Price integration in the Spanish seafood value chain

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Price integration and SUCCESS

SUCCESS is a European research project financed for 3 years (2015-2018). It is part of the H2020 Strategy

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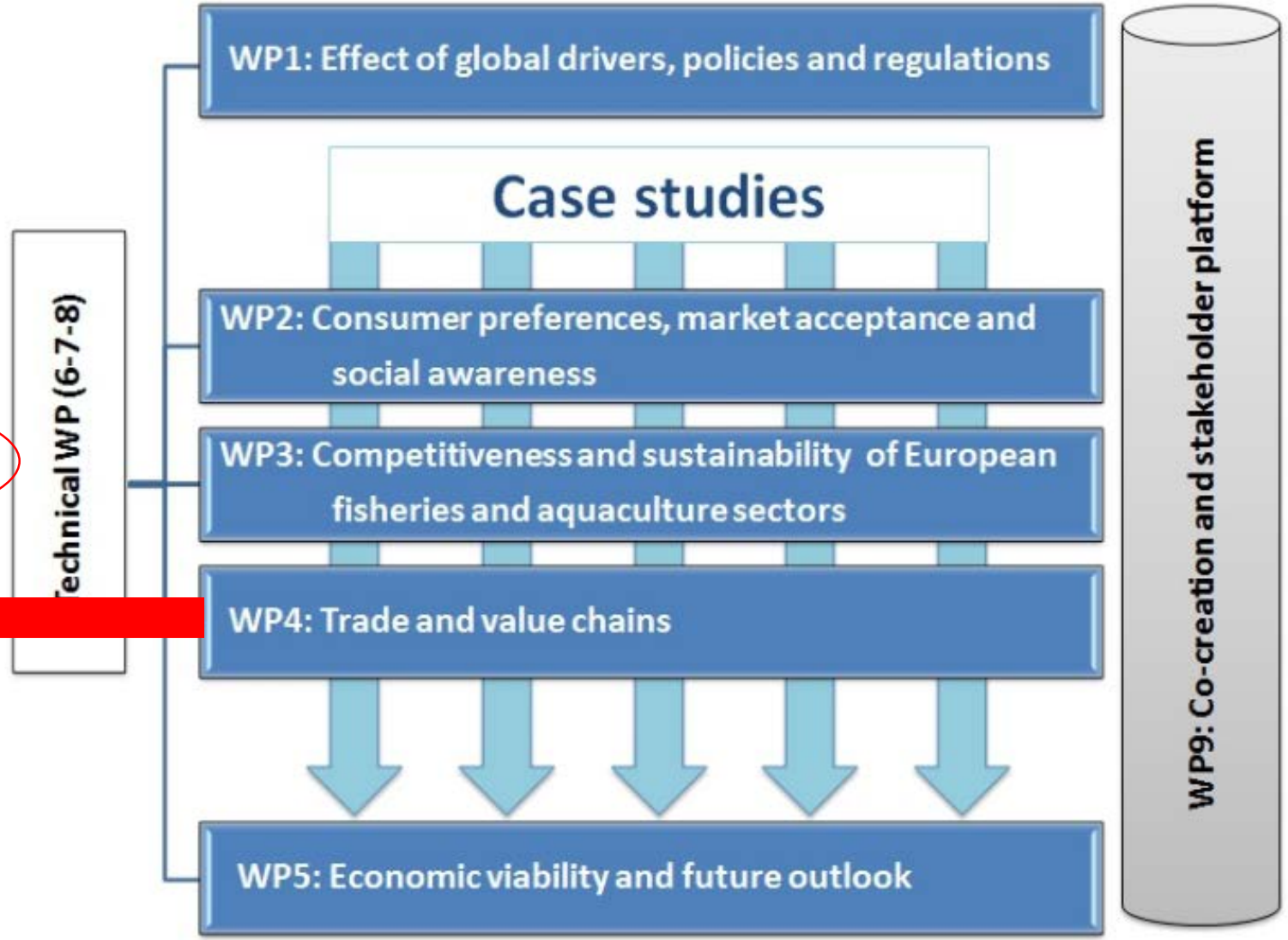
T.4.1: Description of the seafood value chain

T.4.2: Analysis of price transmission and market power

T.4.3: Analyse the effect of margins of processors-traders on fish and seafood producers' incomes and margins

T.4.4: Analyse the economic impact of transparency, (CSR), and industry requirements on seafood producers



Justification for the research

- Due to growing **social and economic concerns about the breakdown of the value added in food value chains** (Bjorndal et al, 2014), **price transmission has received increasing attention in the scientific field in recent years.**

- Furthermore, seafood sector in the EU faces various constraints that include:
  - **Increasing supply in fully developed markets**
  - **Effects of financial crises** in many consumer countries
  - Difficulties of negotiating with **concentrated retailers**

