Vertical Price Transmission and Relationships Between Selected Agri-food Value Chains in Australia and Colombia

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Price Transmission

• Key indicator to **assess the efficiency and degree of competition** in agri-food chains (incentives).

• **Imperfect price transmissions** could require **policy interventions** to raise:
  – Welfare of specific actors.
  – Competitiveness of the whole chain.

• **Inefficient outcomes** affect the **performance and viability** of the whole chain.
Price Transmission: International to Domestic Prices

• Rising of international prices is an opportunity for:
  – Agricultural development,
  – Poverty reduction and
  – Improvements in food security.

• Not if domestic traders could keep high differences between international and farmer prices.

• Variations in prices may:
  1. Not be transmitted through chains,
  2. Be transmitted with a lag or
  3. Be transmitted depending on the direction of the change.
Price Transmission in Agri-food Chains

- Price transmission will be affected by:
  1. Nature or characteristics,
  2. Structure and
  3. Organisation of the chain.

- Asymmetries and lags in price transmission have been found in different agri-food chains in several countries:
  - Beef, chicken and eggs in the US by Vavra and Goodwin (2005),
  - Sorghum and coffee in Uganda by Kaspersen and Foyn (2010), and
  - Pork in Germany by Von Cramon-Taubadel (1998).
Price Transmission: Relationships Between Related Agri-food Products and Inputs

• Farmer prices are also affected by prices paid in related agricultural products.
  – Found by Harri et al. (2009).
  – Limited studies in this area.

• Oil price and other marketing input prices also affect farmer prices.
  – Studied by Wholgenant and Mullen (1987), among others.
Motivation of the Study and Research Question

• Australia and Colombia export some agri-food products in common... But have different production conditions!!

• Limited research about relationships between prices of related agricultural products paid to farmers.

• In This Context...???

What are the factors affecting farmer-export/wholesale price spreads along selected agri-food chains and between them in Australia and Colombia?

Vertical Price Spread from Wholesale to Farm

- Wholgenant and Mullen (1987):

$$P_{ft} = f(P_{wt}, Q_{ft}, C_t)$$

where:
- $P_{ft}$ = Farmer price in time $t$.
- $P_{wt}$ = Export/wholesale price in time $t$.
- $Q_{ft}$ = Quantity of farm input in time $t$.
- $C_t$ = Marketing input prices in time $t$, including transportation costs (oil price) and wage rates (GDP per capita used as proxy variable), among others.
Australian and Colombian Data

• Australian and Colombian data including:
  i. Production,
  ii. Farmer prices and
  iii. Export prices.

• Of 1) banana, 2) beef cattle and 3) sugar cane from 1970 to 2010 was obtained from FAOSTAT (2013).

• International Oil Prices and GDP per capita data was also collected.
An Error Correction Model (ECM) can be used when:

1. Prices are the same integration order and
2. Pricers are cointegrated.

An Asymmetric Error Correction Model (AECM) was used → ECM including asymmetric adjustment terms as proposed by Granger and Lee (1989).

Asymmetry if positive and negative variations of the error correction term lagged one period are different.
Asymmetric Error Correction Model

\[
\Delta P_{fit} = \varphi + \gamma^+ v^+_{t-1} + \gamma^- v^-_{t-1} + \sum_{k=0}^{n} \delta_k \Delta P_{wit-k} + \sum_{k=1}^{n} \theta_k \Delta P_{fit-k} + \sum_{j=1}^{n} \tau_j \Delta P_{fjt} + \sum_{h=1}^{n} \omega_h \Delta C_{ht} + u_t
\]

where:
- \( \Delta P_{fit} \) = First difference of the farmer price in the chain \( i \) in time \( t \).
- \( \Delta P_{wit-k} \) = First difference of the wholesale/export price in the chain \( i \) in time \( t-k \).
- \( \Delta P_{fit-k} \) = First difference of the farmer price in the chain \( i \) in time \( t-k \).
- \( \Delta P_{fjt} \) = First difference of the farmer price in the related chain \( j \) in time \( t \).
- \( \Delta C_{ht} \) = First difference of the prices of marketing input \( h \) in time \( t \).
- \( v^+_{t-1} \) = Positive variations of the error correction term lagged one period.
- \( v^-_{t-1} \) = Negative variations of the error correction term lagged one period.
ADF and Engle-Granger Tests: Results

• All series are I(1):
  – Have unit root in levels and
  – Do not have unit root in first differences.

