What can we learn from primary commodity prices series which is useful to policymakers?
by

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Prepared for the High-Level Seminar on Natural Ressources, Finance and Development Organized by the Central Bank of Algeria and the IMF Institute
Algiers 4-5 November 2010

Dependence on commodity prices

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Challenge I: Secular decline of real commodity prices

- **Potential secular decline in commodity prices relative to manufacture prices: The celebrated Prebish-Singer hypothesis**

- **Possible explanations**

  - Income elasticities of demand for primary commodities are lower than those for manufactures.
  - Absence of differentiation among commodity producers leading to highly competitive markets.
  - productivity differentials between North and South.
  - Asymmetric market structures: Oligopolistic rents for the North and zero economic profit for competitive commodity producers in the South.
  - Wages cannot grow in the presence of "unlimited" supply of labour at the subsistence wage in primary commodity producing countries (Arthur Lewis 1954). This imply zero trend.
  - Decline of demand from industrial countries.

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Challenge II: Cycles over long horizons and mean reversion.

- **Commodity prices are characterised by long-term cycles and high autocorrelation.** "The dynamic of commodity prices are characterised by long period of quiescence, interrupted by dramatic upward flares and downward plunges" (Deaton 2010)
- **Possible explanations:**
  - Elasticities of supply and demand relative to price are low in the short-term but increase with time. therefore, prices come back to the long-run equilibrium after a peak.
  - For non-renewable resources the answer to the question should we leave resources in the ground or extract them will depend on an arbitrage condition between interest rate and expected future of price increase (Hotelling 1931). This lead to an inverse relationship between real interest rates and real commodity prices.
  - Speculative bubbles may drive commodity prices away from their fundamentals until they pop pushing then commodity prices back to their equilibrium prices (oil speculation during the recent peak)

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Challenge III: High and changing volatility around the trend.

- **Most commodity prices are volatile, and volatility is time varying (UNCTAD 2008 and Ilse Mintz 1967).**
- Possible causes of price volatility
  - Supply shocks: wars, epidemic, weather, political unrest... lead to shortfall in production and to large variance of prices.
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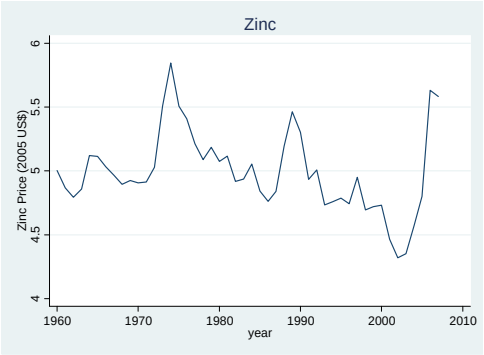
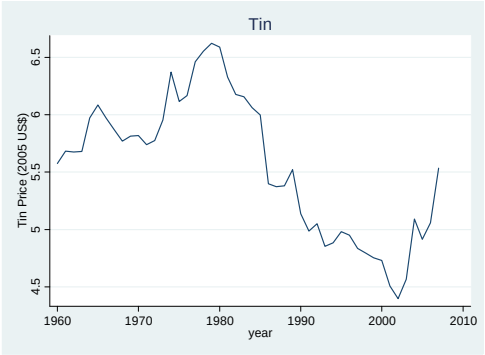
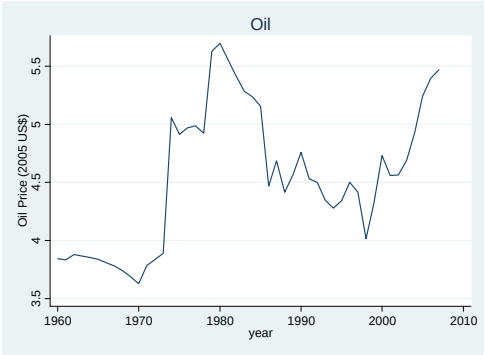
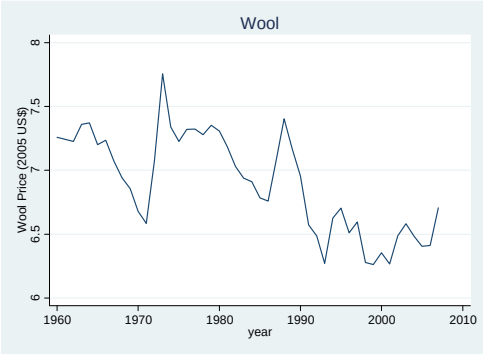
What is the evidence for the secular decline of primary commodity prices?

