IIFET Conference 2018
July 16-20, 2018
Seattle (USA)

Economic Sustainability of Seabass/Seabream Production in the Mediterranean Sea by European Firms

José L. Fernández Sánchez[1], PhD
Manuel Luna García[2]
José M. Fernández Polanco[3], PhD
Ignacio Llorente García[4], PhD
Ladislao LunaSotorrío[5], PhD

University of Cantabria, Faculty of Business and Economics, Santander (Spain)

[1] Professor in Business Organization and researcher of the IDES-UC research group.
[2] Researcher of the IDES-UC research group).
[3] Professor in Business Organization and researcher of the IDES-UC research group.
[4] Lecturer in Business Organization and researcher of the IDES-UC research group.
[5] Professor in Business Organization and Director of the IDES-UC research group.

This research has received financial help through the European Union's Horizon 2020 research program, Grant Agreement 727315.

- The main aim of this paper is to carry out a *break-even analysis* (BEA) of seabass/seabream European producers in the Mediterranean Sea.
- Calculation of the break-even point is an important practical tool for profitability analysis and decision making because it tells business owners and managers how much sales are needed to cover all fixed as well as variable expenses of the business or the sales volume after which the business will start generating profit.
- Therefore, the break-even analysis is useful for analyzing costs and evaluating what might happen to profits in different market environments.

The seabass and seabream production in Europe

- European seabass and gilthead seabream have become two of the main products of the European aquaculture being two of the most important cultured fish species economically along the Mediterranean coast.
- The EU is one of the largest producers of seabass and seabream in the world, being Greece the largest producer within the EU followed by Spain.
- Both species represent respectively 10.9% and 13.5% of the total value of the European aquaculture sector (Eurostat, 2013).
- However, the Turkish seabass and seabream industry has been steadily increasing production volumes for the last decade to the point where Turkey is now the world's major producer of seabass, competing with European producers with lower prices (Globefish, 2015). As consequence, during this period of time, European firms have been struggling to maintain profitability of their farms.

The break-even analysis (BEA)

- The point at which total of fixed and variable costs (*TC*) of a business becomes equal to its total revenue (*TR*) is known as break-even point. At this point, a business neither earns any profit nor suffers any loss.
- On the other hand, the *margin of safety* (*MOS*) is the difference between actual sales and break-even sales. The margin of safety is a measure of operating risk, the larger is the ratio the lesser is the risk in reaching the breakeven point and have losses.

$$MOS = 100 \times (Expected\ sales - Break\text{-}even\ sales) / Expected\ sales$$

- According to the microeconomic theory, a firm in a perfectly competitive market faces a horizontal demand curve at a given price level that is determined by the market supply and demand. This implies no pricing power since the firm is a price-taker and it can sell its entire (homogeneous) production at the market price thus its total revenue curve (*TR*) is a positively sloped straight line that increases indefinitely. Thus, given any particular market price (p), each firm must decide how much to produce (q).

$$TR = pq$$

- Economic theory stipulates certain properties of the cost function (Varian, 1992). First, it should be positive, i.e. costs cannot be negative and, second, it should be increasing in the volume of production, q. In the economic theory, there are different options to model the total cost curve (TC) of a firm: a linear, a quadratic, or a cubic function. We have employed a linear function because the other functions did not offer us better results.

$$TC = c_0 + c_1 q$$

- Therefore, the break-even point of a firm would be:

$$q_0 = c_0 / (p - c_1)$$

- To carry out this analysis, we have used an unbalanced panel composed of a sample of 30 seabass/seabream producers' firms in the Mediterranean Sea from 7 European countries (Croatia, Cyprus, France, Greece, Italy, Slovenia, and Spain).
- The period of time analyzed ranges from 2005 to 2014 (10 years).
- Economic data for this analysis was obtained from the AMADEUS and EUMOFA databases.
- *TR* curve was estimated with a linear function by OLS and *TC* curve was estimated using nonlinear regression with parameter constraints. The TC function was estimated using linear, quadratic, and cubic functions (in the analysis we have employed a linear function because the fit was the best).

INTRODUCTION
THEORY FRAMEWORK
METHODOLOGY
RESULTS
CONCLUSIONS

Sample firm characteristics (average 2005-2014)

Country	Firms with losses/Total firms in the sample	Firm size*	Employees (#)	Total assets (th. €)	Operating revenues (th. €)	Operating profits (th. €)	ROA (%)
Croatia	3/4	Medium	64	14,401	4,652	–440	–0.55
Cyprus	0/2	Medium	75	11,248	10,461	716	9.94
France	0/2	Small	30	2,923	3,259	54	1.05
Greece	1/7	Large	473	148,450	70,755	1,907	2.48
Italy	4/10	Small	23	7,888	4,859	237	1.83
Slovenia	0/1	Micro	7	615	912	1	0.80
Spain	2/4	Medium	132	33,071	16,098	795	–82.45
All countries	10/30	Mean	143	48,983	24,429	698	–8.51
		SD	300	105,165	40,916	7,606	167.14

*According to European criteria.
Source: authors' elaboration using AMADEUS database.

