or exchange slaves for guns; that is, the gun-slave cycle (see Lovejoy 1982). While guns were imported for slave-gathering (Inikori 1977), it should also be noted that guns purchased for slave-gathering and/or military purposes may also have been put to alternative uses, such as hunting for ivory, or food, or firing during ceremonial occasions (Northrup 1978, White 1971). But for these cases, the demand for guns was much weaker compared to the demand from slave traders (Inikori 1977). As noted by Roberts (1987), the increase in arms after the mid-18<sup>th</sup> century was the result of people requiring these weapons to enslave and the price of slaves steadily increased, which is also approximately around the time we identify increasing prices.

A more recent assessment of political consolidation is found in Diouf (2004). A number of essays in the edited volume argue that part of the political consolidation was to resist the European slave traders. Access to guns had contrary consequences. On the one hand,

it enabled raiding and kidnapping as a form of protection and self-preservation. While, on the other hand, the free people used these weapons to attack slave ships. It inevitably reduced the number of slaves that would have been traded.

Here it is important to emphasize the recent findings of Whatley (2018) in relation to the British slave trade in the 18<sup>th</sup> century. Whatley (2018) notes that from around 1740 there was a remarkable growth in slave exportation. New regions further west and to the interior of Africa, notably the Bight of Biafra, the Windward Coast and Sierra Leone, increasingly became an important source of slaves for the British traders with the help of the Aro incursion into the densely populated Igbo centre (see Nwokeji 2010). As noted by Whatley (2018), the expansion into the new regions meant that from around 1740 there was an ‘explosive growth [in slaves], with British traders leading the way’ (pp. 100). The increasing demand for slaves from 1740 also led to the expansion of the Asante and Dahomey kingdoms to the coast. Their control of the ports of Accra and Quidah meant these kingdoms also played an important role in the supply of slaves. Therefore, it could be argued that a clearer structure of supply had emerged in Africa, where strong states raided weaker decentralized villages<sup>12</sup>.

In summary, a combination of the decline in population and strategic resistance increased the cost to the European slave traders. Despite a fall in population from selected regions along the west coast of Africa, by venturing into new regions in the hinterland the supply of slaves for the British traders would have increased, albeit at an increased cost. Indeed, there is a strong argument that it was also the strategic resistance resulting from

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<sup>12</sup> Whatley and Gillezeau (2011) purports an interesting hypothesis; the increasing demand for slaves, due to the global demand for sugar, generates greater economic rents for the supply of slaves. Thereby, increasing slave raiding and the desire to control ports that were crucial to slave trading. They maintain that this hypothesis is largely able to explain the expansion of the Asante kingdom from its hinterland origins to the control of the coastal port of Accra and consequently a dominant supplier of slaves to European traders. Lindsey (2014) considered the role of ‘extraversion’ and the Atlantic slave trade, specifically in the context of large-state predation. Essentially, leaders of a centralised state tried to control important trading sites. Therefore, for example, the kingdom of Dahomey’s eventual control of the coastal port of Quidah allowed her leaders to closely supervise and control external trade with Europeans. Likewise, the Aro traders who established an extensive trading network in the Bight of Biafra.

political consolidation and newly acquired weaponry that forced European slave traders further inland and, thereby, increasing costs (see Diouf (2004), pp. xvi). Furthermore, political consolidation also meant that there was a clearer structure of slave supply. The increasing importance of the gun-slave cycle and the dominant role played by Aro traders, who were considered powerful oligarchy traders with access to slaves in the interior and Igbo centre, along with the Asante and Dahomey kingdoms control of slave supply from 1740 would have crucially exerted an upward pressure on slave prices.

### *III.2: Demand side arguments*

Manning (1990 p.88) notes that slave populations were never able to maintain themselves and this resulted in a continuous demand for new slaves. The majority of slaves were supplied along an approximately 200 miles deep belt along the west coast of Africa (Curtin and Vansina 1964). These belts were populated by scores of different political entities comprising of states and sub-states (Fortes 2018). The dense concentration of forts and lodges owned by Europeans along the coast of Africa (which alternated between different nationalities) led to competition among European slave traders thereby precluding any monopsony power as buyers (Thomas and Bean 1974). The number of ships arriving on the African coast was substantial with British slave traders having to bid against other European traders (Thomas and Bean 1974). Our results suggest the arrival of large numbers of ships on the African coast may have accelerated after 1740 and this increased demand for slaves contributed to the upward trend in prices. Europeans were not allowed defensible coastal forts and no monopoly rights were given to any European nationality (Akinjogbin 1963) as African rulers were aware that high prices for their slaves depended upon the bidding between Europeans (Thomas and Bean 1974).