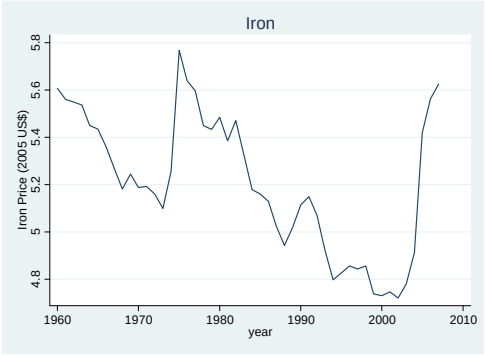
Sample of 9 commodities observed during 48 years (1960-2007)

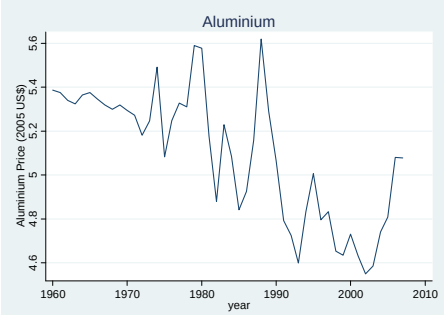


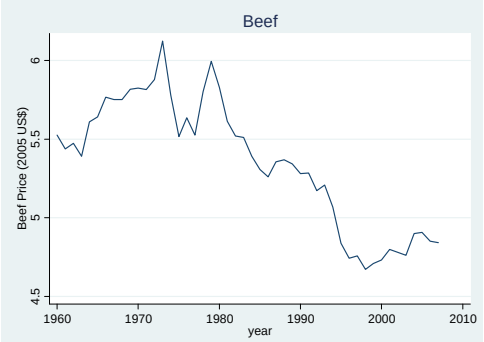


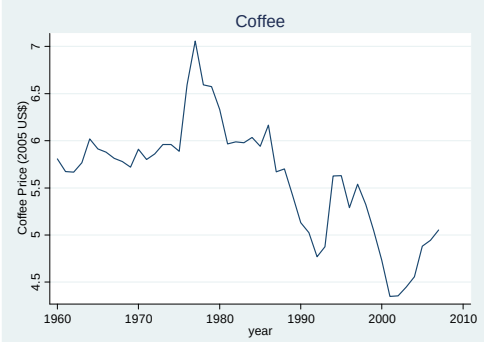


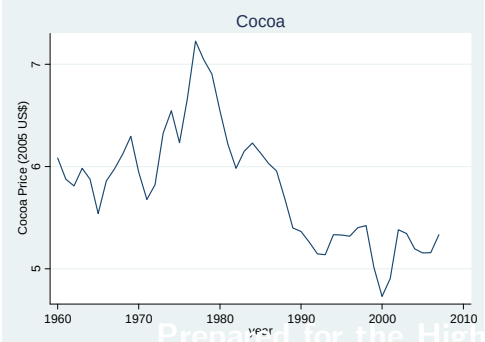












What is the distribution of commodity prices?

