

1. Annexes

1.1. Annex A. First statistic

Brand	Model	Motor times	Cylinders	Refrigeration	Motor	CC	Traction	Gearshift	Length (mm)	Fuel (L)	Weight (kg)	Places	Price (€)
ADLY	ATV 280 S	4	1	Liq.		249		Auto + reduct	1803	10,0	210	2	4299 - 4499
ADLY	ATV 280 U	4				249		Auto + reduct	1980	10,0	210	2	4699
ADLY	ATV 320 S	4				272		Auto + reduct	1850	10,0	210	2	4899
ADLY	ATV 320 U	4				272		Auto + reduct	1980	10,0	210	2	4999
ADLY	ATV 320 U Remolque	4				272	4x4/6	Auto + reduct + larga	1980	10,2		2	6499
ADLY	ATV 50 VR	4				50			1525		103	0	2320
ADLY	ATV 520 S	4				499		manual 5 vel.	1900	10,0	230	0	7499
ADLY	BUGGY 320 S	4				272	2x4	CVT + reduct	2700		378	2	7500
ADLY	CROSS X OVER 150	4				150		Semiauto 1+2	1843		186	2	3299
ADLY	CROSS X OVER 300	4				300		Manual 5 vel.	1843		220	2	4299

ADLY	CROSS X ROAD 150	4				150		Semiauto 1+2	1730		186	2	3199
ADLY	CROSS X ROAD 300	4				300		manual 5 vel.	1685		220	0	4199
ADLY	GO KART ATK 125	4				124	2x4	Semiauto	2270		173	1	3070
ADLY	SUPERCROSS 50	2				50			1843		155	0	2849
ADLY	SUPERSONIC 50	2				50			1843		155	0	2749
AEON	COBRA 50	2			Horit.	49	F/N/R	Auto CVT	1676	5,0	129	1	2400
AEON	COBRA 220		4		Vert.			Auto	1700	9,5	175	2	3677
AEON	COBRA 320		4		Vert.	272	2 WD	Auto	1820	8,5	207	2	4597
AEON	COBRA 350							Auto M A.	0			0	4728
AEON	CROSSLAND 300	4	1			300		Auto	1940	14,5		2	4801
AEON	CROSSLAND 350							Auto	0			0	5095
AEON	CUBE 300		1		4 valv.	272		CVT	2510	25,0	360	2	8069
AEON	CUBE 350 4X4							Auto M A.	0			0	8979
AIYUMO	Sport 250	4	1		4T/1C	244		Auto	1770	11,0	192	2	
ALPINA	NORDIK 650 Auto Bas	4	2	Water		646	4x4	Manual 4 + R	2150	17,0	340	2	7758
ALPINA	NORDIK 650 Auto Luj	4	2	Water		646	4x4	Manual 4 + R	2170	17,0	340	2	7861

ALPINA	NORDIK 650 Manu Luj	4	2	Water		646	4x4	Manual 4 + R	2150	17,0	340	2	7252
ARCTIC CAT	1000 Thundercat offroad	4			SOHC 4Valv. V-Twin	950	2/4x4	Auto CVT	2154	24,6		0	13550
ARCTIC CAT	300 DVX	4			SOHC 4Val.	271	2WD	Auto CVT	1720	12,5	215	0	4795
ARCTIC CAT	400 DVC 4x4	4			DOHC 4-/ 4Val.	398	2WD	Manual 5 + R	1830	9,8	196	0	6730
ARCTIC CAT	400 HI 2x4	4			SOHC 4 Val.	367	2x4	Auto CVT	2059	15,1	273	0	4810
ARCTIC CAT	400 HI 4x4 EFT	4			SOHC 4 Val.	367	4x4	Auto CVT	2058	15,1	292	0	6450
ARCTIC CAT	500 4x4	4			SOHC 4 Val.	493	4x4	Auto CVT	2180	24,6	325	0	9535
ARCTIC CAT	500 TRV	4			SOHC 4 Val.	493	2/4x4	Auto CVT	2390	20,8	355	0	10210
ARCTIC CAT	650 TRV	4			SOHC 4 Val.	641	4x4	Auto CVT	2390	20,8	366	0	10150
ARCTIC CAT	650 Prowler XT	4			SOHC 4 Val.	641	2/4x4	Auto CVT	2970	31,0	575	0	14410
ARCTIC CAT	700 Diesel TRV EFT	4			SOHC 2 Val.	686	2/4x4	Auto CVT	2390	20,8	400	0	11840