Research goals

- Analyse **market delimitation and price transmission** from **the primary sector to the retail stage** in **selected seafood value chains**
- Scrutinise the **influence of international trade on domestic prices formation** for different intra and extra EU trade flows and domestic markets of seafood commodities.
- Identification of **asymmetries in the transmission of prices and market powers in the seafood value chains**

Background

- It is possible to study **price integration** by analyzing **price linkages**

- The price integration analysis has been used in various research applications in the field of fisheries markets:

  - **Different levels of the value chain → Price transmission → Vertical price integration** (Jimenez-Toribio et al. (2003); Guillotreau (2004); Jaffry (2005); Guillotreau et al. (2005); Asche et al. (2007) Guillen and Franquesa (2008); Jimenez-Toribio et al. (2010b); Sakai et al. (2012); Asche et al (2014).

  - **Different products/producers → Market integration → Horizontal price integration** (Nielsen (2004); Asche et al. (2005); Nielsen et al. (2007); Asche et al. (2007); Vinuya (2007); Nielsen et al. (2009); Jimenez-Toribio et al. (2010a); Asche et al. (2012); Rodriguez et al. (2013) Schrobback et al. (2014)).

Materials and Methods

- Given the non-stationary nature of most of the price series, the statistical method used to study the relationships among these is the **cointegration analysis**.

- **Co-integration analysis requires non-stationary price series** data and **univariate unit root (nonstationary) test can indicate the stationary properties of the data** (Norma Lopez et al. 2014)

- The **Augmented Dickey-Fuller (ADF)** test (Dickey & Fuller, 1979; 1981) is used to test the time series properties of the data (non-stationarity).

- When the price series are non-stationary the **Johansen test** (Johansen, 1991) is the natural approach (Asche et al. 2007).

- Also **weak exogeneity** and **Granger causality** tests are applied to understand price leadership and price transmission

Materials and Methods

Aquaculture : Seabream

- The prices for sea bream at **ex-farm, wholesale and retail levels** have been collected **weekly** for sea bream from 2009 to 2016 by **Spain's Ministry of Agriculture and Food through the Observatory of Food.**
- Prices for Spain's **imports from Greece and Turkey were obtained from 2009 to 2016** from **the European Commission's Eurostat trade database**.

Fisheries: Fresh Hake

- The prices for sea bream at **ex-farm, wholesale and retail levels** have been collected **weekly** from 2004 to 2016 by **Spain's Ministry of Agriculture and Food through the Observatory of Food.** The price is the average between "Merluza"(2,5 kg to 5 kg) and "Pescadilla" (1,5 kg)

Seabream Results

- The **Augmented Dickey-Fuller (ADF)** test (Dickey & Fuller, 1979; 1981) is used to test the time series properties of the data (non-stationarity).

	Constant		Linear trend		Quadratic trend	
	Levels	1st diff.	Levels	1st diff.	Levels	1st diff.
Greece	-2.401	-8.122***	-3.517	-8.142***	-3.460	-8.162***
Turkey	-2.582	-8.075***	-2.574	-8.207***	-2.655	-8.149***
Spain	-1.867	-8.165***	-3.094	-8.177***	-3.025	-8.220***
Wholesale	-2.259	-8.189***	-2.898	-8.181***	-2.964	-8.136***
Retail	-1.428	-9.437***	-1.597	-9.393***	-1.331	-9.467***

*** 99% CL; ** 95% CL; * 90% CL

- **Unit root can not be rejected** for all the involved variables at their levels, rejecting the null hypothesis for the first differences. **The price series behave as non stationary variables**.

Seabream Results

In order to better understand the relations across price series, Granger causality test is performed for all pair wise combinations

Granger Causality					
Causes					
	Greece	Turkey	Spain	Wholesale	Retail
Greece	4.4699***	0.0043	1.2293	1.6074	2.6746
Turkey	1.782	39.697***	3.1864*	4.2965**	0.073437
Spain	1.334	0.14895	3.9735**	0.3817	0.000233
Wholesale	1.6456	1.7791	3.9019**	19.838	0.22145
Retail	2.129	1.9666	1.3453	0.52356	418.78

- **Retail prices appear to be independent from all other price series included in the system.**

Seabream Results

Johansen and weak exogeneity tests:

Rank	Eigenvalue	Trace Test	Lmax test
0	0.36351	107.980***	42.016***
1	0.28831	65.969***	31.631***
2	0.19608	34.337*	20.298
3	0.097826	14.040	9.5741
4	0.046883	4.4657**	4.4657**
Weak exogeneity test			
Greece	Turkey	Spain	Wholesale
16.303***	2.157	6.909**	4.624

- The maximum rank order reported by the Johansen test **1** . Since the variables were found to be non-stationary for the selected number of lags and model specifications, **further tests are performed using two cointegrating vectors**.
- Under these conditions, the weak exogeneity test points **Greek imports and Spanish ex-farm prices as endogenous**, being all other variables exogenous.