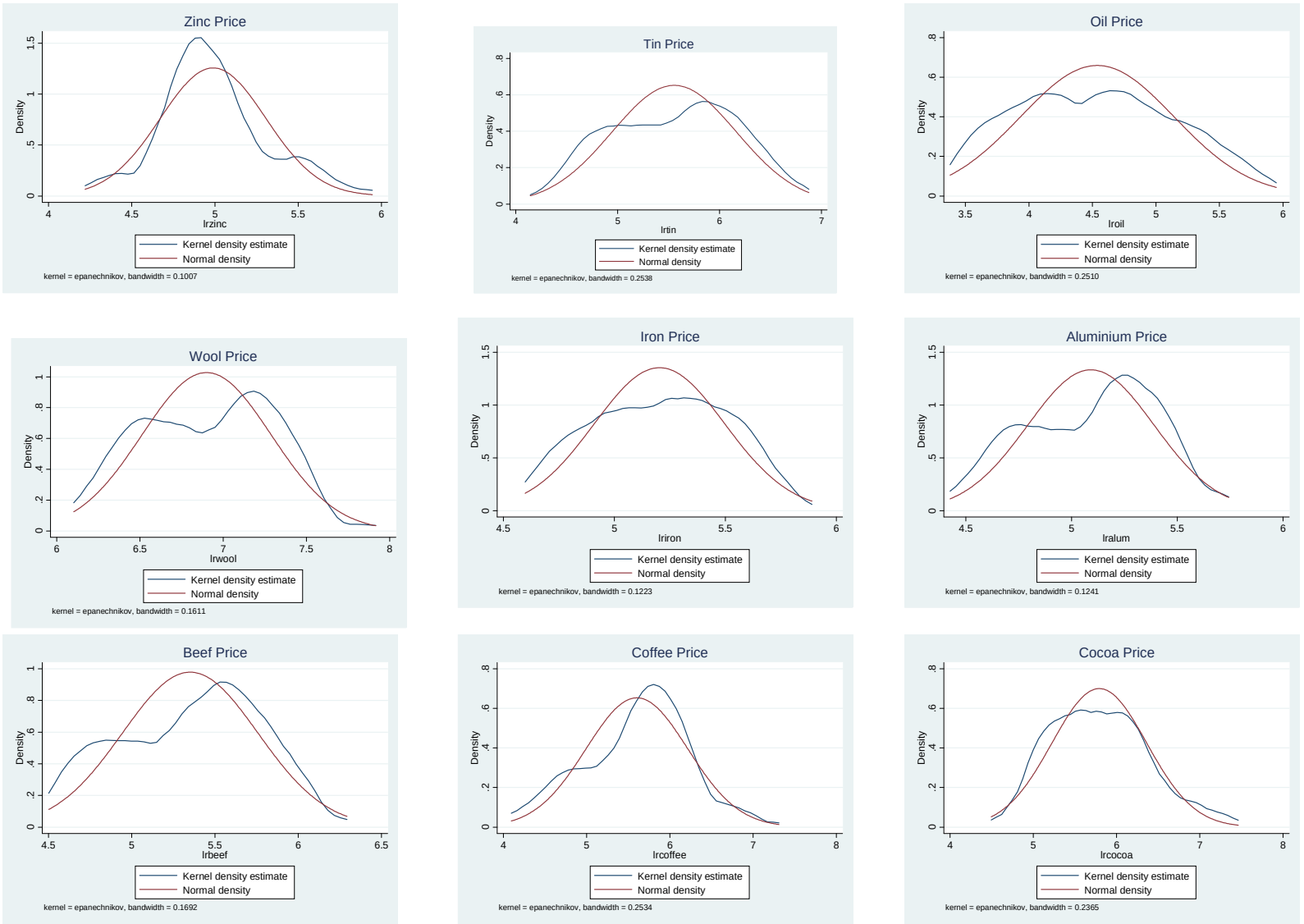


Fig. 2.

Testing the Prebish-Singer hypothesis

By just eyeballing the price series, it is not clear if they have a downward trend, if they are mean reverting... We did some statistical tests:

- **We used a panel test (Hadri & Yao 2008) allowing for possible structural breaks and correlation across different commodity prices. We found that all the 9 commodity prices in our sample are mean reverting and therefore shocks have only transitory effects.**
- **We used other single price series tests. The results were mixed. Panel tests are more reliable because more powerful due to the use of more information.**
- **Finally, we found that all commodities have a significant negative trend except oil which has a positive but not significant trend. Prebish-Singer hypothesis is therefore not rejected.**

