

Treball de Fi de Màster

Màster Universitari en Supply Chain, Transport i Mobilitat

Supply Chain in B2C and B2B Online Channels

ANNEX

Autor: Luis Miguel Morell Batlle
Director: Immaculada Ribas Vila
Convocatòria: Setembre, 2021



Escola Tècnica Superior
d'Enginyeria Industrial de Barcelona



INDEX

A.1 – Company V’s Facilities: Classification.....	109
A.2 – Company V’s Facilities: Geographic Distribution.....	110
A.3 – Evolution of the Online Businesses.....	111
A.4 – Logistic costs.....	114
A.4.1 – B2B chilled 3PL.....	114
A.4.2 – B2C chilled 3PL.....	115
A.5 – Phase 1.....	116
A.5.1 – Capacity scenarios in point 17 facility.....	116
A.5.2 – Sales Order History Test.....	117
A.5.3 – Harris Wilson.....	118
A.5.4 – Costs development and pricing.....	119
A.5.5 – AMZ Costs.....	120
A.5.6 – Phase 1 Results.....	122
A.6 – Phase 2.....	123
A.6.1 – Brown & Gibson Method.....	123
A.6.2 – Supply facilities.....	126
A.6.3 – R Studio Script.....	127

A.1 – Company V's Facilities: Classification

COMPANY V FACILITIES						
COMPANY & MAP CODE	COUNTRY	PROVINCE	Postal Code	ACTIVITY	PRODUCTION (Product)	Map's Classification Group
1	SPAIN	Valladolid	47162	Pork production and integration	Animal feed production	FEED & FLOUR
2	SPAIN	Valencia	46560	Production and integration of pork, poultry and beef	Animal feed production	FEED & FLOUR
3	SPAIN	Barcelona	08940	Slaughterhouse, cutting room and packing of poultry products	Poultry	POULTRY
4	SPAIN	Lleida	25191	Poultry slaughterhouse and cutting room	Poultry	POULTRY
5	SPAIN	Pontevedra	36157	Poultry slaughterhouse and cutting room	Poultry	POULTRY
6	SPAIN	Valladolid	47009	Poultry slaughterhouse	Poultry	POULTRY
7	SPAIN	Guadalajara	19004	Manufacturing of baked, roasted and marinated meat products	Cooked products	COOKED PRODUCTS
8	SPAIN	Teruel	44200	Drying room, boning room and slicing of cured products	Cured products	CURED PRODUCTS
9	PORTUGAL	Ponte de Lima	4990-610	Beef slaughterhouse, distribution and cutting	Beef	BEEF
10	SPAIN	Lleida	25191	Raw materials purchasing department	Raw materials	OTHER
11	SPAIN	Zaragoza	50600	Pork meat: slaughterhouse and cutting room	Pork meat	PORK
12	SPAIN	Lleida	25191	Medicines production and distribution	Medicines	OTHER
13	SPAIN	Girona	17820	Poultry slaughterhouse	Poultry	POULTRY
14	SPAIN	Ourense	32817	Rabbit slaughterhouse	Rabbit	RABBIT
15	SPAIN	Valencia	46530	Logistics and purchasing: commercialization of chicken, pork and processed products	Chicken, pork and processed products	VARIED PRODUCTS
16	SPAIN	Valencia	46680	Poultry slaughterhouse and cutting room	Poultry	POULTRY
17	SPAIN	Guadalajara	19004	Iberian Hams Production	Hams and cured products	CURED PRODUCTS
18	SPAIN	Santa Cruz de Tenerife	38297	Pork and beef meat	Pork and beef, cured ham, cured and processed products	VARIED PRODUCTS
19	SPAIN	Gran Canaria	35008	Pork and beef meat	Pork and beef, cured ham, cured and processed products	VARIED PRODUCTS
20	SPAIN	Lanzarote	35509	Pork and beef meat	Pork and beef, cured ham, cured and processed products	VARIED PRODUCTS
21	SPAIN	Lanzarote	35509	Pork and beef meat	Pork and beef, cured ham, cured and processed products	VARIED PRODUCTS
22	SPAIN	Ciudad Real	13300	Pork cutting room and beef slaughterhouse. Processed products production	Pork, beef, processed products	VARIED PRODUCTS
23	SPAIN	A Coruña	15171	Pork meat: slaughterhouse and cutting room	Pork meat	PORK
24	SPAIN	Cuenca	16196	Pork slaughterhouse and cutting room	Pork	PORK
25	SPAIN	Guadalajara	19190	Flour	Flour	FEED & FLOUR
26	SPAIN	Zaragoza	50014	Pork meat	Pork meat	PORK
27	SPAIN	Huelva	21360	Iberian Hams Production	Hams	CURED PRODUCTS
28	SPAIN	Teruel	44200	Hams and shoulders	Hams and shoulders	CURED PRODUCTS
29	SPAIN	Lleida	25191	Bread flour production	Flour	FEED & FLOUR
30	SPAIN	Palencia	34191	Bread flour production	Flour	FEED & FLOUR
31	SPAIN	Palma de Mallorca	07007	Pork meat: slaughterhouse and cutting room	Pork meat	PORK
32	SPAIN	Lleida	25191	Pharmaceutical industry	Medicines	OTHER
33	SPAIN	Sevilla	41012	Bread flour production	Flour	FEED & FLOUR
34	SPAIN	Salamanca	37768	Iberian Hams Production	Hams	CURED PRODUCTS
35	SPAIN	Lleida	25460	Animal feeding, first ages	Animal feeding	OTHER
36	SPAIN	Valladolid	47100	Animal feeding, first ages	Animal feeding	OTHER
37	SPAIN	Barcelona	08511	Pork slaughterhouse and cutting room	Pork	PORK
38	SPAIN	Lleida	25430	Poultry hatchery room	Poultry hatching	OTHER
39	SPAIN	Madrid	28923	Beef meat production ; distribution of beef, pork, poultry, cured products, mutton, etc	Beef	VARIED PRODUCTS
40	SPAIN	Lleida	25195	Poultry slaughterhouse	Poultry	POULTRY
41	SPAIN	Barcelona	08302	Slaughterhouse, cutting room and packing of poultry products	Poultry	POULTRY
42	SPAIN	Girona	17820	Slaughterhouse, cutting room and packing of poultry products	Poultry	POULTRY
43	SPAIN	Lleida	25191	Logistics and Transport	Logistics	LOGISTICS
44	SPAIN	Lleida	25191	Animal feed production	Feed	FEED & FLOUR
45	SPAIN	Barcelona	08500	Animal feed production	Feed	FEED & FLOUR
46	SPAIN	Zaragoza	50600	Animal feed production	Feed	FEED & FLOUR
47	SPAIN	Barcelona	08553	Alternative protein products production	Alternative protein	ALTERNATIVE PROTEIN
48	SPAIN	Barcelona	08170	Storage and distribution of frozen products	Transport	LOGISTICS

Table 29: Classification of Company V's facilities.

A.2 – Company V’s Facilities: Geographic Distribution

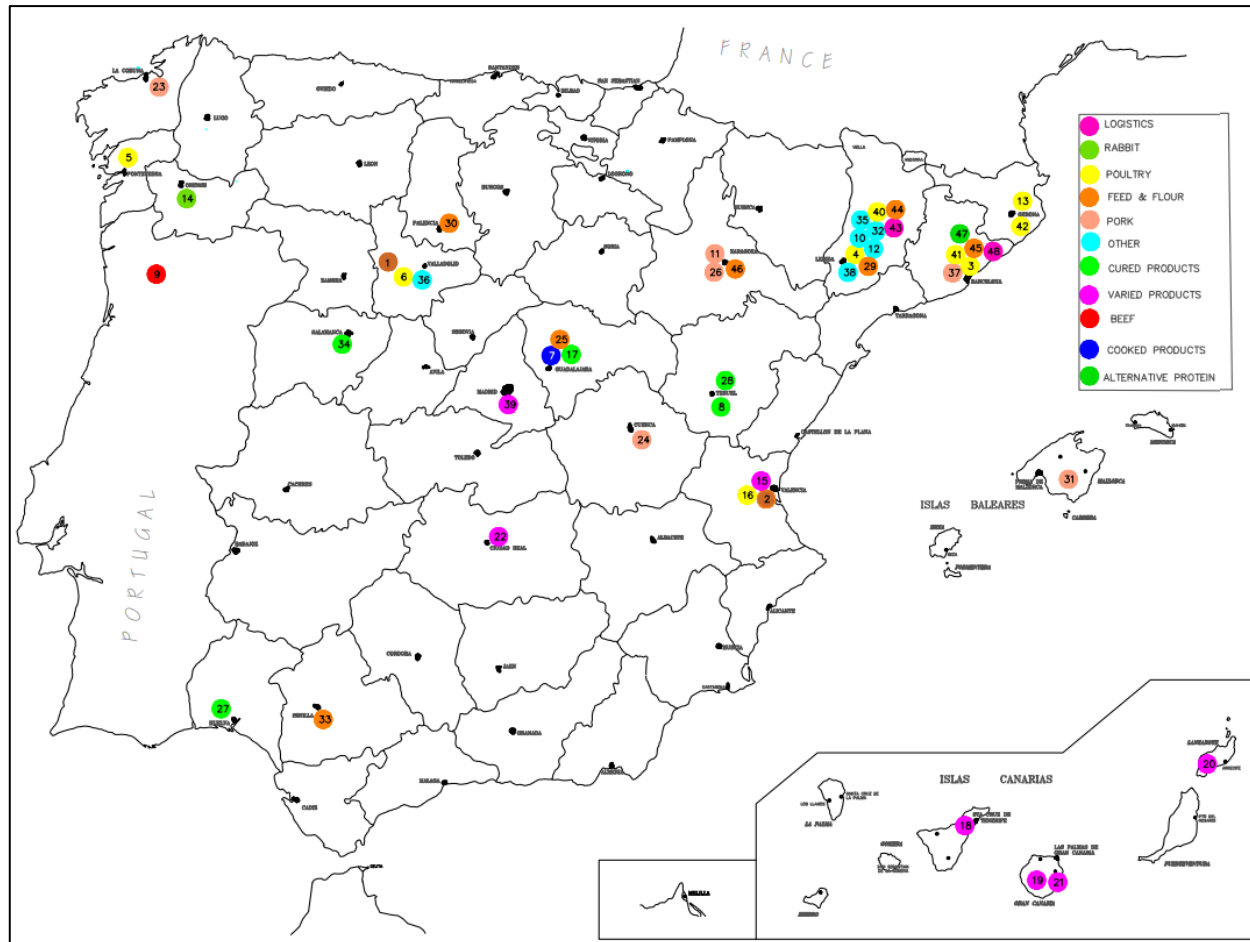


Figure 48: Geographic distribution of Company V’s facilities.