ARCTIC CAT	700 HI EFI TRV EFT	4			DOCH 4 Val.	695	2/4x4	Auto CVT	2362	20,8	344	0	11600
AZEL	Buggy 500	4	1		CF Moto	500			2600		295	0	6790
AZEL	Buggy Infantil 110	4	1		LONCIN	125			1900		150	0	1495
AZEL	Buggy 1100				HH465Q-2E	1100		Manual 5 Vel.	2985		395	2	9995
BUGS BUGGIES	008				DOHC 3C 12V	812	Trasera	Manual 5+R	3130		549	2	10500
BUGS BUGGIES	Classic 1.100				Fiat OHC 8Val Gasolina	1100	Trasera	Manual 5+R	3000	26,0	465	2	18560
BUGS BUGGIES	Serie 250	4	1	Water		244		Auto + R	2430	12,0		2	4864
BUGS BUGGIES	Serie 500	4	1	Water		493	4x4	Auto + R	3350	16,0	398	2	9152
Bugato	Asac 400	4	1			400	Trasera	CVVT+m.a. cortas reductora	2920	16,0	395	2	7195
Bugato	Asac 500	4	1			500	Trasera	CVVT+m.a. cortas reductora	2710	15,0	395	2	8295
Bugato	Asac07-260	4	1			260	Trasera	auto m. a.	2470	9,5	355	2	5253
CAN-AM	Ds 450 Efi		1	Liq.		449	caden	manual 5 vel.	1839	11,5	156	1	8580

CAN-AM	Ds 450 Efi (ec)		1	Liq.		449	caden	manual 5 vel.	1839	11,5	156	1	9490
CAN-AM	DS 450 Efi X		1	Liq.		449	caden	manual 5 vel.	1267	11,5	156	1	9580
CAN-AM	DS 450 Efi X (ec)		1	Liq.		450	caden	manual 5 vel.	1267	11,5	156	1	10490
CAN-AM	Outlander 400 Efi 4x4	4	1	Liq.		400	4x4	CVT	2184	16,0	279	1	7490
CAN-AM	Outlander 400 Efi 4x4 Xt	4	1	Liq.		400	4x4	CVT	2184	16,0	279	1	8690
CAN-AM	Outlander 650 Efi 4x4	4	2	Liq.	Cilindres en V	650	4x4	CVT	2184	20,0	294	1	10990
CAN-AM	Outlander 650 Efi 4x4 Xt	4	2	Liq.	Cilindres en V	650	4x4	CVT	2184	20,0	298	1	12190
CAN-AM	Outlander 800 Efi 4x4	4	2	Liq.	Cilindres en V	800	4x4	CVT	2184	20,0	298	1	12490
CAN-AM	Outlander 800 Efi 4x4 Xt	4	2	Liq.	Cilindres en V	800	4x4	CVT	2184	20,0	298	1	13690
CAN-AM	Outlander Max 400 Efi	4	1	Liq.		400	4x4	CVT	2184	16,0	279	1	7490
CAN-AM	Outlander Max 400 Efi Xt	4	1	Liq.		401	4x4	CVT	2184	16,0	279	1	8690
CAN-AM	Outlander Max 650 Efi	4	2	Liq.	Cilindres en V	650	4x4	CVT	2184	20,0	298	1	10990
CAN-AM	Outlander Max 650 Efi Xt	4	2	Liq.	Cilindres en V	650	4x4	CVT	2184	20,0	298	1	12190
CAN-AM	Outlander Max 800 Efi	4	2	Liq.	Cilindres en V	800	4x4	CVT	2387	20,0	321	2	14990