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Test of the Prebish-Singer hypothesis

Table 3.One Sided Test for a NegativeTrend. Pvalue inside brackets

	Growth Rate(%) (no break)	before break	after break.
Zinc		–0.0087 (.0055)	0.35078 (0.993)
Tin		–0.033 (0.000)	0.1905 (0.97)
Oil	0.0214 (1)		
Wool	–0.0205 (0.000)		
Iron		–0.0184 (0.000)	0.2339 (0.994)
Aluminium	–0.16 (0.000)		
Beef	–0.024 (0.000)		
Coffee	–0.294 (0.000)		
Cocoa	–0.0254 (0.000)		

- All commodities without a break have a significant negative trend except oil which is positive but not significant.
- the ones with a break have a significant negative trend before the break and a positive but insignificant trend after the break. The estimations after the break are not reliable because of the size of the sample (only 5 observations).

Co-movement of commodity prices

- **Commodity prices move together (generally positively correlated) except with Oil price). This co-movement amplifies cycles and volatility.**
- **Correlation between oil and other commodity prices are relatively small, some are negative and all are statistically insignificant.**

Table 1 Correlation Coefficients of Commodity Prices (*p*-values between parenthesis)

	zinc	tin	oil	wool	iron	aluminium	beef	coffee	cocoa
zinc	1.0000								
tin	0.5673 (0.0000)	1.0000							
oil	0.2560 (0.0791)	0.1963 (0.1812)	1.0000						
wool	0.5594 (0.0000)	0.7897 (0.0000)	−0.0442 (0.7653)	1.0000					
iron	0.5748 (0.0000)	0.7305 (0.0000)	0.1786 (0.2246)	0.6100 (0.0000)	1.0000				
aluminium	0.5896 (0.0000)	0.7882 (0.0000)	−0.1067 (0.4706)	0.8381 (0.0000)	0.6360 (0.0000)	1.0000			
beef	0.4558 (0.0011)	0.8465 (0.0000)	−0.1757 (0.2322)	0.7744 (0.0000)	0.5567 (0.0000)	0.7911 (0.0000)	1.0000		
coffee	0.4546 (0.0012)	0.8736 (0.0000)	0.0444 (0.7646)	0.7441 (0.0000)	0.5879 (0.0000)	0.7328 (0.0000)	0.7407 (0.0000)	1.0000	
cocoa	0.4141 (0.0034)	0.8802 (0.0000)	0.1662 (0.2590)	0.7584 (0.0000)	0.6032 (0.0000)	0.6860 (0..0000)	0.7610 (0.0000)	0.8899 (0.0000)	1.0000

Identification of cycles in commodity prices

We decompose commodity prices into three components:

