



2024 World Classifiers Workshop – Cremona (ITA)

WHFF Survey on phenotypic correlations between linear traits within complex

on behalf of:
Working Group ‘Type Trait Harmonization

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survey

- ▶ Countries were asked to provide phenotypic correlations between linear traits for Holstein 1st lactation cows scored in 2023
- ▶ 23 countries provided phenotypic correlations 2023
 - 22 out of 24 countries participating in MACE conformation trait 04-2024 (missing AUS, KOR)
 - plus Slovakia

BEL	Belgium
CAN	Canada
CHE	Switzerland
CZE	Czech Republic
DEU	Germany
DFS	Denmark/Finland/Sweden
ESP	Spain
EST	Estonia

FRA	France
GBR	Great Britain
HUN	Hungary
IRL	Ireland
ITA	Italy
JPN	Japan
LVA	Latvia
NLD	Netherlands

NZL	New Zealand
POL	Poland
PRT	Portugal
SVK	Slovakia
SVN	Slovenia
USA	United States
ZAF	South Africa

Interpreting the correlations

- ▶ The phenotypic correlation indicates whether changes in one trait are systematically associated with changes in a second trait
- ▶ The value (-1.0 to +1.0) indicates how strong the association is
 - -1.0 or +1.0 means if one trait changes in value the other trait does it always too i.e. both traits are the same, may be just on a different scale
- ▶ Different correlations between countries don't tell
 - what trait is the source/reason (1st, 2nd, both traits)
 - who is 'right'

▶ Correlations between body traits inkl. Angularity and BCS

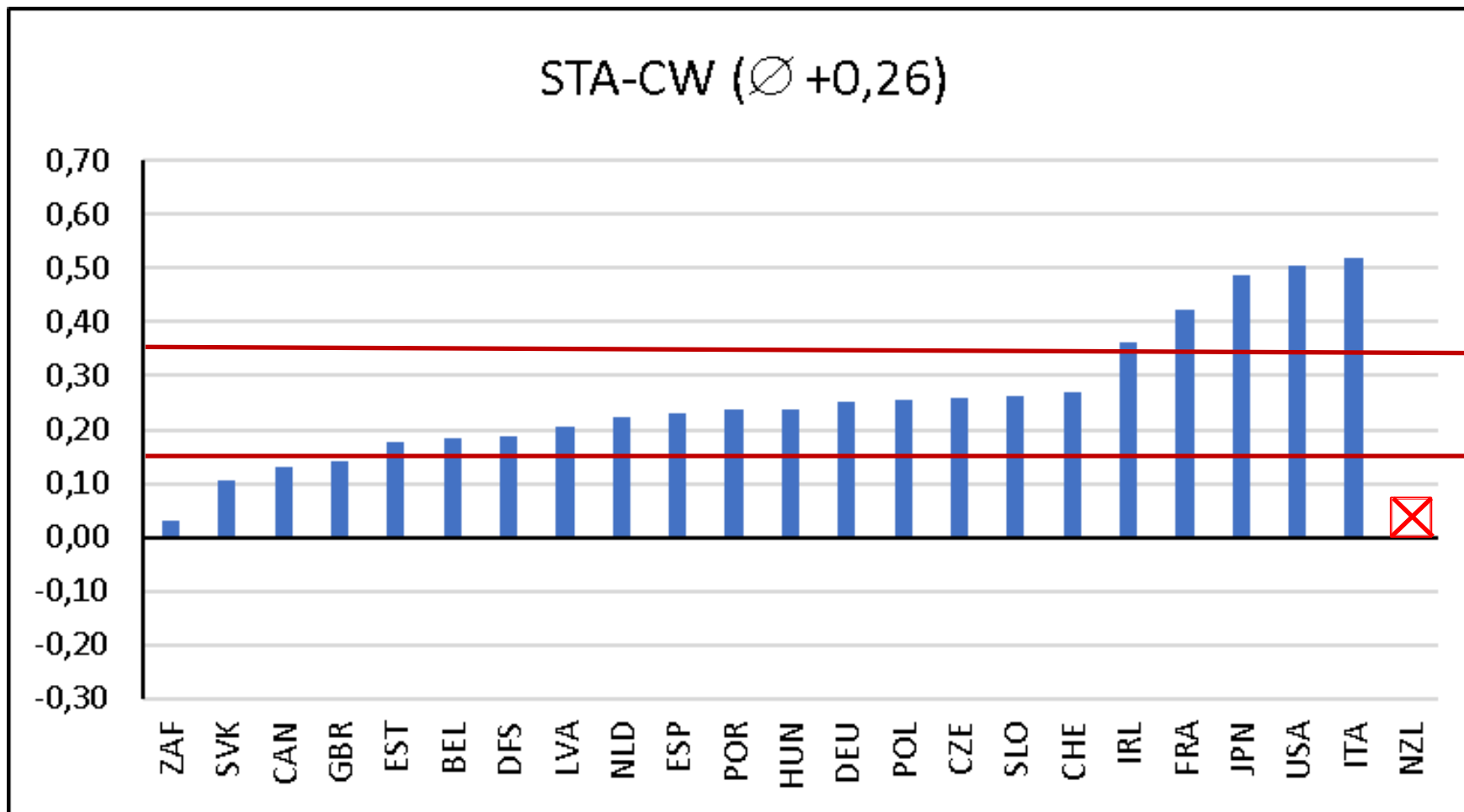
In all graphs the Y-axis has the same range covering 1.0:

-0.5 to +0.5 or

-0.3 to +0,7 or

-0.7 to +0.3

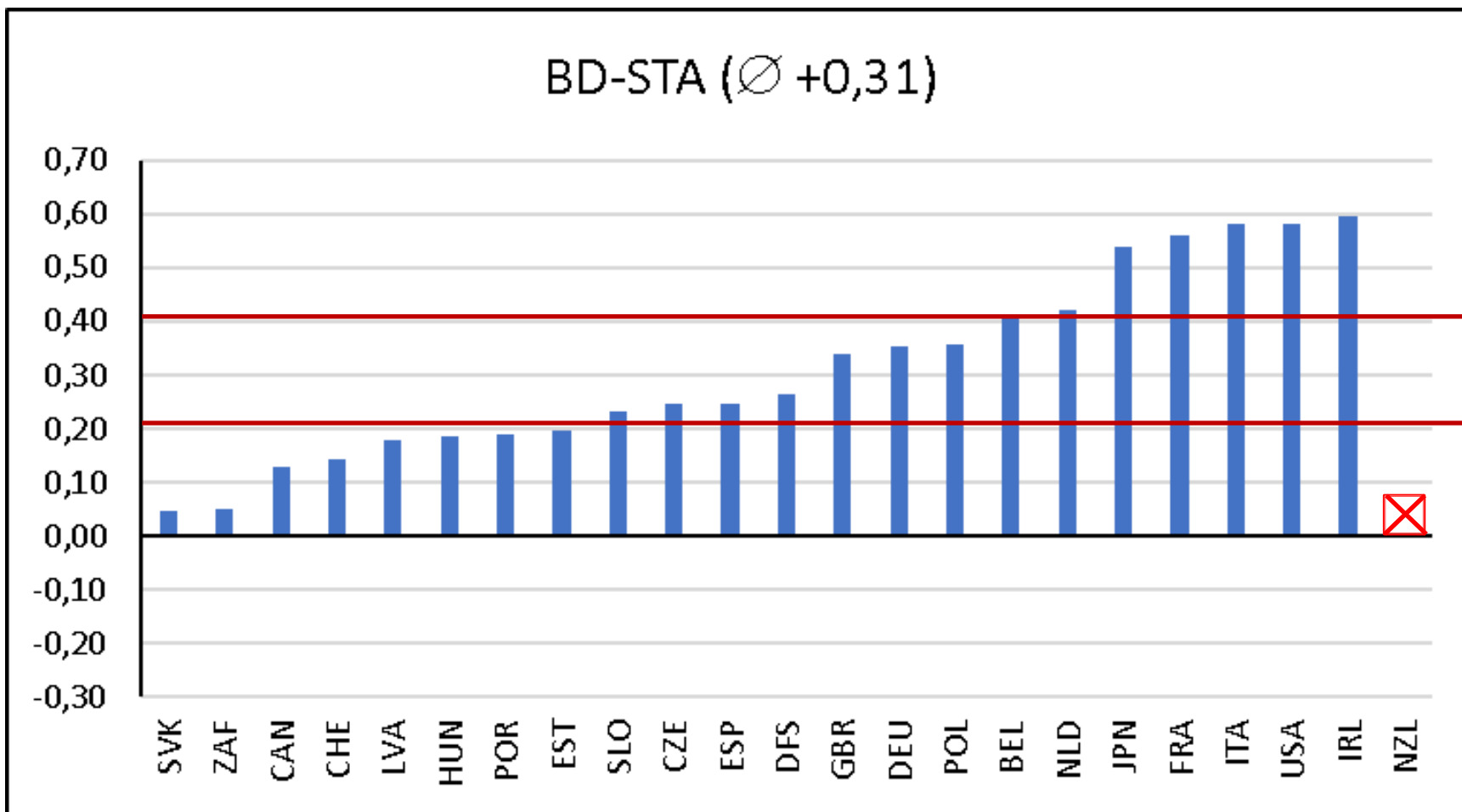
Stature ↔ Chest Width



$\emptyset \pm .10$

NZL: no RS, CW, BD
 ZAF: no RS, BCS
 LVA: no BCS

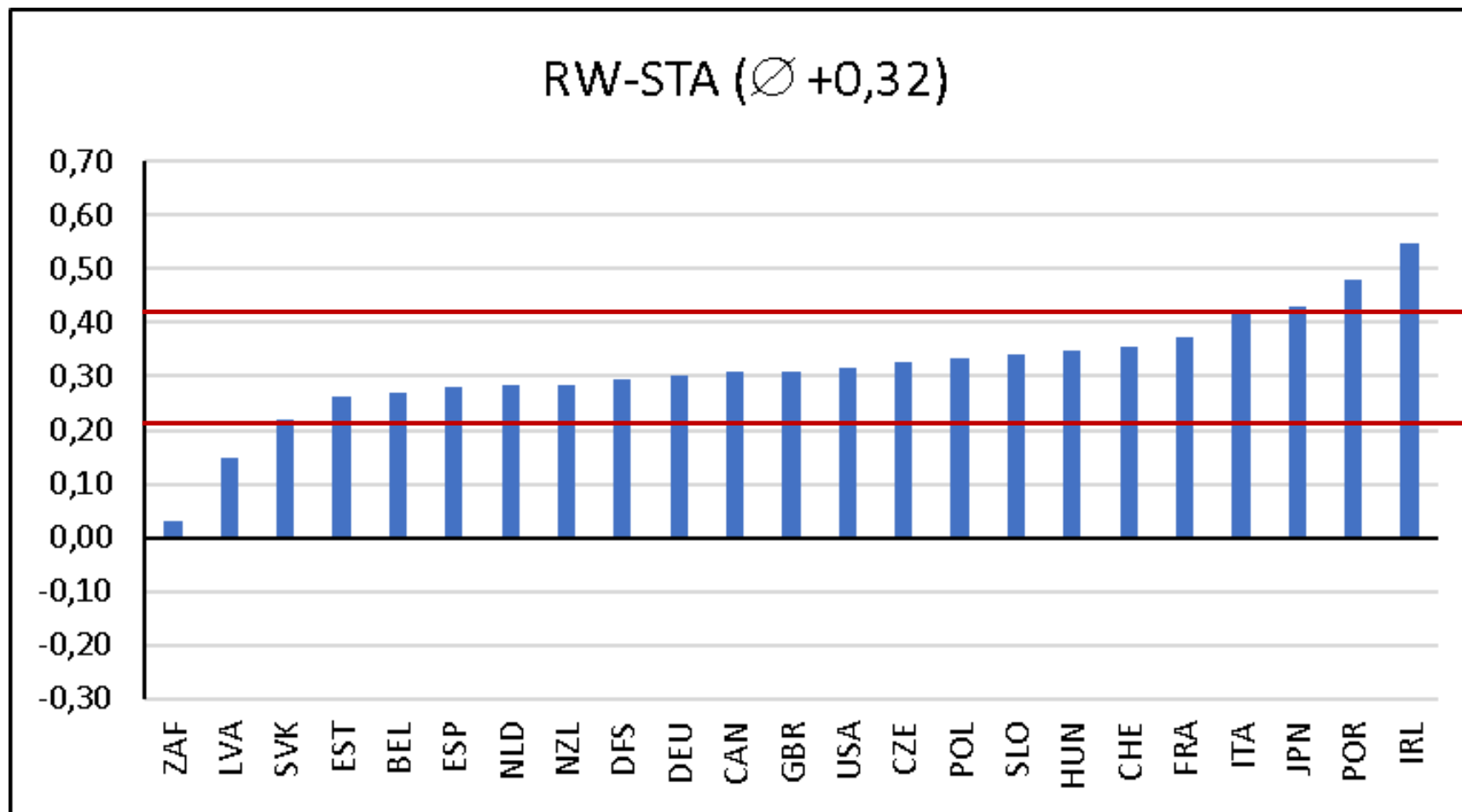
Stature ↔ Body Depth



\emptyset ±.10

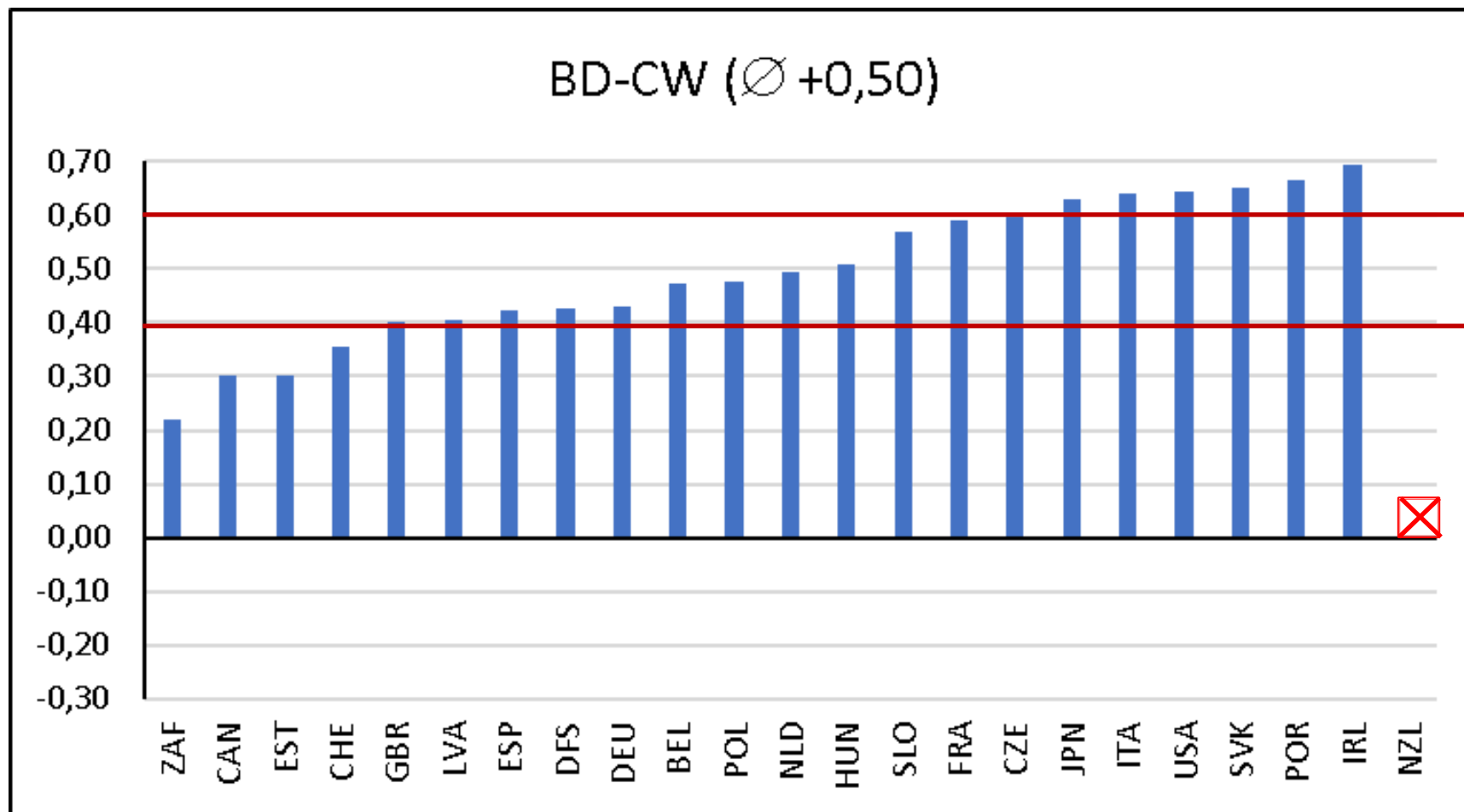
NZL: no RS, CW, BD
 ZAF: no RS, BCS
 LVA: no BCS