The staple crop industries in colonial America increased in size but was largely competitive as there were large number of producers, with easy entry and exit from the

market producing a homogenous good (i.e., sugar, tobacco).<sup>13</sup> However, Manning (1990, p.96) describes the competitive model to be ‘anarchic’ as the entry and exit was transitory and erratic. Sugar production mostly took place in Barbados in the early 18<sup>th</sup> century. However, the number of plantations increased significantly when the largely undeveloped Jamaica accounted for a significant number of plantations by the late 18<sup>th</sup> century (Long 1774). The number of slaves working in tobacco plantations grew from a few hundred to several thousand (Thomas and Bean 1974). Over the 18<sup>th</sup> century as tobacco and sugar plantations grew, so did the demand for land to grow these crops. For example, Jamaican land was free from 1655 to 1670 but gradually increased to £4 to £5 per acre by the end of the 18<sup>th</sup> century (Dunn 2012). In 1700, the value of sugar plantation output in the whole Caribbean stood at an estimated £1.7 million and over the next 70 years it quadrupled in real terms. By 1850 it had increased by ten times (Eltis et al. 2005). From 1674 –1699 to 1780–1807, real sugar prices increased by 54 per cent, while the price of newly-arrived male slaves rose by 141 per cent (Eltis et al. 2005).

Planters in British America could obtain additional slaves either from the slave traders or from persons who ‘reared’ slaves in the New World. A question to consider: was there a capital gain to be made from the prevailing slave price and the earlier purchase price or the natural increase in the price of slaves? We argue against Thomas and Bean (1974) who suggest that it was not profitable to rear slaves as the cost was high. For example, the loss of labour due to pregnancy, substantial risk of mortality for both mother and child and the cost of subsistence and childcare during infancy (Gray and Thompson 1933, Pitman 1926), which would have been transmitted to the slave prices negotiated with African slave traders, if such gains were expected. This, they suggest, was highly improbable as capital gains were only

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<sup>13</sup>Our findings contradict Thomas and Bean (1974) inference. They argue that the competitive nature of staple crop production, planters were only able to secure normal profits and, therefore, the slave price would only increase up to the point where supernormal profits were eliminated.



achievable through unanticipated price increases. Thomas and Bean (1974) conclude the slave price increases were not substantial as according to their calculations, rose by only three-quarters of a percent over 150 years. However, using robust procedures, we calculate the annual year on year increase in slave prices from 1740 until 1807 was around 2.4%. We argue, it *was* possible that planters did make and continued to anticipate capital gains for several decades. Overall, we conclude that agricultural expansion of land, increased production of sugar, tobacco and coffee, and the expected capital gains from slave prices contributed to the rise in the price of slaves, despite the case made that slave rearing was costly.

### *III.3: Demand and Supply Interaction and the variability of prices*

We have noted a broken trend in slave prices over the 18<sup>th</sup> century with a change in the magnitude of the trend at the break point. The trend is insignificant prior to 1740, and thereafter positive. We now consider the variance profile for Regime I and Regime II.

The procedure due to Cavaliere and Taylor (2007) provides a graphical approach to establish whether there exists time varying variance in the data series. The variance profile for slave prices for both regimes are shown in Panels A and B in Figure 2 below:

[Figure 2 about here]

The dashed diagonal line in each of the figures represents a constant variance process. The solid line moving around the dashed line is the variance profile of the data. If slave prices straddle around the dashed line very closely, that would be an indication of prices being close to constant variance. For slave prices in Regime I, we find evidence of persistent deviation from this dashed line which signals time varying variance. In contrast, the deviation from the dashed line is much lower in Regime II, reflecting a much closer to constant variance. Besides, the calculated variance in Regime I is found to be 0.13 compared to 0.04 in Regime

II.<sup>14</sup> These results support our finding that in Regime I the trend is not discernible, accompanied by wide confidence intervals, which is due to the higher and changing variance. In contrast, Regime II shows a significant positive trend with tighter confidence intervals and a much lower and constant variance.