A.3 – Evolution of the Online Businesses

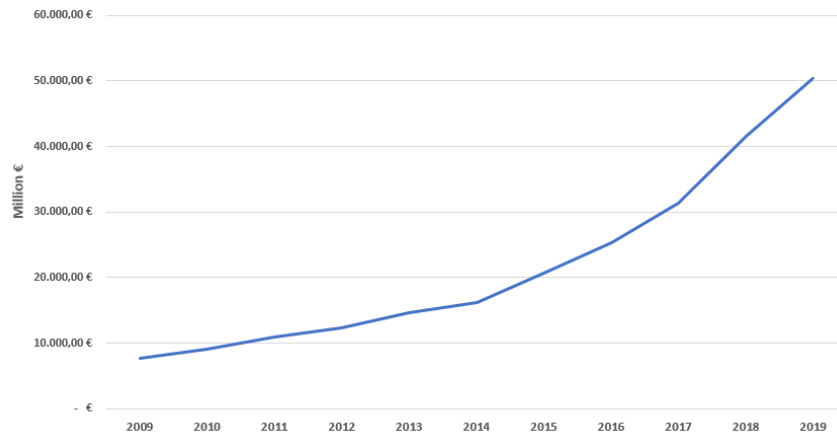


Figure 49: Evolution of Spanish E-Commerce volume of sales, period 2009 – 2019 (Source: [6]).

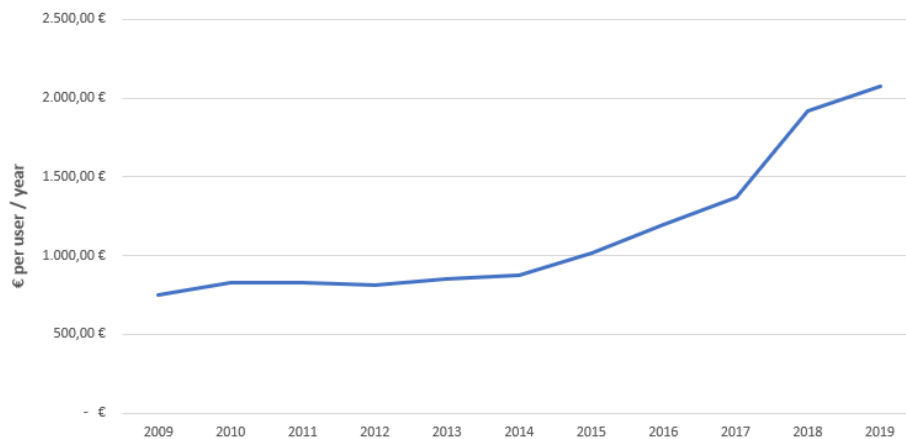


Figure 50: Evolution of average user annual expense regarding Spanish E-Commerce, period 2009 – 2019. (Source: [6]).

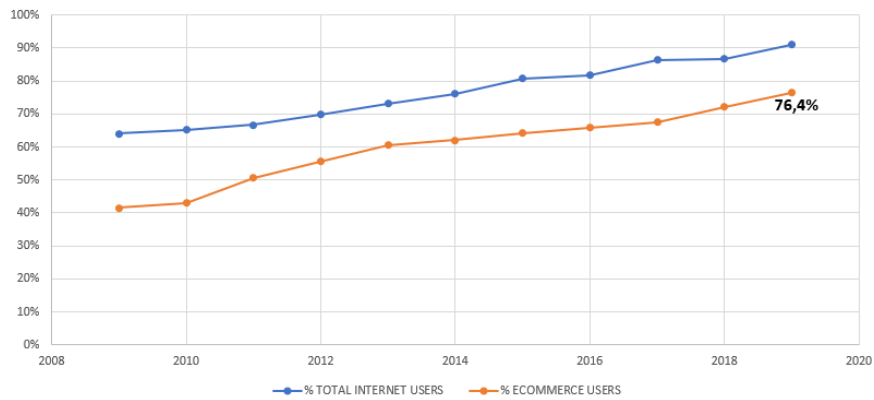


Figure 51: Evolution of E-Commerce users within Spain, period 2009 – 2019. (Source: [6]).

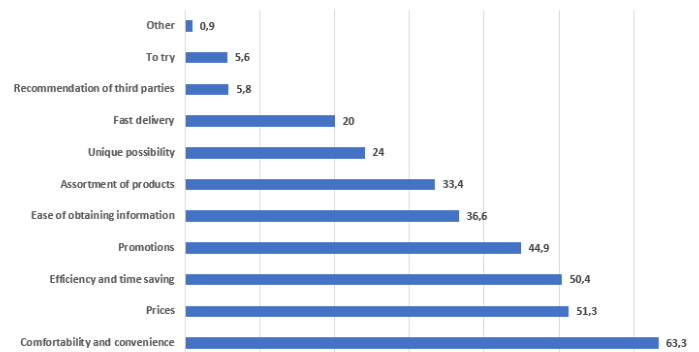


Figure 52: Reasons to make online purchase in 2019 within Spain, survey with multiple responses. (Source: [6]).

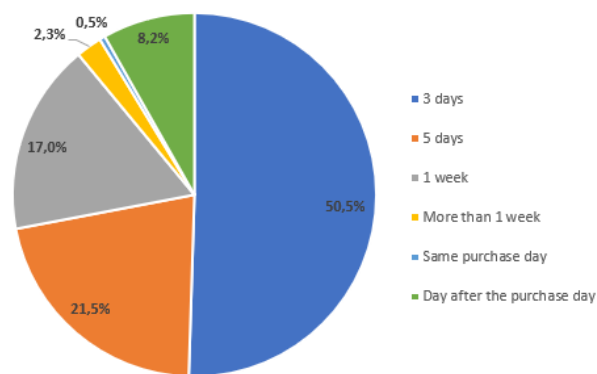


Figure 53: Delivery lead time preferences according to Spanish 2019 survey. (Source: [6]).

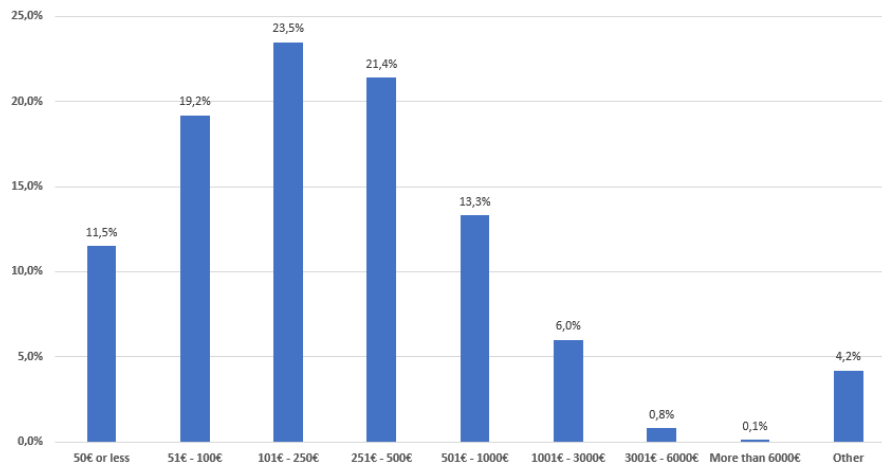


Figure 54: Online purchase expense (€ per purchase) during Spanish lockdown, March 2020 – May 2020. (Source: [6]).

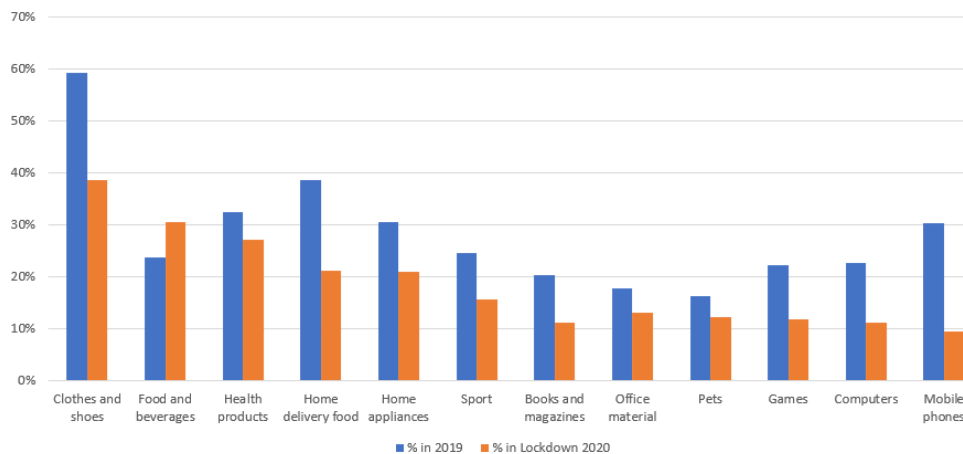


Figure 55: Products purchased through E-Commerce by online users, survey with multiple responses. Comparison 2019 against lockdown in 2020. (Source: [6]).