Stature ↔ Rump Width



$\emptyset \pm .10$

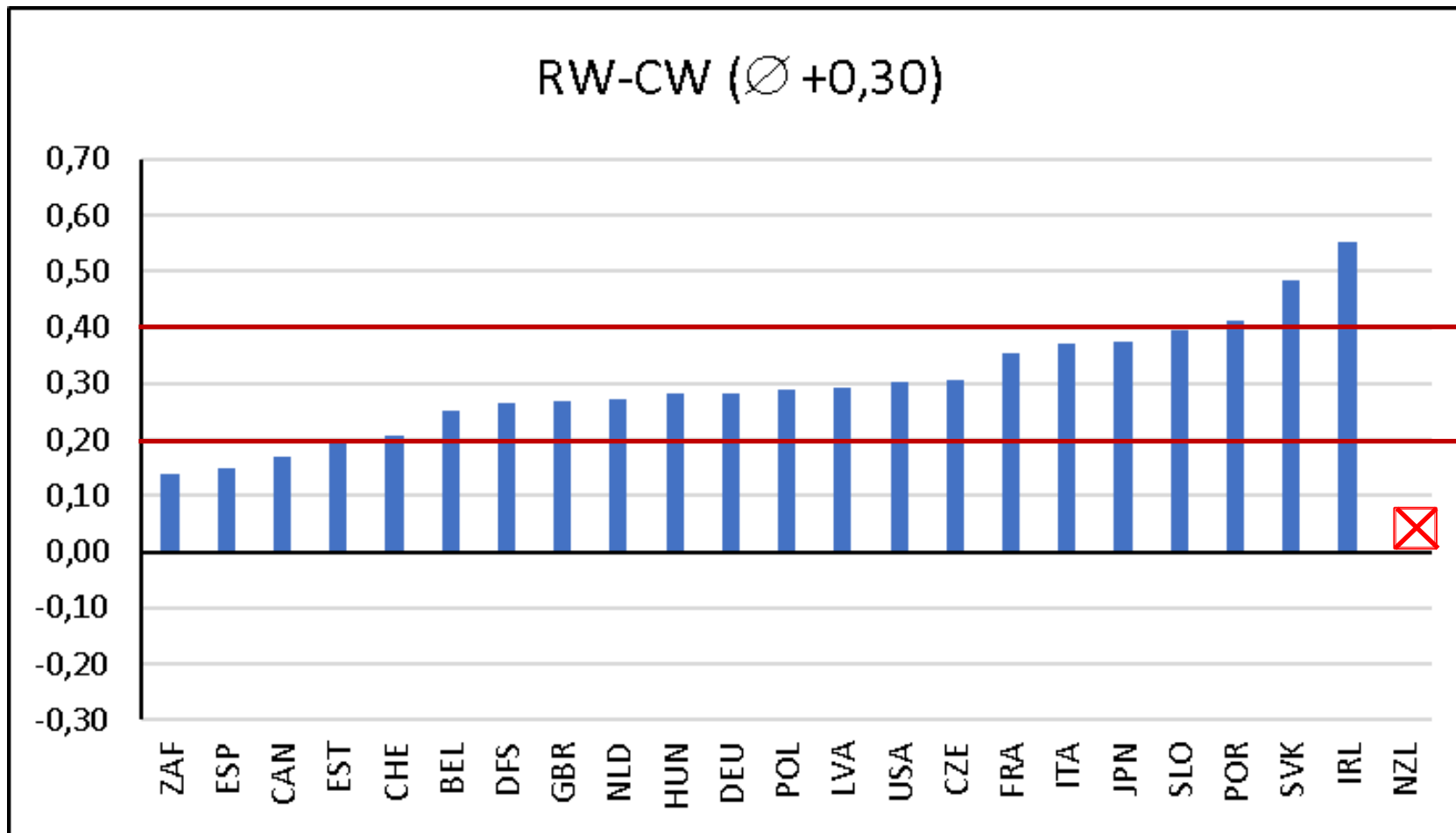
Chest Width ↔ Body Depth



$\emptyset \pm .10$

NZL: no RS, CW, BD
 ZAF: no RS, BCS
 LVA: no BCS

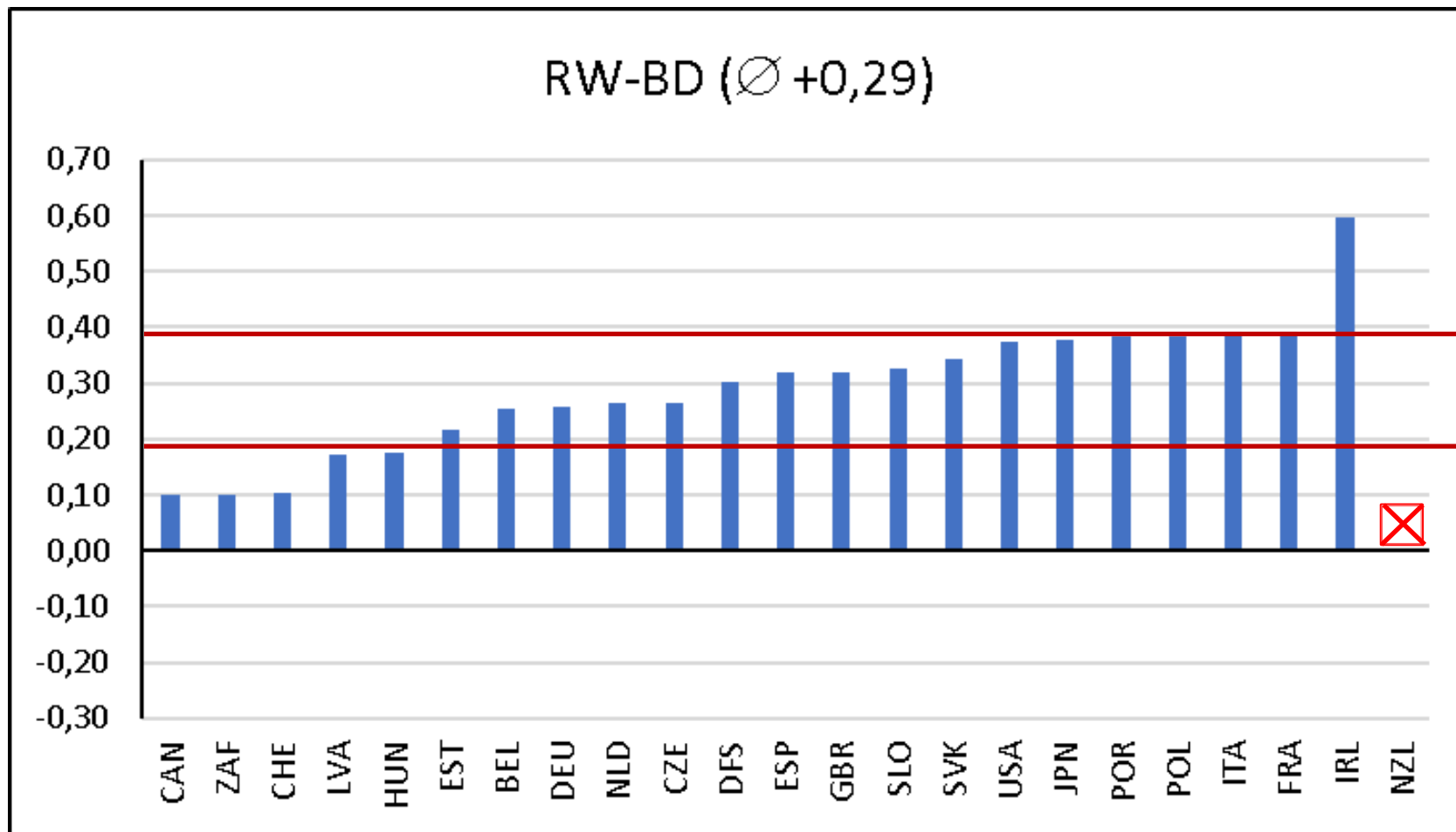
Chest Width ↔ Rump Width



∅ ± .10

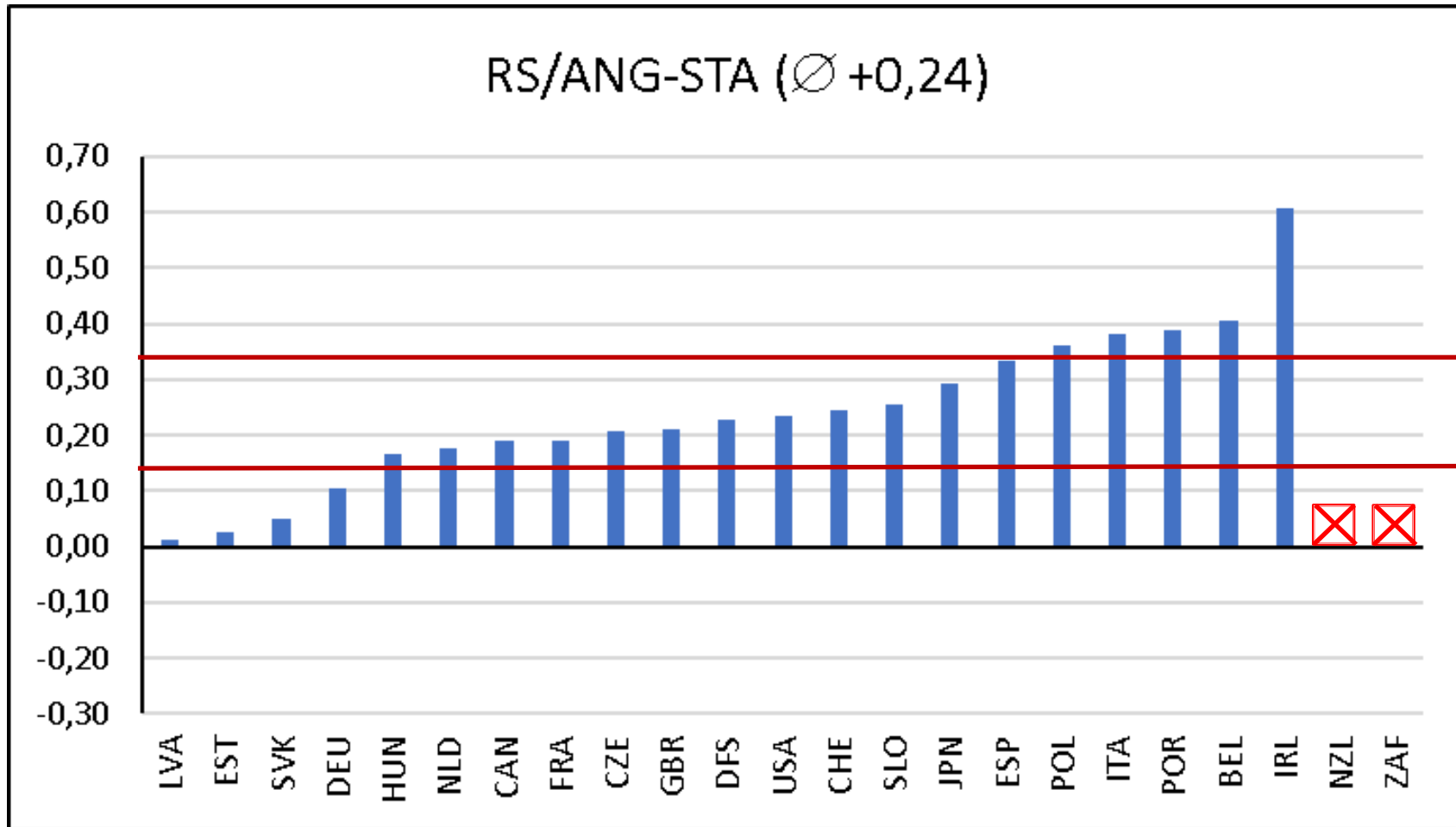
NZL: no RS, CW, BD
 ZAF: no RS, BCS
 LVA: no BCS

Body Depth ↔ Rump Width



NZL: no RS, CW, BD
 ZAF: no RS, BCS
 LVA: no BCS

Stature ↔ Ribstructure/Angularity

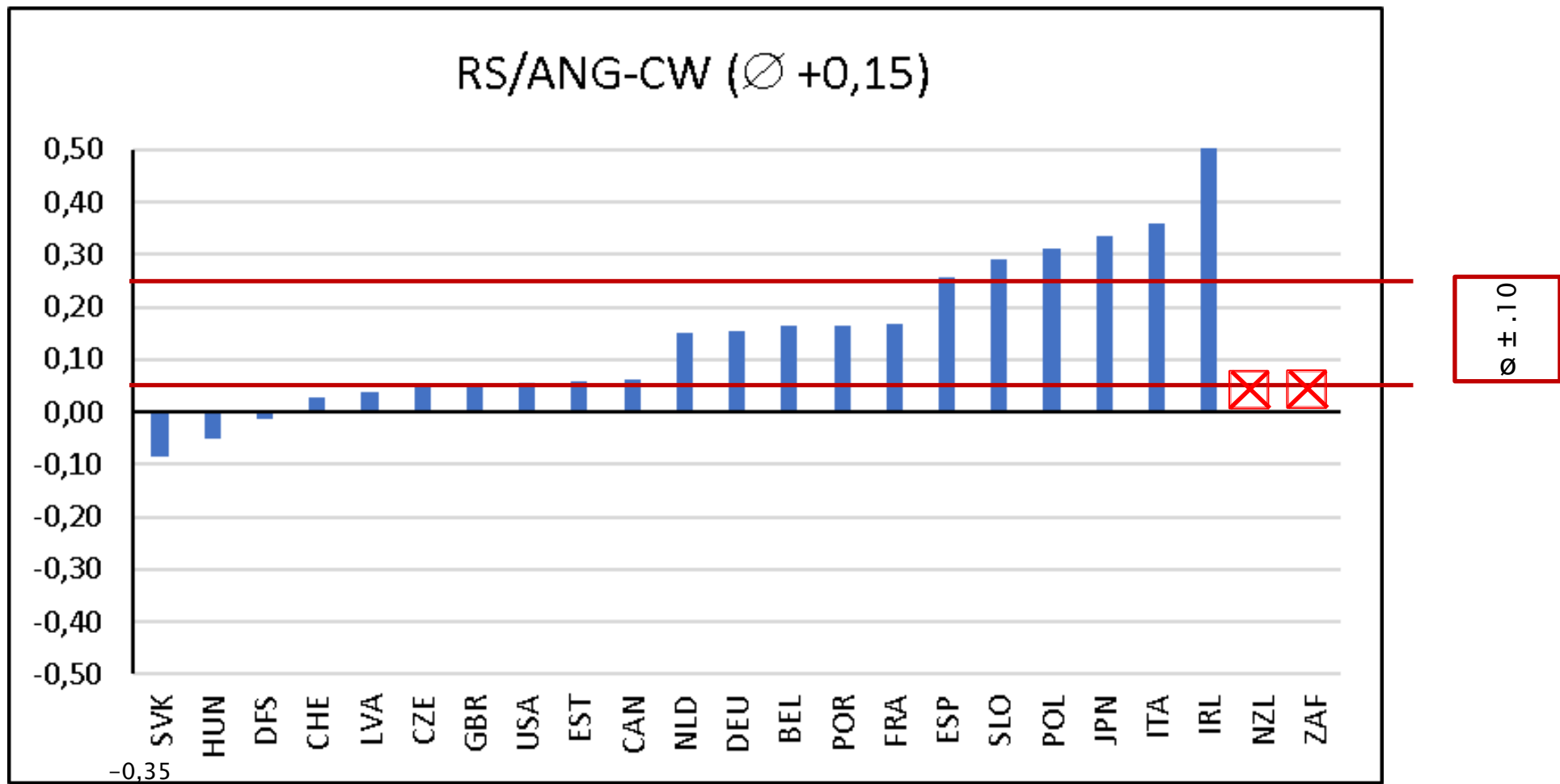


$\emptyset \pm .10$

NZL: no RS, CW, BD
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LVA: no BCS

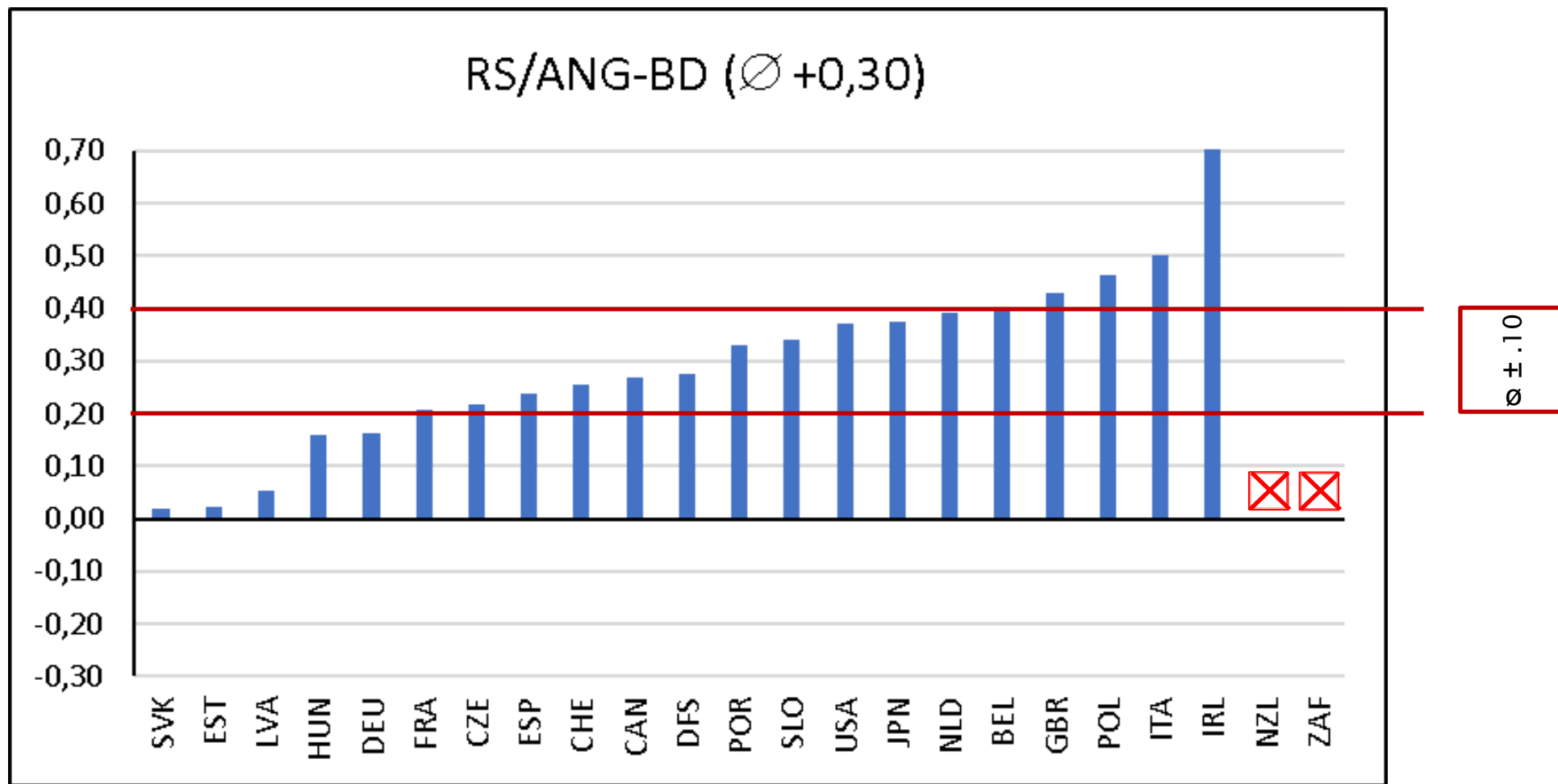


Chest Width ↔ Ribstructure/Angularity



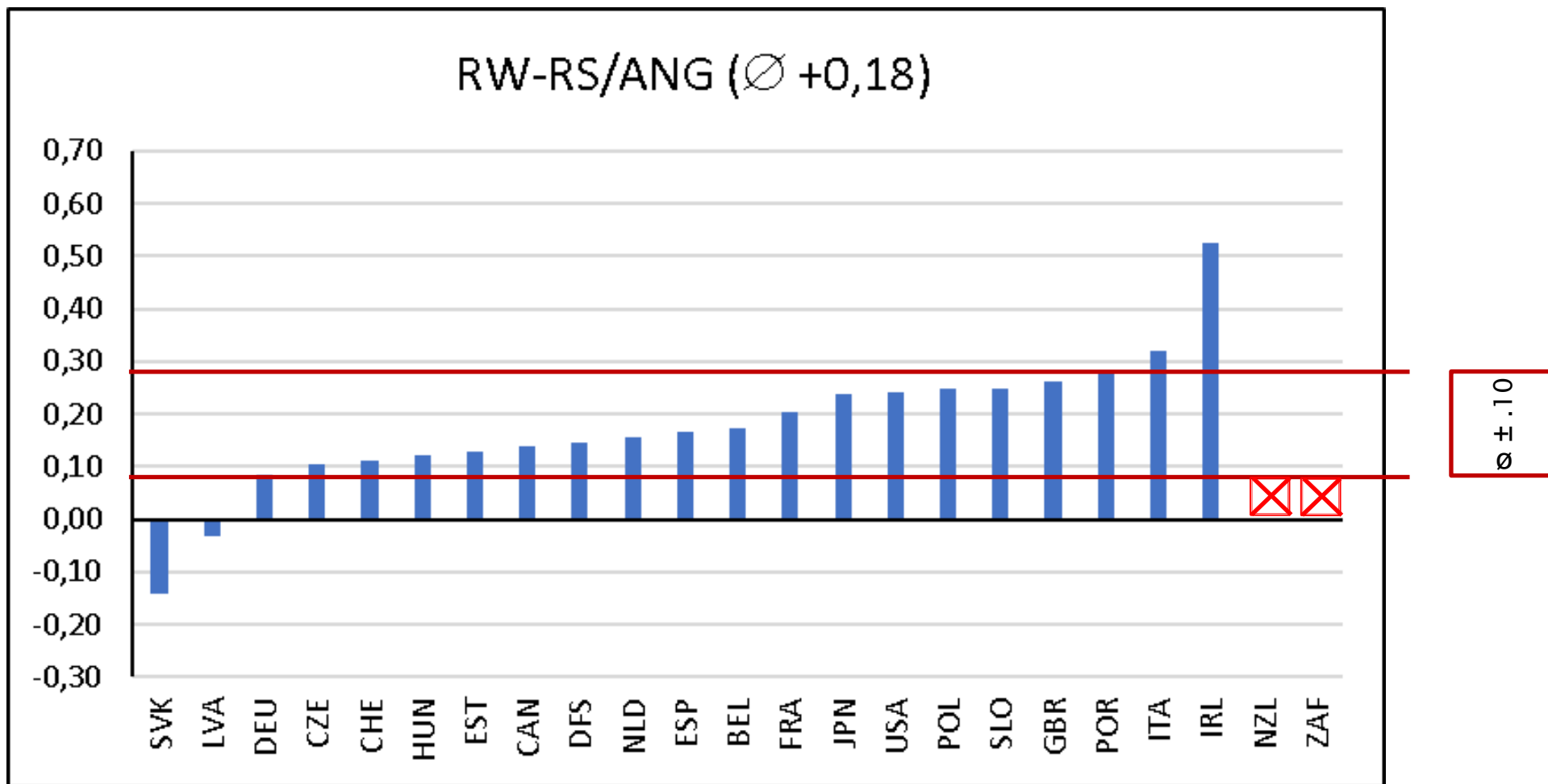
NZL: no RS, CW, BD
 ZAF: no RS, BCS
 LVA: no BCS

Body Depth ↔ Ribstructure/Angularity



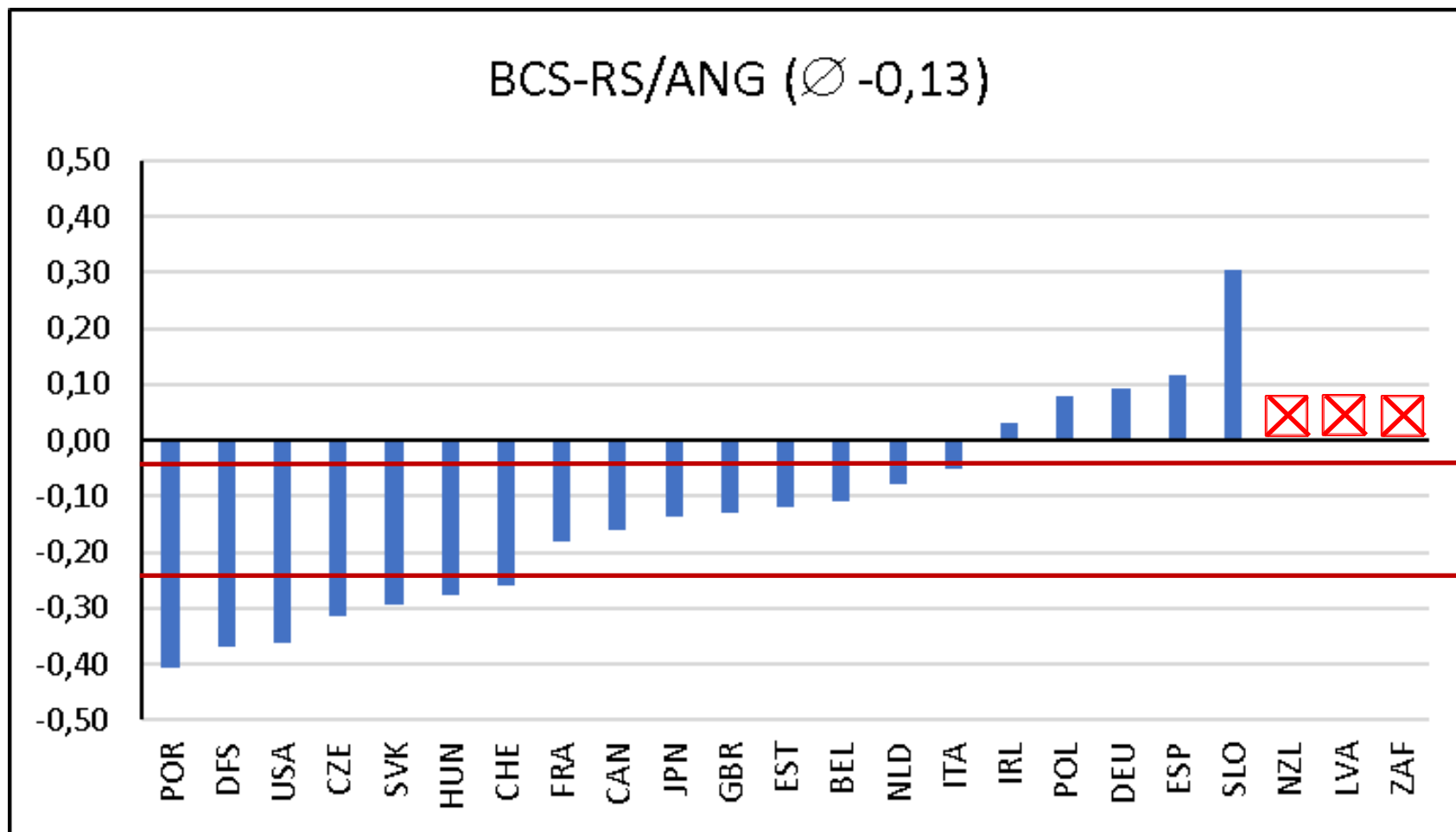
NZL: no RS, CW, BD
 ZAF: no RS, BCS
 LVA: no BCS

