The new PLI and SCI

AHDB Agriculture & Horticulture DEVELOPMENT BOARD

DairyCo

Marco Winters

£PLI – Profitable Lifetime Index

- Why?
- Many genetic indexes available to use
  - 35 individual trait indexes
  - E.g. Milk, Fat%, SCC, Lifespan, Fertility, Stature, Legs, Udder
- What is the relative importance of all of these?
- Time consuming to study and balance all traits individually

£PLI – Profitable Lifetime Index

- Need for easy to use ranking which balances all traits
- Optimises the genetic progress for important traits
- Maximises progress of best genetics

Value of £PLI

- Promar study – 2011
- Top 1% PLI herd
  - £24,839 extra margin per 100 cows
  - Compared to average
- Choosing the right bull is important !

How predicted genetic benefits translate into improved margin

Since its inception, Profitable Lifetime Index has been sold on the strength of the additional margin it has the potential to generate, but whether this is reflected in real life profits can only be seen by studying farm accounts. **Ann Hardy** reports on a new study using Promar Farm Business Accounts.

The economic value of the PLI breeding index has been reaffirmed by a new study which puts its value at £4.21 per PLI point at today's milk prices. This equates to additional annual margin for a high genetic merit herd (top one per cent) of £24,839 for each 100 cows, when compared to a herd of average genetic merit.

The study was undertaken by Promar International and used fully bank-reconciled financial data from users of Promar's Farm Business Accounts (FBA). This was married to data from either NMR or CIS milk recorded herds and independent genetic information supplied by DairyCo Breeding+.

It is the second UK study in the past five years to highlight the economic value of Profitable Lifetime Index (PLI) and indicates the relevance of the index in a range of economic environments.

In the study, a Genetically Influenced Margin (GIM) was developed to identify all financially measurable factors of dairy farm income and costs that are influenced by cow genetics. (See Table 1).

"These include income from milk, calf and cull sales minus cost of all feed, herd replacements, vet and med, AI and semen," says Promar consultant Tim Harper who undertook the analysis.

"Assuming there is no relationship between genetics and any other costs, this translates directly through to pre-tax profit," he says.

Table 1: Genetically influenced income (GIM) =

	Milk income
Plus	Calf income
Minus	All purchased feed costs
	All home grown feed costs (including forage)
	Vet and medicine costs
	AI and semen costs
	Net replacement costs (includes cull cow income)

Tim Harper: higher margins.

The areas of difference between high and low index herds can be seen in Table 2.

Precisely where the higher genetic merit herds score is seen in this table, in which the participating FBA herds are grouped according to their average PLI.

"This shows that the improved financial performance of the higher genetic merit herds is explained largely by their higher milk yields, partially offset by the use of more concentrate," says Mr Harper.

"It gives a clear economic endorsement of PLI, but it is important to recognise that there are clearly other factors which also influence the bottom line.

"These include feed and forage quality, cow comfort, and other aspects of good herd management – most importantly the capability of the farmer and his staff.

"Higher genetic merit herds also tend to be larger, which in turn can impact on buying power and milk price, but none of these factors alone accounts for their superior performance," he says.

"The important part played by genetics is unambiguous in this study, and with some 400 farms included in the analysis it gives us even more confidence than before in the results."

> **"The important part played by genetics is unambiguous in this study"** Tim Harper

The larger study this time around has also allowed for a more detailed analysis of the type of management system – high or low input – and which benefit the most from high genetic merit.

"This study has clearly shown that for lower production herds using low input systems, PLI is just as important as for the high input herds," says Mr Harper. "This is seen in consistently higher margins in the higher PLI herds, irrespective of the system."

Two particularly important messages for breeders emerge from these results, according to Marco Winters, head of genetics at DairyCo.

"One is that they should use high PLI bulls for their breeding, irrespective of their production system. The other is the importance of selection for health and fitness traits in order to reduce veterinary costs.

"Although PLI itself places considerable emphasis on health and fitness traits (55 per cent) which is already helping reduce vet and med costs, any dairy farmer seeking to further improve a particular area of fitness, such as fertility, is advised to drill down through a bull's index to make sure he is likely to transmit good fertility on to his daughters," he said.

"With any breeding strategy, PLI is an important starting point, but the strategy can be fine tuned to reflect specific needs," he adds.

Reflecting on this strong affirmation of the financial benefits of PLI, Mr Winters concludes: "This study reinforces our confidence that the index is fulfilling exactly the objectives it was designed to meet."

Table 2: Performance of herds (grouped by PLI)

	Top 25%	Average	Bottom 25%
PLI	29.2	10.3	-19.8
Herd size (cows)	211	184	135
Milk yield (litres)	8,583	7,950	6,881
Milk price (p/litre)	26.8	26.6	26.4
Milk income (£/cow/year)	2302	2118	1816
Concentrate usage (tonnes/cow)	3.35	3.03	2.48
Concentrate price (£/tonne)	191	189	182
Feed rate (kg/litre)	0.39	0.38	0.36
Total feed cost (£/cow/year)	705	628	504
MOPF (£/cow/year)	**1,597**	**1,490**	**1,312**
Calf income (£/cow/year)	128	130	132
Vet and medicine* (£/cow/year)	94	85	67
AI and semen (£/cow/year)	46	40	29
Net replacement cost** (£/cow/year)	216	217	196
Direct forage costs*** (£/cow/year)	82	81	73
Margin (£ per cow)	**1,285**	**1,197**	**1,079**

400 black-and-white herds (over 73,000 cows) averaging 7,950 litres had their genetic and financial records matched for this study.

* Veterinary and medicine costs include costs of preventative care and treatment.

** Net replacement cost represents the difference in value between the cull and the replacement animal, reduced to an annualised figure.

*** Direct forage costs include only seed, spray and fertiliser costs (but not the cost of application or harvesting).

DairyCo

Goals are evolving

Selection from traditional ‘dual purpose’

↓

Production - Milk, fat, protein (PIN)

↓

Longevity – incl. Type (ITEM)

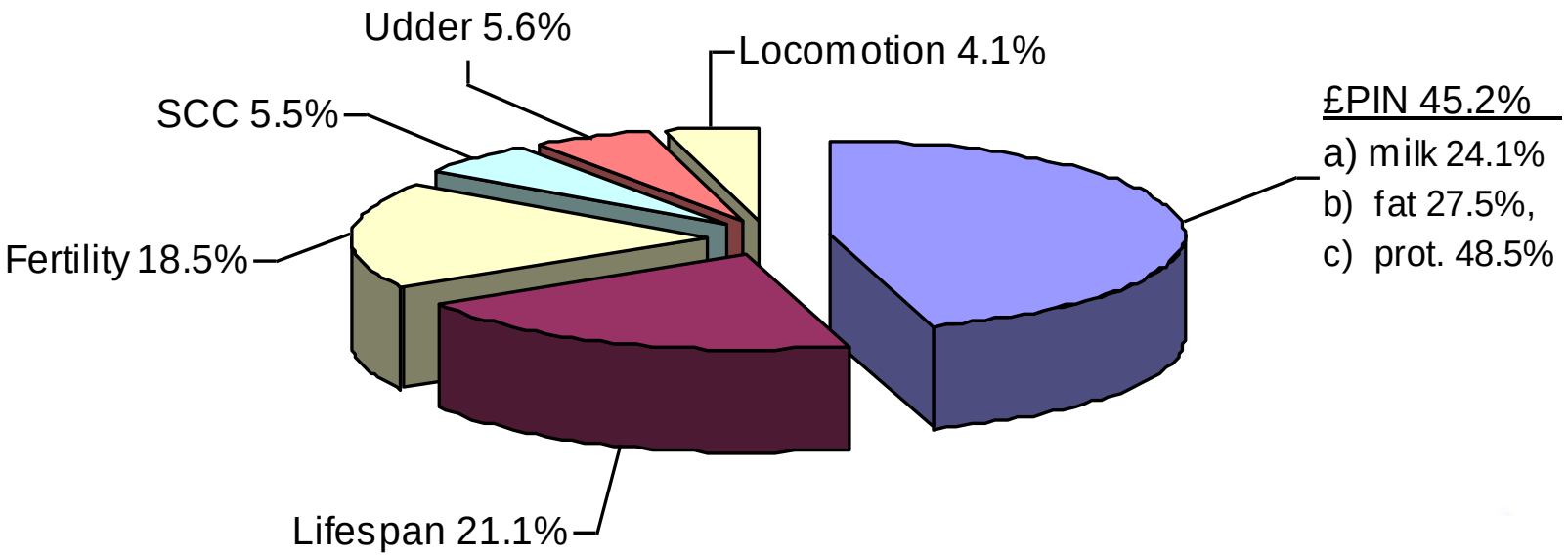
↓

‘Fitness’ (£PLI)

