Extended Abstract
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Paper/Poster Title	Cyclicality in the Prices of Tropical Crops

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Abstract	***116 words***
The episode of high food prices in the period from 2007 and the more recent post-lockdown commodity price resurgence have prompted discussion of commodity price cycles and the alleged "commodity super-cycle". Tropical commodities, particularly tree crop commodities, stand out as the most likely to exhibit cyclical patterns. The paper uses annual data for cocoa, coffee and sugar extending back into the middle of the nineteenth century to attempt to identify long cycles. The bandpass filter procedure, used to analyse cycles in metals price data, turns out to be unreliable. Use of the unobserved components model produces mixed results with some evidence of long cycles in coffee and sugar prices but no such evidence for cocoa prices.	
Keywords	Cycles, cocoa, coffee, sugar
JEL Code	Demand and Supply • Prices (Q21)

Introduction	***101 words***
A feature of tree crops is the gap of several years between planting and the first harvest. This "time to build" (Kydland, 1982) limits the responsiveness of production to high prices. Labour and other input costs can be reduced in periods of low prices and this, together with the option value of maintaining the tree stock, also limits the response to low prices. The consequence is that prices can remain either above or below long run marginal cost for extended periods of time (Gilbert, 2016). These factors have led economists (e.g. Gelb, 1979) to believe that prices may exhibit long cycles.	

Methodology	***239 words***
The identification of long price cycles requires long price series. These are available for both cocoa and coffee, extending back to the middle of the nineteenth century. I look additionally at sugar, where there is also a long time series. Although sugar is not a tree crop, where the same considerations apply because production is only economic where there are inexpensive transport links to a nearby refinery. The coffee price series is for Brazilian beans in New York. The cocoa and sugar series are less consistently defined until the middle of the twentieth century. Two methodological approaches are available – the bandwidth filter (Baxter and King, 1999; Christiano and Fitzgerald, 2003)), which filters out low frequency price	

movements, and the unobserved components model (UCM, Harvey, 1989), which that decomposes the series into trend, cycle and irregular movements. The bandwidth filter has been widely used to identify cycles in metals prices, in particular in attempting to identify "the commodity super-cycle" (Heap, 2005; Cuddington and Jerrett, 2008). It is a decomposition, and not a model, and is thus untestable – the only issue is the interpretation of the filtered components. The term "cycle" implies a degree of regular repetition. It is preferable to regard the filter as identifying "waves" where there is implication of regularity. Monte Carlo analysis shows the wandering paths generated by random walk models will, when filtered, appear as waves. But random walks do not repeat and are not cyclical.

Results	***166 words***

The bandwidth filter identifies long waves for all three commodities: periodicities 41 year (cocoa), 31 years (coffee) and 34 years (sugar); average amplitudes 39% (cocoa) and 33% (cocoa and sugar).

The UCM shows strong evidence for a 57-year cycle in coffee prices, (amplitude 46%), mixed evidence for a 28-year cycle (average amplitude 26%) in sugar prices but no evidence for any cycle longer than four years in cocoa prices. The coffee and sugar UCM cycles correlate reasonably well with the cycles identified by the bandwidth filter (r = 0.62 and 0.76 respectively).

The over-riding difficulty in this form of analysis is distinguishing between a long cycle and a variable trend. Interpretation of the bandwidth filter involves an implied hypothesis that the trend varies smoothly. The cycle periodicity of the coffee cycle is not precisely estimated and it is difficult to distinguish a stochastic cycle of this length from a variation in the trend.

It is unclear why the results differ so much across the three crops.

Discussion and Conclusion	***170 words***

At this stage, the conclusions remain preliminary. It is clear that very long time series are required to identify long cycles. However, markets were regionally segmented prior to the middle of the nineteenth century so it is not possible to go further back. There are also later periods in which the concept of a world price is problematic. Results are therefore inevitably qualified by data consistency and reliability.

In terms of methodology, the analysis demonstrates that the bandwidth filter is problematic – the filter will recover a long cycle if one is present but will also identify completely accidental waves in wandering time series. The UCM approach generates testable results – negative for cocoa, apparently positive for coffee but with a periodicity and a lack of precision that makes the cycle close to a variable trend. The results for sugar are the most interesting – depending on the model selection procedure, either prices are cyclical or they are generated by a noisy random walk process which happens to have generated a cyclical pattern.