Ribstructure/Angularity ↔ Rump Width



NZL: no RS, CW, BD
 ZAF: no RS, BCS
 LVA: no BCS

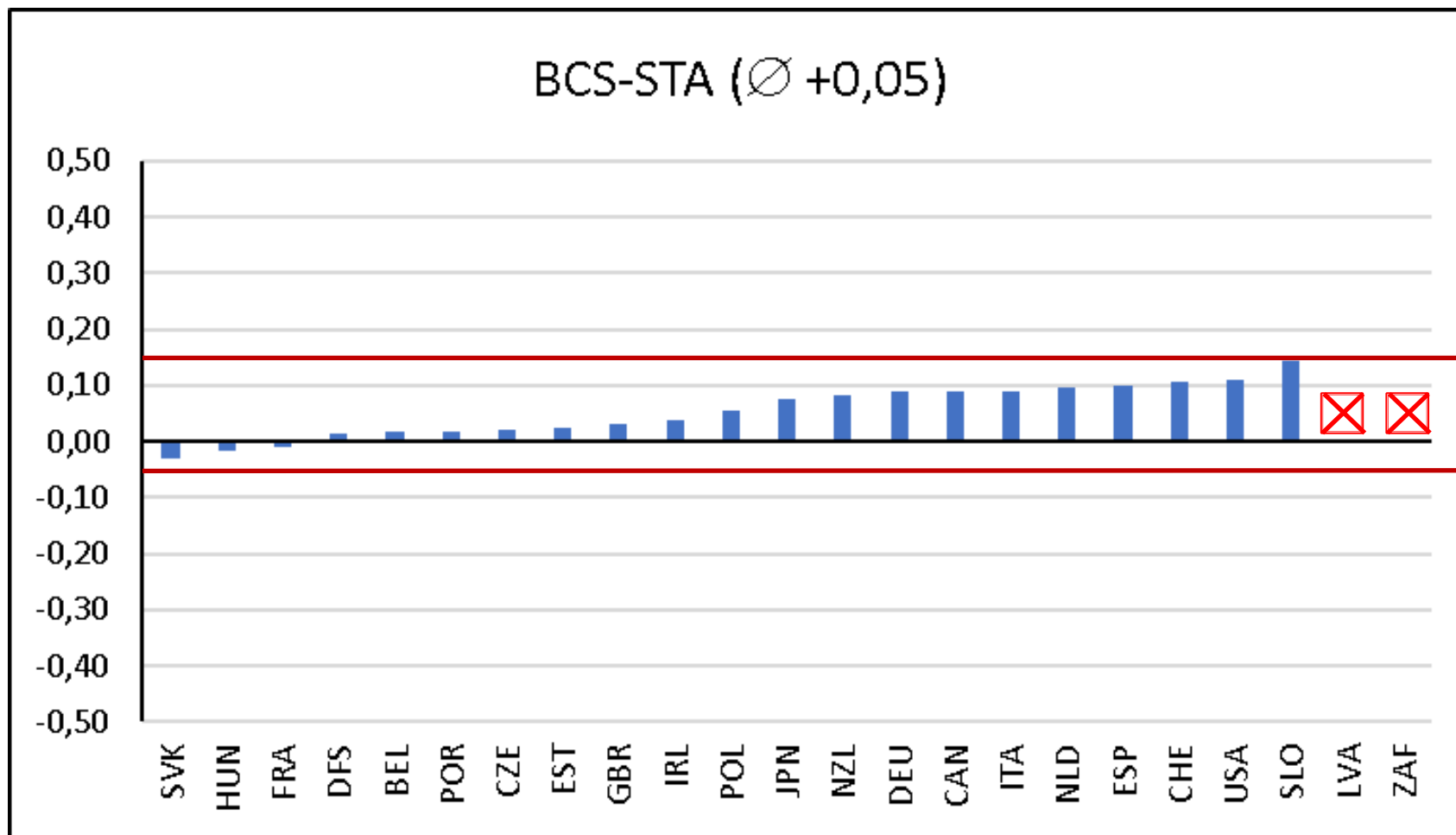
Ribstructure/Angularity ↔ BCS



Ø ± .10

NZL: no RS, CW, BD
 ZAF: no RS, BCS
 LVA: no BCS

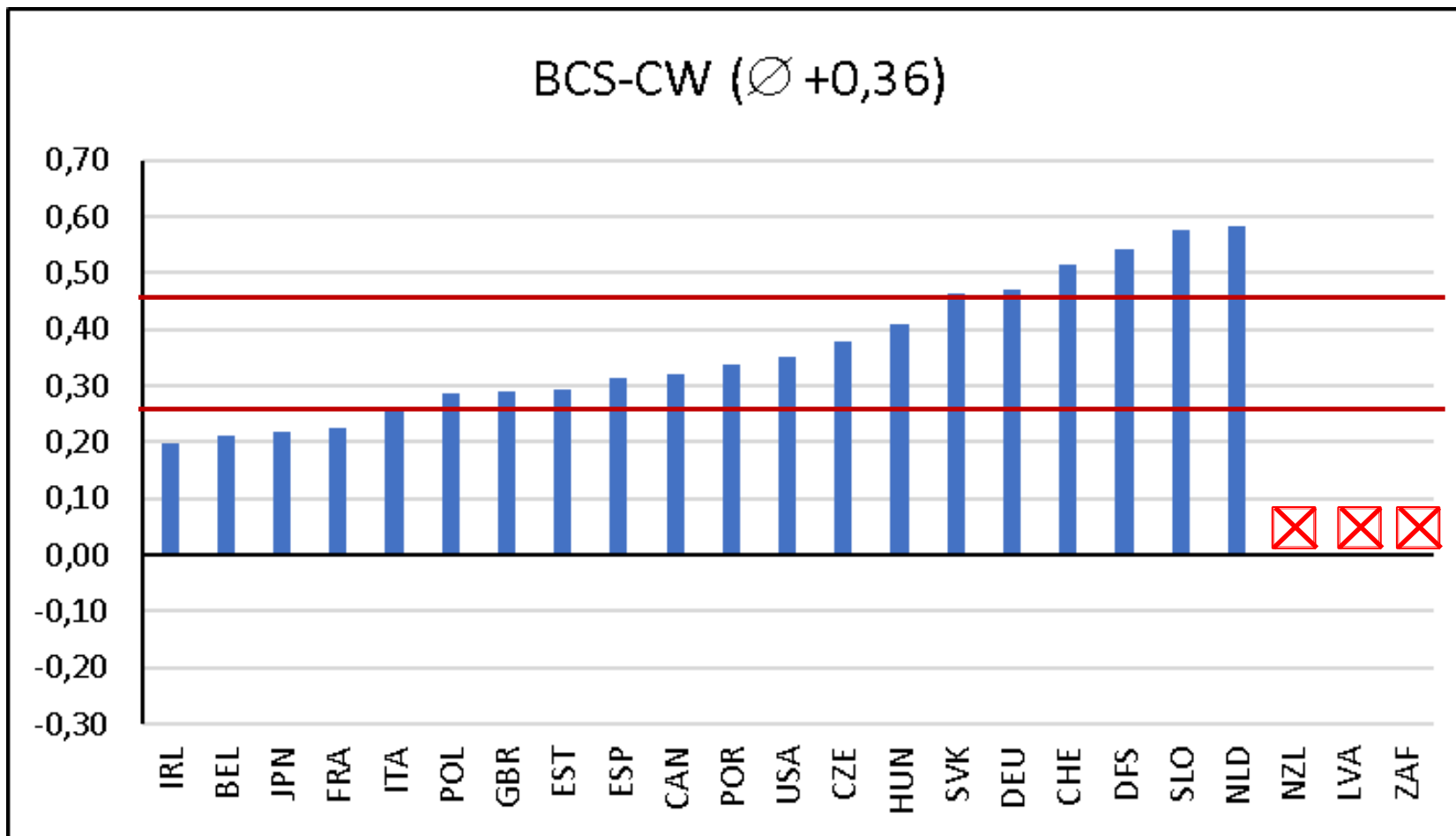
Stature ↔ BCS



∅ ± .10

NZL: no RS, CW, BD
 ZAF: no RS, BCS
 LVA: no BCS

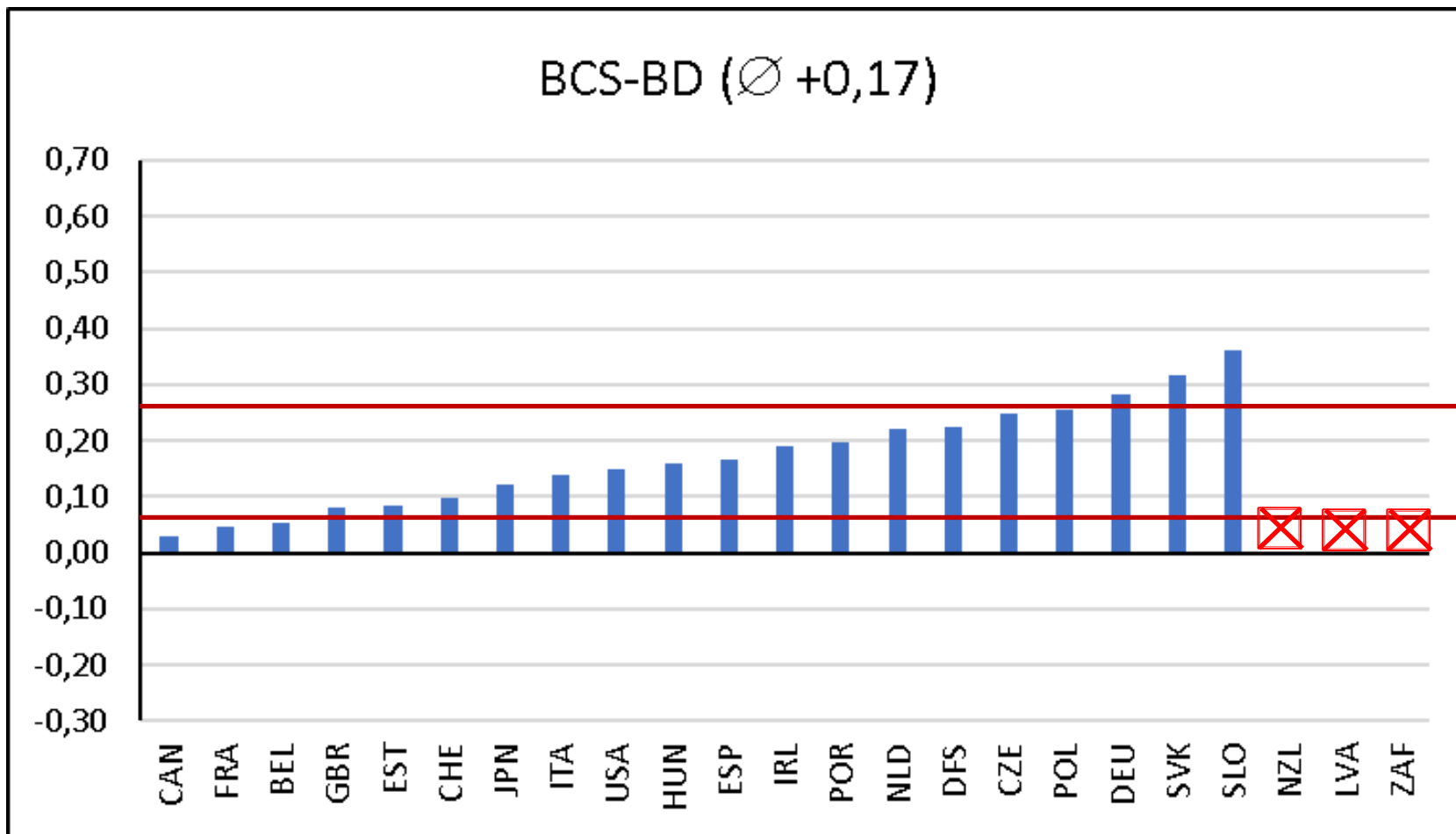
Chest Width ↔ BCS



$\bar{\sigma} \pm .10$

NZL: no RS, CW, BD
 ZAF: no RS, BCS
 LVA: no BCS

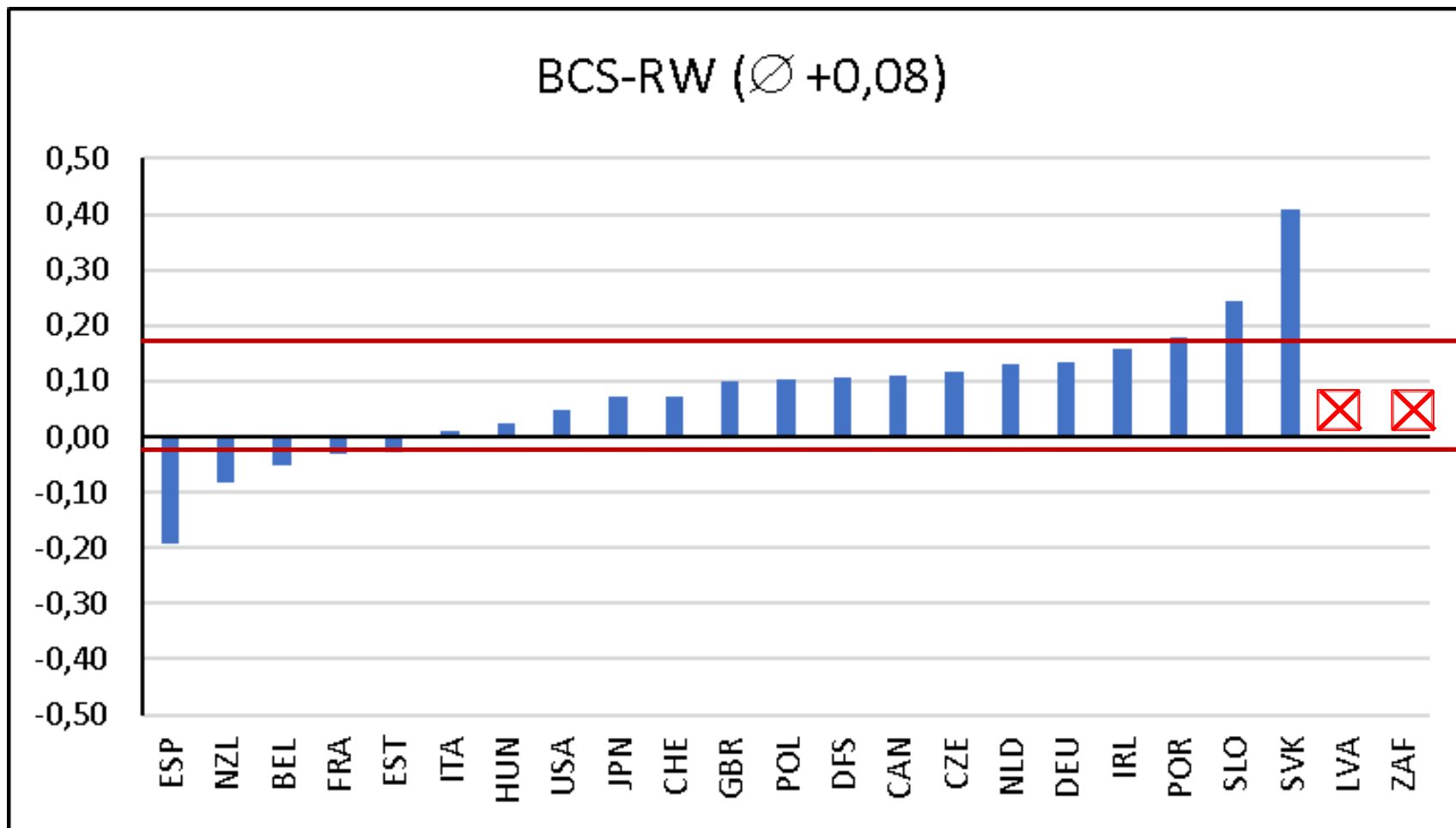
Body Depth ↔ BCS



$\emptyset \pm .10$

NZL: no RS, CW, BD
 ZAF: no RS, BCS
 LVA: no BCS

Rump Width ↔ BCS



$\bar{} \pm .10$

NZL: no RS, CW, BD
 ZAF: no RS, BCS
 LVA: no BCS

Results body traits

▶ Average phenotypic correlations

av. correlation body traits	ST	CW	BD	Ang	RA	RW	BCS
Stature (ST)	1,00	0,26	0,31	0,24	0,12	0,32	0,05
Chest Width (CW)		1,00	0,50	0,15	0,02	0,30	0,36
Body Depth (BD)			1,00	0,30	-0,02	0,29	0,17
Angularity (Ang)				1,00	0,02	0,18	-0,13
Rump Angle (RA)					1,00	0,05	0,00
Rump Width (RW)						1,00	0,08
BCS							1,00

▶ .

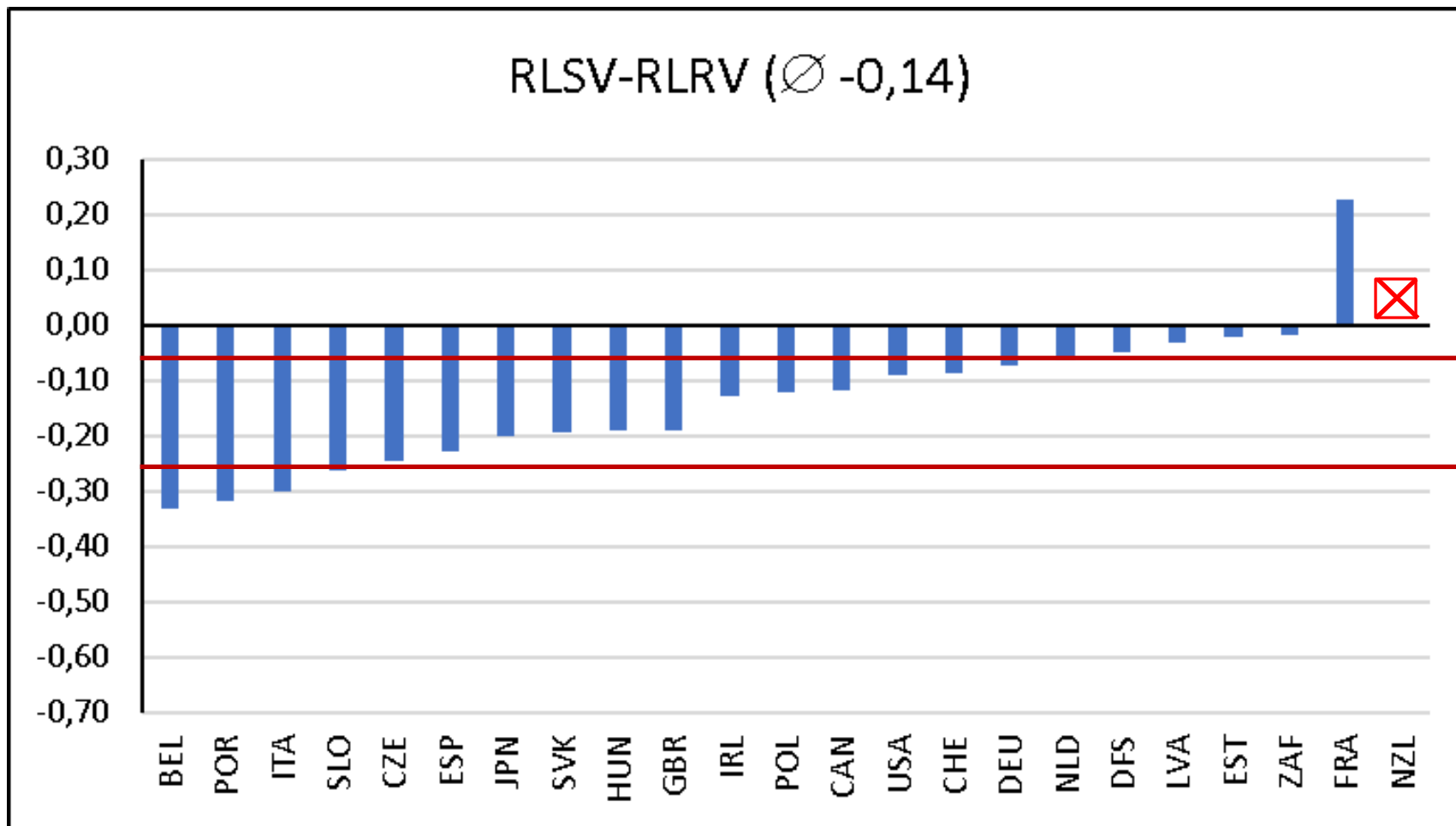
2021 for comparison

av. correlation body traits	ST	CW	BD	Ang	RA	RW	BCS
Stature (ST)	1,00	0,28	0,28	0,23	0,13	0,34	0,06
Chest Width (CW)		1,00	0,47	0,12	0,04	0,30	0,38
Body Depth (BD)			1,00	0,28	0,00	0,27	0,17
Angularity (Ang)				1,00	0,02	0,17	-0,15
Rump Angle (RA)					1,00	0,04	0,01
Rump Width (RW)						1,00	0,08
BCS							1,00