The growing importance of guns and weaponry, that is the ‘guns-for-slaves in exchange’ and ‘guns for slaves in production’ (see Whatley 2018), had two effects, that may have contributed to the lower variability since 1740. Firstly, as Whatley (2018) points out, is the share of weaponry in British cargo increased steadily in the mid and late 1700s. The type of goods exchanged for slaves narrowed with weaponry playing an increasingly significant role. The second effect, as the demand for slaves increased in the mid-18<sup>th</sup> century, a clearer structure of slave supply to European traders emerged. As a result of the ‘guns-for-slaves in exchange’ and ‘guns-for-slaves in production’, the supply was increasingly controlled by the highly militarised Asante and Dahomey kingdoms and Aro traders, who were able to exercise monopoly powers causing slave price to increase.

As the British expanded their trade further interior, especially into the Bight of Biafra, they increasingly relied on the Aro for trading in human cargo. The fearsome reputation and position of the Aro traders in this region had already been well established (see Njoku, 2016, p. 31). The Aro traders soon became the dominant supplier of slaves to British traders. They also accelerated the importance of gunpowder as an exchange for slaves (once again, see Njoku, 2016, p. 37). Hence, the increasingly importance of gunpowder in exchange of slaves, may have reduced price variability post-1740.

The interaction of slave demand and supply since 1740 increased the impact of the guns-for-slaves in exchange as well guns-for-slaves in production. As the global demand for

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<sup>14</sup> The correlation coefficient between slave price and quantity of slaves can be used to make inferences about the variance in slave prices. For example, the correlation coefficient is low, equal to 0.157 in the period prior to 1740; and then relatively higher, equal to 0.484 in the period post-1740. However, this observation needs to be treated with caution as the quantity of slaves is used in the construction of slave prices.

sugar increased over this period, the derived demand for slaves increased too. Consequently, the importance of guns for slaves in exchange as well as production increased. This, in turn, changed the supply structure of slaves resulting in monopoly power leading to increasing prices over time; the increasing share of guns in the interaction of demand and supply may have contributed to reduce slave price variability.

#### IV: Concluding Remarks:

The present analysis makes a few important findings with significant contributions to the ongoing debate pertaining to the British Transatlantic slave trade. The year 1740 appears to be a significant point for the British slave trade. We find that the price of slaves was roughly constant with large variability from the start of the 18<sup>th</sup> century to around 1740. Thereafter, the price of slaves grew steadily at the rate of approximately 2.4% year on year with near constant variance.

This remarkable increase in slave prices post-1740 can be inferred from various accounts by historians. Though the interpretation of historians may differ, a variety of reasons support this steady increase in prices. Some of the key reasons discussed earlier are that while the African population in some regions declined dramatically, around this period the British increased its slave imports by expanding further west into the interior. Therefore, it is not obvious that the source of human cargo necessarily declined. Regardless, the cost associated with 'slave production' increased as fees and tolls were imposed. To understand why the price of slaves increased by 2.4% annually since 1740, one might consider the capture cost of slaves, which may have risen, and possibility that the productivity of African slaves increased

too. It is unlikely that productivity increased by the rate of 2.4%, rather the costs of capturing slaves are more likely to have contributed to the increase in slave price.

In addition, with regards to the British slave trade, the oligarchic Aro traders became dominant suppliers of slaves from the new regions and the use of weaponry as a form of exchange gained more significance. The overall supply of slaves to European traders were also dominated by the Asante and Dahomey kingdoms. It is worth noting that the Dahomey kingdom had an extensive and long-standing relationship with Portuguese traders, which included embassies in Bahia, Brazil, and Portugal (see, Araujo (2012) for a detailed account). This would have reduced price variability and increased the price of slaves. Probably, the most important element in the post 1740 period is the demand for slaves. There was an increased demand for slave labour to work on plantations that were expanding with increasing demand of crops such as sugar and tobacco, and the anticipated capital gain from buying increasing numbers of slaves; all of which contributed to the increasing trend in slave prices.

It is worth noting that the average price for slaves included groups that were mixed in terms of age and sex composition which varied over time (e.g., the ratio of men to women on the west coast of Africa declined as the export of slaves grew; (see Manning 1990)). This could have contributed to the price increase as female slaves were taken off the export market by African slave traders. Indeed, the prices of slaves could have varied significantly along the west coast of Africa. A further investigation of slave prices based on age and sex composition as well as geographical location, would be an area of future research.