CAN-AM	Outlander Max 800 Efi Ltd	4	2	Liq.	Cilindres en V	800	4x4	CVT	2387	20,0	326	2	17900
CAN-AM	Outlander Max 800 Efi Xt	4	2	Liq.	Cilindres en V	800	4x4	CVT	2387	20,0	321	2	16190
CAN-AM	Renegade 500 Efi	4	2	Liq.	Cilindres en V	500	4x4	CVT	2184	20,0	275	1	9990
CAN-AM	Renegade 800 Efi	4	2	Liq.	Cilindres en V	800	4x4	CVT	2184	20,0	275	1	13990
CAN-AM	Renegade 800 Efi X	4	2	Liq.	Cilindres en V	801	4x4	CVT	2184	20,0	275	1	14990
CARTER	GSR 150		4	Oil		150	Trasera	automatico	2261		210,92	2	2995
CARTER	GTR 250		4		SYM 20HP	250		CVT	2286	15,1	294,84	2	5395
CARTER	Mini Talon				ecumseh 3.5 HP				1524		79,38	2	1999
CLIPIC	Mini Buggy 39	4	1			39		auto	1550	6,0	83	0	849
CLIPIC	Mini Rex 50	2	1			50		auto	1250	2,2	74	1	786
CSR	ATV 500	4				493	4x4	manu/auto	2316	15,0	326	0	6100
CSR	Scartt 500 2x4	4				500		auto	2480	15,0	380	0	8700
CSR	Scartt 500 4x4	4				500	4x4	auto	2480	15,0	380	0	8600
DAELIM	ET 300		1	Liq.	1C/Refr. Liq.	287		Auto	1830	12,0	217	0	3795
DORTON	Saffary 50	4	1	Air		49		CVT	1520	3,0	78	2	1290

DORTON	Saffary 150	4	1	Air	150		CVT	2320	7,0	258	2	3145
DORTON	Saffary 260	4	1	Liq.	257		CVT	2420	9,5	355	2	4799
DERBI	DFW 50	2	1		49	trase	auto: 2 vel + R	1475	5,0	115	0	
DERBI	DXR 250	4	2		234	trase	5 vel+ R	1640	8,0	173	0	
Factory bike	Mini Helix 50	2	1		49		CVA	1260	2,2	74	1	1450
Factory bike	Helix 50	2	1		49			1450	5,2	102	2	2436
Factory bike	Helix 100	2	1		99			1450	5,2	108	2	2560
Factory bike	Helix 150	4	1		149			1450	5,2	108	2	3040
Factory bike	Rex 50	2	1		49			1400	5,2	102	2	2117
Factory bike	Shark 50	2	1		49		auto	1476	5,2	108	2	2436
Factory bike	Shark 150	4	1		149		auto+R	1476	5,2	108	2	3040
Factory bike	Tornado 50	2	1		49			1476	5,2	97	2	2436

Factory bike	Tornado 100	2	1			99			1476	5,2	108	2	2560
GAS GAS	Wild 450	4	1			449		6 vel	0	12,0		0	7299
Gilera	Oregon	4	1		Quasar	244		CVT, variador auto + R	1795	12,0	206	2	5499
HONDA	TRX 250 EX	4	1			229	Eje D	5 vel	1739	163,3	163,3	0	5359
HONDA	TRX 250 TE	4	1			229	Eje D	5 vel + R	1905	9,1	190	0	6029
HONDA	TRX 350 TE	4	1	Air		329	2x4	5 vel + R	2031	13,9	232	0	7049
HONDA	TRX 400 FA	4	1	Air		397	4x4	auto	2031	14,4	254	0	
HONDA	TRX 400 EX	4	1		RFCV	397	Trans	5 vel + R	1835	10,0	175	0	7269
HONDA	TRX 450 R	4	1	Liq.		450		5 vel	1841	12,0	168	0	9019
HONDA	TRX 450 ER	4	1		4 Valv.	450	cadena	5 vel	1841	12,0	168	0	9529
HONDA	TRX 500 FA	4	1		OHV	475	trans	5 vel + R	2109	15,8	270	0	10429
HONDA	TRX 500 FE	4	1		OHV	475	trans	5 vel + R	2109	15,8	271	0	9299
HONDA	TRX 680 FA	4	1		OHV	675	trans	auto	2113	17,0	277	0	10769
HYOSUNG	Rapier 450		1	Water		449		5vel. + R	1835	11,0	172	0	5499
Kawasaki	KFX 450 R					449	trase	5 vel + R	0			0	8349

Kawasaki	KFX 700	4	2	Liq.	V-Twin a 90º	697	2WD	CVT + R	1985	12,0	234	0	9049
Kawasaki	KVF 360 2x4	4	1	Air		362	cadena	auto CVT + Reduc	2065	13,5	500	0	6649
Kawasaki	KVF 360 4x4	4	1	Air		363	cadena	auto CVT + Reduc	2065	13,5	274,5	0	7549
Kawasaki	KVF 650 4x4	4	2	Liq.	V-Twin a 90º	633	cadena	auto CVT + Reduc	2185	18,0	273	0	7999
Kawasaki	KVF 750 4x4	4	2	Liq.	V-Twin a 90º	749	Tracc	CVT de rango dual + R	2195	19,0	275	0	9499
Kenrod	Walker	4	1	Water		250			1970	7,5	268	0	3599
Keeway	ATV 50	2	1	Air		50			1403	4,5	125	0	1799
Keeway	Dragon 250	4	1	Air		248		auto	1950	9,3	238	0	3579
Metrakit	Quark 50	2			Horitz	49		auto	1140	5,0	110	0	
MINELLI	Hercules 250	4				250			2485			0	3499
MINELLI	Hercules 650	4				650			2485			0	4999
Monkey Bikes	Mini ATV 70	4		Air		49		1 vel	1160		60	0	
Spin Buggy	Spin 260	4	1	Water		257	Trasera		2690	9,5	357	2	4390