- ▶ Correlations between feet & leg traits

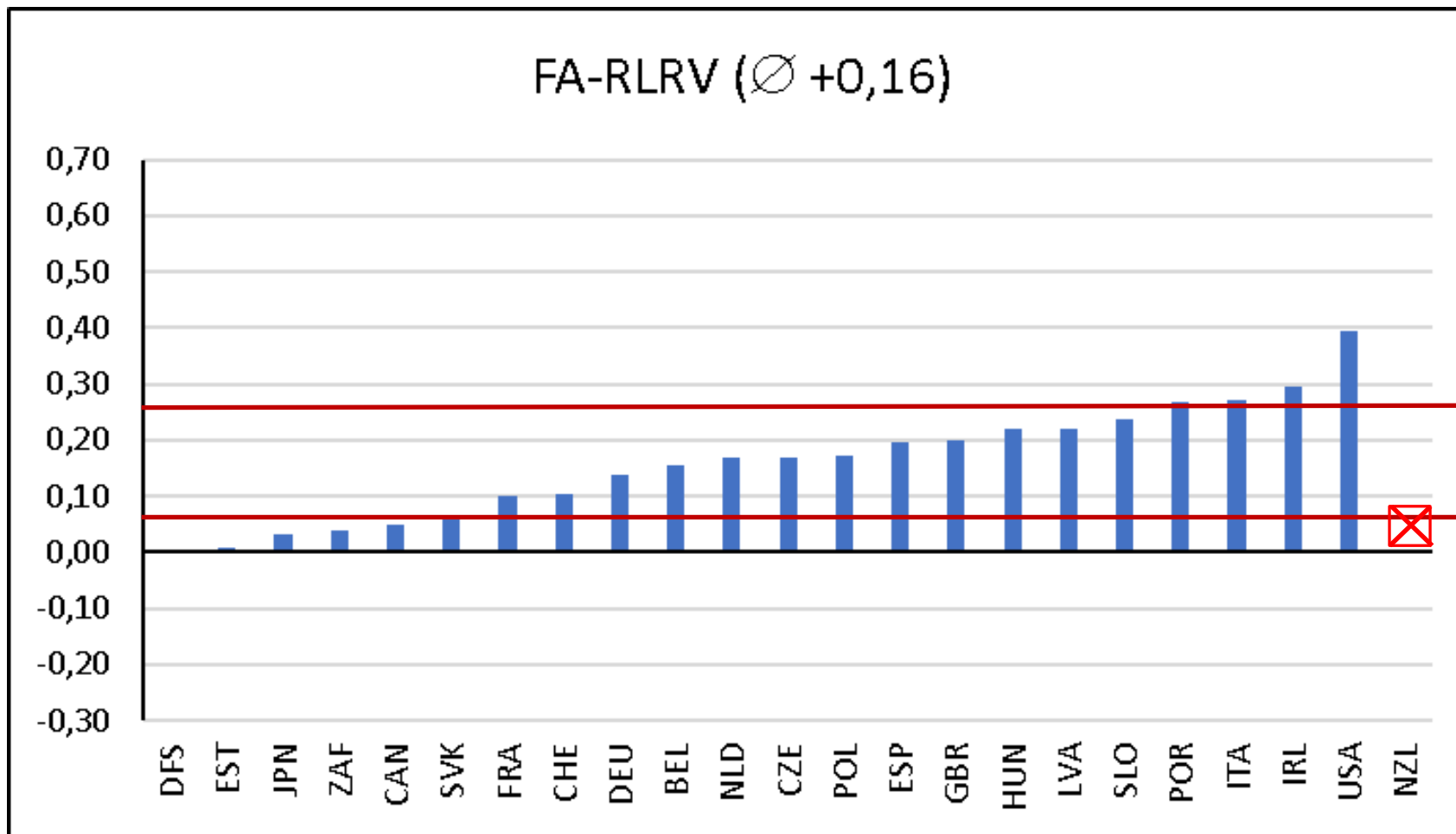
Rear Legs Side ↔ Rear Legs Rear



∅ ± .10

NZL: no RLRV, RLSV, FA
 BEL: no Loc
 DFS: no Loc
 ZAF: no Loc

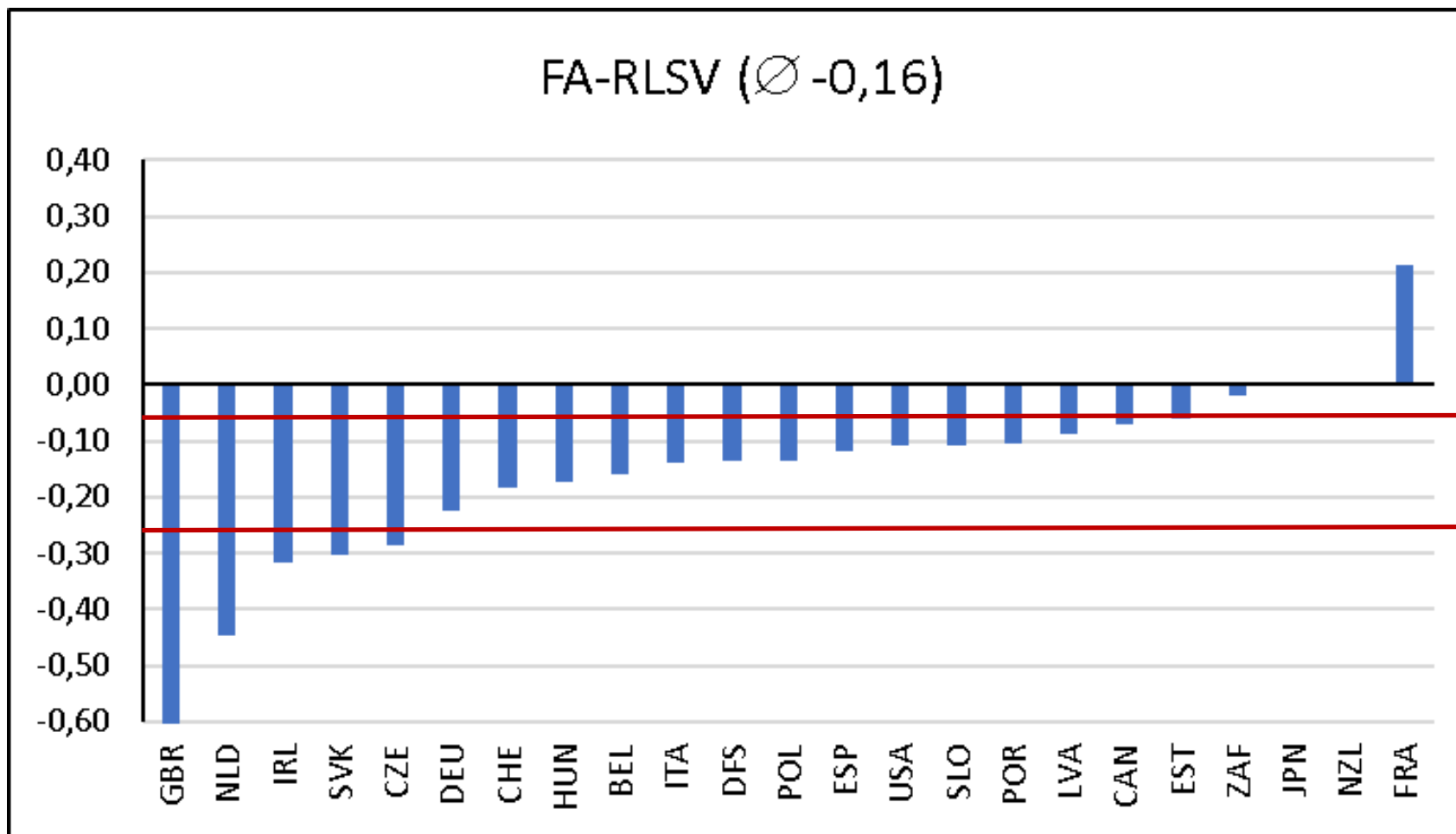
Foot Angle ↔ Rear Legs Rear



∅ ± .10

NZL: no RLRV, RLSV, FA
 BEL: no Loc
 DFS: no Loc
 ZAF: no Loc

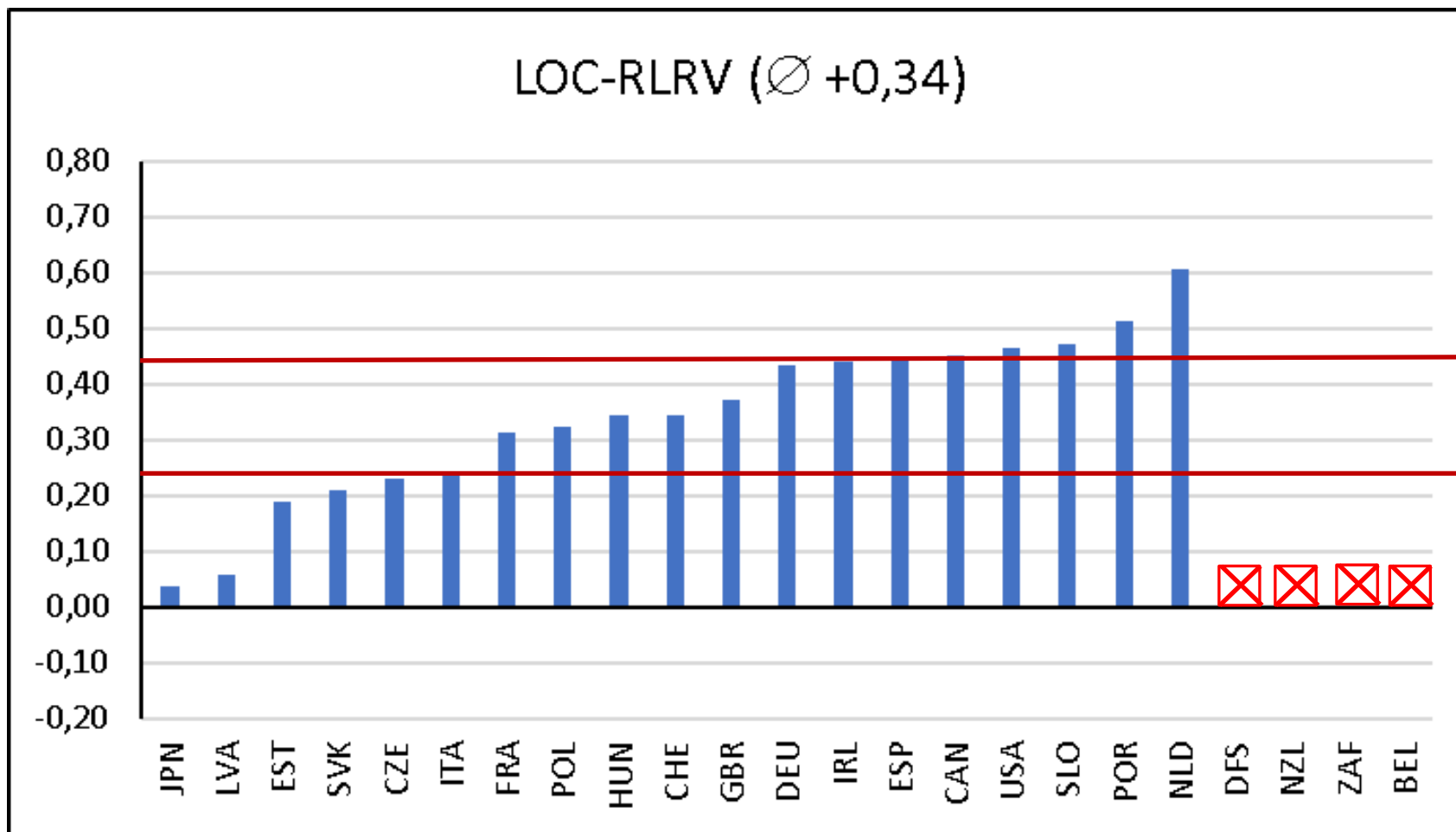
Foot Angle ↔ Rear Legs Side



$\bar{\sigma} \pm 0,10$

NZL: no RLRV, RLSV, FA
 BEL: no Loc
 DFS: no Loc
 ZAF: no Loc

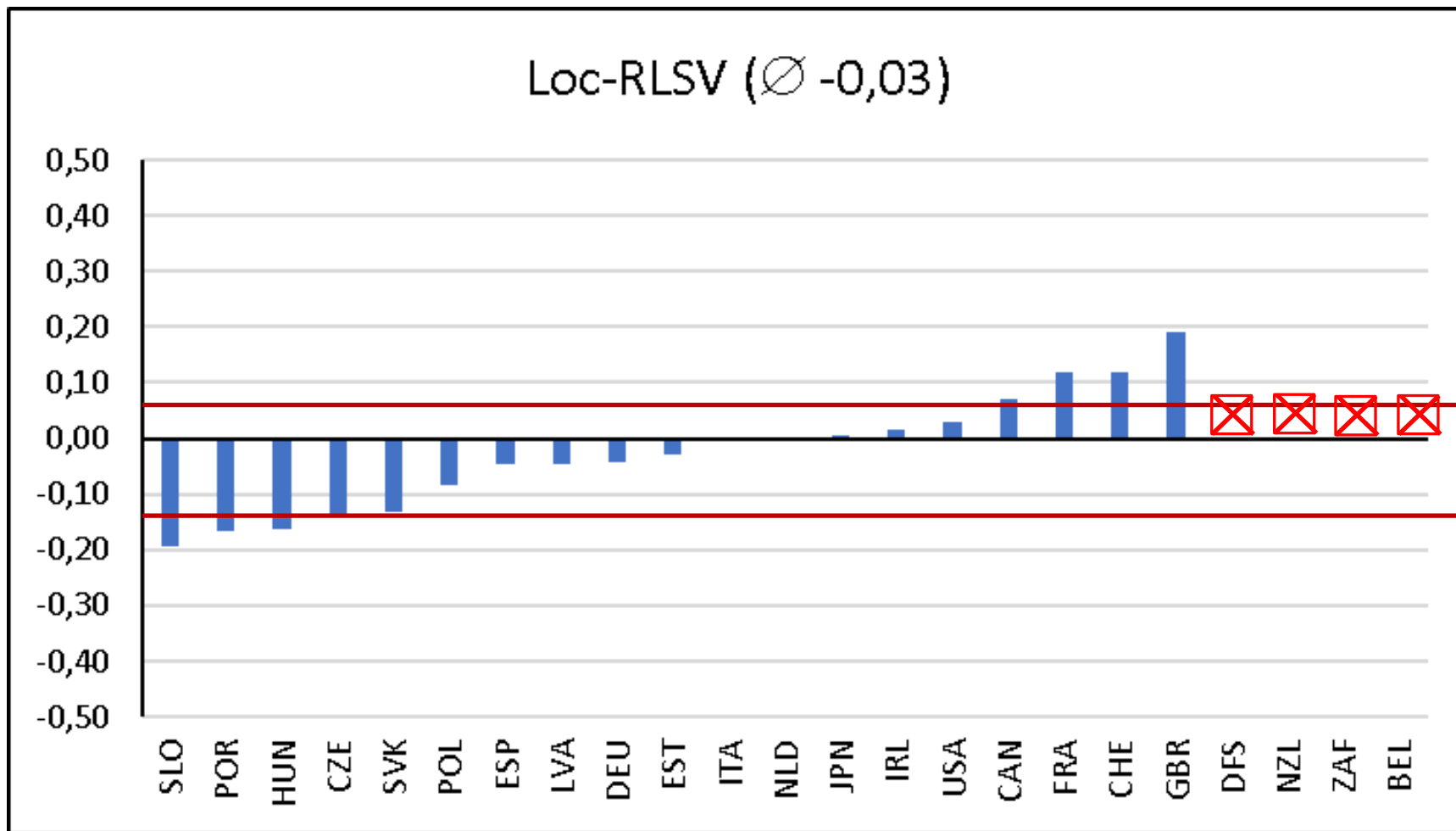
Locomotion ↔ Rear Legs Rear



$\bar{\sigma} \pm 0,10$

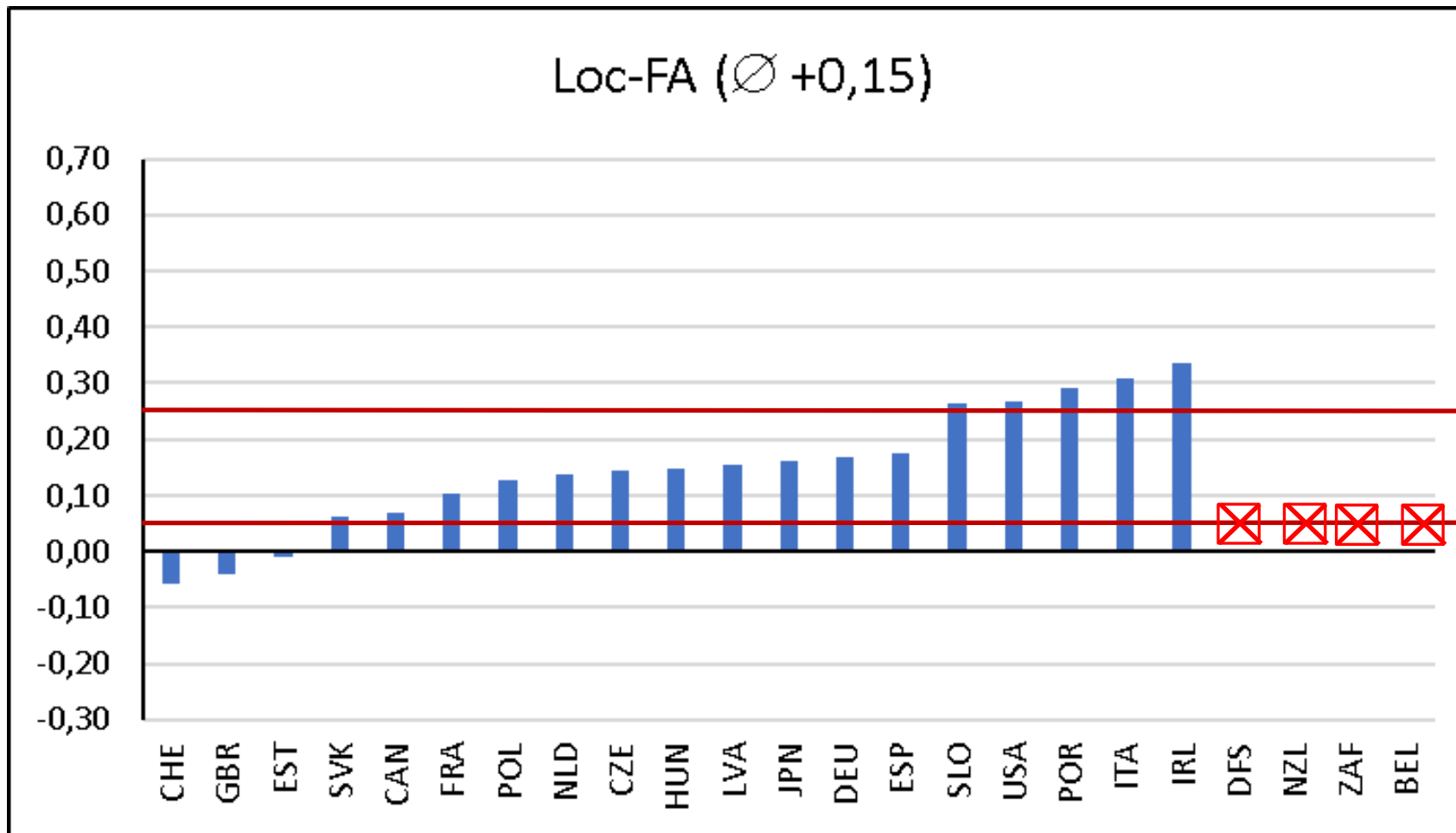
NZL: no RLRV, RLSV, FA
 BEL: no Loc
 DFS: no Loc
 ZAF: no Loc

Locomotion ↔ Rear Legs Side



NZL: no RLRV, RLSV, FA
 BEL: no Loc
 DFS: no Loc
 ZAF: no Loc

Locomotion ↔ Foot Angle



NZL: no RLRV, RLSV, FA
 BEL: no Loc
 DFS: no Loc
 ZAF: no Loc

Results feet & leg traits

▶ Average phenotypic correlations

av. Correlation Feet&Leg traits	RLRV	RLSV	FA	Loc
Rear Legs Rear View (RLRV)	1,00	-0,14	0,16	0,34
Rear Legs Side View (RLSV)		1,00	-0,16	-0,03
Foot angle (FA)			1,00	0,15
Locomotion (Loc)				1,00

▶ .