A.4 – Logistic costs

A.4.1 – B2B chilled 3PL

Origin = MADRID & GUADALAJARA	Minimum (€)		COST €/KG					COST €/PALLET			
	0 30	31 50	51 70	71 100	101 150	151 200	201 300	1 PALLET	2 A 3 PALLET	4 A 5 PALLET	6 A 10 PALLET
ÁLAVA (Vitoria)	37,68	42,31	0,7168	0,5575	0,3982	0,3319	0,2370	87,75	76,01	68,39	65,69
ALBACETE	28,67	32,07	0,5419	0,4215	0,3011	0,2509	0,1792	65,55	56,74	51,14	49,10
ALICANTE	22,32	27,51	0,4867	0,3785	0,2704	0,2253	0,1778	67,57	58,08	52,40	50,17
ALMERÍA	25,79	32,64	0,5851	0,4551	0,3251	0,2799	0,2399	93,64	80,27	73,78	67,01
ÁVILA	27,57	29,57	0,4871	0,3788	0,2706	0,2255	0,1611	51,44	43,39	38,32	36,60
BADAJOS	27,18	28,10	0,4636	0,3606	0,2643	0,2643	0,2265	90,61	73,18	65,64	58,81
MALLORCA	65,22	65,22	1,0788	0,8391	0,5993	0,4994	0,4054	160,97	145,06	130,89	121,36
BARCELONA	27,22	31,72	0,5485	0,4266	0,3047	0,2539	0,1956	73,72	64,93	59,31	57,12
BURGOS	21,89	26,52	0,4650	0,3617	0,2583	0,2153	0,1639	62,00	52,81	47,34	45,24
CÁCERES	30,99	31,43	0,5239	0,4075	0,2911	0,2877	0,2466	98,65	78,87	70,39	62,60
CÁDIZ	29,98	35,07	0,6078	0,4727	0,3377	0,2814	0,2186	82,47	72,75	66,53	64,09
CASTELLÓN	29,17	33,21	0,5671	0,4411	0,3151	0,2625	0,1924	72,01	62,85	57,02	54,82
CIUDAD REAL	21,61	25,90	0,4513	0,3510	0,2507	0,2089	0,1551	58,47	49,48	44,14	42,11
CÓRDOBA	22,34	27,56	0,4878	0,3794	0,2710	0,2259	0,1786	67,88	58,37	52,68	50,45
CORUÑA	23,53	30,27	0,5473	0,4257	0,3040	0,2529	0,2168	83,16	72,83	66,57	63,99
CUENCA	28,67	32,07	0,5419	0,4215	0,3011	0,2509	0,1792	65,55	56,74	51,14	49,10
GERONA	29,85	34,78	0,6014	0,4677	0,3341	0,2784	0,2145	80,83	71,19	65,03	62,64
GRANADA	22,34	27,56	0,4878	0,3794	0,2710	0,2259	0,1786	67,88	58,37	52,68	50,45
GUADALAJARA	27,57	29,57	0,4871	0,3788	0,2706	0,2255	0,1611	51,44	43,39	38,32	36,60
GUIPÚZCOA (San Sebastián)	37,68	42,31	0,7168	0,5575	0,3982	0,3319	0,2370	87,75	76,01	68,39	65,69
HUELVA	29,98	35,07	0,6078	0,4727	0,3377	0,2814	0,2186	82,47	72,75	66,53	64,09
HUESCA	28,94	32,69	0,5557	0,4322	0,3087	0,2573	0,1851	69,07	60,07	54,35	52,22
JAÉN	23,51	30,24	0,5466	0,4251	0,3037	0,2524	0,2164	82,98	72,66	66,41	63,83
LEÓN	22,46	27,82	0,4936	0,3839	0,2742	0,2285	0,1823	69,35	59,76	54,02	51,75
LÉRIDA	29,85	34,78	0,6014	0,4677	0,3341	0,2784	0,2145	80,83	71,19	65,03	62,64
LA RIOJA (Logroño)	37,13	41,06	0,6894	0,5362	0,3830	0,3192	0,2280	80,69	69,34	61,98	59,44
LUGO	30,58	36,44	0,6380	0,4962	0,3544	0,2953	0,2380	90,23	80,09	73,58	70,97
MADRID	23,77	25,49	0,4199	0,3266	0,2333	0,1944	0,1388	44,34	37,40	33,03	31,55
MÁLAGA	23,28	29,71	0,5349	0,4161	0,2972	0,2756	0,2258	84,23	74,72	68,20	63,32
MURCIA	22,34	27,56	0,4878	0,3794	0,2710	0,2259	0,1786	67,88	58,37	52,68	50,45
NAVARRA (Pamplona)	37,13	41,06	0,6894	0,5362	0,3830	0,3192	0,2280	80,69	69,34	61,98	59,44
ORENSE	30,58	36,44	0,6380	0,4962	0,3544	0,2953	0,2380	90,23	80,09	73,58	70,97
ASTURIAS (Oviedo)	23,20	29,52	0,5308	0,4129	0,2949	0,2457	0,2062	78,93	68,82	62,73	60,24
PALENCIA	28,71	32,17	0,5442	0,4233	0,3024	0,2520	0,1800	66,13	57,29	51,67	49,62
PONTEVEDRA	23,53	30,27	0,5473	0,4257	0,3040	0,2529	0,2168	83,16	72,83	66,57	63,99
SALAMANCA	28,71	32,17	0,5442	0,4233	0,3024	0,2520	0,1800	66,13	57,29	51,67	49,62
CANTABRIA (Santander)	37,68	42,31	0,7168	0,5575	0,3982	0,3319	0,2370	87,75	76,01	68,39	65,69
SEGOVIA	27,57	29,57	0,4871	0,3788	0,2706	0,2255	0,1611	51,44	43,39	38,32	36,60
SEVILLA	22,93	28,90	0,5171	0,4022	0,2873	0,2394	0,1974	75,40	65,49	59,52	57,11
SORIA	37,13	41,06	0,6894	0,5362	0,3830	0,3192	0,2280	80,69	69,34	61,98	59,44
TARRAGONA	29,85	34,78	0,6014	0,4677	0,3341	0,2784	0,2145	80,83	71,19	65,03	62,64
TERUEL	28,94	32,69	0,5557	0,4322	0,3087	0,2573	0,1851	69,07	60,07	54,35	52,22
TOLEDO	27,57	29,57	0,4871	0,3788	0,2706	0,2255	0,1611	51,44	43,39	38,32	36,60
VALENCIA	22,11	27,04	0,4764	0,3705	0,2647	0,2206	0,1713	64,94	55,59	50,01	47,84
VALLADOLID	21,66	26,00	0,4536	0,3528	0,2520	0,2100	0,1566	59,06	50,03	44,67	42,63
VIZCAYA (Bilbao)	29,49	33,94	0,5831	0,4535	0,3239	0,2699	0,2027	76,13	66,74	60,76	58,47
ZAMORA	21,56	25,77	0,4485	0,3489	0,2492	0,2077	0,1533	57,77	48,81	43,49	41,49
ZARAGOZA	21,89	26,52	0,4650	0,3617	0,2583	0,2153	0,1639	62,00	52,81	47,34	45,24
ANDORRA	140,83	140,83	2,1667	1,5965	1,1010	0,8469	0,5742	197,92	161,84	138,64	116,40
MENORCA	73,59	73,59	1,2265	0,9540	0,6814	0,5678	0,4255	169,43	153,43	138,76	129,55
IBIZA	65,22	65,22	1,0788	0,8391	0,5993	0,4994	0,4054	160,97	145,06	130,89	121,36

Table 30: B2B 3PL chilled transportation costs.

A.4.2 – B2C chilled 3PL

KGs	B2C chilled transportation cost (€)		
	Short range	Medium range	Large range
3	6,50	8,00	9,52
5	7,60	9,40	11,34
10	11,00	12,98	26,20
15	14,60	20,10	24,50
20	21,19	26,70	30,20
25	22,00	31,20	36,80
30	27,80	34,10	41,20
KG Add.	0,50	0,90	1,20

Table 31: B2C 3PL chilled transportation costs.

A.5 – Phase 1

A.5.1 – Capacity scenarios in point 17 facility

	SCENARIO 1		SCENARIO 2		SCENARIO 3	
Phase 1	Resources		Resources		Resources	
	1	employees per day	1	employees per day	1	employees per day
	4	workday (hours per day)	5	workday (hours per day)	8	workday (hours per day)
	5	work days per week	5	work days per week	5	work days per week
	Weekly capacity achieved		Weekly capacity achieved		Weekly capacity achieved	
	740	pieces / week	925	pieces / week	1480	pieces / week
Phase 2	Resources		Resources		Resources	
	1	employees per day	1	employees per day	1	employees per day
	4	workday (hours per day)	5	workday (hours per day)	8	workday (hours per day)
	5	work days per week	5	work days per week	5	work days per week
	Weekly capacity achieved		Weekly capacity achieved		Weekly capacity achieved	
	400	pieces / week	500	pieces / week	800	pieces / week
Phase 3	Storage space					
Phase 4	Resources		Resources		Resources	
	1	employees per day	1	employees per day	1	employees per day
	4	workday (hours per day)	5	workday (hours per day)	8	workday (hours per day)
	5	work days per week	5	work days per week	5	work days per week
	Weekly capacity achieved		Weekly capacity achieved		Weekly capacity achieved	
	500	pieces / week	625	pieces / week	1000	pieces / week
Global Capacity	400	pieces / week	500	pieces / week	800	pieces / week

**Note that, in connection with the products' preparation process, there was a bottleneck in phase 2 due to the manual process that this manipulation required.*

Table 32: Capacity analysis in point 17 facility.

