Contents

Abstract	i	V
Resume	n	VII
Resum -		IX
List of p	publications	XIX
Introduc	ction	XXI
1 Liter	ature review	1
1.1	Introduction	2
1.2	Fitness consumption	3
1.3	Plastic surgery consumption	5
2 Mod	eling the behavior of fitness users in Spain	9
2.1	Introduction	11
2.2	Methods	14
2.2.	.1 Participants	15
2.2.	.2 Mathematical model	16
2.3	Results and Simulations	22
2.3.	.1 Results of the model	22
	.2 Sensitivity analysis of the proportionality ratio of the contagion para	
	- 27	
2.4	Conclusions	28
3 Math	ematical modeling of the low invasive consumption of plastic surgery p	ractices 31
3.1	Introduction	
3.2	Sources of Information and Methodology	35
3.2.	.1 A questionnaire measuring the level of surgery practice	35
3.2.		
3.2.	.3 Constructing the mathematical model	36
3.3	Results and Simulations	41
3.3.	.1 Results of the model	41
3.3.	.2 Sensitivity analysis of the contagion parameter C	44
3.4	Conclusions	
4 Math	ematical modeling of the High-invasive plastic surgery practices	47
4.1	Introduction	49
4.2	Mathematical model construction	50
4.2.	.1 Data collection and sampling	50
4.2.		
4.3	Results and Simulations	53
4.4	Conclusions	57
5 Conc	clusions	59

Bi	Bibliography 65		
Appendix		-78	
A	Appendix A version in Spanish	-79	
В	Appendix A version in English	-83	
\mathbf{C}	Appendix B version in Spanish	-87	
D	Appendix B version in English	-91	

List of Tables

2.1 Data collection and Spanish population distribution for 2011 and 2012 15
2.2 Economic forecast of the Spanish unemployment rate in percentages. Source: Own performance from data available by <i>OECD</i> and <i>FUNCAS</i> 23
2.3 Results of the model for <i>N</i> , <i>S</i> and <i>A</i> subpopulations in volume of users according to the assumed scenarios 23
2.4 Results of the model according to the <i>OECD</i> optimistic economic scenario (<i>OECD</i> +)
2.5 Results of the model according to the <i>OECD</i> pessimistic economic scenario (<i>OECD</i> -)
2.6 Results of the model according to the <i>FUNCAS</i> optimistic economic scenario (<i>FUNCAS</i> +)24
2.7 Results of the model according to the <i>FUNCAS</i> pessimistic economic scenario (<i>FUNCAS</i> -) 24
2.8 Results of the model according to optimistic economic scenario25
2.9 Results of the model according to pessimistic economic scenario 25
3.1 Data collection and Spanish population distribution for 2012
3.2 Economic forecast of the annual Spanish unemployment rate expressed in percentage. Source: Own performance from data available by <i>OECD</i> , <i>IMF</i> and <i>SG</i> 41 3.3 Subpopulation forecast in number of women who practice <i>LIPS</i> by economic scenarios
3.4 Results of the model according to the pessimistic and optimistic economic scenarios 42
4.1 Economic forecast of the Spanish unemployment rate in percentage. Source: Own performance from data available by <i>OECD</i> , <i>IMF</i> and <i>SG</i> 53
4.2 Subpopulations forecasts in volume of HIPS according to the simulated scenarios.54
4.3 Subpopulations forecasts in percentage of <i>HIPS</i> according to the economic scenarios 55

List of Figures

2.1 Total annual turnover of private gyms in Spain (Million of Euros) 12
2.2 Total number of private gyms in Spain (Thousands) 12
2.3 Total annual turnover of public gyms run by private companies in Spain (Million of Euros)
2.4 Dynamics of the population 18
2.5 Forecast of incidental-consumer (<i>N</i>) subpopulation by economic scenarios [2011-2015]26
2.6 Forecast of frequent-consumer (S) subpopulation by economic scenarios [2011- 2015]
2.7 Forecast of non-competitive bodybuilder with <i>MD</i> (<i>A</i>) subpopulation by economic scenarios [2011-2015]
2.8 Sensitivity analysis of γ_2 for non-competitive bodybuilder with MD (A) subpopulations in 2015 28
3.1 Block diagram of the system's dynamics 38
3.2 Simulated subpopulations of rational-consumer (<i>R</i>) during the period [2011-2018] by economic scenario 43
3.3 Simulated subpopulations of over-consumer (<i>O</i>) during the period [2011-2018] by economic scenario43
3.4 Simulated subpopulations of dependent-consumer (<i>D</i>) during the period [2011-2018] by economic scenario44
3.5 Sensitivity analysis of subpopulations versus the contagion parameter for the optimistic scenario. (Abscises represents values of the parameter <i>C</i>) 45
4.1 The dynamics of population who underwent HIPS 51
4.2 Consumption of rational-consumer (<i>P</i>) during the period [2011-2016] by economic scenario 56
4.3 Consumption of occasional-consumer (<i>O</i>) during the period [2011-2016] by economic scenario56
4.4 Consumption of regular-consumer (<i>R</i>) during the period [2011-2016] by economic scenario 57