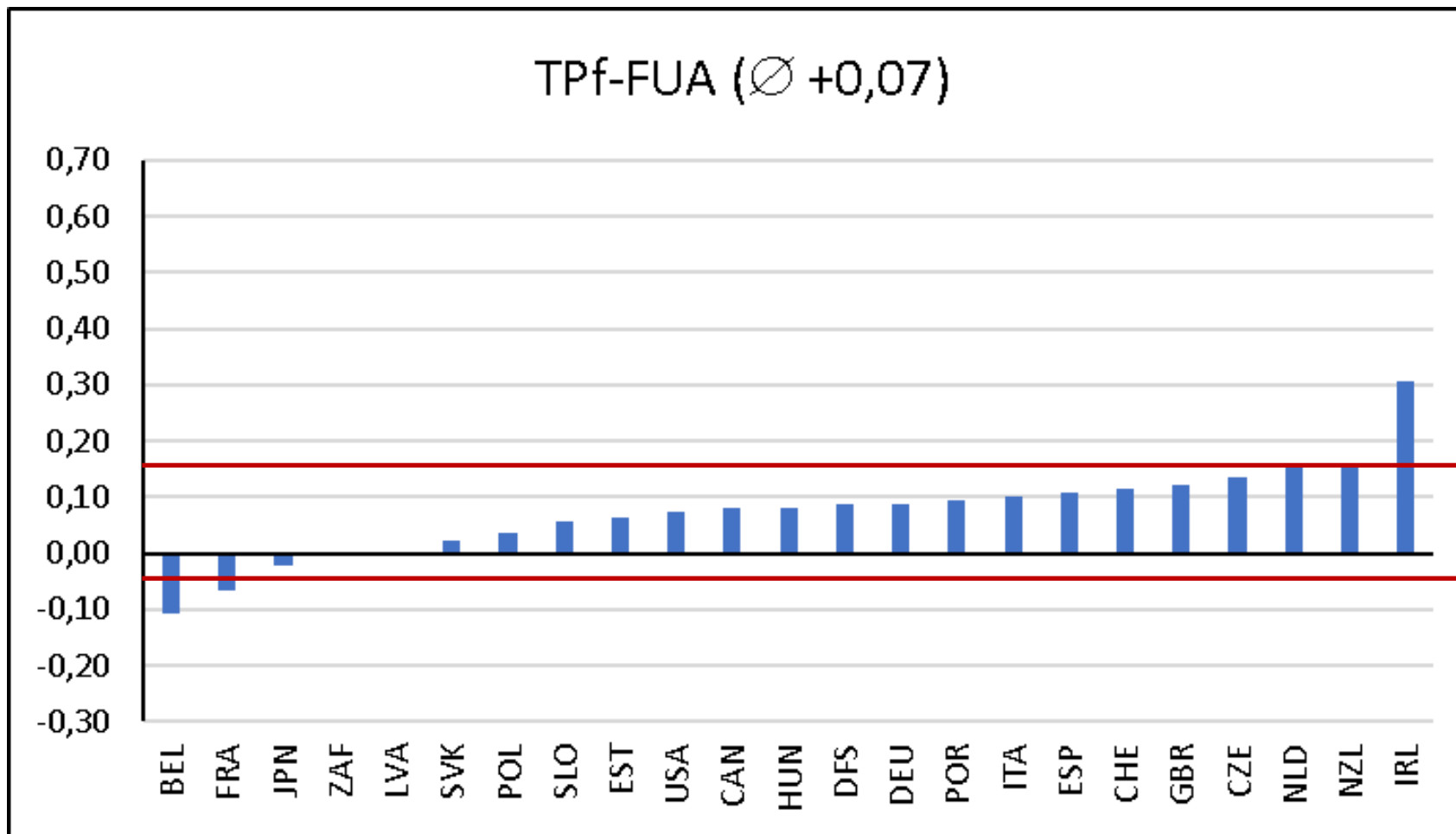
2021 for comparison

av. Correlation Feet&Leg traits	RLRV	RLSV	FA	Loc
Rear Legs Rear View (RLRV)	1,00	-0,17	0,17	0,38
Rear Legs Side View (RLSV)		1,00	-0,20	-0,07
Foot angle (FA)			1,00	0,16
Locomotion (Loc)				1,00