↓

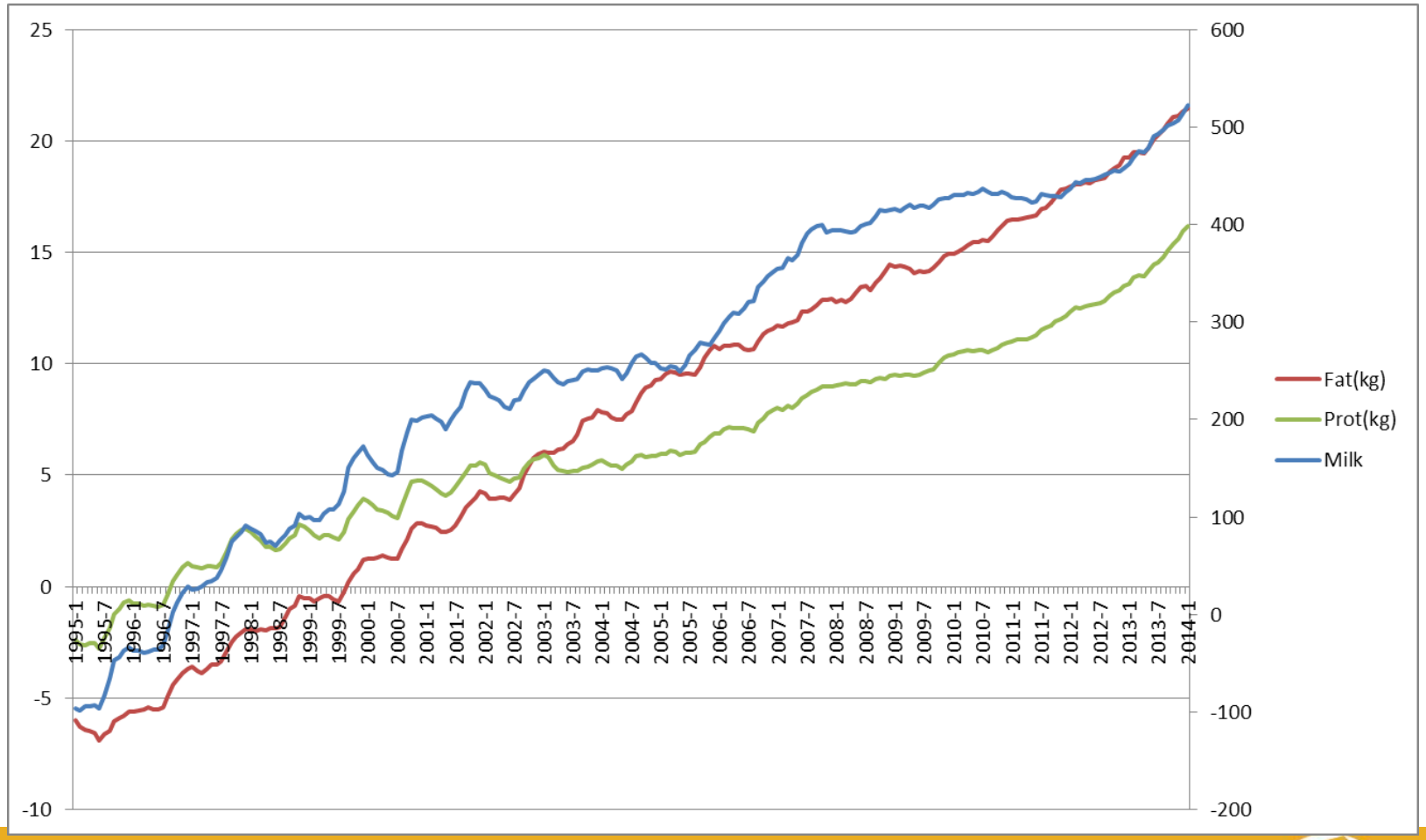
£PLI – August 2007 till now

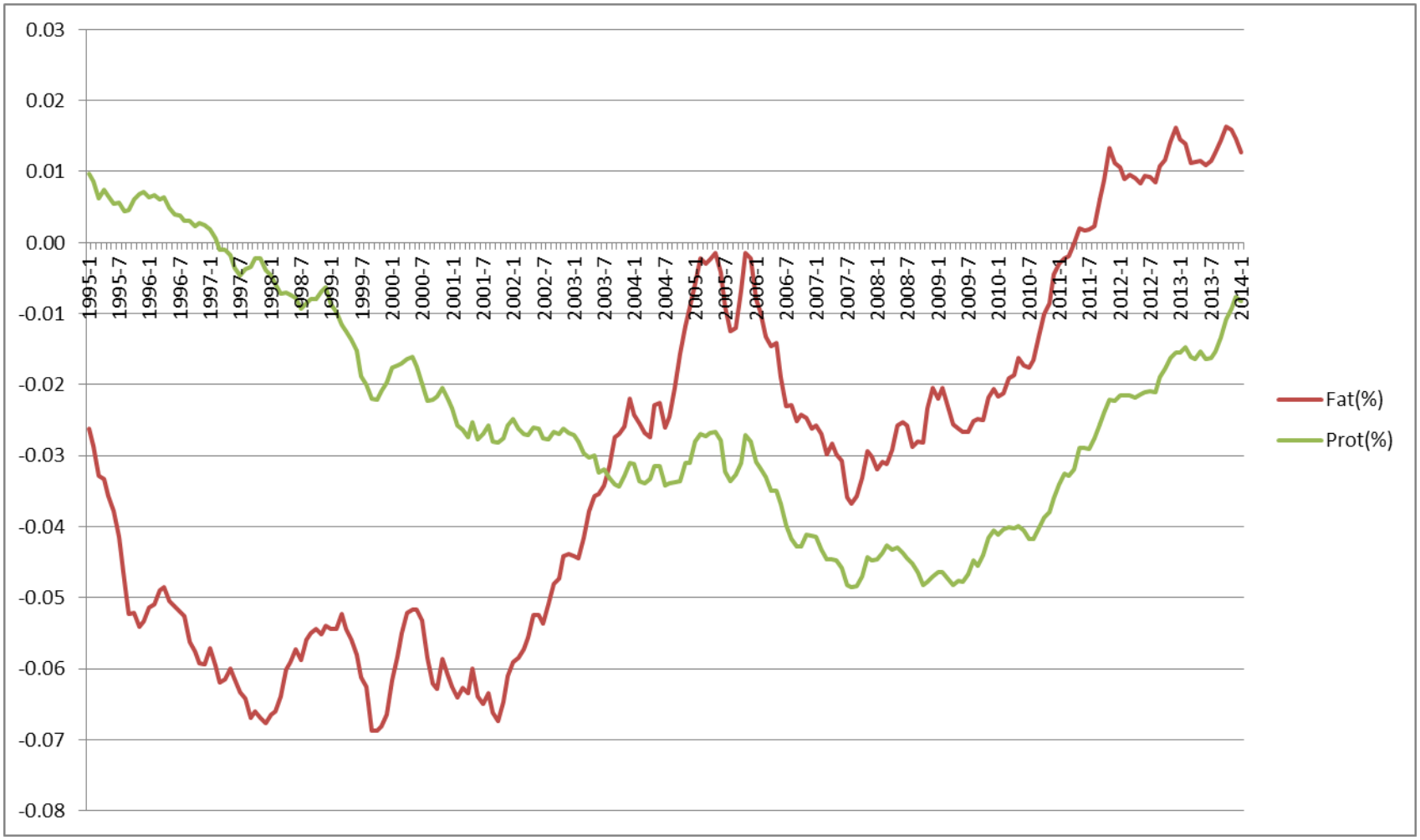
Relative importance of traits in the Profitable Lifetime Index



How is the industry doing?

Genetic trends (based on Inseminations since 1995)