A.5.2 – Sales Order History Test

		SOH Test - Weeks 2019 (t)												
		40	41	42	43	44	45	46	47	48	49	50	51	52
Jamón Gran Reserva Duroc 50%	dt (units)	5	7	4	8	9	10	10	11	10	15	16	19	19
	Q* (t)	300												
	It	295	288	284	276	267	257	247	236	226	211	195	176	157
Jamón Gran Reserva Duroc 100%	dt (units)	0	1	1	0	1	2	3	4	3	5	5	7	7
	Q* (t)	300												
	It	300	299	298	298	297	295	292	288	285	280	275	268	261
Paleta de Cebo	dt (units)	0	0	1	1	0	2	2	1	2	1	2	3	2
	Q* (t)	300												
	It	300	300	299	298	298	296	294	293	291	290	288	285	283
Paleta de Bellota 100%	dt (units)	5	6	4	6	7	7	9	8	9	10	12	10	11
	Q* (t)	300												
	It	295	289	285	279	272	265	256	248	239	229	217	207	196
Paleta Duroc 100%	dt (units)	13	14	16	17	18	21	20	23	24	26	27	28	26
	Q* (t)	300												
	It	287	273	257	240	222	201	181	158	134	108	81	53	27
Jamón Ibérico de Cebo	dt (units)	1	2	3	2	2	5	4	5	7	8	10	9	7
	Q* (t)	300												
	It	299	297	294	292	290	285	281	276	269	261	251	242	235

Note: “dt” is demand, “Q” regards to the batch size sent to AMZ, “It” regards to the available stock in AMZ

Table 33: Sales Order History of AMZ Test in 2019, Phase 1.

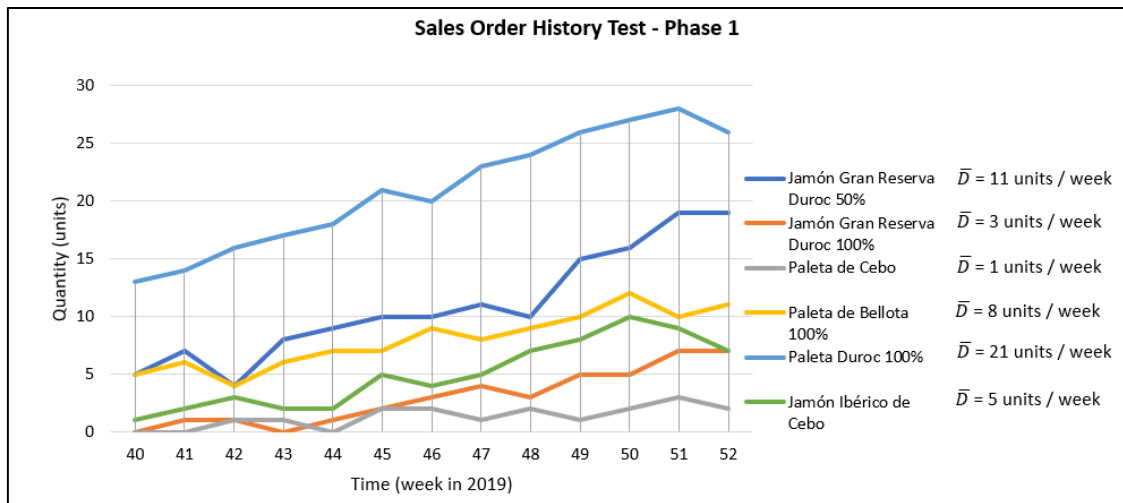


Figure 56: Sales Order History of AMZ Test in 2019, Phase 1.

A.5.3 – Harris Wilson

		Forecast - Weeks 2020 (t)											
		12	13	14	15	16	17	18	19	20	21	22	23
Jamón Gran Reserva Duroc 50%	dt (units)	8	12	9	11	14	11	10	9	8	15	14	11
	Q* (t)	51				51					51		
	It	43	31	22	11	48	37	27	18	10	46	32	21
Jamón Gran Reserva Duroc 100%	dt (units)	1	5	3	3	4	3	3	2	2	5	3	2
	Q* (t)	33										33	
	It	32	27	24	21	17	14	11	9	7	2	32	30
Paleta de Cebo	dt (units)	0	2	2	0	1	2	1	3	0	1	2	0
	Q* (t)	21											
	It	21	19	17	17	16	14	13	10	10	9	7	7
Paleta de Bellota 100%	dt (units)	5	7	11	6	9	11	11	8	7	11	9	6
	Q* (t)	74								74			
	It	69	62	51	45	36	25	14	6	73	62	53	47
Paleta Duroc 100%	dt (units)	15	18	22	27	24	25	18	20	24	22	20	21
	Q* (t)	79			79				79				79
	It	64	46	24	76	52	27	9	68	44	22	2	60
Jamón Ibérico de Cebo	dt (units)	2	4	3	5	8	4	6	7	4	5	7	6
	Q* (t)	49										49	
	It	47	43	40	35	27	23	17	10	6	1	43	37

Note: “dt” is demand, “Q” regards to the batch size sent to AMZ, “It” regards to the available stock in AMZ.

Table 34: Demand forecast in Phase 1.

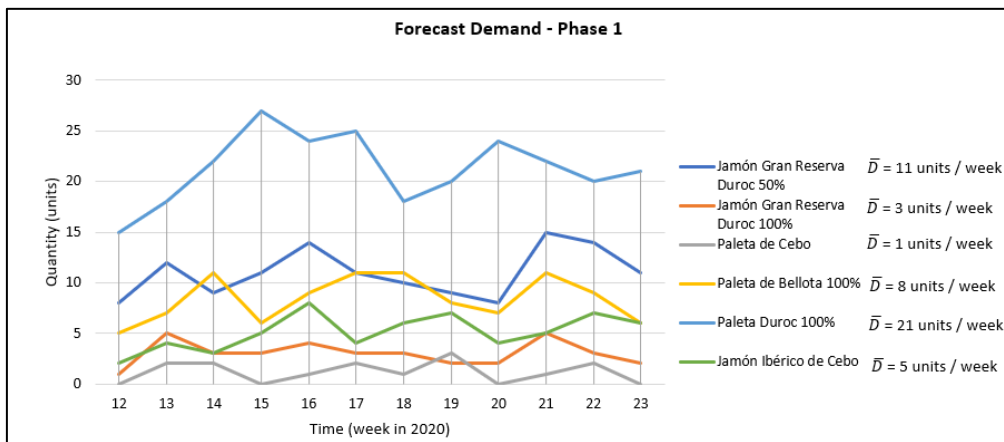


Figure 57: Demand forecast in Phase 1.

$$\text{Optimum batch size} = Q^* = \sqrt{\frac{2 \cdot C_A \cdot D}{C_h}}$$

$$\text{Replacement frequency} = v^* = \frac{D}{Q^*}$$

$$\text{Cycle time} = T^* = \frac{1}{v^*}$$

Formula 8: Harris Wilson’s expressions, Phase 1.