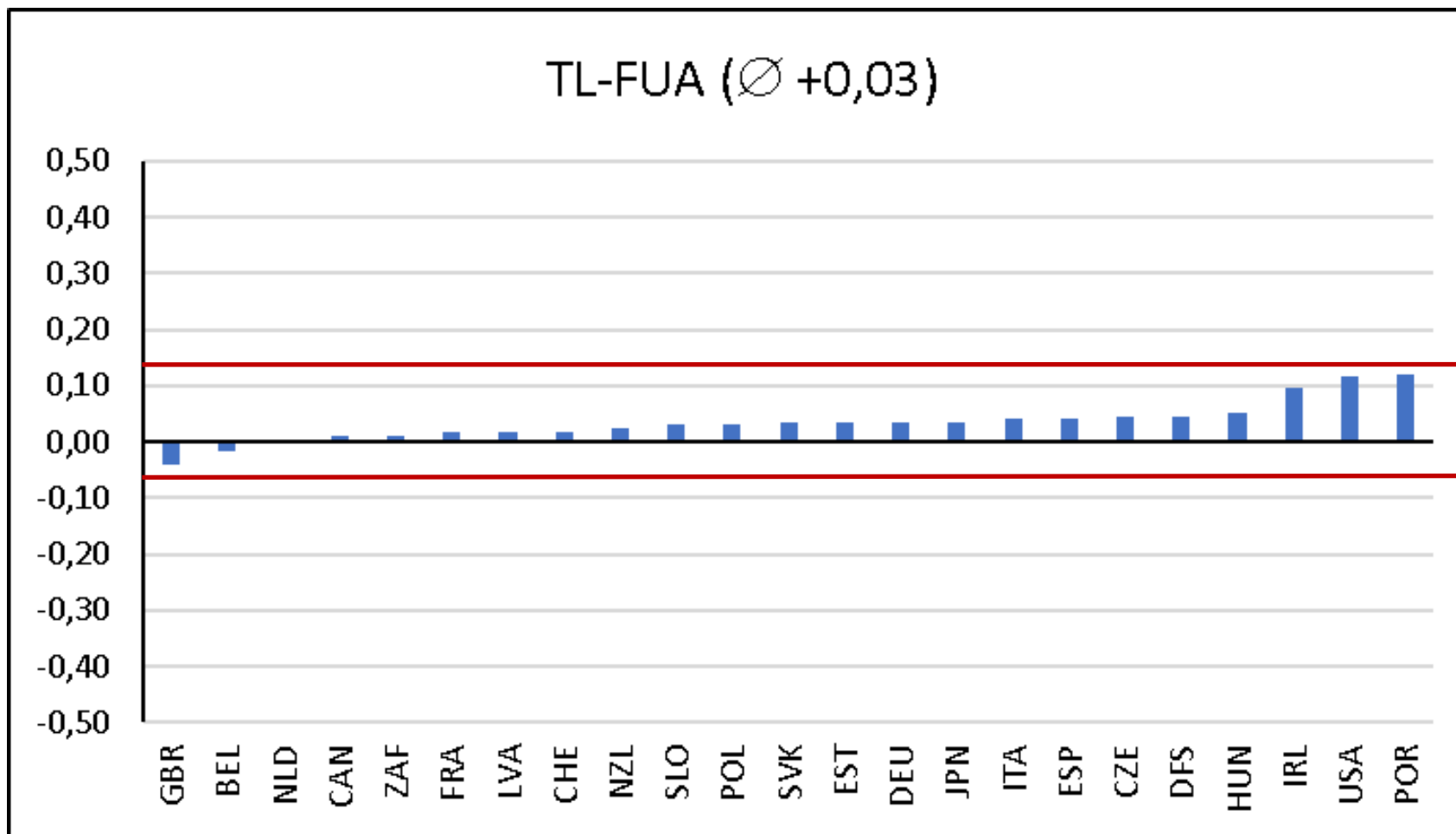
- ▶ Correlations between udder traits

Teat Place. front ↔ Fore Udder



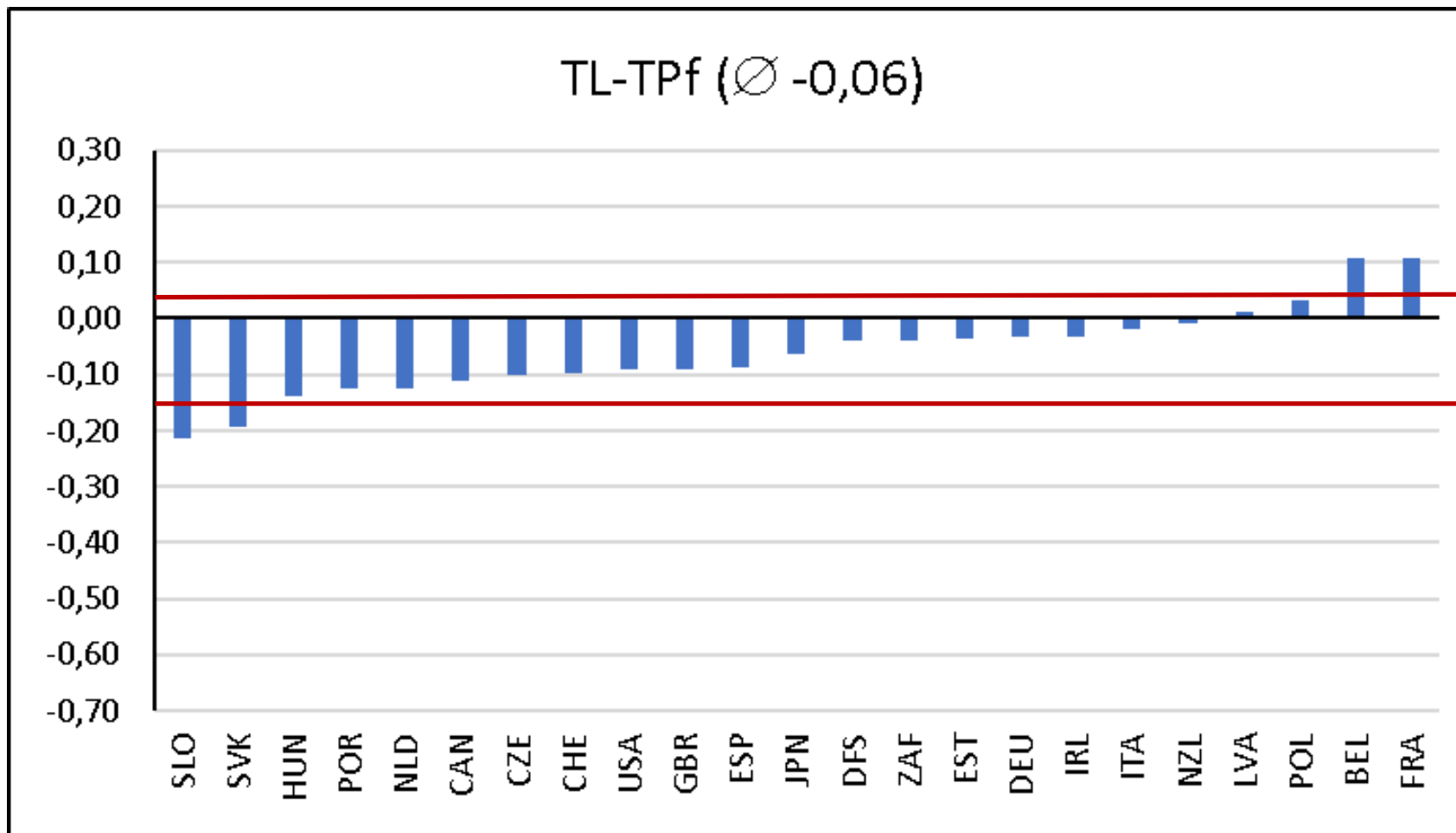
∅ ± .10

Teat Length ↔ Fore Udder



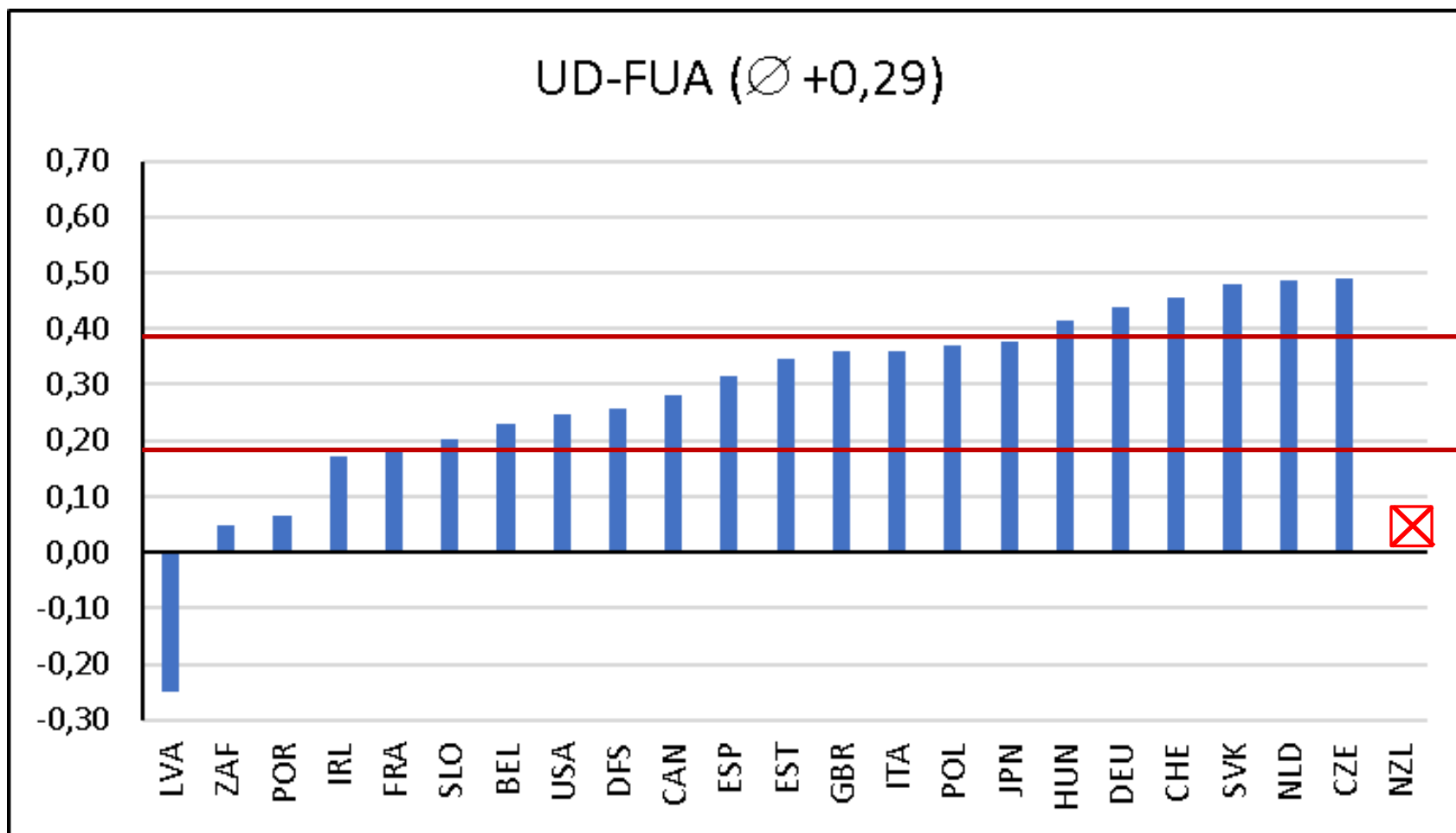
∅ ± .10

Teat Length ↔ Teat Place. front



∅ ± 0,10

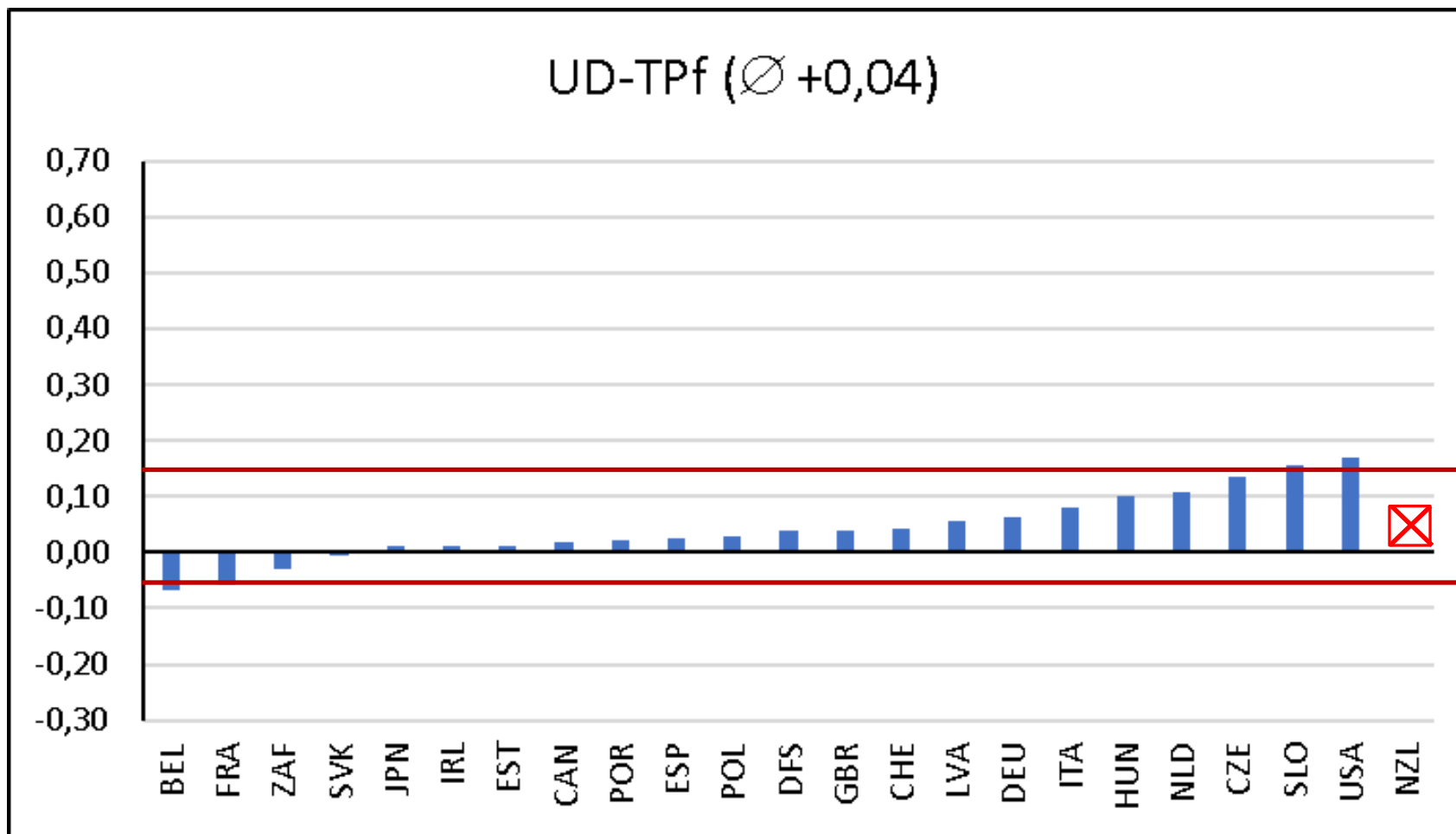
Udder Depth ↔ Fore Udder



∅ ± .10

NZL: no DU
ZAF: no CL

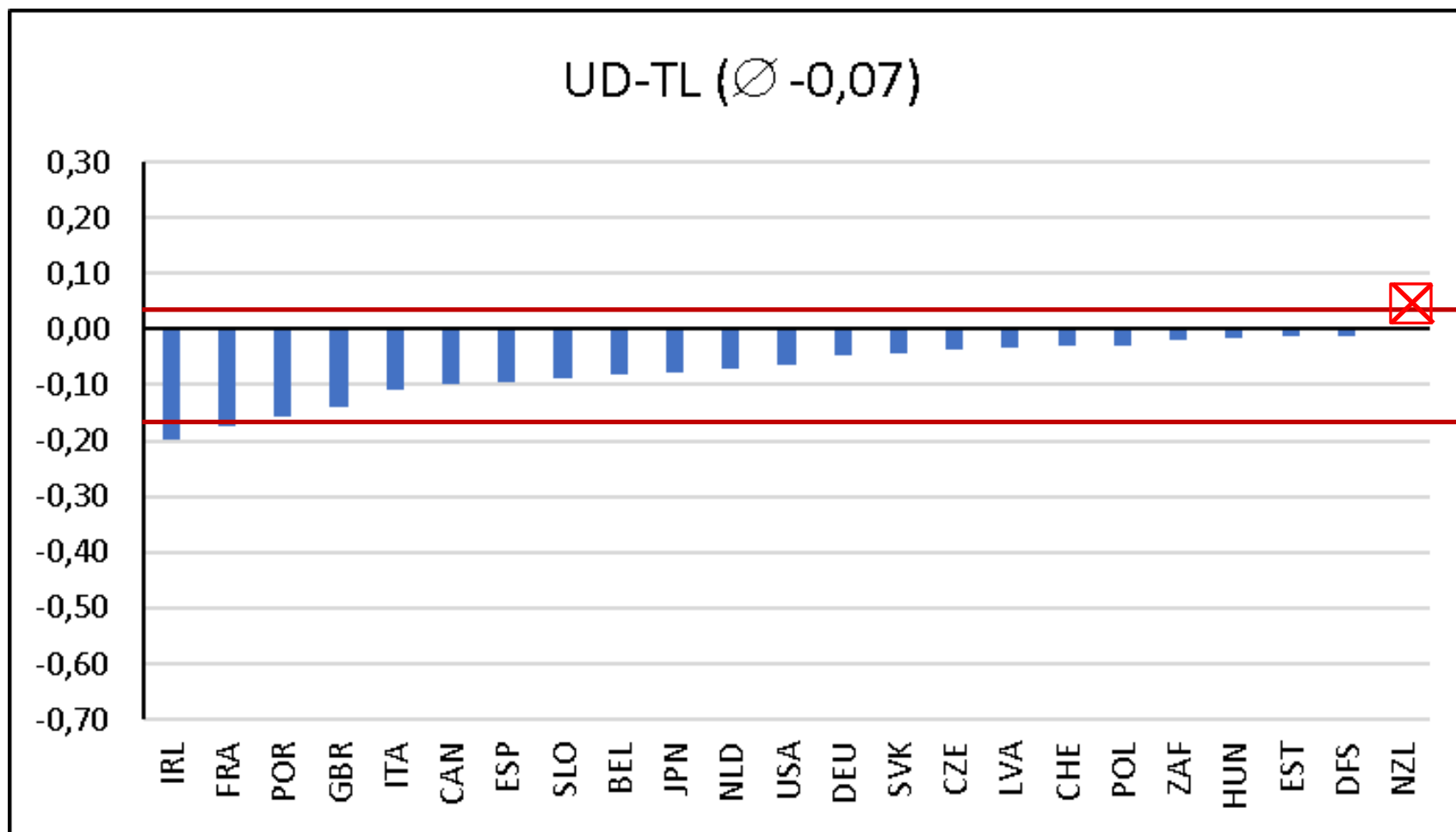
Udder Depth ↔ Teat Place. front



∅ ± .10

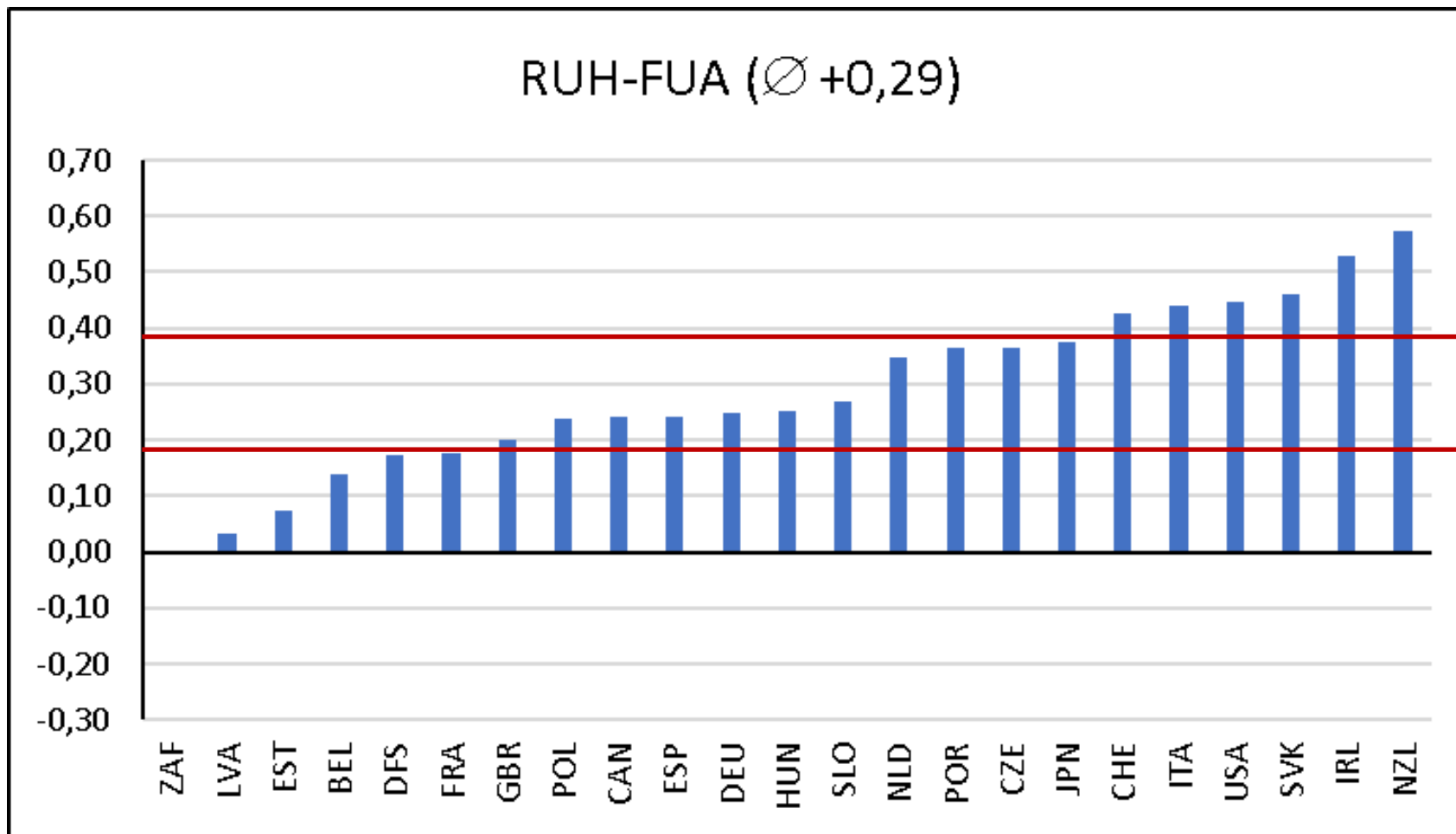
NZL: no DU
ZAF: no CL

Udder Depth ↔ Teat Length



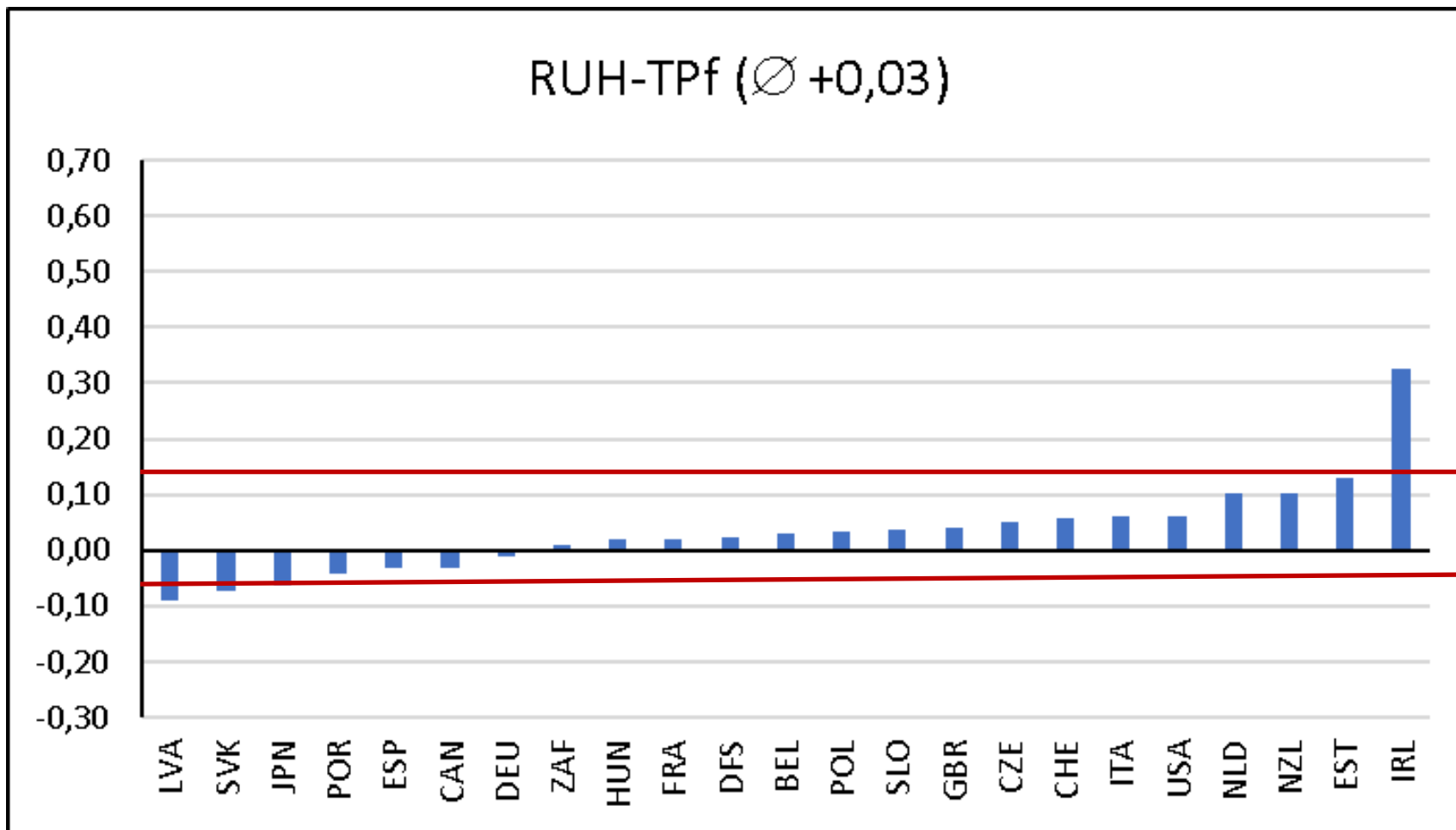
NZL: no DU
ZAF: no CL

Rear Udder Height ↔ Fore Udder



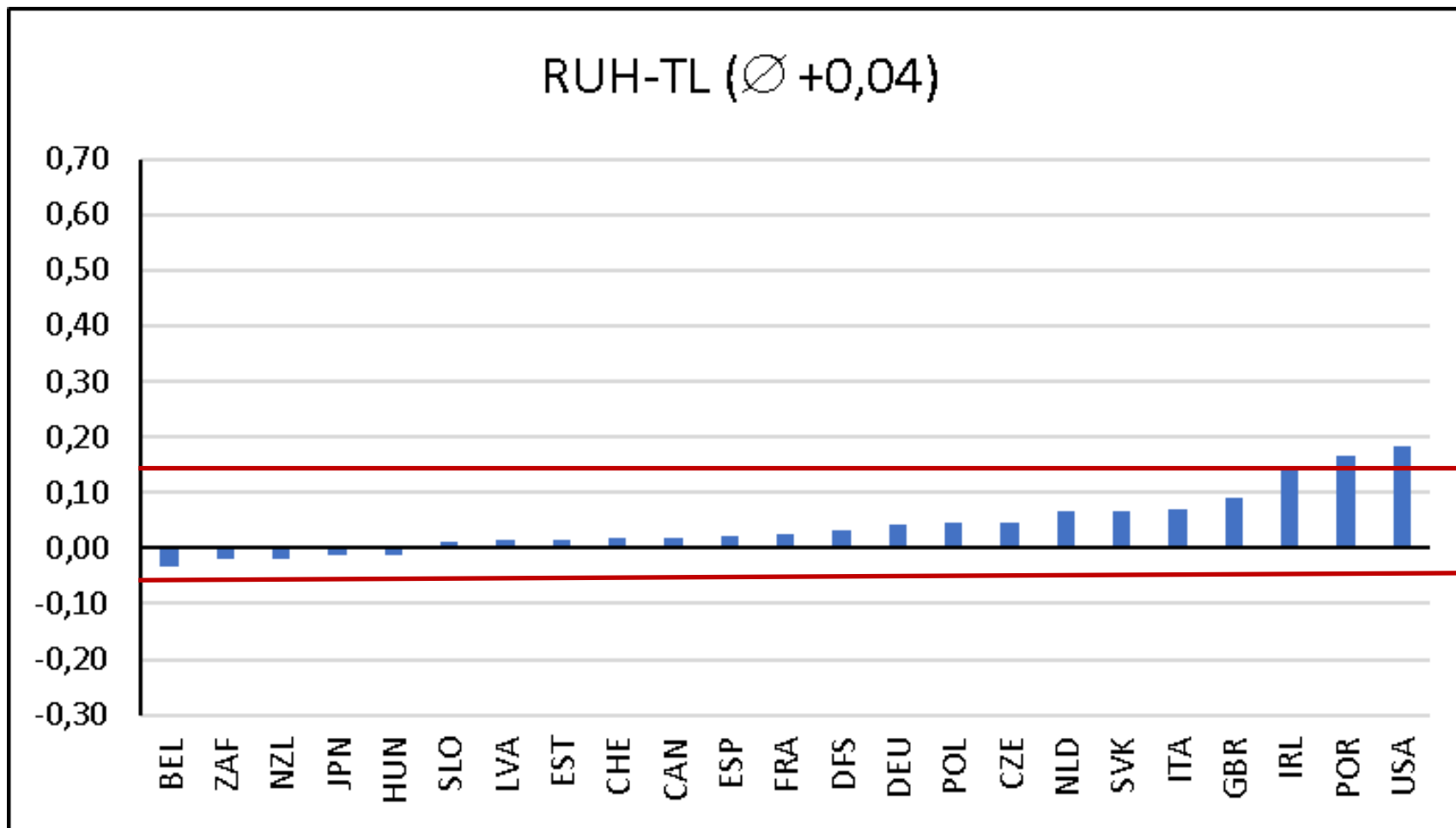
∅ ± 0,10

Rear Udder Height ↔ Teat Place. front



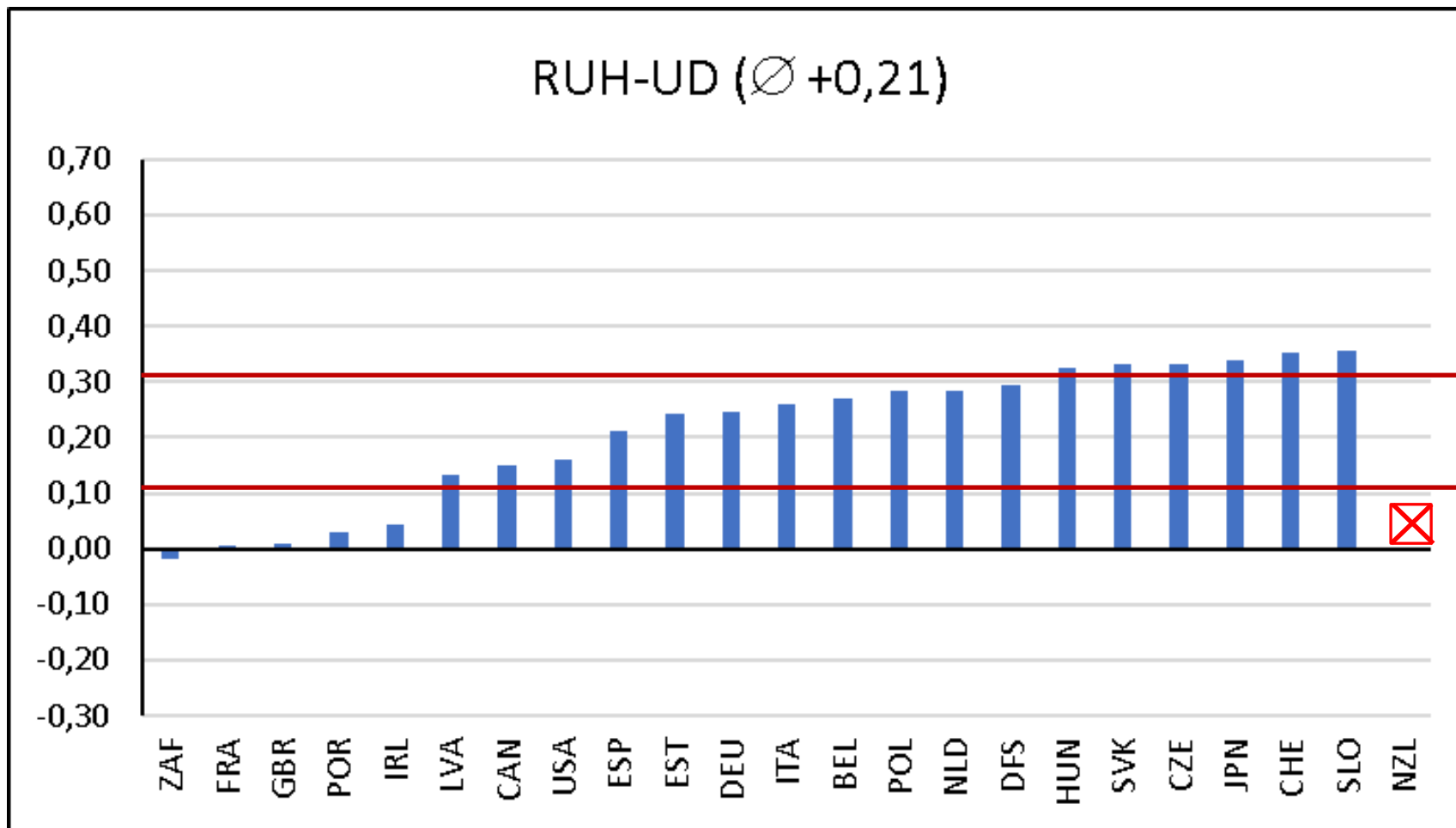
∅ ± 0,10

Rear Udder Height ↔ Teat Length



$\emptyset \pm 0,10$

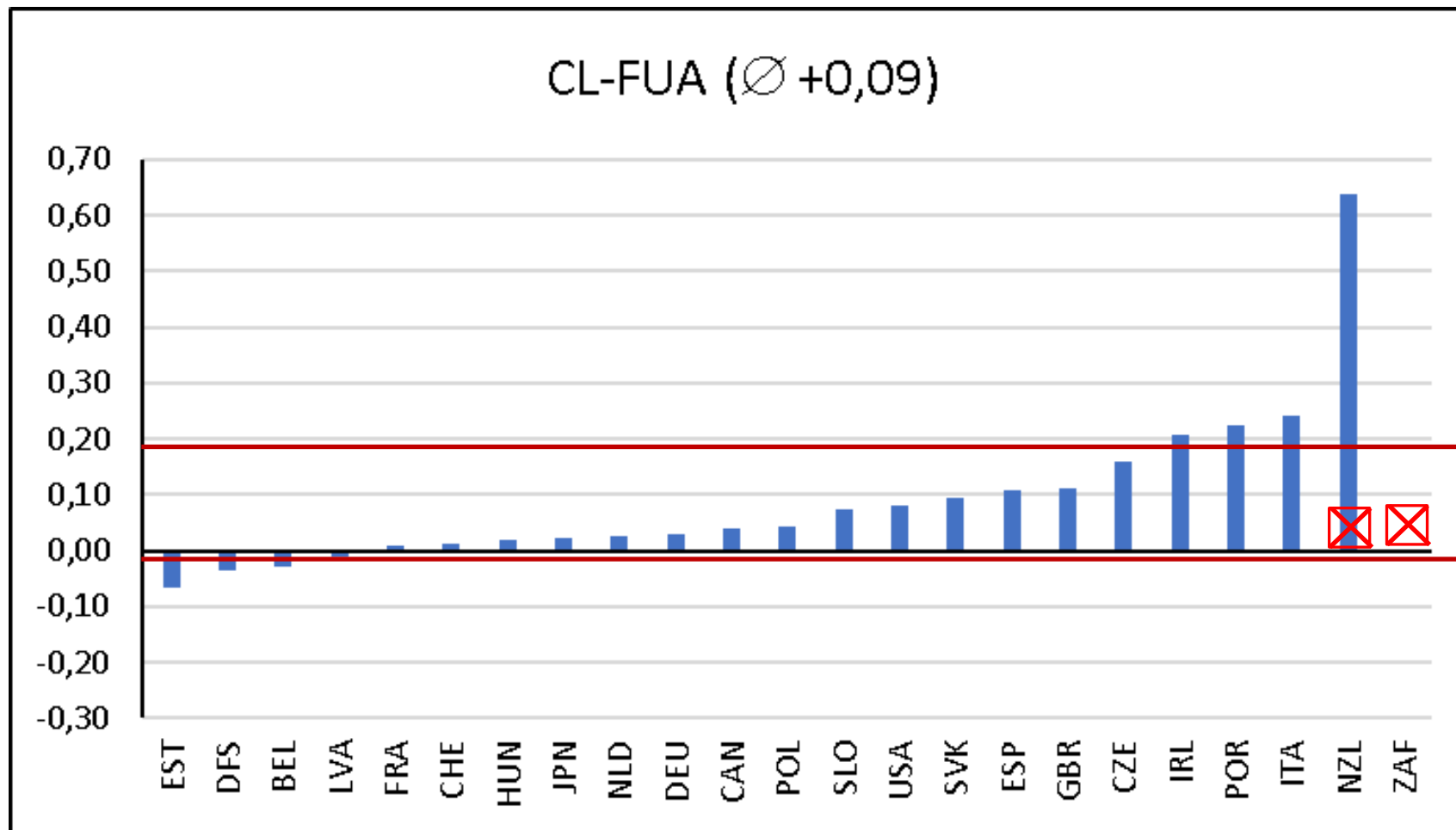
Rear Udder Height ↔ Udder Depth



∅ ± .10

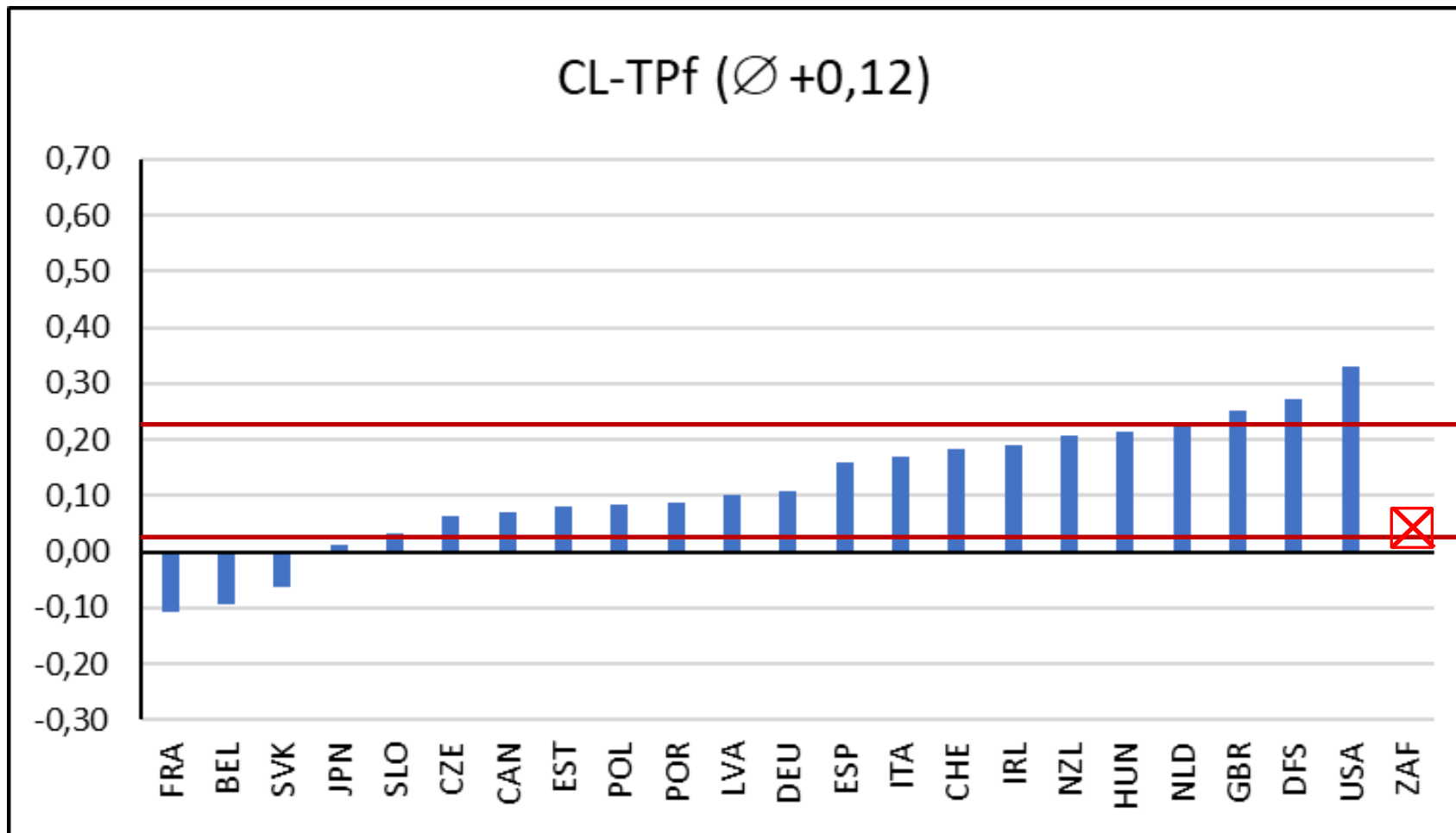
NZL: no DU
ZAF: no CL

Central Ligam. ↔ Fore Udder



NZL: no separate DU+CL
ZAF: no CL

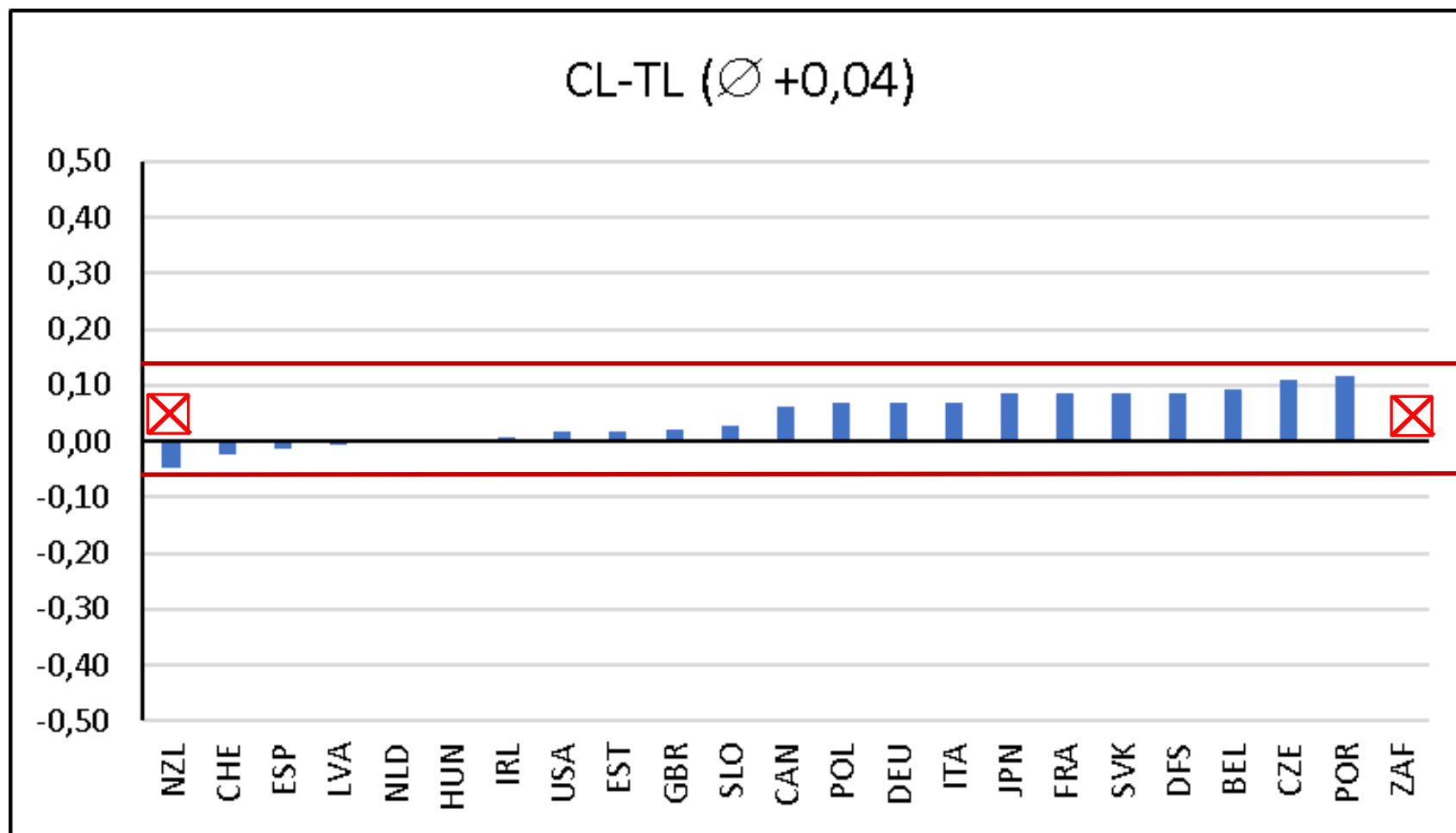
Central Ligam. ↔ Teat Placem. front