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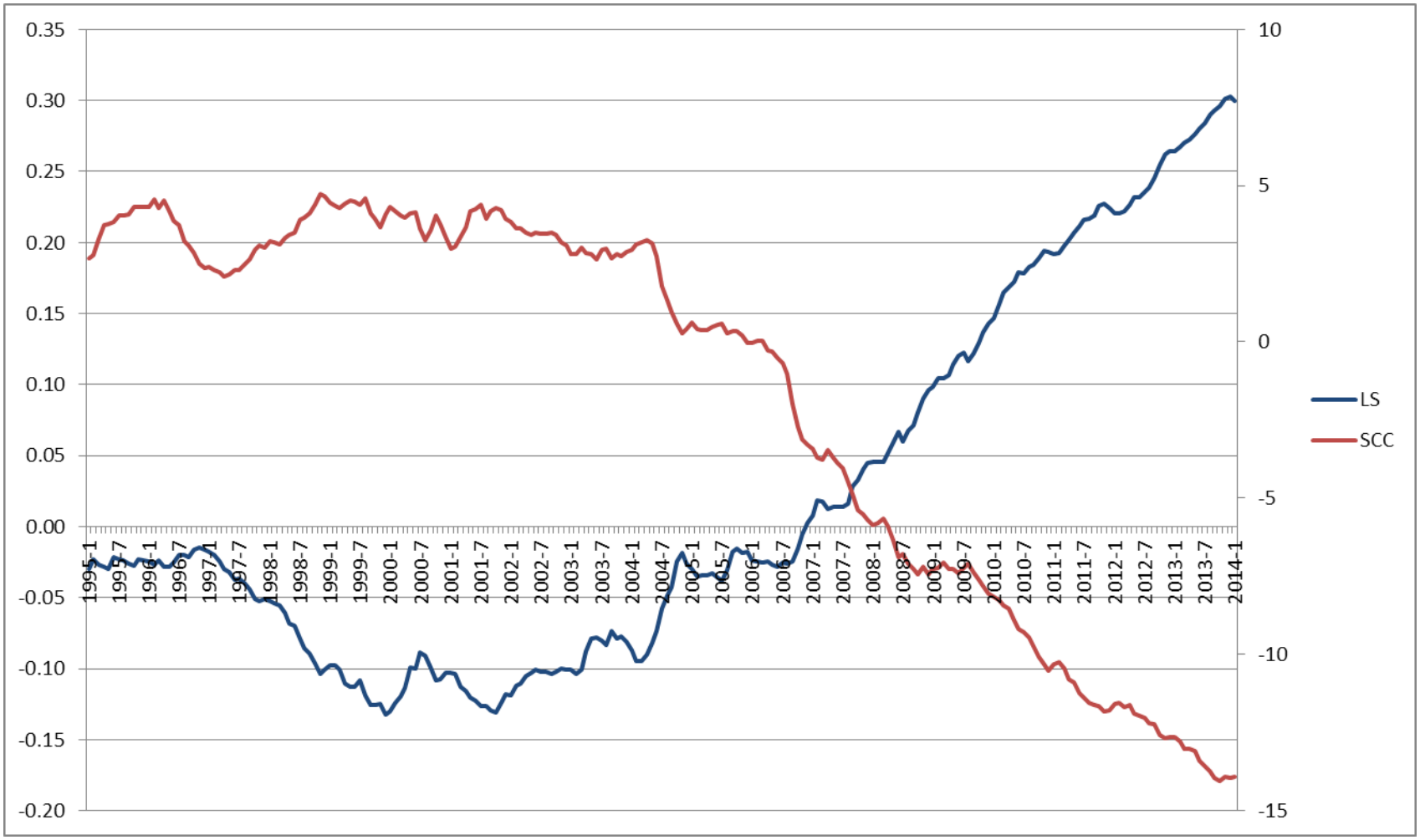
Prot(%)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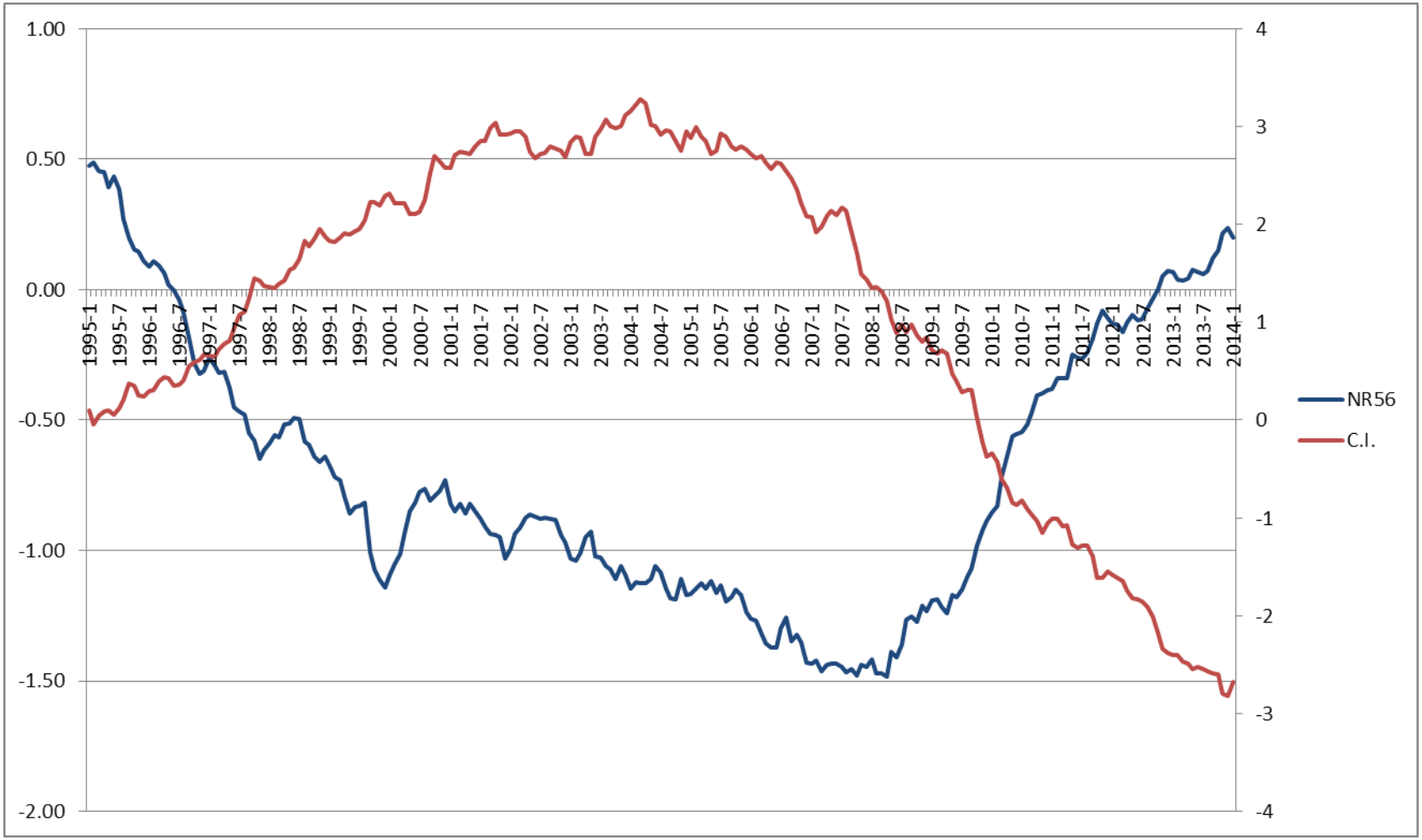
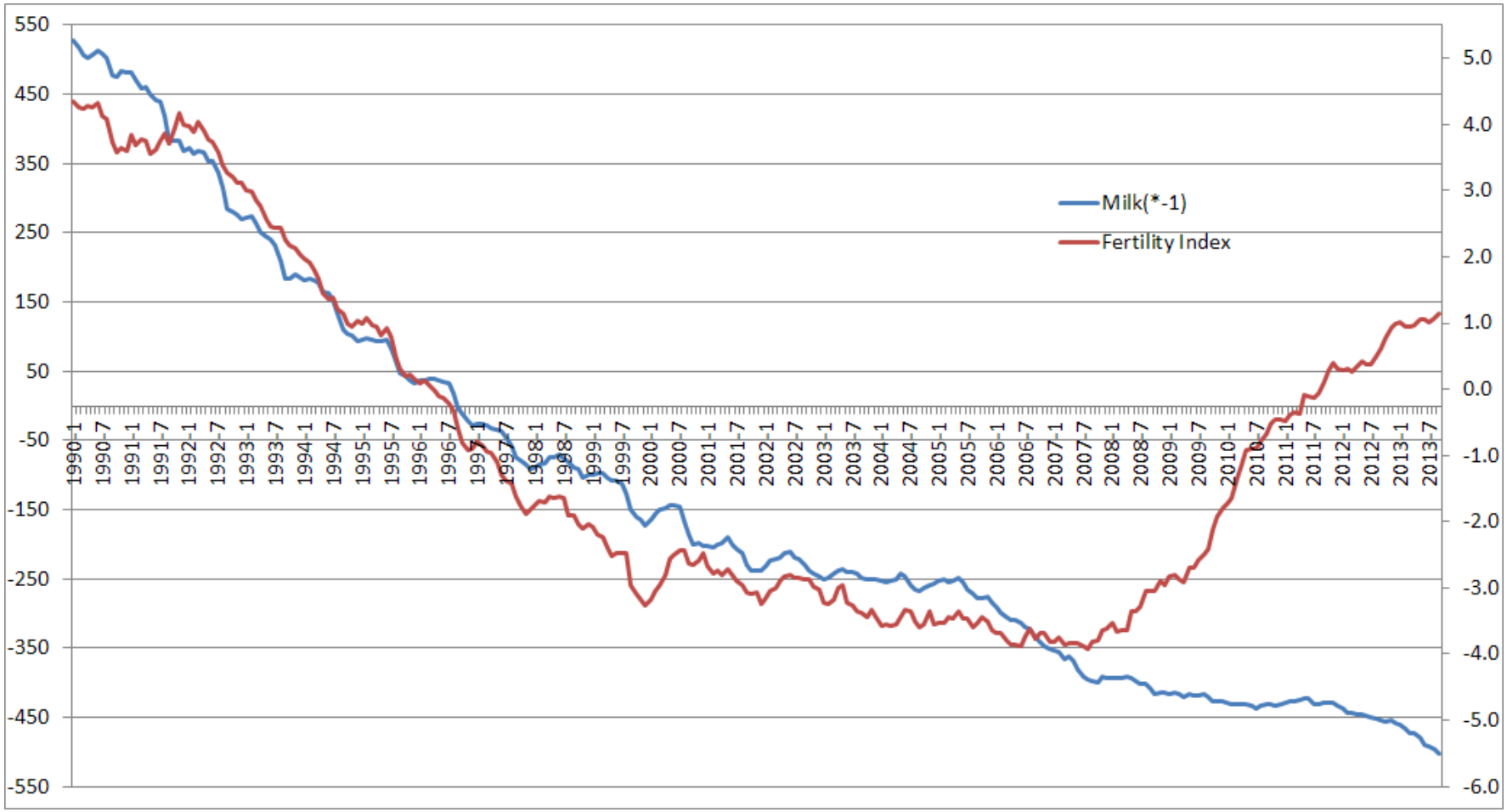
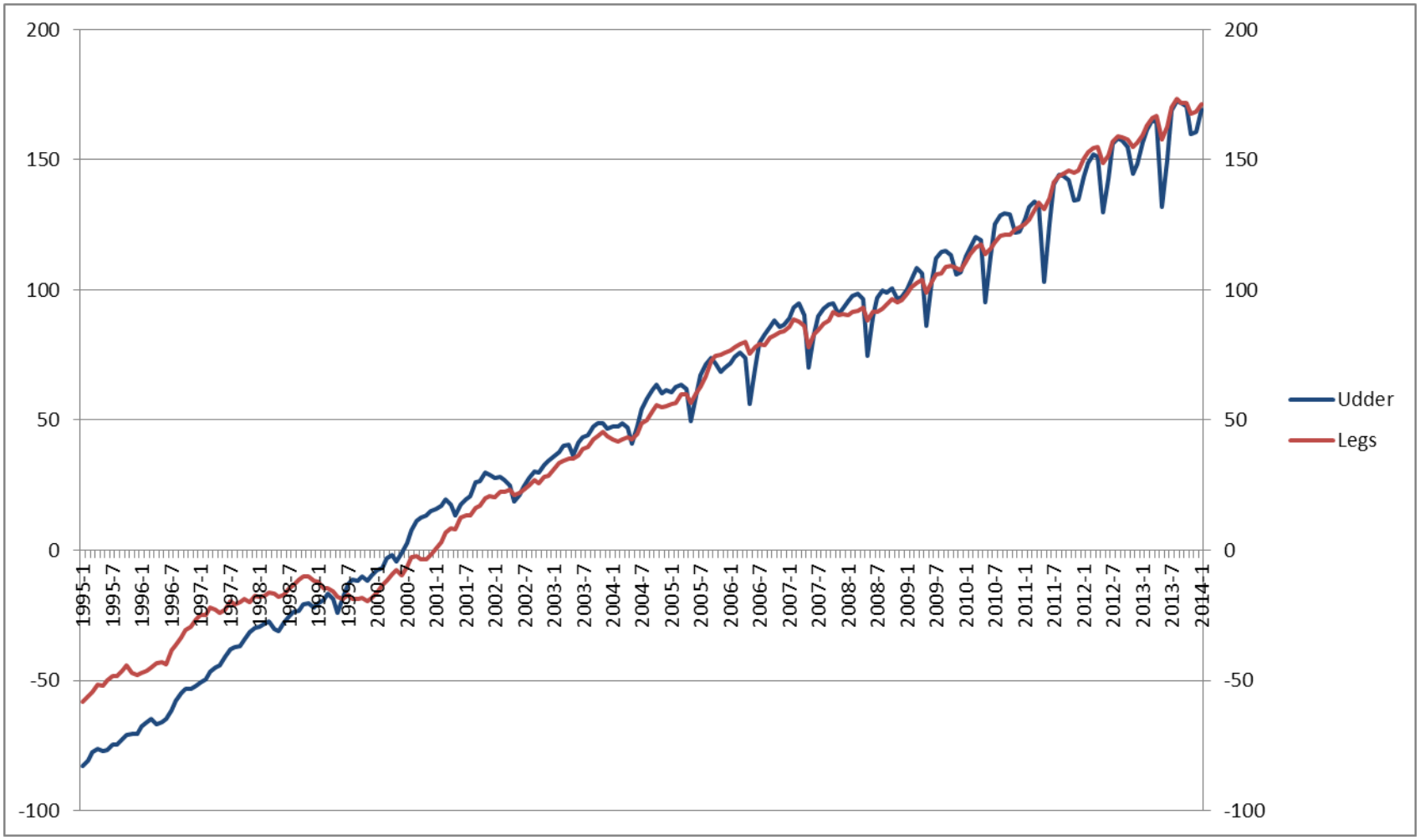
Impact of Fertility Index and £PLI