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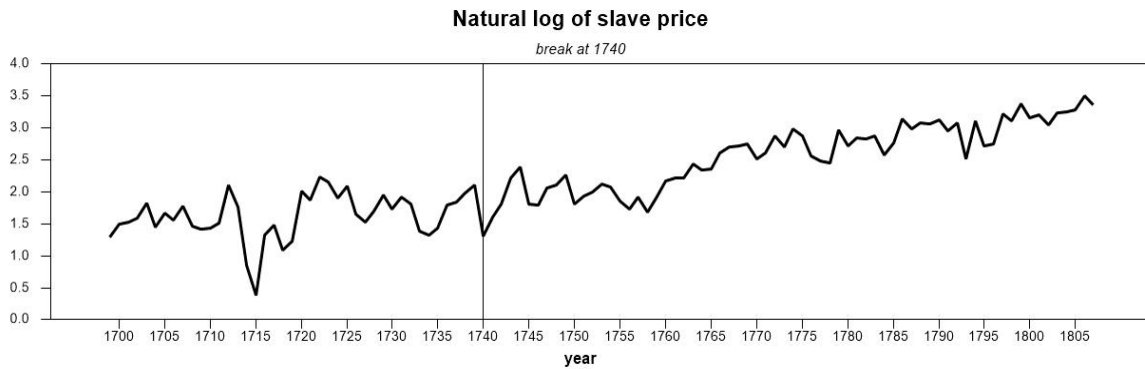
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**Table 1.** Robust estimation of deterministic trend

	$\widehat{\beta}$ (%)	90% Confidence Interval of $\widehat{\beta}$	Lag	$t_{PY}$
$P_t^{Slave}$ (Regime I)	0.72	(-0.58, 2.03)	1	0.91
$P_t^{Slave}$ (Regime II)	2.40	(1.99, 2.81)	2	9.59

**Notes:** The regimes labelled (I and II) are demarcated by the structural break found at 1740.

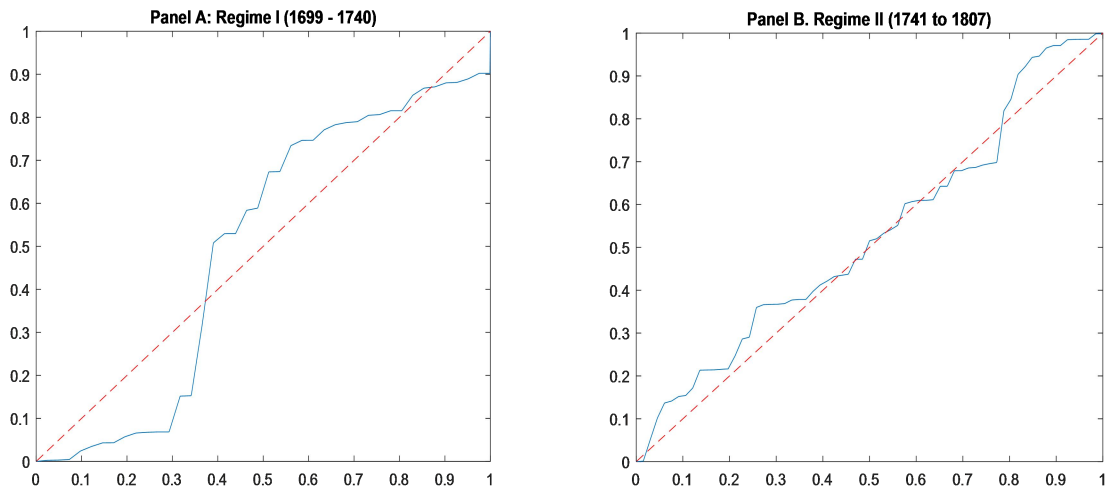
**Figure 1.** Slave prices



Source: Whatley 2018

Notes: The gridline gives the position of the structural break in the deterministic trend of the data.

**Figure 2.** Variance Profile



Notes: The dashed diagonal line in the figures represents the constant variance process. For slave prices in Regime I, we find the variance profile shows persistent deviation from this dashed line which signals time varying variance. In comparison, the slave prices in Regime II are closely aligned to the dashed line showing near constant variance.