$\bar{} \pm .10$

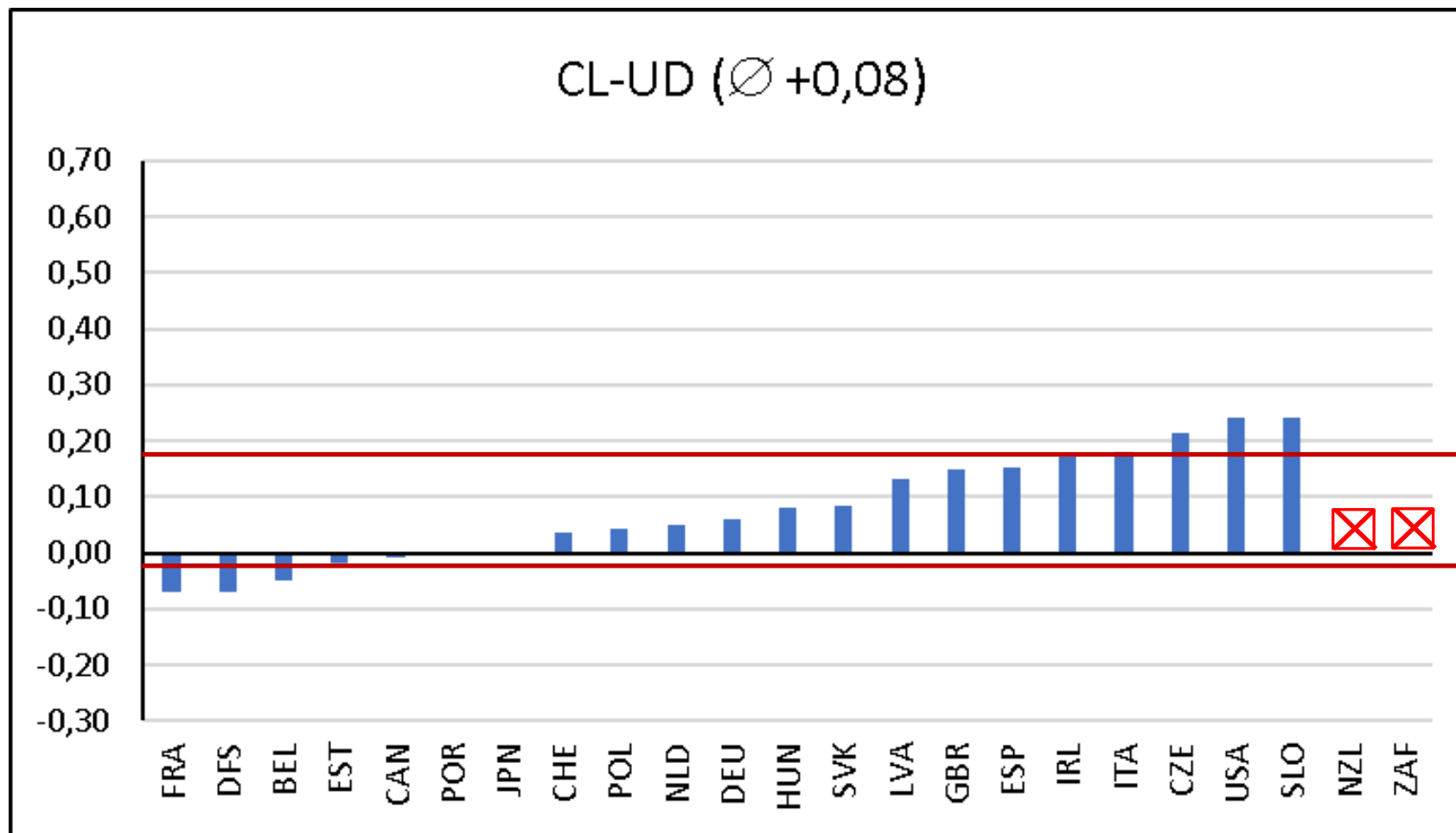
NZL: no separate DU+CL
ZAF: no CL

Central Ligam. ↔ Teat Length



NZL: no separate DU+CL
ZAF: no CL

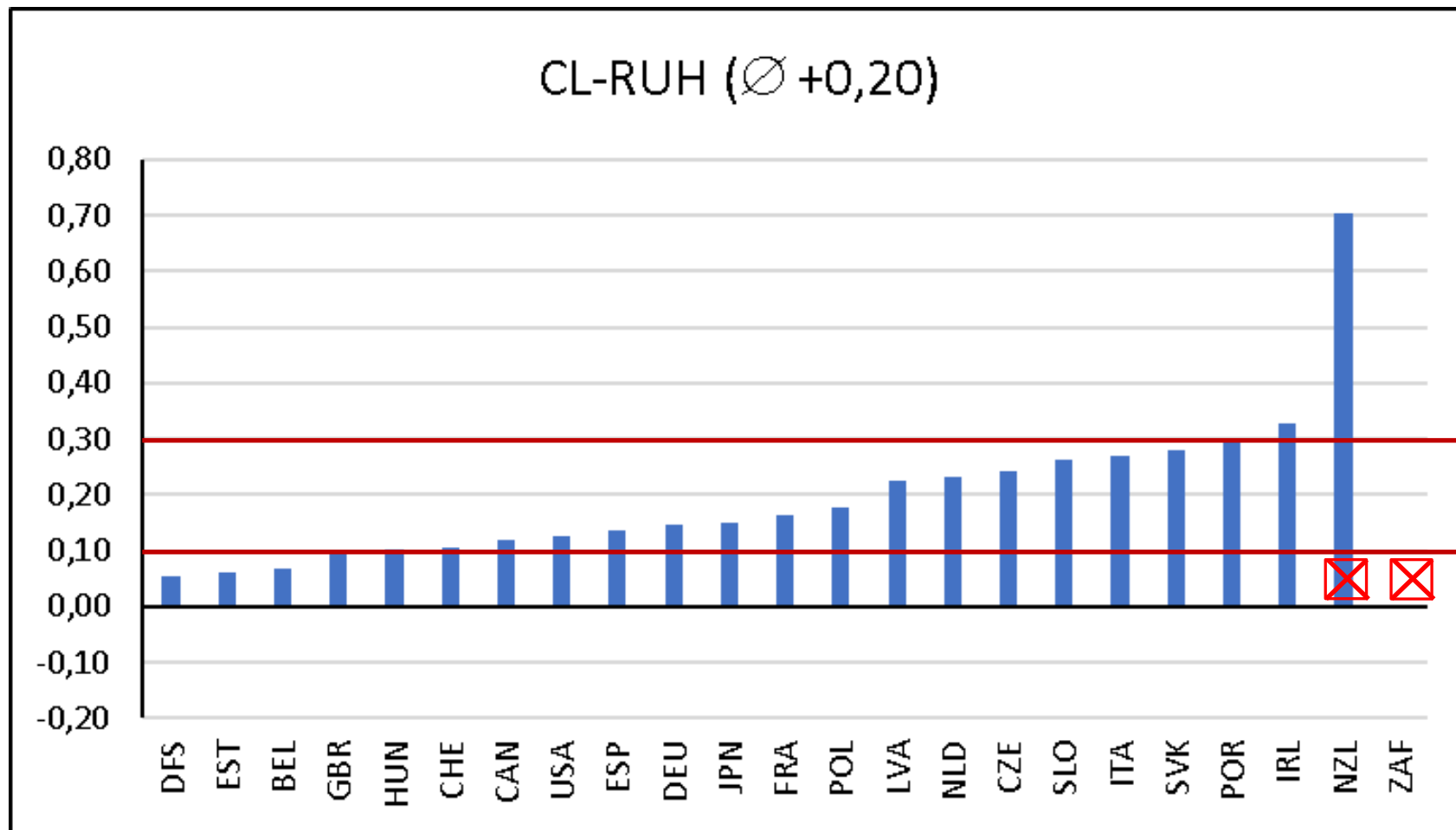
Central Ligam. ↔ Udder Depth



∅ ± .10

NZL: no separate DU+CL
ZAF: no CL

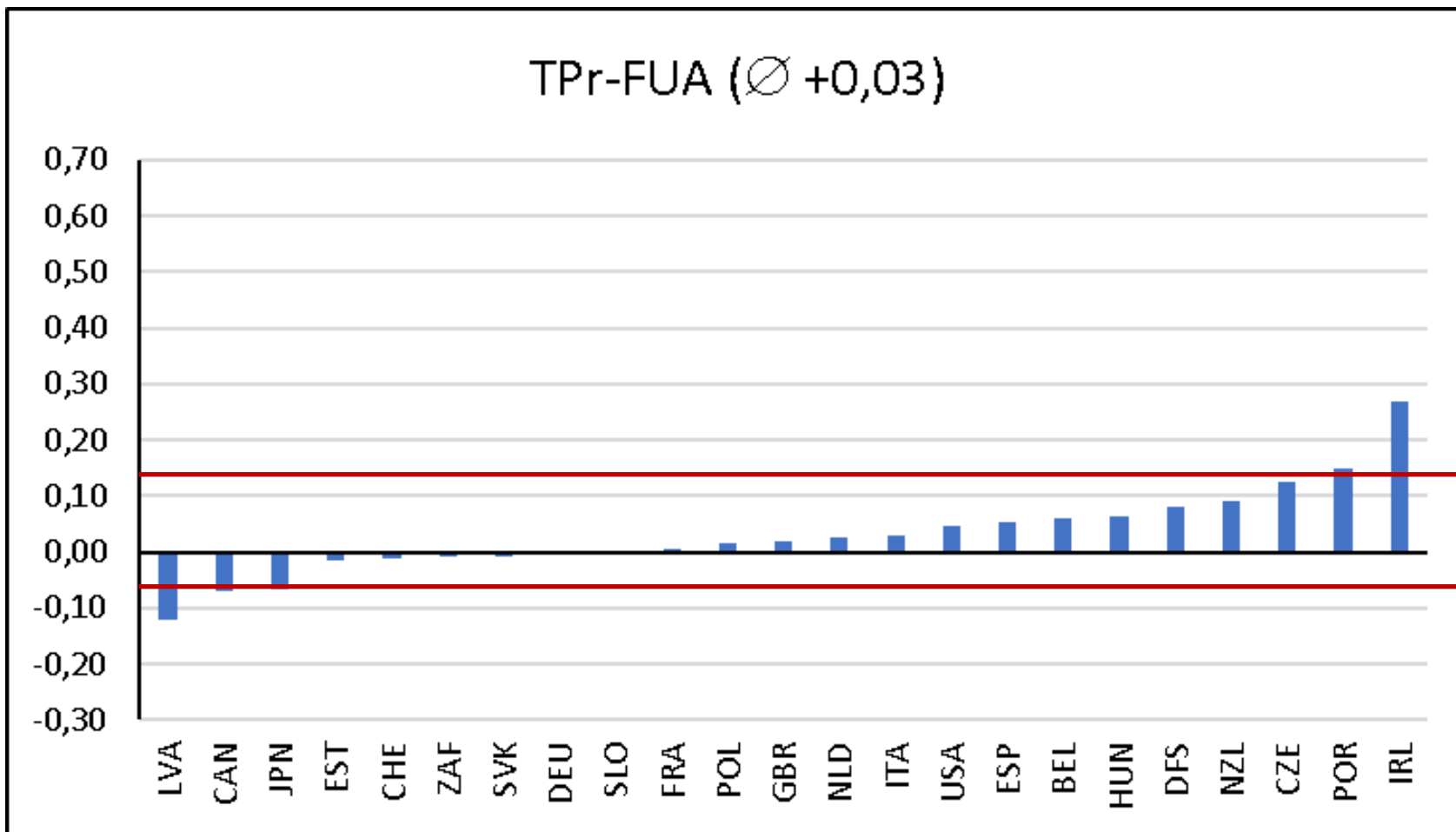
Central Ligam. ↔ Rear Udder Height



∅ ± .10

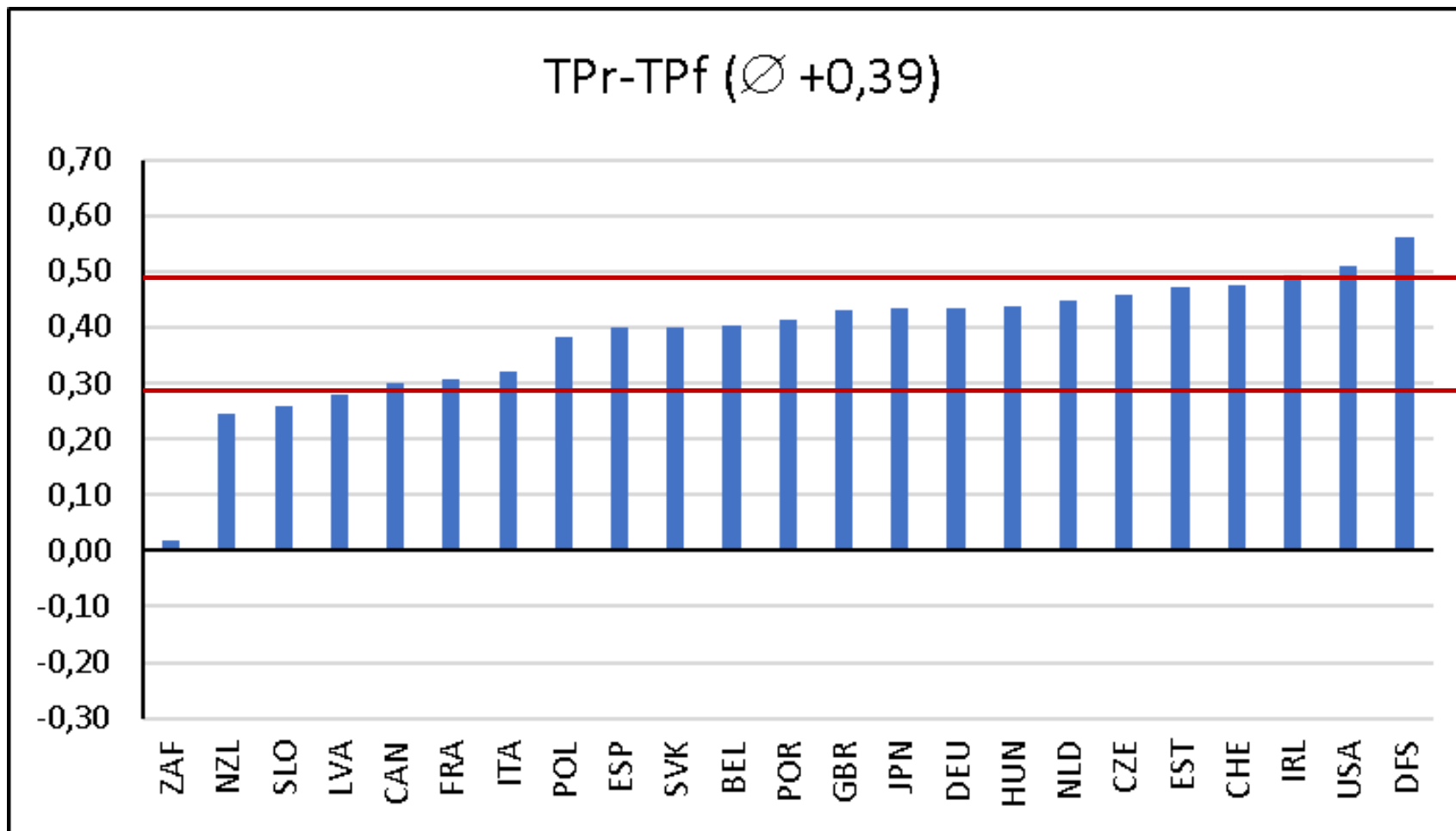
NZL: no separate DU+CL
ZAF: no CL

Teat Placem. rear ↔ Fore Udder



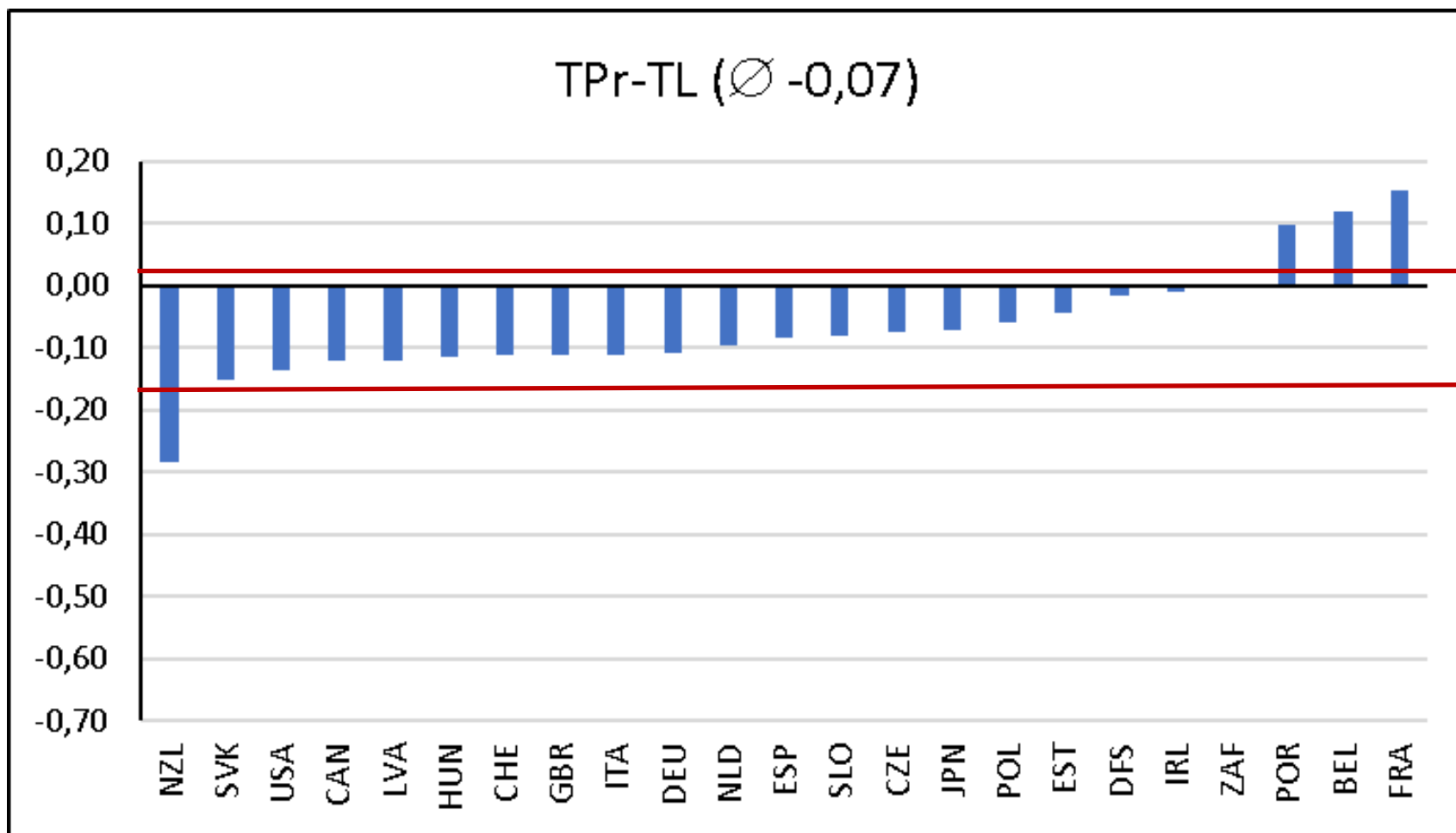
∅ ± 0,10

Teat Placem. rear ↔ Teat Placem. front



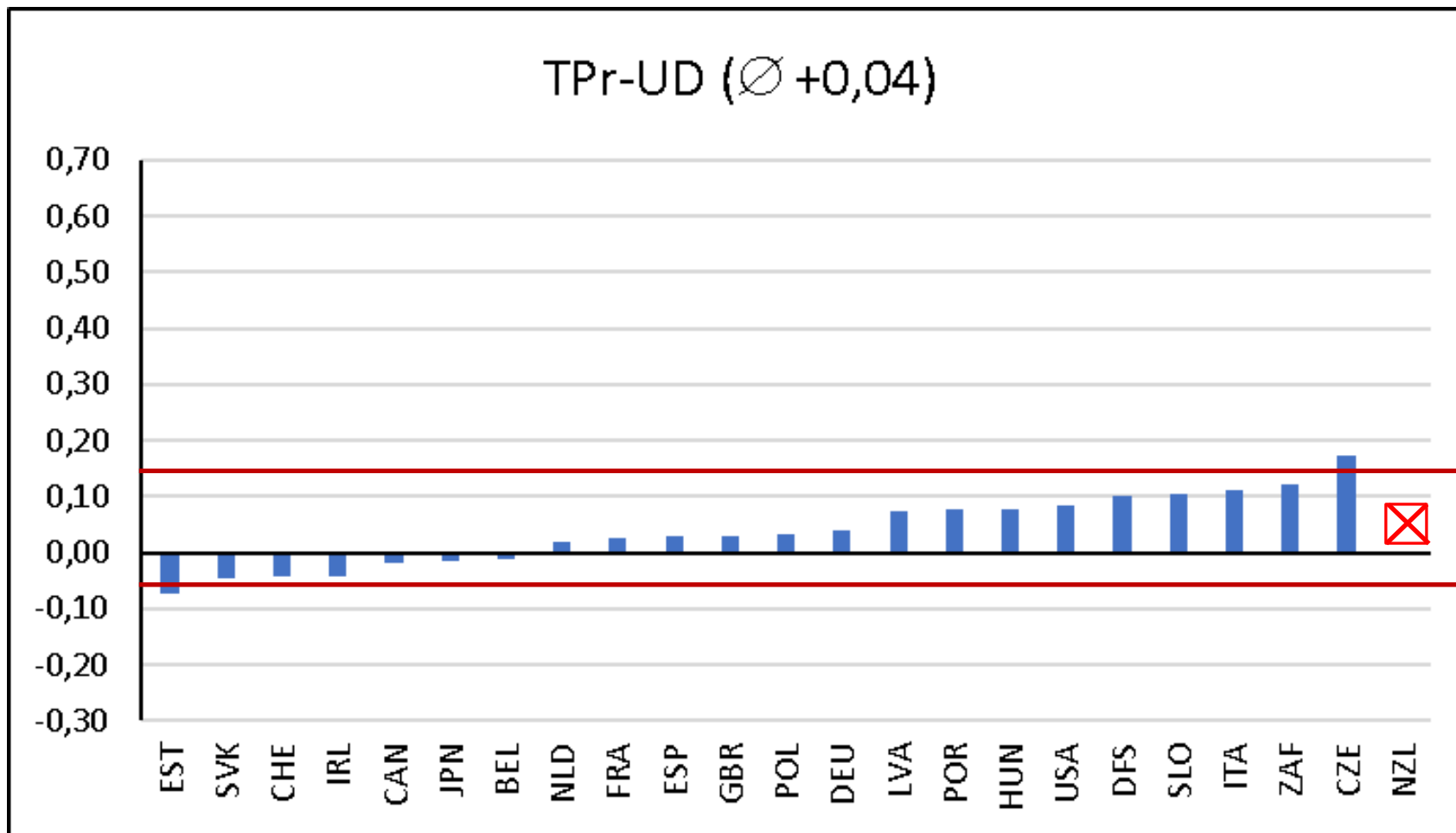
∅ ± .10

Teat Placem. rear ↔ Teat Length



$\emptyset \pm .10$

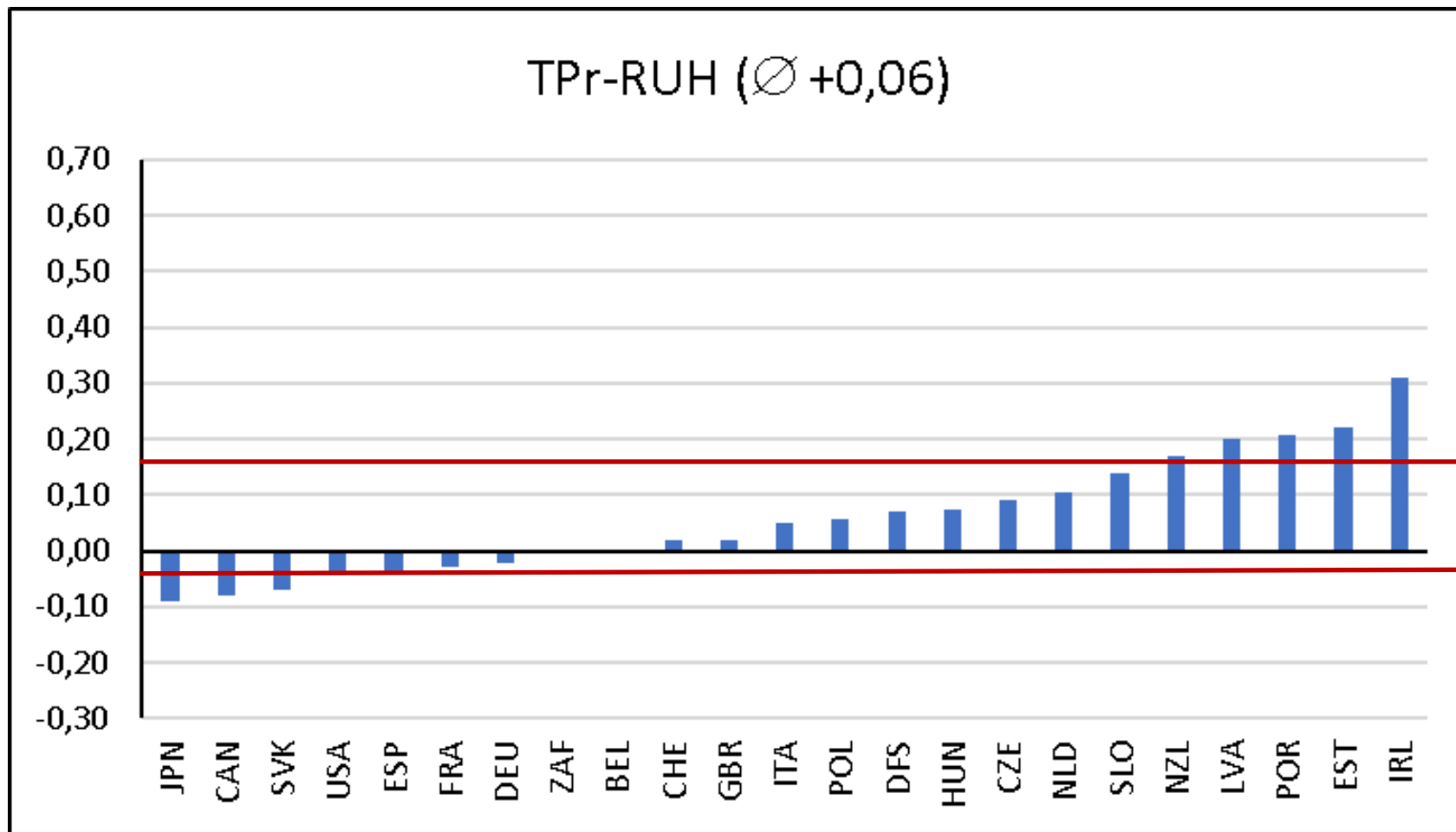
Teat Placem. rear ↔ Udder Depth



$\emptyset \pm .10$

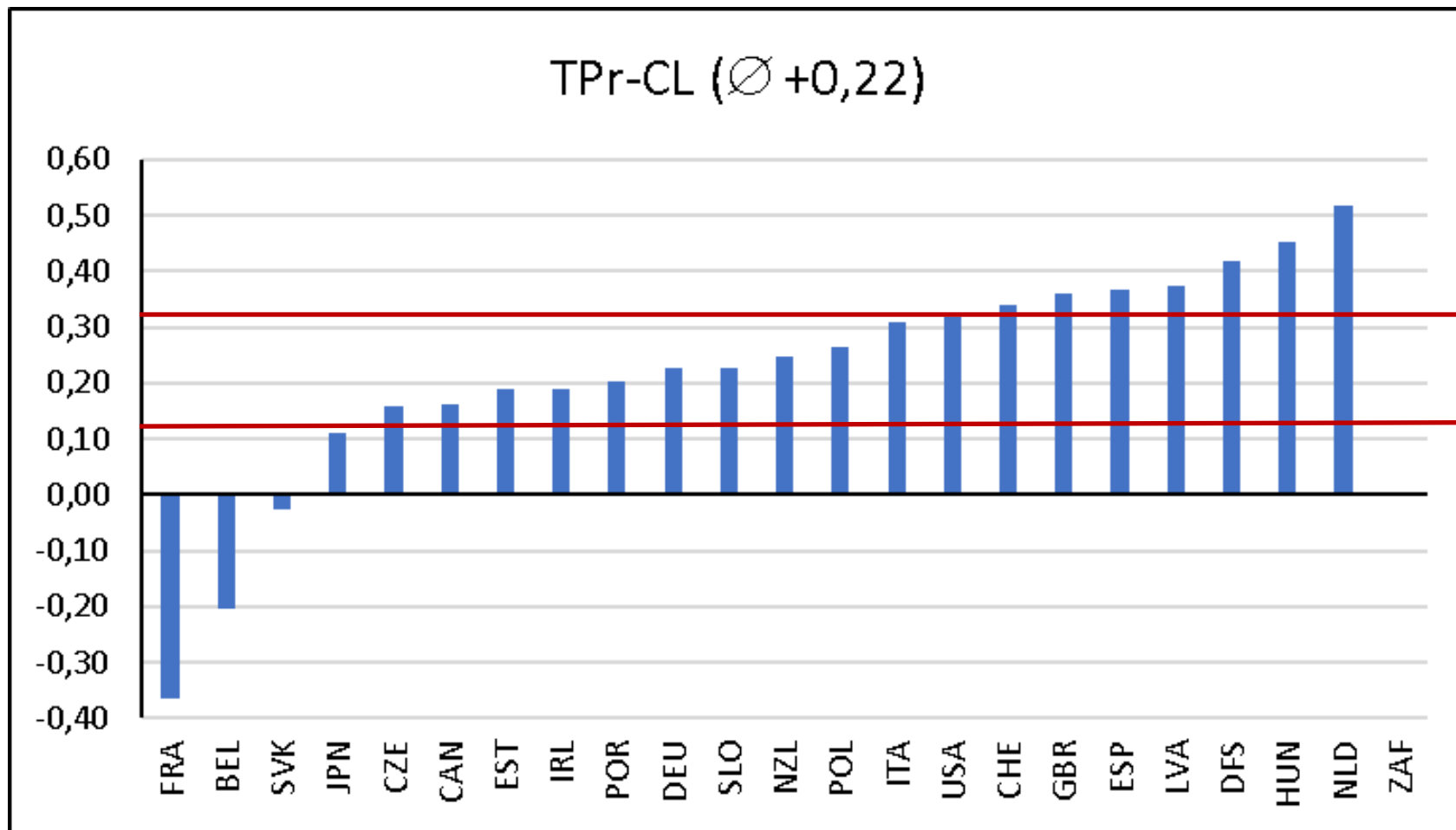
NZL: no separate DU+CL
ZAF: no CL

Teat Placem. rear ↔ Rear Udder Height



∅ ± .10

Teat Placem. rear ↔ Central Ligament



$\sigma \pm .10$

NZL: no separate DU+CL
ZAF: no CL

Results udder traits

▶ Average phenotypic correlations

av. Correlation Udder traits	FUA	TPf	TL	UD	RUH	CL	TPr
Fore Udder Attachment (FUA)	1,00	0,07	0,03	0,29	0,29	0,09	0,03