A.5.4 – Costs development and pricing

Country	SKU	KG		Internal Process Cost		Picking & Distribution Costs (€/unit)		AMZ Fixed Costs		AMZ Variable Costs (€/unit)			TOTAL COST (€/unit)	Sales Process (€/unit)		
		Range	Average	€/unit	€/kg	Picking	B2B Distribution	Storage (€/month)	AMZ's B2C Delivery (from AMZ to customer) - €/unit	Long storage	Advertising	Inventory return & withdrawal (€/unit)		Sale price	AMZ Comission	Profit margin
Spain	Jamón Gran Reserva Duroc 50%	7,5 - 8,0	7,75	83,87 €	10,82 €	1,10 €	2,10 €	31,13 €	9,19 €	- €	8,33 €	4,10 €	125,81 €	207,00 €	31,05 €	50,14 €
	Jamón Gran Reserva Duroc 100%	7,5 - 8,0	7,75	125,52 €	16,20 €	1,10 €	2,10 €	31,13 €	9,19 €	- €	8,33 €	4,10 €	167,46 €	256,00 €	38,40 €	50,14 €
	Paleta de Cebo	4,5 - 5,5	5,00	82,82 €	16,56 €	1,10 €	1,89 €	31,13 €	6,89 €	- €	8,33 €	3,00 €	121,60 €	202,00 €	30,30 €	50,10 €
	Paleta de Bellota 100%	5,0 - 6,0	5,50	148,63 €	27,02 €	1,10 €	2,08 €	31,13 €	8,76 €	- €	8,33 €	3,20 €	189,59 €	282,00 €	42,30 €	50,11 €
	Paleta Duroc 100%	4,5 - 5,5	5,00	65,83 €	13,17 €	1,10 €	1,89 €	31,13 €	6,89 €	- €	8,33 €	3,00 €	104,61 €	182,00 €	27,30 €	50,09 €
	Jamón Ibérico de Cebo	8,0 - 8,5	8,25	165,21 €	20,03 €	1,10 €	2,23 €	31,13 €	9,73 €	- €	8,33 €	4,30 €	207,95 €	303,00 €	45,45 €	49,60 €
UK	Jamón Gran Reserva Duroc 50%	7,5 - 8,0	7,75	83,87 €	10,82 €	1,10 €	2,10 €	31,13 €	16,00 €	- €	8,33 €	11,25 €	136,91 €	220,00 €	33,00 €	50,09 €
	Paleta de Bellota 100%	5,0 - 6,0	5,50	148,63 €	27,02 €	1,10 €	2,08 €	31,13 €	15,87 €	- €	8,33 €	9,00 €	200,18 €	294,00 €	44,10 €	49,72 €
	Jamón Ibérico de Cebo	8,0 - 8,5	8,25	165,21 €	20,03 €	1,10 €	2,23 €	31,13 €	16,00 €	- €	8,33 €	11,75 €	218,69 €	316,00 €	47,40 €	49,91 €
France	Jamón Gran Reserva Duroc 50%	7,5 - 8,0	7,75	83,87 €	10,82 €	1,10 €	2,10 €	31,13 €	10,19 €	- €	8,33 €	11,25 €	131,10 €	213,00 €	31,95 €	49,95 €
	Paleta de Bellota 100%	5,0 - 6,0	5,50	148,63 €	27,02 €	1,10 €	2,08 €	31,13 €	10,02 €	- €	8,33 €	9,00 €	194,33 €	288,00 €	43,20 €	50,47 €
	Jamón Ibérico de Cebo	8,0 - 8,5	8,25	165,21 €	20,03 €	1,10 €	2,23 €	31,13 €	10,19 €	- €	8,33 €	11,75 €	212,88 €	309,00 €	46,35 €	49,77 €
	Paleta de Cebo	4,5 - 5,5	5,00	82,82 €	16,56 €	1,10 €	1,89 €	31,13 €	9,46 €	- €	8,33 €	8,50 €	127,47 €	209,00 €	31,35 €	50,18 €
Germany	Jamón Gran Reserva Duroc 50%	7,5 - 8,0	7,75	83,87 €	10,82 €	1,10 €	2,10 €	31,13 €	7,41 €	- €	8,33 €	11,25 €	128,32 €	210,00 €	31,50 €	50,18 €
	Jamón Ibérico de Cebo	8,0 - 8,5	8,25	165,21 €	20,03 €	1,10 €	2,23 €	31,13 €	7,41 €	- €	8,33 €	11,75 €	210,10 €	306,00 €	45,90 €	50,00 €

Table 35: Cost development and pricing in Phase 1.

A.5.5 – AMZ Costs

Venta en Amazon – Tamaño estándar y tamaño grande
(FBA Local, Inventario Internacional, Paneuropeo, EFN)

Logística de amazon

Calcular tus tarifas

Para calcular tus tarifas de Logística de Amazon totales, simplemente suma las tarifas de envío y almacenamiento con cualquier servicio opcional que necesites.



1. Tarifa por envío

Una tarifa plana por unidad, en función del:

- Tamaño
- Peso de envío saliente = peso de tu unidad + peso de nuestro embalaje



2. Tarifa de almacenamiento

(Ver página 4.)

Importe por metro cúbico por mes o por pie cúbico por mes



3. Tarifa por servicios opcionales

(Ver página 4.)

Incluye:

- Devoluciones
- Baja
- Etiquetado
- Embalaje con bolsa
- Embalaje con cinta adhesiva
- Plástico de burbujas

1 Sobrecargo del Programa Paneuropeo - gran tamaño

Como se indica en la tabla siguiente, a las tarifas de gestión logística nacional se les aplica un recargo para la gestión de unidades de tamaño grande mediante el programa Paneuropeo.

Suplemento del Programa Paneuropeo

Envío del Programa Paneuropeo a*:				
UK	DE	FR	IT	ES
0,89 €	Sin sobrecargo	2,00 €	2,00 €	2,00 €

*El recargo varía en NL. Para obtener más información, por favor [haga clic aquí](#)

Las tarifas no incluyen el IVA ni otros impuestos, cuyo pago corresponde al vendedor

1. Tarifa de gestión logística por unidad gestionada

	Envío local (FBA Local, Inventario Internacional) en:						Envío internacional (EFN) desde:		
	UK (€)	DE/PL/CZ (€)	Sólo DE* (€)	FR (€)	IT (€)	ES (€)	NL (€)	Se vende en Amazon.co.uk (€)	non-UK (€)
Sobre pequeño: Dimensiones: ≤ 20 X 15 X 1 cm									
Peso del paquete: 20 g									
≤ 0,1 kg	1,35 €	1,63 €	2,13 €	2,24 €	2,59 €	2,13 €	1,54 €	3,71 €	4,13 €
Sobre tamaño estándar: Dimensiones: ≤ 33 X 23 X 2,5 cm									
Peso del paquete: 40 g									
≤ 0,1 kg	1,48 €	1,79 €	2,29 €	2,37 €	2,72 €	2,37 €	1,69 €	3,86 €	4,30 €
≤ 0,25 kg	1,63 €	1,92 €	2,42 €	3,00 €	3,01 €	2,65 €	1,82 €	4,14 €	4,60 €
≤ 0,5 kg	1,73 €	2,04 €	2,54 €	3,37 €	3,19 €	2,85 €	1,95 €	4,20 €	4,67 €
Sobre grande: Dimensiones: ≤ 33 X 23 X 5 cm									
Peso del paquete: 40 g									
≤ 1 kg	2,17 €	2,40 €	2,90 €	3,95 €	3,44 €	2,97 €	2,34 €	4,50 €	5,00 €
Paquete tamaño estándar Dimensiones: ≤ 45 X 34 X 26 cm									
Peso del paquete: 100g									
≤ 0,25 kg	2,14 €	2,53 €	3,03 €	3,94 €	3,52 €	2,82 €	2,39 €	4,52 €	5,02 €
≤ 0,5 kg	2,27 €	2,81 €	3,31 €	4,59 €	3,94 €	3,30 €	2,65 €	5,52 €	6,13 €
≤ 1 kg	2,44 €	3,22 €	3,72 €	5,32 €	4,59 €	3,60 €	3,08 €	6,50 €	7,23 €
≤ 1,5 kg	2,60 €	3,76 €	4,26 €	5,51 €	4,94 €	4,05 €	3,62 €	7,14 €	7,94 €
≤ 2 kg	2,84 €	4,09 €	4,59 €	5,62 €	5,16 €	4,11 €	3,88 €	8,18 €	9,09 €
≤ 3 kg	4,06 €	4,57 €	5,07 €	6,90 €	5,98 €	4,67 €	4,34 €	9,10 €	10,12 €
≤ 4 kg	4,44 €	4,95 €	5,45 €	7,34 €	6,70 €	5,58 €	4,36 €	9,92 €	11,03 €
≤ 5 kg	4,53 €	5,02 €	5,52 €	7,36 €	7,11 €	5,64 €	4,37 €	10,42 €	11,58 €
≤ 6 kg	5,18 €	5,41 €	5,91 €	7,99 €	7,96 €	6,04 €	4,54 €	10,42 €	11,58 €
≤ 7 kg	5,18 €	5,41 €	5,91 €	7,99 €	7,96 €	6,04 €	4,59 €	10,42 €	11,58 €
≤ 8 kg	5,31 €	5,55 €	6,05 €	8,19 €	8,22 €	6,19 €	4,64 €	11,02 €	12,25 €
≤ 9 kg	5,31 €	5,55 €	6,05 €	8,19 €	8,25 €	6,19 €	4,69 €	11,30 €	12,56 €
≤ 10 kg	5,31 €	5,55 €	6,05 €	8,19 €	8,42 €	6,19 €	4,83 €	13,52 €	15,03 €
≤ 11 kg	5,32 €	5,74 €	6,24 €	8,24 €	8,42 €	6,19 €	4,99 €	13,52 €	15,03 €
≤ 12 kg	5,52 €	5,75 €	6,25 €	8,25 €	8,44 €	6,20 €	5,00 €	13,52 €	15,03 €
Tamaño grande (pequeño): Dimensiones: ≤ 61 X 46 X 46 cm									
Peso del paquete: 240g									
≤ 1 kg	4,00 €	5,33 €	5,83 €	7,48 €	7,80 €	5,31 €	5,03 €	9,97 €	11,08 €
≤ 1,25 kg	4,46 €	5,45 €	5,95 €	7,75 €	7,98 €	5,31 €	5,14 €	10,28 €	11,43 €
≤ 1,5 kg	4,81 €	5,49 €	5,99 €	7,84 €	8,26 €	5,76 €	5,18 €	10,32 €	11,47 €
≤ 1,75 kg	4,90 €	5,49 €	5,99 €	7,84 €	8,31 €	5,76 €	5,18 €	10,37 €	11,53 €
≤ 2 kg	4,96 €	5,57 €	6,07 €	8,36 €	8,36 €	5,97 €	5,25 €	10,40 €	11,56 €
Tamaño grande (estándar): Dimensiones: ≤ 120 X 60 X 60 cm									
Peso del paquete: 240g									
≤ 1 kg	4,87 €	5,33 €	5,83 €	7,52 €	8,26 €	5,35 €	5,05 €	11,69 €	13,00 €
≤ 2 kg	5,19 €	5,57 €	6,07 €	8,59 €	8,40 €	5,97 €	5,25 €	12,03 €	13,38 €
≤ 3 kg	5,29 €	6,50 €	7,00 €	9,02 €	8,41 €	6,61 €	6,13 €	12,84 €	14,27 €
≤ 4 kg	5,32 €	6,55 €	7,05 €	9,40 €	8,99 €	6,67 €	6,17 €	12,91 €	14,35 €
≤ 5 kg	5,36 €	6,55 €	7,05 €	9,46 €	9,03 €	6,89 €	6,17 €	13,01 €	14,46 €
≤ 6 kg	6,33 €	6,76 €	7,26 €	10,02 €	10,02 €	8,76 €	6,18 €	14,27 €	15,87 €
≤ 7 kg	6,39 €	6,86 €	7,36 €	10,13 €	10,02 €	8,92 €	6,20 €	14,39 €	16,00 €
≤ 8 kg	6,42 €	6,91 €	7,41 €	10,19 €	10,16 €	9,19 €	6,23 €	14,39 €	16,00 €
≤ 9 kg	6,42 €	6,91 €	7,41 €	10,19 €	10,22 €	9,75 €	6,26 €	14,39 €	16,00 €
≤ 10 kg	6,45 €	6,94 €	7,44 €	10,24 €	10,28 €	10,13 €	6,36 €	14,72 €	16,37 €
≤ 15 kg	6,86 €	7,53 €	8,03 €	10,94 €	11,39 €	10,90 €	6,41 €	15,61 €	17,35 €
≤ 20 kg	7,21 €	8,00 €	8,50 €	11,50 €	11,74 €	11,83 €	6,41 €	16,98 €	18,88 €
≤ 25 kg	7,98 €	9,06 €	9,56 €	11,50 €	12,49 €	11,83 €	6,41 €	18,21 €	20,24 €
≤ 30 kg	7,98 €	9,06 €	9,56 €	12,81 €	13,12 €	13,14 €	6,41 €	18,47 €	20,54 €
Tamaño grande (grande): Dimensiones: > 120 X 60 X 60 cm									
Peso del paquete: 240g									
≤ 5 kg	8,10 €	7,11 €	7,61 €	13,12 €	11,05 €	7,92 €	6,71 €	18,07 €	20,09 €
≤ 10 kg	9,76 €	8,20 €	8,70 €	15,91 €	12,58 €	11,65 €	7,74 €	21,64 €	24,06 €
≤ 15 kg	10,32 €	8,78 €	9,28 €	16,84 €	13,86 €	12,59 €	8,28 €	23,00 €	25,57 €
≤ 20 kg	10,81 €	9,28 €	9,78 €	17,67 €	14,31 €	13,60 €	8,75 €	23,36 €	28,20 €
≤ 25 kg	11,77 €	10,27 €	10,77 €	19,31 €	16,05 €	14,75 €	9,69 €	27,52 €	30,60 €
≤ 30 kg	11,80 €	10,29 €	10,79 €	19,77 €	16,15 €	16,92 €	9,71 €	27,52 €	30,60 €