Spin Buggy	Spin 650	4	2	Water		644		Manual 4 + R	2560	25,0	388	2	6990
Suzuki	Eiger 400	4	1	Air		376		auto	2235	15,0	269	0	
Suzuki	Kingquad 450	4	1		4 Valv.	454		auto var.	2115	17,5	273	0	7799
Suzuki	Kingquad 450 Lim. Ed.		1	Liq.		454		var	2115	17,5	273	0	7999
Suzuki	Kingquad 700	4	1	Water		695		auto var.	2115	17,5	273	0	9499
Suzuki	Kingquad 750		1	Liq.		722		var	2115	17,5	273	0	9699
Suzuki	Kingquad 750 Lim. Ed.		1	Liq.		722		var	2115	17,5		0	9899
Suzuki	LT-F-160	4	1	Air	SOHC	158	auto	5 vel + R	1070	8,5	162	0	2999
Suzuki	LT-R-450	4	1	Liq.	DOHC	450	cadena	5 vel	1845	10,0	167	0	7999
Suzuki	LT-R-450-z	4	1	Liq.	DOHC	450	cadena	5 vel	1845	10,0	167	0	8149
Suzuki	LT-Z-250	4	1	Air	SOHC	246	arbol	5vel. + R	1720	10,6	166	0	499
Suzuki	LT-Z-50	4	1	Liq.	DOHC	398	cadena	5vel. + R	1830	10,0	169	0	6999
Suzuki	LT-Z-400	4	1	Liq.	DOHC	398	cadena	5vel. + R	1830	10,0	169	0	7149
Suzuki	LT-Z-400-z	4	1	Air		49		auto con variador	1270	2,6	75	0	1799
Suzuki	Ozark 250	4	1	Air	SOHC	246	arbol	5 vel toma const.	1870	10,6	188	0	4699

Yamaha	Big Bear 250	4	1	Air	229,6			1916	12	207	0	5100
Yamaha	Grizzly 125	4	1	Air	124	auto tipo V F/N/R		1700	7	139	0	4000
Yamaha	Grizzly 350 2ws	4	1	Air	348			1984	13,5	230	0	6200
Yamaha	Grizzly 350 4wd	4	1	Air	348			1984	13,5	243	0	7100
Yamaha	Grizzly 450	4	1	Liq.	421			1995	15	268	0	8100
Yamaha	Grizzly 700	4	1	Liq.	686			2065	20	274	0	10400
Yamaha	Wolverine 350	4	1		349			1978	14,5	217	0	5500
Yamaha	Wolverine 450	4			421			1978	14,5	234	0	7000
Yamaha	YFM 250 R	4	1	Air	249			1625	9	142	0	4850
Yamaha	TFM 350 R	4	1	Air	349			1780	9	170	0	5750
Yamaha	YFM 700 R	4	1	Liq.	686			1845	11	180	0	9100
Yamaha	YFM 80	4	1	Air	79			1537	6,8	110	0	2800
Yamaha	YFZ 450	4	1	Liq.	449			1840	10	159	0	9100