$$y_t = T_t + LC_t + SC_t \; t = 1, \ldots, T$$

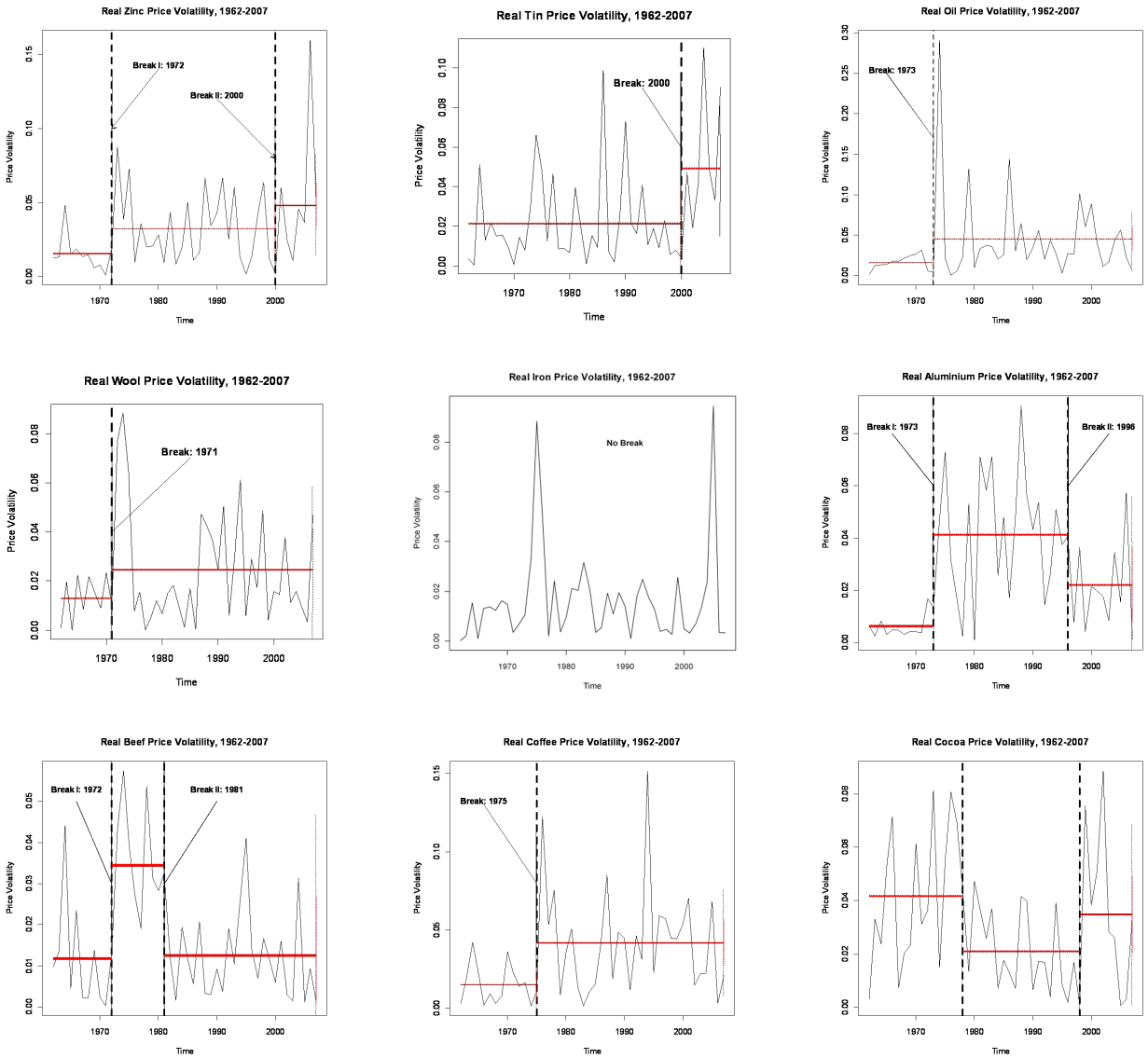
- **Dominance of the long-term component in cyclical commodity price movements.**
- **The mean periodicity (column 4) ranges from 11.7 years (Zinc) to 20 years (Cocoa). Superior to 20 years in longer time series.**

Table 5. Summary Measures of 10-30 Year Cyclical Components (LC_t)

	$s.d.(LC_t)$	$\frac{s.d.(LC_t)}{s.d.(SC_t+LC_t)}$	Mean Periodicity	AR(1) Parameter
Zinc	0.141	0.661	11.667	0.918
Tin	0.170	0.824	17.500	0.935
Oil	0.289	0.854	16.500	0.956
Wool	0.140	0.632	12.333	0.904
Iron	0.108	0.777	14.667	0.936
Aluminium	0.073	0.414	12.000	0.924
Beef	0.093	0.710	12.000	0.902
Coffee	0.211	0.690	16.500	0.898
Cocoa	0.178	0.643	20.000	0.952

Time varying volatility.

Fig 3.



Short term volatility in primary commodity prices

- Commodity prices have been found highly volatile.
- The volatility is time varying: period of tranquility followed by high volatility with possibility of structural breaks.

What can do policy makers to counter the downward trend of commodity prices?