UNIVERSIDAD DE CANTABRIA

Economic Sustainability of Seabass/Seabream Production in the Mediterranean Sea by European Firms

RESULTS

INTRODUCTION

THEORY FRAMEWORK

METHODOLOGY

RESULTS

CONCLUSIONS

Break-even analysis for each firm (period 2005-2014)

Country	Company	Average production[1] (Tons)	Gross profit margin[1] (€/Kg)	Breakeven point[1] (Tons)	MOS[1] (%)	Average operating cost[2] (€/Ton)	Average operating profit[2] (th. €)	ROA[2] (%)
Croatia	*Cromaris*	2,911	–0.196	No point	NA	5.62	–1,561	–4.14
	Friskina	116	0.176	0	100	4.64	24	8.52
	Orada Adriatic	564	0.568	874	–54.9	5.93	–192	–3.14
	Seabass Junior	17	2.514	29	–70.5	7.43	–31	–3.46
Cyprus	*Blue Island*	2,573	0.208	0	100	5.30	632	3.63
	Kimagro Fishfarming	1,226	0.643	0	100	4.84	800	16.24
France	*Cannes Aquaculture*	897	2.007	876	2.3	6.34	104	1.48
	Provence Aquaculture	112	1.157	113	–0.3	6.45	5	0.62
Greece	*Andromeda*	15,556	0.289	0	100	4.23	5,369	6.14
	Dias Aquaculture	18,582	0.535	23,442	–26.2	4.53	–2,038	–4.61
	Kefalonia	4,356	0.278	0	100	4.23	1,131	4.68
	Galaxidi Maritime Farms	5,810	0.351	0	100	4.14	2,114	4.74
	Nirefs Fishfarming	41,355	1.145	38,437	7.1	4.35	3,846	0.83
	Selonda Fish Farming	25,028	0.090	0	100	4.35	2,782	0.48
	Stratos	215	0.389	0	100	3.89	141	5.13
Italy	*Acqua Azzurra*	76	0.077	0	100	7.03	7	7.59
	Azienda Agricola Ittica	153	–0.813	No point	NA	7.69	–88	–2.04
	Ittiche Riunitte	911	1.460	346	62.0	6.07	827	11.89
	Cosa-Societa ' Agricola	815	2.354	240	70.6	5.40	1,323	16.69
	Itticca Golfo	329	0.786	0	100	6.39	223	0.38
	Panittica Pugliese	1,391	1.572	1,451	–4.3	6.81	–8	–2.03
	Piscicultura del Golfo	1,290	0.315	183	85.8	7.13	179	–1.43
	Ponza Fish	25	–0.742	No point	NA	10.02	–74	–11.68
	Societa' Agricola Civita	767	–0.299	No point	NA	7.68	–416	–3.96
	Valle Ca' Zuliani	1,125	3.478	1,012	10.0	6.63	396	2.91
Slovenia	*Fonda SI*	136	0.937	220	–61.3	6.68	1	0.80
Spain	*Acuícola Marina*	1,675	0.188	0	100	4.90	313	2.00
	Alevines del Sureste	378	0.907	390	–3.1	5.22	–27	–2.76
	Cudomar	146	2.271	164	–12.3	5.40	–41	–331.42
	Culmarex	10,445	0.306	0	100	4.81	2,934	2.37

[1]Estimated value. [2]Actual value.
NA: Not available.
Source: authors' elaboration using AMADEUS and EUMOFA databases.

INTRODUCTION

THEORY FRAMEWORK

METHODOLOGY

RESULTS

CONCLUSIONS

Simulation of different economic conditions or decisions

Economic variable	Variation (%)	Proportion of firms with losses (%)	Variation (units)	Average ROA (%)	Variation (units)
Price (*p*)	+ 10	10.0	–30.0	9.79	8.07
	+ 5	26.7	–14.3	5.75	4.03
	+ 1	30.0	–10.0	2.53	0.81
	0	40.0	0	1.72	0
	– 1	43.3	3.3	0.91	–0.81
	– 5	70.0	30.0	–2.31	–4.03
	– 10	86.7	46.7	–6.34	–8.05
Production (*q*)	+ 10	30.0	–10.7	2.73	1.01
	+ 5	30.0	–10.7	2.23	0.51
	+ 1	36.7	–3.6	1.82	0.10
	0	40.0	0	1.72	0
	– 1	40.0	0	1.62	–0.10
	– 5	43.3	3.6	1.22	–0.50
	– 10	50.0	10.7	0.71	–1.01

CONCLUSIONS

- In general, the economic situation of European firms producing seabass and seabream in the Mediterranean Sea is not bad since the majority of companies (2/3) obtained, on average, profits during the period 2005-2014 and many of them have a large margin of safety.
- In the case of firms with losses, we observe that some companies are producing with a negative gross profit (i.e., the case of Croatian and Italian companies). In this case, the increase of production to solve the problem is not a good idea. These companies should reduce their unit variable cost before they decide to increase their production.
- On the other hand, there are companies with a positive gross profit that are having losses because they are producing below the break-even point. In this case, these companies should increase their production.
- The same thing we can say about profitable companies with low profits. The problem of these companies is that are producing close to the break-even point. However, there are some companies with large profits although they have a low ROA. This situation is motivated by a low capital productivity.
- Finally, the changes in market prices has a larger effect (positive or negative) on firms' profits than changes in production decisions.

IIFET Conference 2018

July 16-20, 2018
Seattle (USA)

THANK YOU FOR YOUR ATTENTION

José L. Fernández Sánchez, PhD – fernandezjl@unican.es
Manuel Luna García – manuel.luna@unican.es
José M. Fernández Polanco, PhD – jm.fernandez@unian.es
Ignacio Llorente García, PhD – ignacio.llorente@unican.es
Ladislao Luna Sotorrío, PhD – lunal@unican.es