*0,45 € / 0,50 € por producto enviado desde centros logísticos de Alemania y se aplica a vendedores que almacenan su inventario exclusivamente en Alemania y no participan en la Ampliación de la Red logística (Programa paneuropeo). Ver página 9 de preguntas frecuentes para obtener más información.

Table 36: AMZ services cost (1).

Almacenamiento mensual y tarifas de servicio opcional Logística de

Tarifas mensuales de almacenamiento



Las tarifas mensuales de almacenamiento se cobran cada mes y su importe varía en función de la ubicación del centro logístico. Las tarifas de almacenamiento prolongado se aplican al inventario almacenado durante más de 365 días.

2. Tarifa por almacenamiento mensual

	Tamaño estándar				Tamaño grande	
	Ropa y accesorios y Zapatos y complementos		Todas las categorías		Todas las categorías	
	Enero-setiembre	Octubre-diciembre	Enero-setiembre	Octubre-diciembre	Enero-setiembre	Octubre-diciembre
UK (La tarifa es por pie cúbico al mes)	0,39 €	0,55 €	0,65 €	0,91 €	0,45 €	0,63 €
DE/IT/FR/ES/NL (La tarifa es por pie cúbico al mes)	15,60 €	21,60 €	26,00 €	36,00 €	18,00 €	25,00 €

Las tarifas de almacenamiento prolongado se suman a las tarifas por almacenamiento de inventario y sólo se aplican al inventario de más de 365 días. El mayor entre las siguientes opciones se cobrará como tarifa de almacenamiento prolongado: (1) una tarifa mensual de almacenamiento prolongado de 4,50 € por pie cúbico / 170 € por metro cúbico o (2) un mínimo de tarifa de almacenamiento prolongado de 0,10 € / 0,10 € por producto dentro de la categoría multimedia. Ver página 9 de preguntas frecuentes para obtener más.

Tarifa por servicios opcionales



Incluye devoluciones nacionales, devoluciones transfronterizas (ver definiciones de la zona 1 y la zona 2), bajas, etiquetado, embalaje con bolsa, plástico de burbujas, embalaje con cinta adhesiva y embalaje con bolsa opaca. Los servicios se cobran por unidad.

3.1 Servicios opcionales: Retirada

	Tamaño estándar		Tamaño grande	
	Peso	Coste por unidad (€ / £) ¹	Peso	Coste por unidad (€ / £) ¹
	Devolución nacional	0-200g 201-500g 501-1000g 100lg+	0,25 € / 0,25 € 0,25 € / 0,25 € 0,45 € / 0,45 € 0,50 € / 0,50 € + 0,40 € / 0,40 € incremental kg ²	0-500g 501-1000g 1001-2000g 2001-5000g 5001g+
Devolución transfronteriza³	Peso	Coste por unidad (€ / £) ¹	Peso	Coste por unidad (€ / £) ¹
	Zona 1	Zona 2	Zona 1	Zona 2
	0-200g	0,65 € / 0,65 € 0,80 € / 0,80 €	0-500g	2,75 € / 2,75 € 3,50 € / 3,50 €
	201-500g	1,00 € / 1,00 € 1,75 € / 1,75 €	501-1000g	3,75 € / 3,75 € 5,50 € / 5,50 €
	501-1000g	2,00 € / 2,00 € 3,00 € / 3,00 €	1001-2000g	5,00 € / 5,00 € 8,00 € / 8,00 €
	1001g+	2,50 € / 2,50 € + 1,50 € / 1,50 € incremental kg ²	2001-5000g	8,00 € / 8,00 € 10,00 € / 10,00 €
			5001g+	8,50 € / 8,50 € + 1,00 € / 1,00 € incremental kg ²
				10,50 € / 10,50 € + 0,25 € / 0,25 € incremental kg ²
Baja	Peso	Coste por unidad (€ / £) ¹	Peso	Coste por unidad (€ / £) ¹
	0-200g	0,25 € / 0,25 €	0-500g	0,50 € / 0,50 €
	201-500g	0,30 € / 0,30 €	501-1000g	1,00 € / 1,00 €
	501-1000g	0,45 € / 0,45 €	1001-2000g	1,50 € / 1,50 €
	1001g+	0,50 € / 0,50 € + 0,40 € / 0,40 € incremental kg ²	2001-5000g	2,50 € / 2,50 €
			5001g+	3,00 € / 3,00 € + 0,40 € / 0,40 € incremental kg ²

¹La tarifa se cobrará en la moneda de tu sitio web. Si vendes en el Reino Unido se te cobrará en £ y si vendes en otros sitios web europeos se te cobrará en €.
²Todos los pesos se redondean a los 1000 g más cercanos.
³La zona 1 y la zona 2 se definen a continuación.

Zona 1	Zona 2
Alemania, Austria, Bélgica, Dinamarca, España, Francia, Irlanda, Italia, Luxemburgo, Países Bajos, Polonia, Reino Unido, República Checa, Rumanía	Bulgaria, Chipre, Eslovaquia, Eslovenia, Estonia, Finlandia, Grecia, Hungría, Letonia, Lituania, Malta, Portugal, Suecia

3.2 Servicios opcionales: Otros

	Tamaño estándar	Tamaño grande
	Coste por unidad (€ / £) ¹	
Servicio de etiquetado	0,15 € / 0,15 €	0,15 € / 0,15 €
Embolsado	0,45 € / 0,25 €	0,90 € / 0,50 €
Envoltorio de burbujas	0,70 € / 0,40 €	1,40 € / 0,80 €
Precintado	0,20 € / 0,10 €	0,40 € / 0,20 €
Bolsa opaca	0,90 € / 0,50 €	1,80 € / 1,00 €

¹La tarifa se cobrará en la moneda de tu sitio web. Si vendes en el Reino Unido se te cobrará en £ y si vendes en otros sitios web europeos se te cobrará en €.

Las tarifas no incluyen el IVA ni otros impuestos, cuyo pago corresponde al vendedor

¿Tienes alguna pregunta?
 Consulta el apartado de Preguntas frecuentes en la página 9

Table 37: AMZ services cost (2).