Impact of F.I. and £PLI

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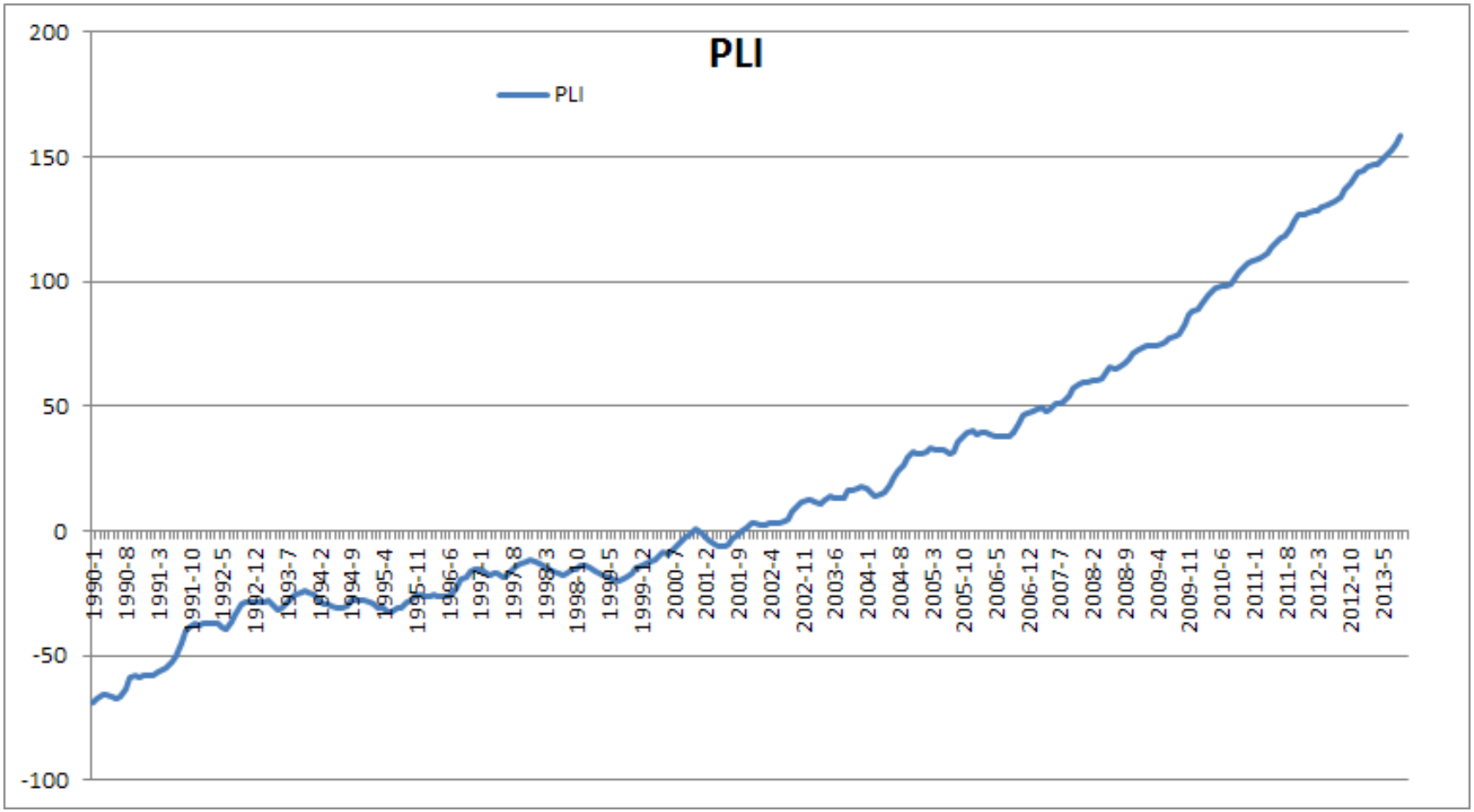
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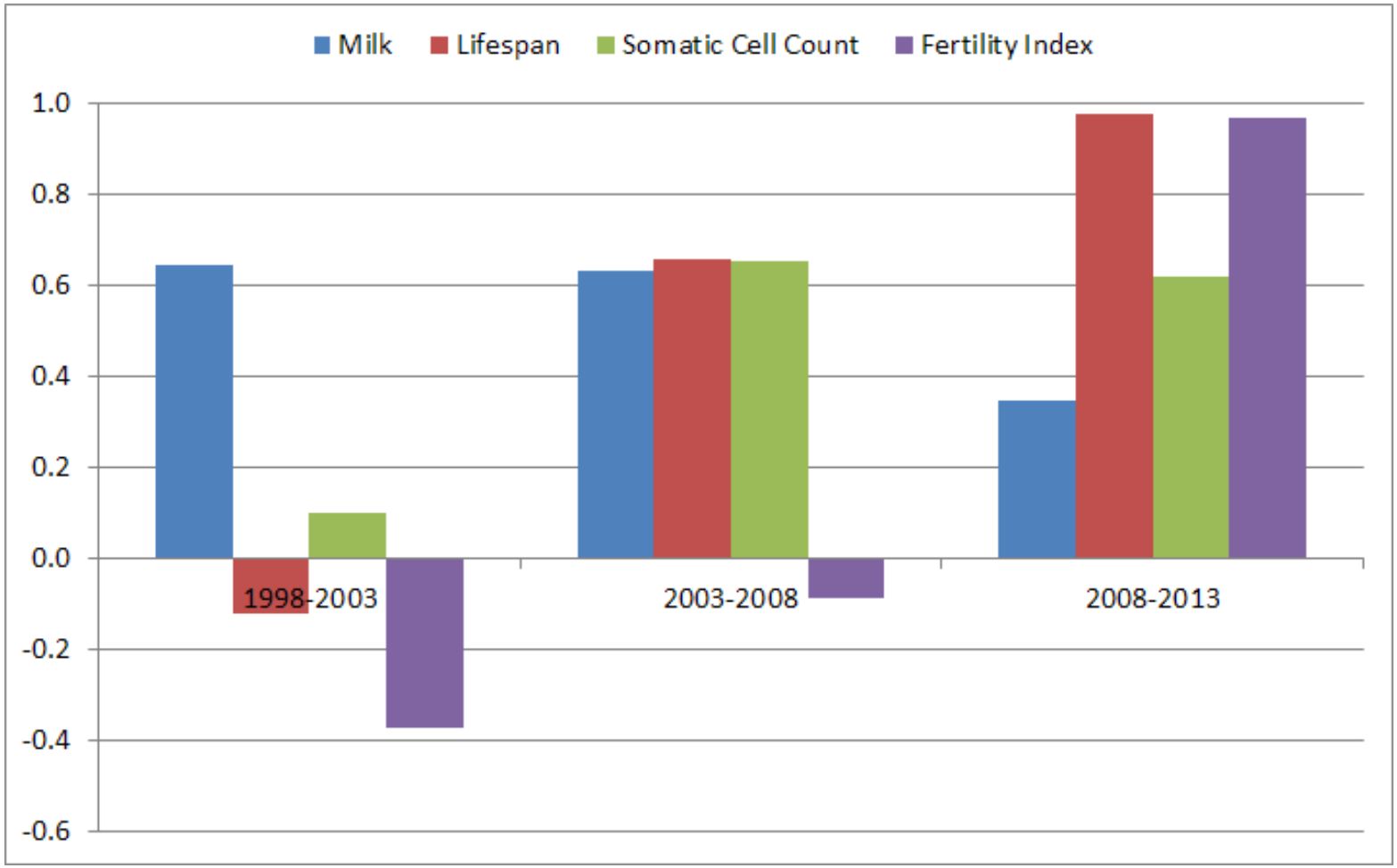
2012-3
2012-10
2013-5