Teat Placement front (FPf)		1,00	-0,06	0,04	0,03	0,12	0,39
Teat Length (TL)			1,00	-0,07	0,04	0,04	-0,07
Udder Depth (UD)				1,00	0,21	0,08	0,04
Rear Udder Height (RUH)					1,00	0,20	0,06
Udder Cleft (CL)						1,00	0,22
Teat Placement rear (TPr)							1,00

▶ .

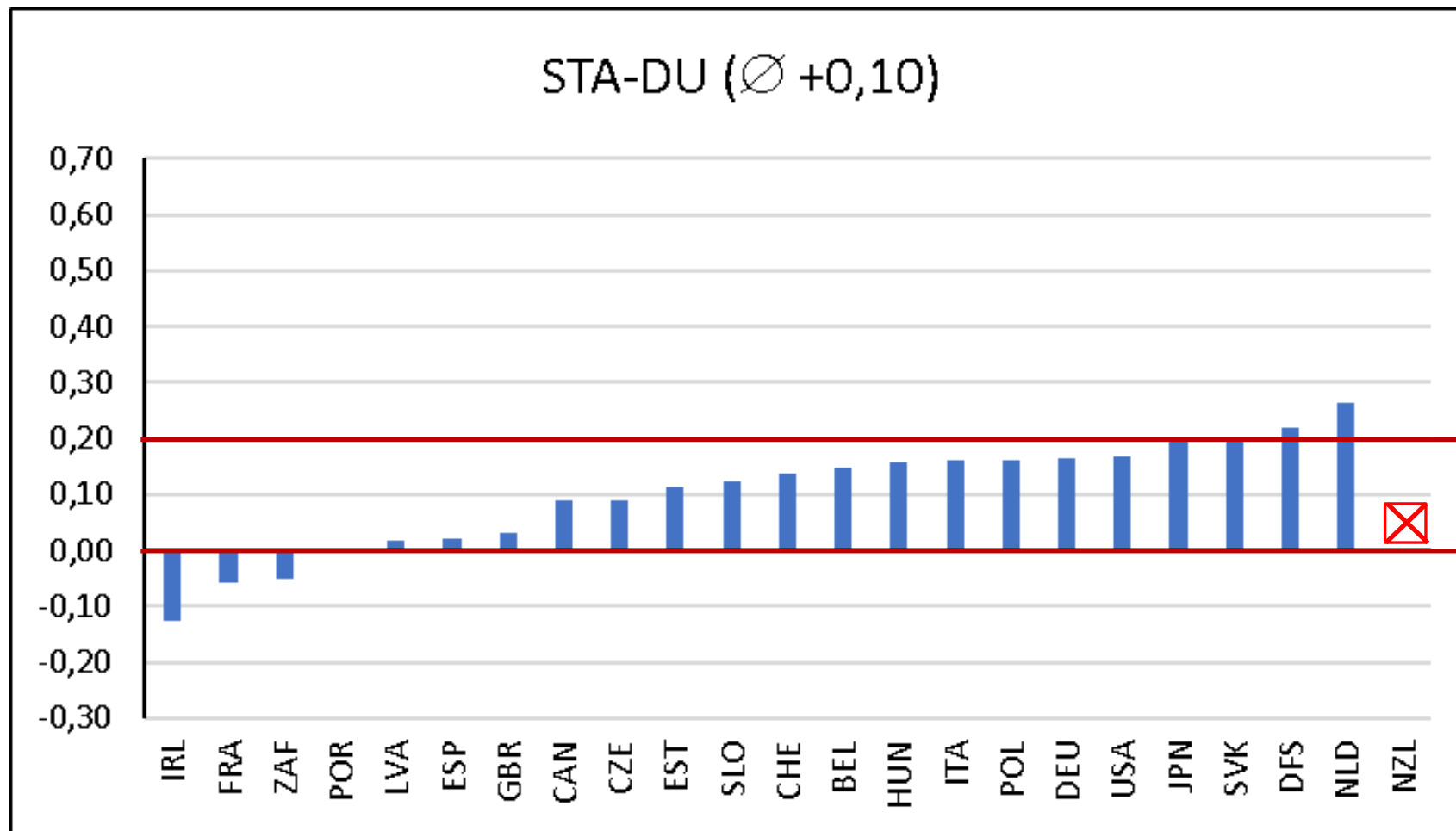
2021 for comparison

av. Correlation Udder traits	FUA	TPf	TL	UD	RUH	CL	TPr
Fore Udder Attachment (FUA)	1,00	0,10	0,03	0,33	0,28	0,13	0,06
Teat Placement front (FPf)		1,00	-0,06	0,07	0,06	0,16	0,40
Teat Length (TL)			1,00	-0,06	0,05	0,04	-0,07
Udder Depth (UD)				1,00	0,21	0,12	0,08
Rear Udder Height (RUH)					1,00	0,20	0,07
Udder Cleft (CL)						1,00	0,25
Teat Placement rear (TPr)							1,00



- ▶ Correlations between Stature and udder traits

Stature ↔ Udder Depth



∅ ± .10

NZL: no separate DU+CL
ZAF: no CL

Summary & Conclusions

- ▶ Differences in phenotypic correlations can give hints where countries probably apply in practice different trait definitions
- ▶ Countries finding very different correlations for specific combinations compared to other countries should try to find out what of the involved two traits is the reason and probably change definition