A.5.6 – Phase 1 Results

- d.f: Forecasted demand
- d.r: Real demand
- Q*.f: Harris Wilson batch size
- Q*.r: Real batch expedited
- It.r: AMZ's remaining inventory

		Weeks 2020 (t)											Total	Considering: (d.r) & (Q*.f)			Considering: (d.r) & (Q*.r)			Comments		
		12	13	14	15	16	17	18	19	20	21	22		23	Cost	Income	Benefit	Cost	Income		Benefit	
Jamón Gran Reserva Duroc 50%	d.f	8	12	9	11	14	11	10	9	8	15	14	11	132								
	d.r	22	6	8	2	8	7	7	10	7	5	4	3	89								
	Q*.f	51				51					51			153	18.925,56 €	16.075,63 €	- 2.849,93 €	19.050,03 €	16.075,63 €	- 2.974,41 €	<i>(Q*.r) > (Q*.f) causes the increase of storage costs since v* decreases (81% storage costs)</i>	
	Q*.r	50						100						150								
	It.r	28	22	14	12	4	0	93	83	76	71	67	64	--								
Jamón Gran Reserva Duroc 100%	d.f	1	5	3	3	4	3	3	2	2	5	3	2	36								
	d.r	4	0	0	0	0	0	0	0	0	0	0	0	4								
	Q*.f	33											33	66	10.330,80 €	870,40 €	- 9.460,40 €	7.993,32 €	870,40 €	- 7.122,92 €	<i>(Q*.r) > (Q*.f) causes the increase of storage costs since v* decreases (81% storage costs), but finally less quantity of product is expedited</i>	
	Q*.r	50												50								
	It.r	46	46	46	46	46	46	46	46	46	46	46	46	--								
Paleta de Cebo	d.f	0	2	2	0	1	2	1	3	0	1	2	0	14								
	d.r	1	10	6	0	2	2	1	0	1	0	0	2	25								
	Q*.f	21												21	2.661,90 €	4.366,88 €	1.704,97 €	6.092,19 €	4.366,88 €	- 1.725,31 €	<i>(Q*.r) > (Q*.f) causes the increase of storage costs since v* decreases (81% storage costs)</i>	
	Q*.r	50												50								
	It.r	49	39	33	33	31	29	28	28	27	27	27	25	--								
Paleta de Bellota 100%	d.f	5	7	11	6	9	11	11	8	7	11	9	6	101								
	d.r	10	9	15	4	10	3	1	4	2	2	1	2	63								
	Q*.f	74											74	148	27.474,54 €	15.422,40 €	-12.052,14 €	27.832,38 €	15.422,40 €	-12.409,98 €	<i>Due to smaller (Q*.r) batch size in W12, bigger batch size is needed in W17, thus storage costs increase</i>	
	Q*.r	50					100							150								
	It.r	40	31	16	12	2	99	98	94	92	90	89	87	--								
Paleta Duroc 100%	d.f	15	18	22	27	24	25	18	20	24	22	20	21	256								
	d.r	28	1	14	14	19	19	10	14	5	5	3	2	134								
	Q*.f	79				79							79	316	31.477,71 €	20.729,80 €	-10.747,91 €	25.146,46 €	20.729,80 €	- 4.416,66 €	<i>Finally, (d.r) is smaller than (d.f), thus the batch size sent had to be adjusted accordingly</i>	
	Q*.r	50			100		100							250								
	It.r	22	21	7	93	74	155	145	131	126	121	118	116	--								
Jamón Ibérico de Cebo	d.f	2	4	3	5	8	4	6	7	4	5	7	6	61								
	d.r	10	0	0	2	7	9	5	8	7	5	3	6	62								
	Q*.f	49											49	98	21.302,78 €	16.257,95 €	- 5.044,83 €	24.908,30 €	16.257,95 €	- 8.650,35 €	<i>Due to facility constraints (Q*.f) schedule could not be accomplished</i>	
	Q*.r	50						36					36	122								
	It.r	40	40	40	38	31	22	53	45	38	33	30	60	--								

Table 38: Phase 1 summary results, comparing H. Wilson scenario with the realistic one.

A.6 – Phase 2

A.6.1 – Brown & Gibson Method

Objective Factors:

Facility (7)	Year					
	0	1	2	3	4	5
Facility opening	400,00 €	0,00 €	0,00 €	0,00 €	0,00 €	0,00 €
Facility functioning	0,00 €	1.800,00 €	1.800,00 €	1.800,00 €	1.800,00 €	1.800,00 €
Wages	0,00 €	22.026,00 €	22.026,00 €	22.026,00 €	22.026,00 €	22.026,00 €
Indirect costs	0,00 €	2.880,00 €	2.880,00 €	2.880,00 €	2.880,00 €	2.880,00 €
Total cost	400,00 €	26.706,00 €	26.706,00 €	26.706,00 €	26.706,00 €	26.706,00 €
NPV of cost	400,00 €	25.928,16 €	25.172,97 €	24.439,77 €	23.727,94 €	23.036,83 €
Total NPV of cost ; T = 5 years			122.705,66 €			

Table 39: Objective factors Facility (7).

Facility (17)	Year					
	0	1	2	3	4	5
Facility opening	440,00 €	0,00 €	0,00 €	0,00 €	0,00 €	0,00 €
Facility functioning	0,00 €	1.920,00 €	1.920,00 €	1.920,00 €	1.920,00 €	1.920,00 €
Wages	0,00 €	22.026,00 €	22.026,00 €	22.026,00 €	22.026,00 €	22.026,00 €
Indirect costs	0,00 €	2.880,00 €	2.880,00 €	2.880,00 €	2.880,00 €	2.880,00 €
Total cost	440,00 €	26.826,00 €	26.826,00 €	26.826,00 €	26.826,00 €	26.826,00 €
NPV of cost	440,00 €	26.044,66 €	25.286,08 €	24.549,59 €	23.834,55 €	23.140,34 €
Total NPV of cost ; T = 5 years			123.295,23 €			

Table 40: Objective factors Facility (17).

Facility (24)	Year					
	0	1	2	3	4	5
Facility opening	390,00 €	0,00 €	0,00 €	0,00 €	0,00 €	0,00 €
Facility functioning	0,00 €	1.560,00 €	1.560,00 €	1.560,00 €	1.560,00 €	1.560,00 €
Wages	0,00 €	22.176,00 €	22.176,00 €	22.176,00 €	22.176,00 €	22.176,00 €
Indirect costs	0,00 €	2.880,00 €	2.880,00 €	2.880,00 €	2.880,00 €	2.880,00 €
Total cost	390,00 €	26.616,00 €	26.616,00 €	26.616,00 €	26.616,00 €	26.616,00 €
NPV of cost	390,00 €	25.840,78 €	25.088,13 €	24.357,41 €	23.647,97 €	22.959,20 €
Total NPV of cost ; T = 5 years			122.283,49 €			

Table 41: Objective factors Facility (24).

Facility (39)	Year					
	0	1	2	3	4	5
Facility opening	370,00 €	0,00 €	0,00 €	0,00 €	0,00 €	0,00 €
Facility functioning	0,00 €	1.440,00 €	1.440,00 €	1.440,00 €	1.440,00 €	1.440,00 €
Wages	0,00 €	27.316,00 €	27.316,00 €	27.316,00 €	27.316,00 €	27.316,00 €
Indirect costs	0,00 €	2.880,00 €	2.880,00 €	2.880,00 €	2.880,00 €	2.880,00 €
Total cost	370,00 €	31.636,00 €	31.636,00 €	31.636,00 €	31.636,00 €	31.636,00 €
NPV of cost	370,00 €	30.714,56 €	29.819,96 €	28.951,42 €	28.108,18 €	27.289,49 €
Total NPV of cost ; T = 5 years			145.253,62 €			

Table 42: Objective factors Facility (39).

Subjective Factors:

	Comparisons						Sum	(w _j)
	Storage quality	Link with 3PLs hubs	Link with Balearic Islands	Social impact	Weather	Advert.		
Storage quality		1	1	1	1	1	5	0,3333
Link with 3PLs hubs	0		1	1	1	1	4	0,2667
Link with Balearic Islands	0	0		1	1	1	3	0,2000
Social impact	0	0	0		1	1	2	0,1333
Weather	0	0	0	0		1	1	0,0667
Advertising	0	0	0	0	0		0	0,0000

Table 43: Comparison of subjective factors two by two to compute w_j.

	Storage quality				Sum	R _j
	Facility (7)	Facility (17)	Facility (24)	Facility (39)		
Facility (7)		1	1	0	2	0,2222
Facility (17)	1		1	0	2	0,2222
Facility (24)	1	1		0	2	0,2222
Facility (39)	1	1	1		3	0,3333

Table 44: Value of factor "storage quality" depending on each facility.

	Link with 3PLs hubs				Sum	R _j
	Facility (7)	Facility (17)	Facility (24)	Facility (39)		
Facility (7)		1	1	0	2	0,2857
Facility (17)	1		1	0	2	0,2857
Facility (24)	0	0		0	0	0,0000
Facility (39)	1	1	1		3	0,4286

Table 45: Value of factor "link with 3PLs hubs" depending on each facility.

Link with Balearic Islands						
	Facility (7)	Facility (17)	Facility (24)	Facility (39)	Sum	R _j
Facility (7)		1	1	0	2	0,2857
Facility (17)	1		1	0	2	0,2857
Facility (24)	0	0		0	0	0,0000
Facility (39)	1	1	1		3	0,4286

Table 46: Value of factor “link with Balearic Islands” depending on each facility.

Social impact						
	Facility (7)	Facility (17)	Facility (24)	Facility (39)	Sum	R _j
Facility (7)		1	1	0	2	0,2857
Facility (17)	1		1	0	2	0,2857
Facility (24)	0	0		0	0	0,0000
Facility (39)	1	1	1		3	0,4286

Table 47: Value of factor “social impact” depending on each facility.

Weather - Frequency of extreme heat						
	Facility (7)	Facility (17)	Facility (24)	Facility (39)	Sum	R _j
Facility (7)		1	0	1	2	0,2857
Facility (17)	1		0	1	2	0,2857
Facility (24)	1	1		1	3	0,4286
Facility (39)	0	0	0		0	0,0000

Table 48: Value of factor “weather” depending on each facility.