Standardised Genetic Gains

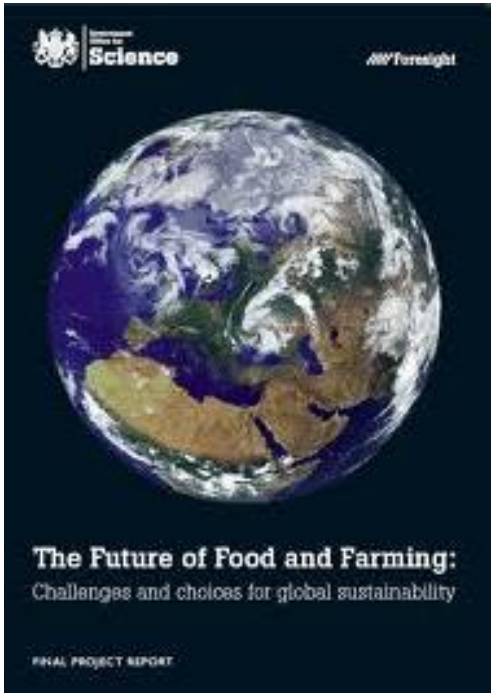
(based on insemination data)



Cow of the Future

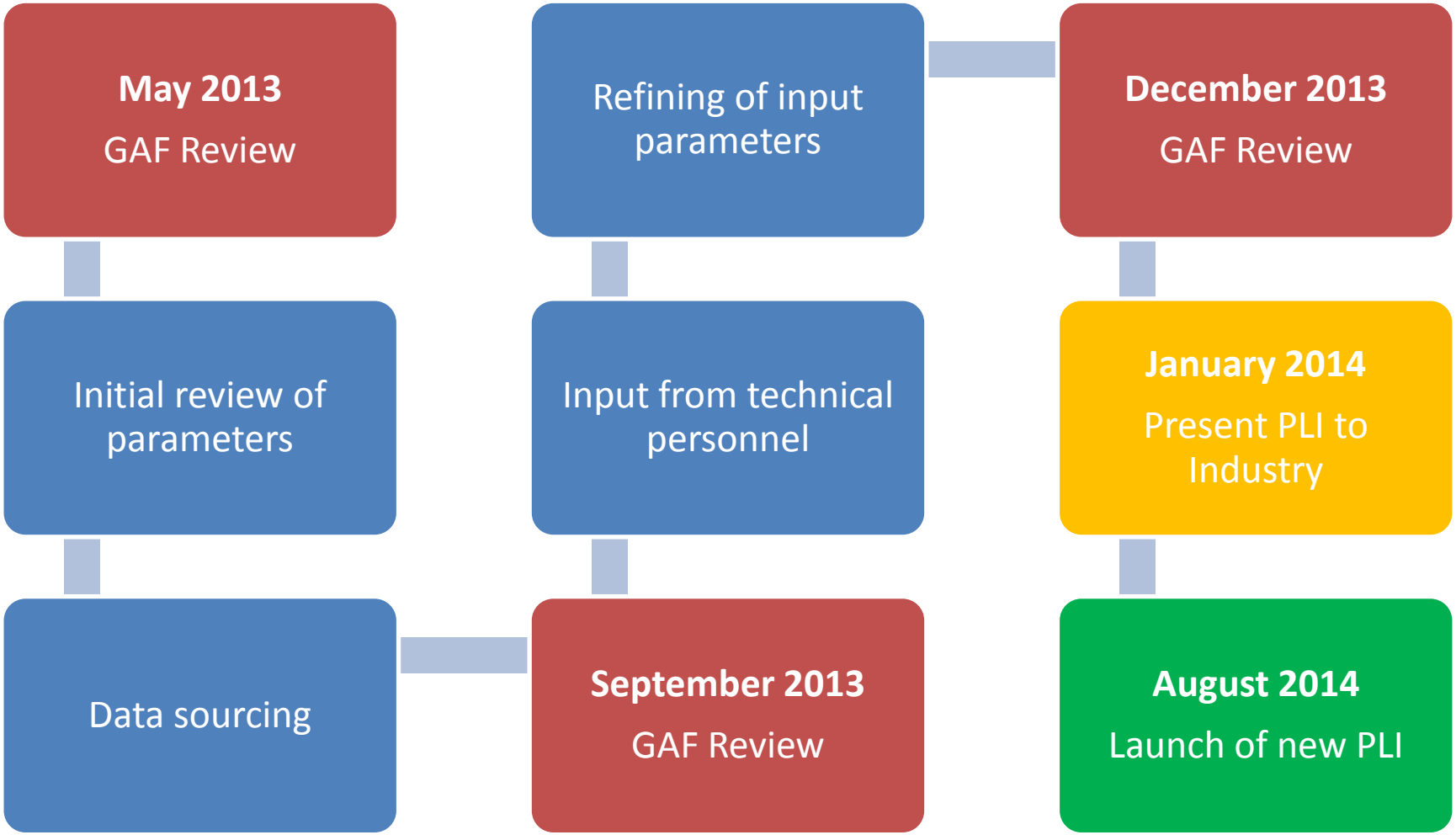
- What kind of farming operation will we need in 5, 10 or 15 years to be competitive on a global dairy industry ?

- ..what kind of cow is needed?



Updating PLI

- Model developed in conjunction with SRUC and AbacusBio (NZ)
- Economic value attributed to a 1 unit change a specific trait
- Over 350 input values


May 2013
GAF Review
Initial review of parameters
Data sourcing
September 2013
GAF Review
Input from technical personnel
Refining of input parameters
December 2013
GAF Review
January 2014
Present PLI to Industry
August 2014
Launch of new PLI

Data Sources

- Research projects
- Industry data:
  - Milk Recording
  - DEFRA
  - DairyCo MI
- Industry expertise:
  - EGENES Technical Advisory Group
  - Genetics Advisory Forum

CIS
EGENES
holstein UK
holstein & british friesian
UNITED DAIRY FARMERS
NMR
information partnerships
UK BROWN SWISS
ENGLISH GUERNSEY CATTLE SOCIETY
Cattle Services (Ayr) Limited
AYRSHIRES
CATTLE SERVICES
STATES OF GUERNSEY
SHORTHORN
UK Jerseys
Montbeliarde UK

National Breeding Goal

- To breed dairy cows which;
  - Thrive in the diverse UK dairy farming systems
  - Show improved health, welfare and productivity

- Such a breeding policy will contribute to a profitable, healthy and environmentally sustainable dairy herd.