1.1. Annex B – Second statistic study

Brand	Model	Category	Strokes	Cylinders	Refrigeration	Displacement (cc)	Transmission	Wheel Drive	Fuel Capacity (L)	Overall Length (mm)	Price (€)
Kawasaki	Brute Force 300	Utility	4	Single	Air	271	2-Speed automatic + R	2	12,1	1915	3919
Kawasaki	Brute Force 750 4x4i	Utility	4	V-twin	Liquid	749	2-Speed automatic + R	4	18,9	2195	8203
Kawasaki	Brute Force 750 4x4i EPS	Utility	4	V-twin	Liquid	749	2-Speed automatic + R	4	18,9	2195	9114
Kawasaki	Brute Force 750 4x4i EPS Camo	Utility	4	V-twin	Liquid	749	2-Speed automatic + R	4	18,9	2195	9661
Kawasaki	KFX 50	Kid	4	Single	Air	50	CVA	2	5,7	1400	1822
Kawasaki	KFX 90	Kid	4	Single	Forced Air	89	CVA	2	5,7	1425	2369
Yamaha	Grizzly 350 2WD	Utility	4	Single	Air	348	Correa Trapezoidal	2	13,5	1984	6200
Yamaha	Grizzly 450 IRS	Utility	4	Single	Liquid	421	Correa Trapezoidal	4	15,0	1993	8100
Yamaha	Grizzly 700 EPS / SE	Utility	4	Single	Liquid	708	Auto CVT	4	18,0	2070	9269
Yamaha	Kodiak 700 / EPS / SE	Utility	4	Single	Liquid	708	Auto CVT	4	18,0	2070	8099
Yamaha	YFM700R SE	Sport	4	Single	Liquid	686	5-Speed + R	2	11,0	1845	7559
Yamaha	YFZ450R / SE	Sport	4	Single	Liquid	449	5-Speed	2	10,0	1795	8369
Yamaha	YFM90R	Kid	4	Single	Air	88	Auto CVT	2	4,8	1490	2609

Yamaha	YFZ50	Kid	4	Single	Air	49	Correa Trapezoidal	2	5,8	1250	1889
Suzuki	Ozark 250	Utility	4	Single	Air	245	5-Speed + R	2	9,8	1800	4699
Suzuki	Kingquad 750AXi	Utility	4	Single	Liquid	722	CVT + R	4	17,5	2115	7739
Suzuki	KingQuad 500AXi	Utility	4	Single	Liquid	493	CVT + R	4	17,5	2115	6659
Suzuki	KingQuad 400ASi	Utility	4	Single	Air	376	Atomatic + R	4	16,0	2060	5849
Suzuki	QuadSport Z400	Sport	4	Single	Liquid	376	5-Speed + R	2	9,1	1830	6434
Suzuki	QuadSport Z90	Kid	4	Single	Air	90	Automatic	2	6,0	1505	3149
Suzuki	QuadSport Z50	Kid	4	Single	Air	49	Automatic	2	2,6	1270	1799
Honda	FourTrax Rincon	Utility	4	Single	Liquid	675	3-Speed Auto + R	4	16,7	2113	8369
Honda	FourTrax Foreman Rubicon	Utility	4	Single	Liquid	475	5-Speed Auto + R	4	14,8	2146	7649
Honda	FourTrax Foreman	Utility	4	Single	Liquid	475	5-Speed Auto + R	4	14,8	2103	6479
Honda	FourTrax Rancher	Utility	4	Single	Liquid	420	5-Speed Auto + R	4	14,8	2103	4769
Honda	FourTrax Recon	Utility	4	Single	Air	229	5-Speed Auto + R	2	9,1	1905	4769
Honda	TRX450R	Sport	4	Single	Liquid	450	5-Speed Auto	2	10,2	1862	7019
Honda	TRX400X	Sport	4	Single	Air	397	5-Speed Auto + R	2	9,8	1816	5759
Honda	TRX250X	Sport	4	Single	Air	229	5-Speed Auto + R	2	9,5	1740	4049

Honda	TRX90X	Kid	4	Single	Air	86	4-Speed	2	6,4	1488	2699
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CATEGORI	FUEL (L)		TOTAL LENGHT (M)		PRIZE (€)	
	Average	St. Des.	Average	St. Des	Average	St. Des.
KID	5,284	1,281	1404	105,6	2334	520
SPORT	9,938	0,655	1814,6	43,3	6532	1513
UTILTY	15,547	3,041	2063,3	111	7032	1776

1.2. Annex C – $K_t = K_e$

From the two equations of an electric motor can be deduced that $K_t = K_e$.

$$V = K_e \times \omega_{rotor} + I_{motor} \times R$$

$$\Gamma_{motor} = K_t \times I_{motor}$$

Multiplying the first equation by the intensity:

$$V \times I = R \times I_{motor}^2 + K_e \times I_{motor} \times \omega_{rotor}$$

This equation contains the same terms that:

$$P_{elec} = P_{calorific} + P_{mechanical}$$

And it is known that:

$$P_{mechanical} = \Gamma_{motor} \times \omega_{rotor}$$

Finally:

$$K_t \times I_{motor} \times \omega_{rotor} = K_e \times I_{motor} \times \omega_{rotor}$$

$$\mathbf{K_t = K_e}$$