Advertising						
	Facility (7)	Facility (17)	Facility (24)	Facility (39)	Sum	R _j
Facility (7)		1	1	0	2	0,2857
Facility (17)	1		1	0	2	0,2857
Facility (24)	0	0		0	0	0,0000
Facility (39)	1	1	1		3	0,4286

Table 49: Value of factor “advertising” depending on each facility.

A.6.2 – Supply facilities

Product family	Supply facility (I)	Distance ($d_{I,39}$) in KM	Product family	Supply facility (I)	Distance ($d_{I,39}$) in KM
Alternative protein	47	640	Pork	11	330
Beef	9	620		23	590
Cooked products	7	80		24	180
Cured products	8	320		26	330
	17	80		31	650
	27	600		37	640
	28	320	Poultry	3	640
34	220	4		470	
Mutton	15	360		5	620
	18	1900		6	200
	19	1970		13	720
	20	2200		16	370
	21	2200		40	470
	22	180		41	640
	39	0	42	720	

Table 50: Distance between supply facilities and centralized warehouse ($d_{I,39}$).

A.6.3 – R Studio Script

```

#LUIS MIGUEL MORELL BATLLE, dni: 47934859F
#TFM Phase 2 - Data Analysis

# The data "Phase2DataAll" has 7288 observations (rows) and 13 variables (columns).
Regarding these variables, some are factors and some are numeric.

# Prepare the data (df = data frame):

library(carData)
library(car)
library(MASS)
library(effects)
library(FactoMineR)
library(moments)

df<-Phase2DataAll #Create a dataframe (df) that has all the data to be analyzed (7288
observations of 13 variables)
summary(df)
str(df) # "Phase2DataAll" is formed by dates, factors and numeric variables, but
some have to be treated before.
library(lubridate)

#Convert "PO DATE" into "date format":
str(df$`PO Date`)
class(df$`PO Date`)
df$`PO Date`<-as.Date.factor(df$`PO Date`)
class(df$`PO Date`)
summary(df$`PO Date`)
str(df$`PO Date`)

#The following variables have to be defined as "FACTORS":## Define the variable
"PO Date Month" as a FACTOR:
df$`PO Date Month`<-factor(df$`PO Date Month`, labels=c("September 2020","October
2020","November 2020","December 2020","January 2021","February2021","March
2021","April 2021","May 2021","June 2021"))
summary(df$`PO Date Month`)

## Define the variable "Destination Region" as a FACTOR:
df$`Destination Region`<-factor(df$`Destination Region`,labels=c("Castilla La
Mancha","Navarra","Andalusia","Aragon","Catalonia","Madrid
Community","Cantabria","Castilla y Leon","Balearics","Basque
Country","Extremadura","Valencian Community","Galicia","La
Rioja","Murcia","Asturias"))
summary(df$`Destination Region`)

## Define the variable "Business Type" as a FACTOR:
df$`Business Type`<-factor(df$`Business Type`,labels=c("B2B","B2C"))
summary(df$`Business Type`)

## Define the variable "Product Family" as a FACTOR:
df$`Product Family`<-factor(df$`Product
Family`,labels=c("Beef","Pork","Poultry","Mutton","Cured product","Alternative
protein","Cooked product"))
summary(df$`Product Family`)

summary(df)
str(df)

#GRAPHICS:
boxplot(df$`PO Date`~df$`Destination City`)

```

```

pie(df$`PO Qty (KG)`

##Purchases per month:
table(df$`PO Date Month`) 100*round(prop.table(table(df$`PO Date Month`)),10)
barplot(table(df$`PO Date Month`),main="Online purchases B2B &
B2C",col=heat.colors(6),las="1",ylab="Qty of purchases")

##Destinations:
table(df$`Destination Region`) 100*round(prop.table(table(df$`Destination
Region`)),16)
barplot(table(df$`Destination Region`),main="Destination (j) of purchases B2B&
B2C",col=heat.colors(16),las="1",ylab="Qty of purchases",xlab="Destination
(j)",legend.text = c("Andalusia","Aragon","Asturias","Balearics","Basque
Country","Cantabria","Castilla La Mancha","Castilla y
Leon","Catalonia","Extremadura","Galicia","La Rioja","Madrid
Community","Murcia","Navarra","Valencian Community"))

##Product families:
table(df$`Product Family`)
100*round(prop.table(table(df$`Product Family`)),7)
barplot(table(df$`Product Family`),main="Product families consumption B2B &
B2C",col=heat.colors(4),las="1",ylab="Qty of purchases",legend.text =
c("Beef","Pork","Poultry","Mutton","Cured product","Alternative protein","Cooked
product"))

plot(df$`PO Date Month`,df$`PO Qty (KG)`,main="Quantity (KG) per Month",type =
"h",xlab="Month",ylab="KG",las="2")
plot(df$`Product Family`,df$`PO Qty (KG)`,main="Quantity (KG) per Product
Family",type = "h",xlab="Product family",ylab="KG",las="2") plot(df$`Destination
Region`,df$`PO Qty (KG)`,main="Quantity (KG) per Destination (j)",type =
"h",xlab="Destination (j)",ylab="KG",las="2")

##Type of business:
table(df$`Business Type`) 100*round(prop.table(table(df$`Business Type`)),2)
barplot(table(df$`Business Type`),main="Type of
business",col=heat.colors(4),las="1",ylab="Qty of purchases")

#Analysis of B2C orders since they are majority (75%):
dfB2C<-Phase2DataAll_B2C

#Convert "PO DATE" into date format:
str(dfB2C$`PO Date`)
class(dfB2C$`PO Date`)
dfB2C$`PO Date`<-as.Date.factor(dfB2C$`PO Date`)
class(dfB2C$`PO Date`)
summary(dfB2C$`PO Date`)
str(dfB2C$`PO Date`)

#The following variables have to be defined as "factors":##
Define the variable "PO Date Month" as a FACTOR:
dfB2C$`PO Date Month`<-factor(dfB2C$`PO Date Month`, labels=c("September
2020","October 2020","November 2020","December 2020","January 2021","February
2021","March 2021","April 2021","May 2021","June 2021"))
summary(dfB2C$`PO Date Month`)

## Define the variable "Destination Region" as a FACTOR: dfB2C$`Destination
Region`<-factor(dfB2C$`Destination Region`,labels=c("Castilla La
Mancha","Navarra","Andalusia","Aragon","Catalonia","Madrid
Community","Cantabria","Castilla y Leon","Balearics","Basque

```

```

Country", "Extremadura", "Valencian Community", "Galicia", "La
Rioja", "Murcia", "Asturias")
summary(dfB2C$`Destination Region`)

## Define the variable "Product Family" as a FACTOR:dfB2C$`Product Family`<-
factor(dfB2C$`Product
Family`, labels=c("Beef", "Pork", "Poultry", "Mutton", "Cured product", "Alternative
protein", "Cooked product"))
summary(dfB2C$`Product Family`)

## GRAPHICS:
summary(dfB2C)
mm<-mean(dfB2C$`PO Qty (KG)` ,na.rm=TRUE)
ssdd<-sd(dfB2C$`PO Qty (KG)` ,na.rm=TRUE)
mm;ssdd;ssdd/mm #show parameters --> mean= 32774.86; standard
deviaton=19431.72; coeff. of variation =ssdd/mm=0.593
Boxplot(dfB2C$`PO Qty (KG)` )
hist(dfB2C$`PO Qty (KG)` ,freq=F)
curve(dnorm(x,mm,ssdd),col="red",lwd=2,add=T)

##Purchases per month B2C:
table(dfB2C$`PO Date Month`) 100*round(prop.table(table(dfB2C$`PO Date
Month`)),10) barplot(table(dfB2C$`PO Date Month`),main="Online purchases
B2C",col=heat.colors(6),las="1",ylab="Qty of purchases")

##Destinations B2C:
table(dfB2C$`Destination Region`)
100*round(prop.table(table(dfB2C$`Destination Region`)),16)

barplot(table(dfB2C$`Destination Region`),main="Destination (j)
B2C",col=heat.colors(16),las="1",ylab="Qty of purchases",xlab="Destination (j)
B2C",legend.text = c("Andalusia", "Aragon", "Asturias", "Balearics", "Basque
Country", "Cantabria", "Castilla La Mancha", "Castilla y
Leon", "Catalonia", "Extremadura", "Galicia", "La Rioja", "Madrid
Community", "Murcia", "Navarra", "Valencian Community"))

##Product families B2C:
table(dfB2C$`Product Family`)
100*round(prop.table(table(dfB2C$`Product Family`)),7)
barplot(table(dfB2C$`Product Family`),main="Product families consumption
B2C",col=heat.colors(4),las="1",ylab="Qty of purchases",legend.text =
c("Beef", "Pork", "Poultry", "Mutton", "Cured product", "Alternative protein", "Cooked
product"))

plot(dfB2C$`PO Date Month`,dfB2C$`PO Qty (KG)` ,main="Quantity (KG) per Monthin
B2C",type = "h",xlab="date",ylab="kg",las="1")
plot(dfB2C$`Product Family`,dfB2C$`PO Qty (KG)` ,main="Quantity (KG) per Product
Family in B2C",type = "h",xlab="Product family",ylab="kg",las="1")
plot(dfB2C$`Destination Region`,dfB2C$`PO Qty (KG)` ,main="Quantity (KG) per
Destination (j) in B2C",type = "h",xlab="Destination (j)",ylab="kg",las="1")

```