£PLI update

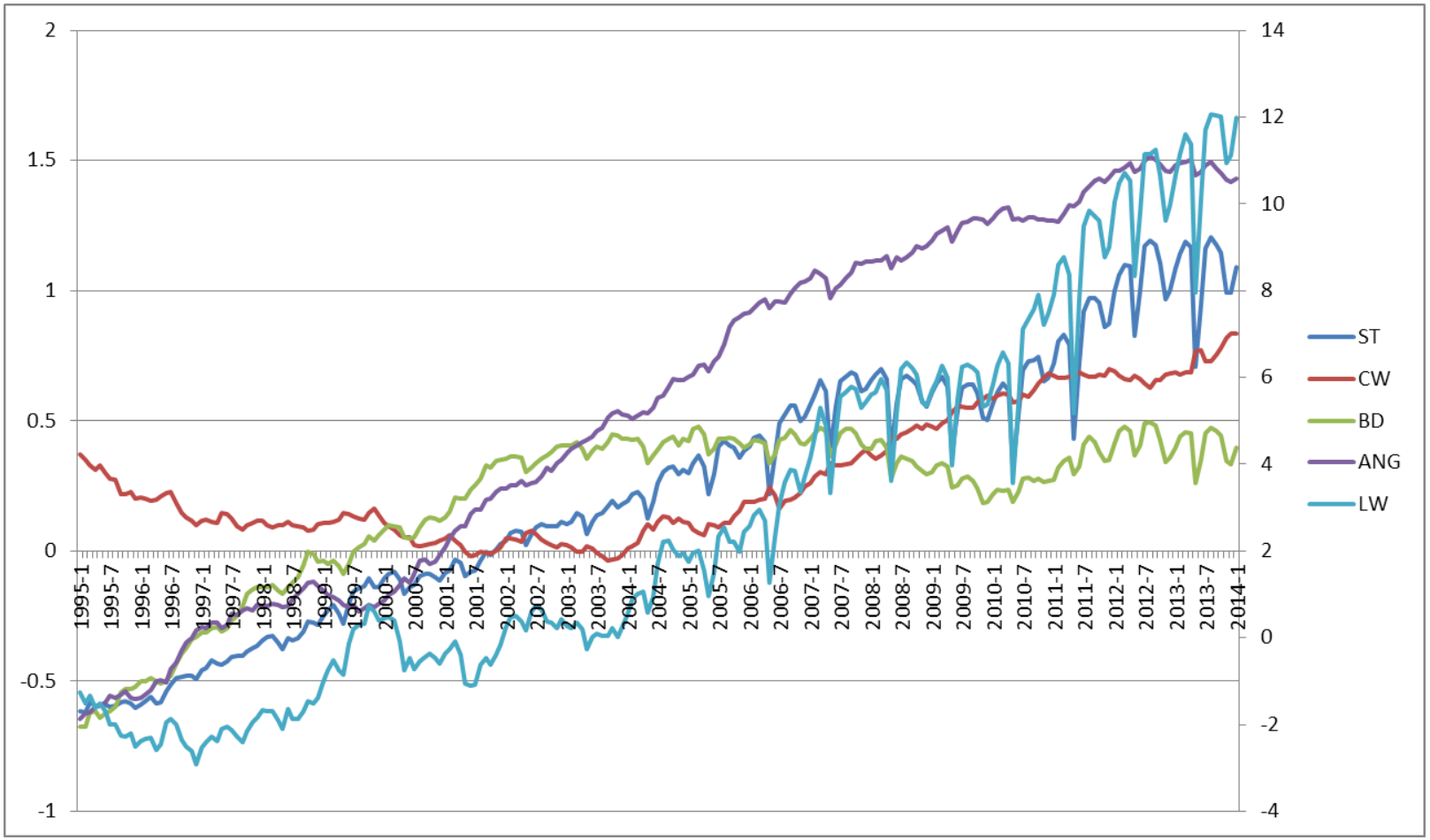
- Evolution of current £PLI
  - More emphasis on ‘Fitness’
  - Maintaining milk quality (fat and protein %)

- Additional traits added to the index
  - Calving Ease (direct and maternal)
  - Maintenance cost

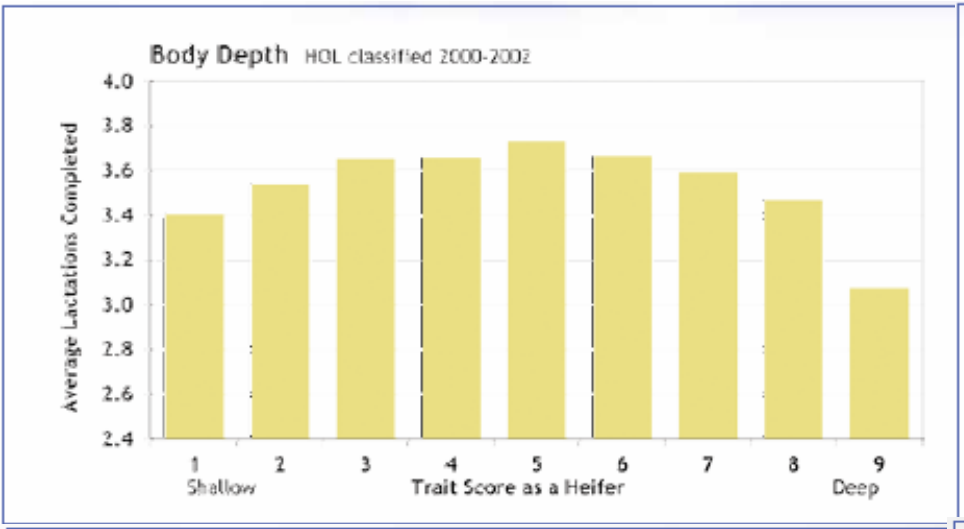
New £PLI - Outcome

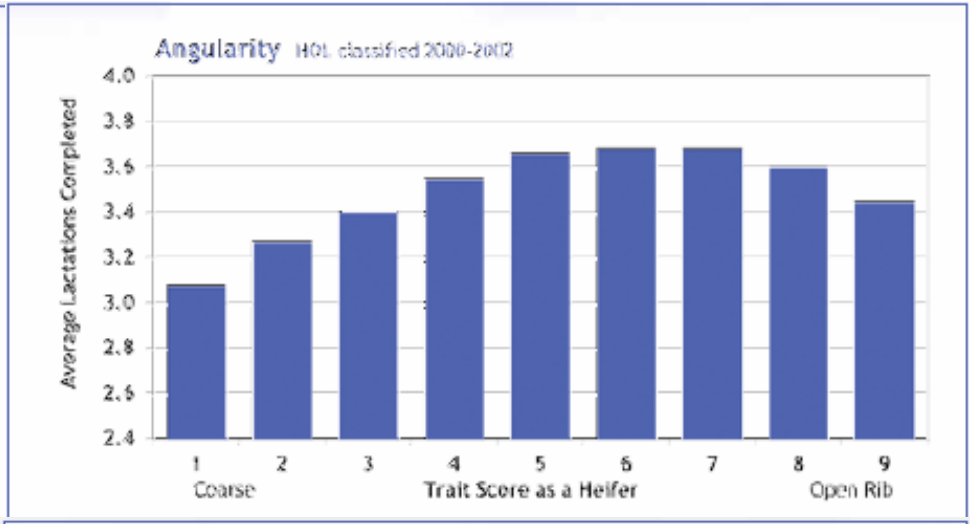
- ✓ Reduce emphasis on Production (~1/3 of £PLI)
  - ✓ Less milk, maintain components
- ✓ Increased emphasis on Fertility
- ✓ Maintain importance of Longevity
- ✓ Increase emphasis on Udder Health
- ✓ Increased importance of functional type
  - ✓ Feet & Legs and Udders
- ✓ Include cost of Maintenance and Calving Ease

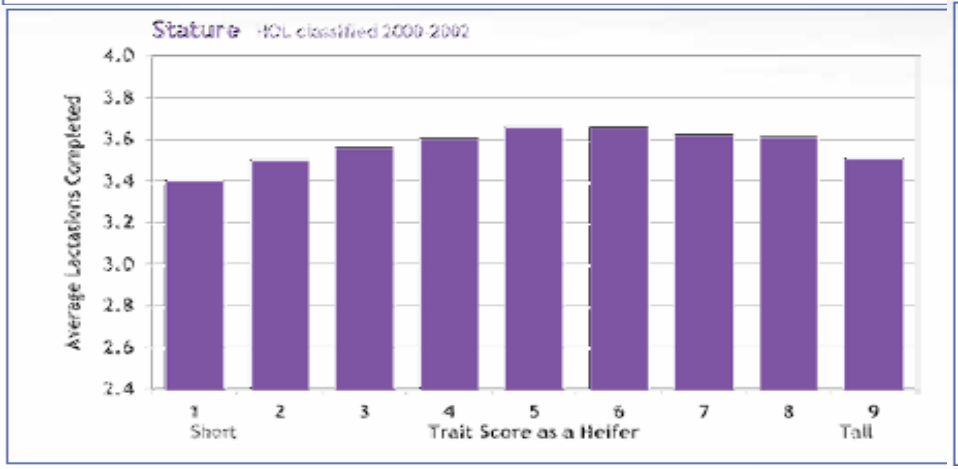
Maintenance cost is increasing - Correlated response to selection