- **Diversification of export by investing in well run and beneficial manufactures and services, opening up their economies ect. This is easier to say than to implement and examples of industrial policies failure abound.**
- **Apply effectively Hartwick rule by investing the rents generated by the primary commodities in worthwhile and competitive reproducible capital to ensure long-run sustainability. A good example is Botswana. These investment should be done by transparent and credible institutions.**
- **International commodity agreements.**

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What can do policy makers to smooth the long cycles?

- **Cycles of high and low commodity prices for relatively long period of time necessitate appropriate policies:**
- Avoid pro-cyclical policies: Save during boom times and spend during bust times.
- The Structural Budget Balance framework adopted by Chile has been successful in implementing a counter-cyclical policy:
  - The Structural Budget reflects the medium-term view.
  - Save during economic prosperity and spend during the lean years within the limit of the Structural Budget.
  - Insulate the components of the Structural Budget that may be affected by politics: trend output and the 10-year price of copper for Chile.

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- Hedging strategies using financial instruments.
- Generally, the export of more than one commodity will not hedge the exporting country against adverse commodity price movements.
- **External finance facilities for credit rationed commodities exporting countries affected by negative temporary shocks.**

Conclusions

- **Necessity of diversification of exports to include manufactures and services because of the secular downward trend, co-movement and volatility of commodity prices. Applying the Hartwick rule.**
- Necessity to adopt structural budget type institutions because of big and persistent commodity price fluctuations.
- Stabilization funds, Financial instruments and external finance facilities may be used to protect developing economies from the negative effect of high and changing volatility of commodity prices.

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Annex 1: Testing the stationarity of commodity prices using panel data

Table 2. Panel Stationary test Results

	N	T	statistic value	Bootstrap critical values	
				10%	5%
Using tsig criteria	9	48	3.913	11.164	12.617
Using BIC criteria	9	48	2.647	7.824	8.975

- More Powerful.
- Test simultaneously all the commodity prices for stationarity.
- Allow for possible structural breaks, serial-correlation and cross-sectional dependence (co-movements).
- All are stationary. Therefore, possibility to use the elementary tests.

Annex 2:Testing the PS hypothesis using univariate robust tests I

Table 3. One Sided Test for a Negative Trend

	statistic z_λ	growth Rate (%)	90% c.i.	95% c.i.	99% c.i.
Zinc	0.166946				
Tin	-0.119133				
Oil	0.977527				
Wool	-1.328856*	-0.218919	+/- 0.270985	+/- 0.322895	+/- 0.424344
Iron	-0.134994				
Aluminium	-1.905996**	-0.243664	+/- 0.210285	+/- 0.250568	+/- 0.329292
Beef	-1.086862				
Coffee	-0.511607				
Cocoa	-0.651729				

Notes: *, **, and *** indicates rejectionat the 10%, 5%, and 1% significance levels respectively.

For tests that reject using the z_λ test, growth rates and two-sided confidence are reported

- Robust to whether commodity prices are $I(0)$ or $I(1)$.
- Only Aluminium and Wool have a significant negative trend (accept PS hypothesis).
- **Policy implications**: Diversification of export to include manufactures and services.

Annex 3: Testing a break in the trend using univariate robust tests II

Table 4. Two-Sided Tests For a Break in Trend using Model A

	t_λ 10%	t_λ 5%	t_λ 1%	Estimated Break Date
Zinc	2.556856*	2.611963**	2.725240	2002
Tin	2.556161*	2.611264 **	2.724531	2002
Oil	1.440468	1.471520	1.535349	
Wool	1.078024	1.098191	1.139646	
Iron	3.457917*	3.532459**	3.685684***	2002
Aluminium	1.648821	1.684364	1.757426	
Beef	1.952770	1.994866	2.081396	
Coffee	1.505347	1.537794	1.604490	
Cocoa	1.715638	1.752622	1.828644	

Notes: *, **, and *** indicates rejectionat the 10%, 5%, and 1% significance levels respectively.

- Robust to whether commodity prices are $I(0)$ or $I(1)$.
- Allow one structural break in the trend only.
- Zinc, Tin and Iron have a break in their trends.
- No additional rejection of the no break null was obtained when we allowed the break in the intercept and the trend.