Seabream Results

The first sub-model analyzes the concurrency across imports and domestic ex-farm prices

Model 1: (**Horizontal integration**) Johansen and weak exogeneity tests

Rank	Eigenvalue	Trace test	Lmax test
0	0.42053	81.903***	51.291***
1	0.21511	30.612**	22.768**
2	0.08005	7.8439	7.8439
Weak exogeneity test			
Greece	Turkey	Spain	
22.432***	0.7084	9.9407***	

Granger Causality			
Causes			
	Greece	Turkey	Spain
Greece	5.0668**	0.039889	1.518
Turkey	3.0746*	47.431***	5.5194**
Spain	3.5772*	0.014053	11.902**

- Both weak exogeneity and Granger causality tests confirm endogeneity for the prices of the domestic production and the imports from Greece. Turkish import prices are a cause of variation for Greek imports and Spanish ex-farm prices.

Seabream Results

The second sub-model includes wholesale prices in the relation across domestic production and imports from Turkey as the price leading country

Model 2: (**Vertical integration**) Johansen and weak exogeneity tests

Rank	Eigenvalue	Trace test	Lmax test
0	0.26826	60.081***	29.359
1	0.22017	30.722***	23.376
2	0.075174	7.3461	7.3461

Weak exogeneity test		
Turkey	Spain	Wholesale
1.80959	11.7827***	7.90486**

Granger Causality			
	Causes		
	Turkey	Spain	Wholesale
Turkey	44.901***	4.7205**	4.7017**
Spain	0.054164	9.9678***	0.0015768
Wholesale	0.54239	2.6633*	31.193***

- The price of imports from Turkey is the only exogenous variable in the model. Besides a low significant causal effect from wholesale on domestic ex-farm prices, the main effects in both endogenous variables comes from the imports incoming from Turkey.

Seabream Conclusions

Market integration /Horizontal price integration:

- As was expected, the Spanish seabream market is delimitated, and competitive.
- International competition led by Turkish imports are a cause of variation for Spanish ex-farm prices, but also for Greek imports price.

Price transmission /Vertical price integration:

- Retail price are independent of the model. Changes along the value chain do not arrive to the retail level.
- Farmers' prices are also adjusted to the price paid by wholesalers, which in turn is influenced by the prices of Turkish competition.
- In this sense, there is some degree of price transmission. There is price transmission forward, from the Turkey imports to wholesalers, and backward price transmission from wholesalers to domestic producers.

Fresh hake Results

- The **Augmented Dickey-Fuller (ADF)** test (Dickey & Fuller, 1979; 1981) is used to test the time series properties of the data (non-stationarity).

	Constant		Linear trend		Quadratic trend	
	Levels	1st diff.	Levels	1st diff.	Levels	1st diff.
Local	-2.377	-9.865***	-3.1308	-9.835***	-4.293***	-9.801***
Wholesale	-1.73906	-10.63***	-2.33449	-10.60***	-3.00726	-10.58***
Retail	-0.913	-9.783***	-1.481	-9.748***	-1.547	-9.873***
Imports	-4.797***	-12.78***	-5.677***	-12.73***	-5.669***	-12.69***

*** 99% CL; ** 95% CL; * 90% CL

- Unit root can be rejected for imports and the domestic prices in a quadratic trend model. The remaining **price series behave as non stationary variables**.

Fresh hake Results

Rank	Eigenvalue	Trace Test	Lmax test
0	0.23923	62.033***	42.108***
1	0.11388	19.925***	18.619***
2	0.0084433	1.3058	1.3058

Weak exogeneity test		
Local	Wholesale	Retail
9.08136***	7.05397***	8.2214***

Granger Causality				
	Causes			
	Local catches	Wholesale	Retail	Imports
Local catches	22.846***	5.7180***	2.2212	0.73659
Wholesale	3.8366***	10.722***	2.8004**	0.15272
Retail	7.9998***	3.1193**	393.29***	0.050933
Imports	0.80053	0.57423	1.1035	14.119***

- **Imports prices appear to be independent** from all other price series included in the system. **Import prices are not transmitted to the final consumer**.
- **Domestic prices** are caused by **wholesale prices** but also cause wholesale prices in a **bidirectional relation**
- **Wholesale prices** are also **affected by changes** in the **retail prices**.
- Finally **retail prices are affected** by changes **in the previous stages of the value chain**.
- Two cointegrating vectors result from the Johansen test. Weak exogeneity tests point to endogeneity in all the three involved variables, confirming the reciprocal relations observed in the Granger causality test.

Fresh hake Conclusions

- With the exception of imports, which are not affected or affect any of the another price series, **the system of domestic prices if perfectly connected** and **prices are transmitted from origin to retail and viceversa.**

Thank you!

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Acknowledgements: This paper is part of the SUCCESS project which has received funding from the European Union's H2020 program under grant agreement No 635188.