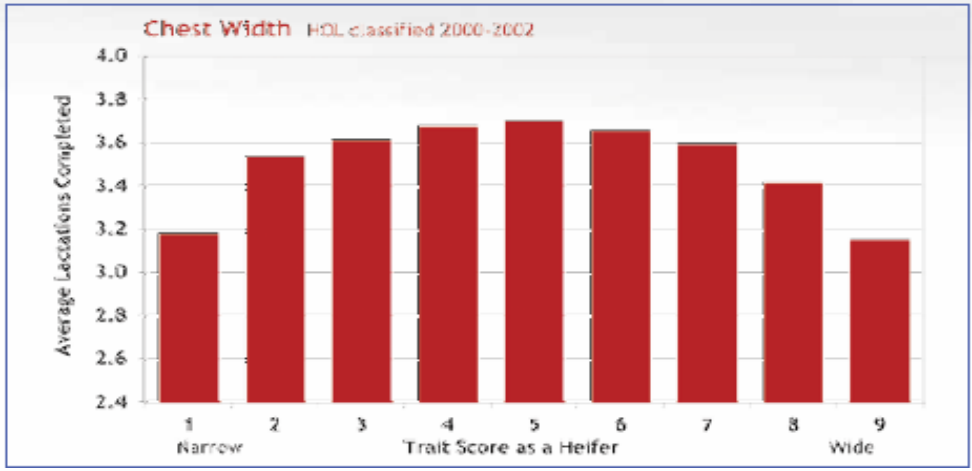


Dairy Traits - Longevity



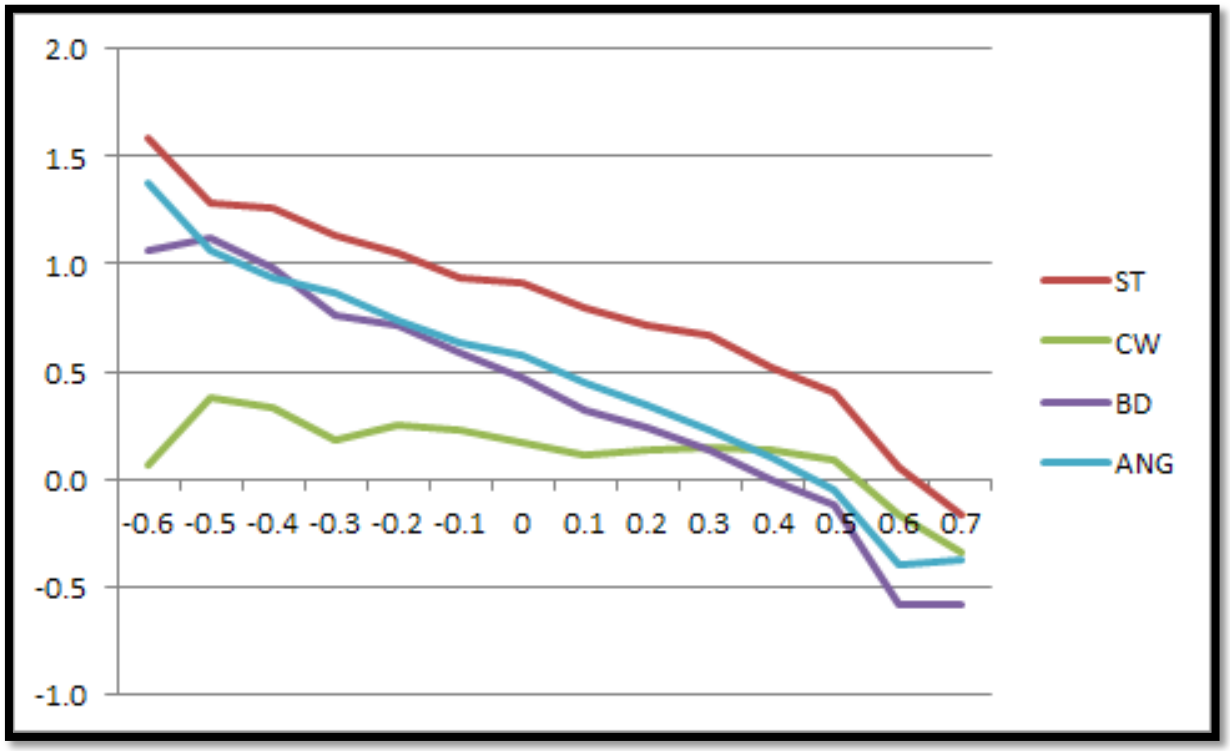




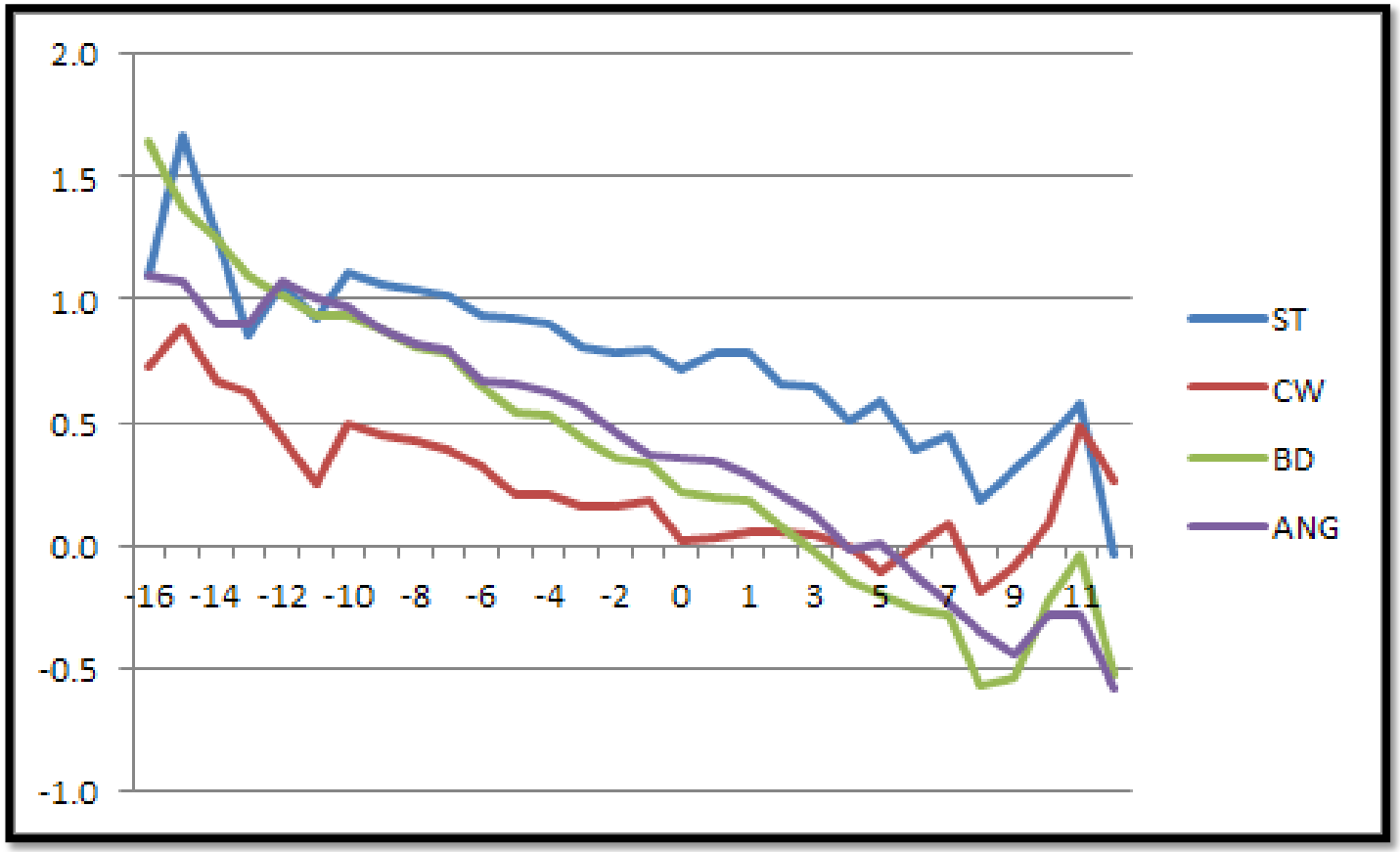


Lifespan vs Body traits

(LS rlb >39, born >1995)



Fertility vs Body



Liveweight

- Predicted from Linear type

J. Dairy Sci. 95:2170–2175
http://dx.doi.org/10.3168/jds.2011-4838
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Technical note: Prediction of liveweight from linear conformation traits in dairy cattle

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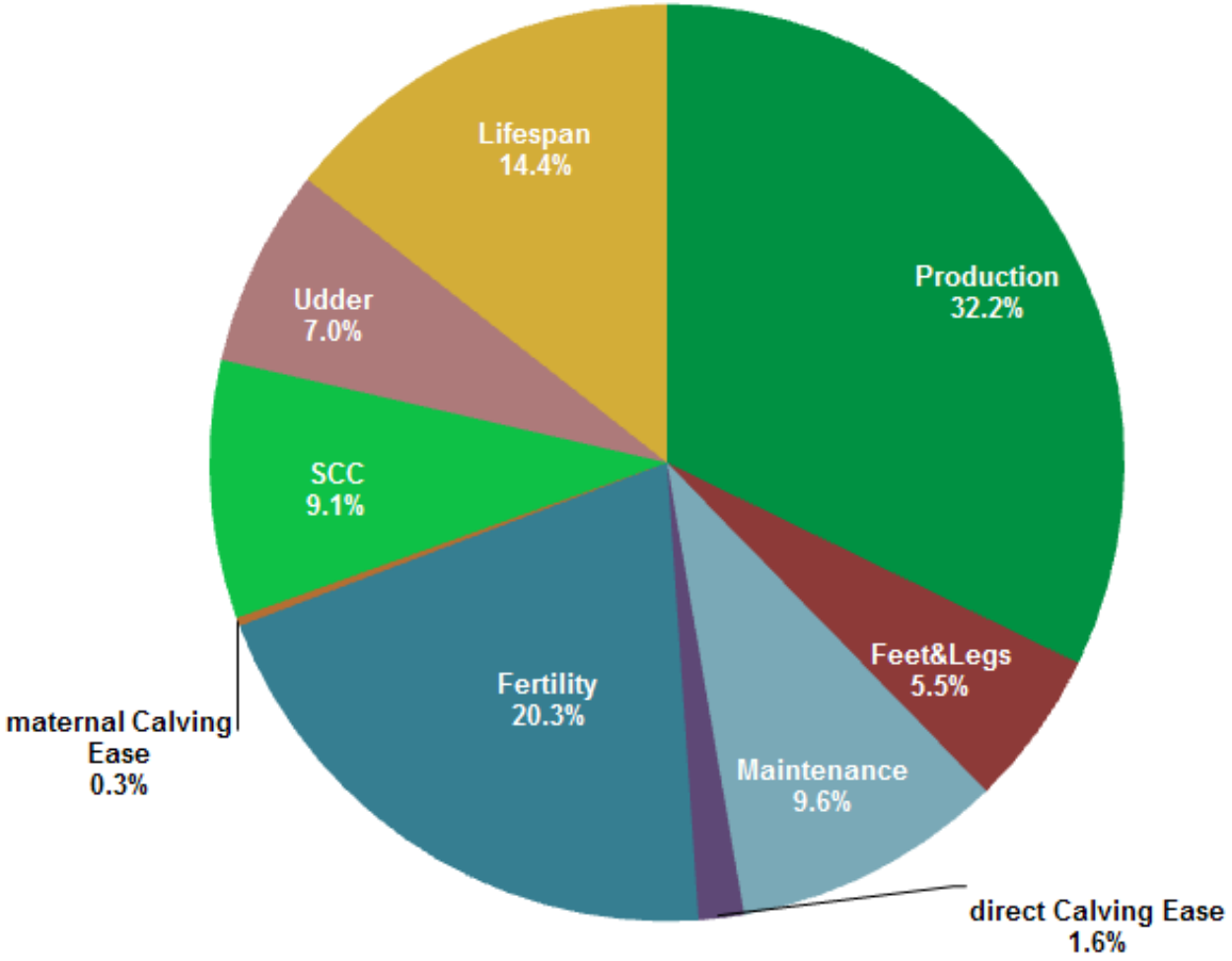
ABSTRACT

The objectives of this study were to derive phenotypic and genetic prediction equations of liveweight from linear conformation traits, and estimate genetic and phenotypic parameters for these traits. Data pertained to 2,728 conformation and liveweight records of 613 cows in 1,529 lactations. Cows were raised at the Scottish Agricultural College research station and had calved between 2002 and 2010. Fifteen linear conforma-

into an overall selection index requires some way of routinely estimating it at the animal or sire level.