• Price series are cointegrated (Exception: Colombian sugar cane).

• Evidence of vertical price transmission in the long run in most of the selected agri-food chains.
Asymmetric Error Correction Models for Selected Agri-Food Chains in Australia and Colombia

<table>
<thead>
<tr>
<th>Variable</th>
<th>First Difference Farmer Prices Australia</th>
<th>First Difference Farmer Prices Colombia</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Banana</td>
<td>Beef Cattle</td>
</tr>
<tr>
<td>Constant</td>
<td>175.3238</td>
<td>-39.4160</td>
</tr>
<tr>
<td>Positive residuals cointegration equation lagged one period</td>
<td>-0.9779***</td>
<td>-0.6319***</td>
</tr>
<tr>
<td>Negative residuals cointegration equation lagged one period</td>
<td>-0.0903</td>
<td>-0.7607***</td>
</tr>
<tr>
<td>First difference export price banana</td>
<td>0.0883</td>
<td>-</td>
</tr>
<tr>
<td>First difference export price beef cattle</td>
<td>-</td>
<td>0.0546</td>
</tr>
<tr>
<td>First difference export price sugar cane</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>First difference farmer price banana lagged one period</td>
<td>0.0409</td>
<td>-</td>
</tr>
<tr>
<td>First difference farmer price beef cattle lagged one period</td>
<td>-</td>
<td>-0.0494</td>
</tr>
<tr>
<td>First difference farmer price sugar cane lagged one period</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>First difference farmer price banana</td>
<td>-</td>
<td>-0.0080</td>
</tr>
<tr>
<td>First difference farmer price beef cattle</td>
<td>0.0831</td>
<td>-</td>
</tr>
<tr>
<td>First difference farmer price sugar cane</td>
<td>6.6859</td>
<td>13.7940***</td>
</tr>
<tr>
<td>First difference GDP per capita</td>
<td>-0.2070*</td>
<td>-0.0454</td>
</tr>
<tr>
<td>First difference oil price</td>
<td>0.4079</td>
<td>13.3568*</td>
</tr>
<tr>
<td>Dummy 1977</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Dummy 1991</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Dummy 2007</td>
<td>1345.1210***</td>
<td>-</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.8112</td>
<td>0.6811</td>
</tr>
<tr>
<td>Adjusted R-squared</td>
<td>0.7374</td>
<td>0.5747</td>
</tr>
<tr>
<td>Corrected violation</td>
<td>None</td>
<td>Heteroskedasticity</td>
</tr>
</tbody>
</table>

(*), (**) and (***) correspond to significance levels at $\alpha = 10.5$ and 1%, respectively.

Source: Developed by the authors using information from FAOSTAT (2013), BP (2013), BLS (2013) and ERS (2013).
Results

• Prices are transmitted from exporters to farmers but:
  – Could take some periods.
  – Variations are more quickly transmitted in Australia.

• Asymmetries in price transmission found in the Australian banana and Colombian beef cattle chains.

• Positive shocks are more quickly transmitted to farmers → Wholesalers could hold substantial margins.

• Australian chains are more intensive in capital than the Colombian chains that use more labour.

• Some relationships between farmer prices in both countries were found significant, but not reciprocal.
Conclusions

• Price variations are vertically transmitted in most of the agri-food chains, but there is asymmetry and variable speed in the transmission.

• There are some relationships between some of the selected chains in Australia and Colombia!!

• Further research is recommended, where data availability will be crucial to:
  – Use more sophisticated techniques, including (VECM).
  – Account for horizontal interactions between farmer prices among agri-food chains.
Thank You Very Much!!

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Comments? / Questions?