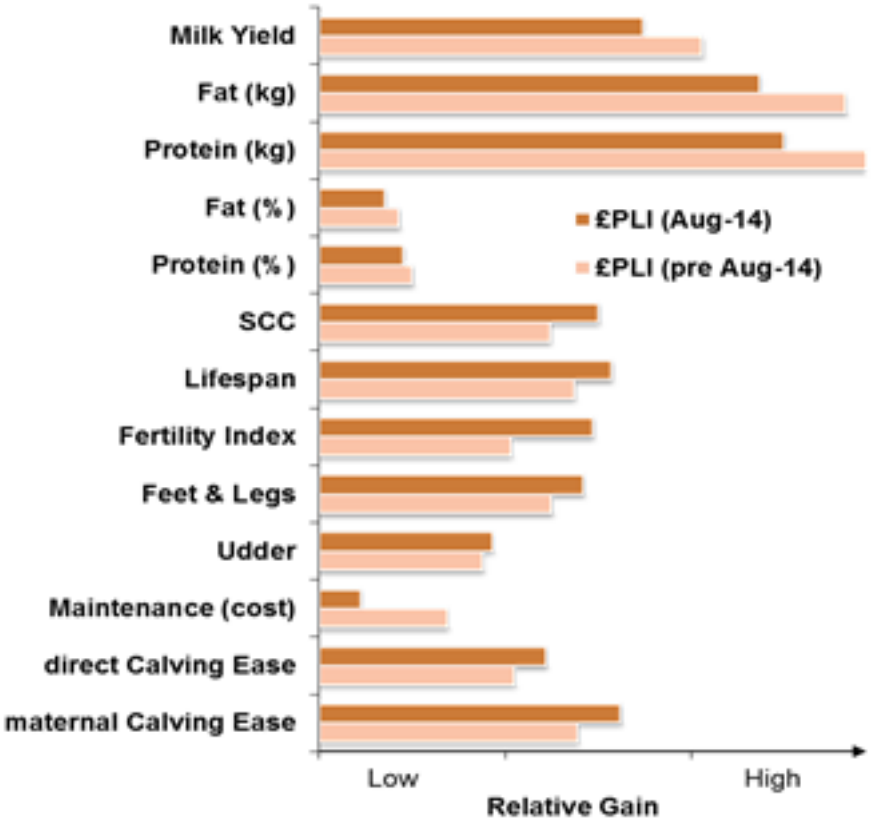
Banos and Coffey (2010) proposed a body energy content indicator based on body condition score and liveweight that could be used in genetic selection programs aiming at enhancing cow robustness. However, although body condition score is now routinely assessed in the commercial population in the UK and some other countries at the time of cow classification

Relative Emphasis – New £PLI



What do top bulls deliver;

Relative genetic gain for a range of traits, based on the average of top ranking £PLI bulls; pre- and post-Aug14



£PLI reliability

- Production reliability is mostly used
- Fitness reliabilities hardly ever quoted

- From August;
  - £PLI specific to the data contributed will be calculated, based on trait reliabilities and their relative contribution to £PLI
- Approx. 0.96 * production rlb (bulls with Genomics included)
- Approx. 0.91 * production rlb (non 'G' bulls; due to lower rlb of fitness)

- <u>Note; £PIN will no longer be published</u>

Introduce new index in Aug-2014

- Spring Calving Index (£ SCI)

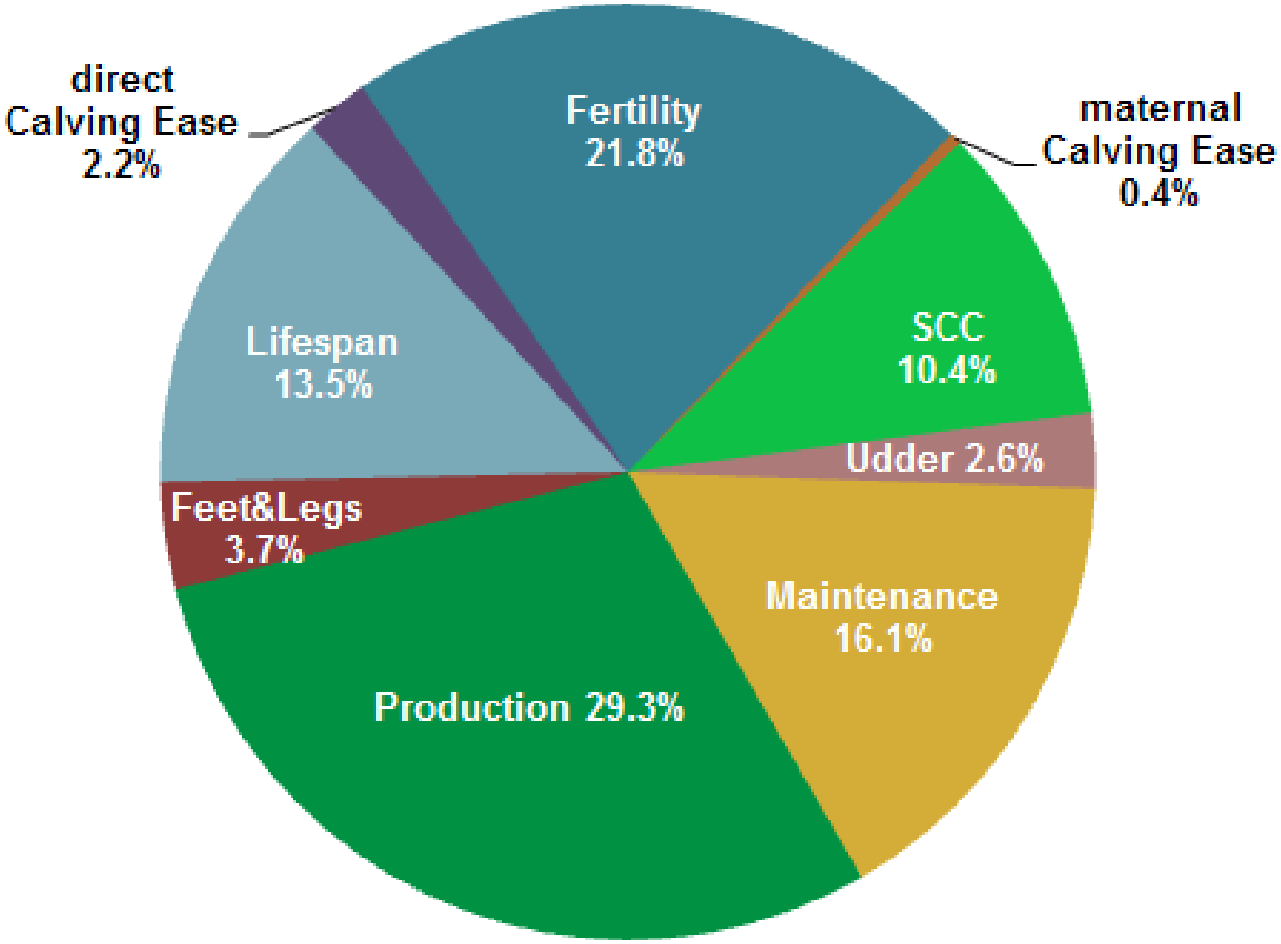
- Targeted towards;
  - Spring calving herds
  - Block calving
  - Extensive use of grass
  - (~4500 kgs milk)

- Ranking Across breeds

£SCI – Outcomes

- ✓ Focus on milk quality, rather than high volume
  - ✓ Maintain Production efficiency with high components
- ✓ High emphasis on Fertility
- ✓ Recognise the importance of cost of maintenance
- ✓ Protect Udder Health
- ✓ Value the cost associated with Calving difficulties
- ✓ Strong selection on Longevity
- ✓ Protect functional type;
  - ✓ Feet & Legs and Udders

Relative Emphasis - £SCI



Summary

- Favourable genetic progress for most major traits
  - Body size however still increasing

- August 2014
  - Update £PLI index
    - Increased emphasis on ‘fitness’
    - Include Maintenance cost
  - Introduce £SCI index
    - Only for spring-block calving herds
    - Yielding around 4500 per lactation
  - Base change

- Factsheets available explaining updates