Effect of crossbreeding on market value of calves from dairy cows

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ABSTRACT: Market values (/kg) of calves obtained from six paternal breeds, Brown Swiss (BS), Holstein Friesian (HF), Simmental (SI), Alpine Grey (AG), Limousin (LI) and Belgian Blue (BB), and four maternal breeds (BS, HF, SI, AG), were studied in order to estimate the crossbreeding effects. A total of 58,877 calves sold during 143 weekly auctions from 2003 to 2005 in Bolzano in Italy near the Austrian border, were analyzed using ANOVA procedure according to a linear model that included the effects of cross, sex and age of the calf, year and month of the auction. Coefficient of determination (R²) was 0.84; cross and sex effects resulted the most important. The BBxSI calves showed the highest commercial value (7.01 /kg), while the BS purebreds the lowest one (2.74 /kg). The LI and BB breeds used as sire breeds showed the greater commercial prices when crossbred with SI and AG respect to BS and HF. However, BB resulted the best sire breed. On average male calves showed greater commercial values than female ones (5.16 vs. 4.44 /kg), but in HF and BS purebreds the commercial value of males and females was similar.

Key words: Dairy cows, Beef bulls, Calves prices, Market value, Crossbreeding.

INTRODUCTION – Crossbreeding is largely used in breeding programs for many livestock species (Weigel and Barlass, 2003), in order to improve productive and reproductive performances in animals. Crossbreeding has become an interesting mating system in dairy cattle (Van Raden and Sanders, 2003) for many reasons: i) to enhance milk nutrient contents, especially in those countries where a great emphasis is given to the cheese industry; ii) to improve functional traits such as reproductive efficiency, health and longevity; iii) to obtain a greater economic income from selling the crossbred calves as compared to purebred calves. Calves obtained by dairy breeds provide a large quota of meat market in Italy (Tonietto, 1990). The studies on market value of dairy calves are very scarce, but in Bolzano province in Italy, near the Austrian border, there is an important breeders' cooperative that sell about 500 calves at every weekly auctions. The objective of the study was to estimate the differences in commercial values of different crossbred calves.

MATERIAL AND METHODS – Data of calves commercial value (\in /kg) were recorded by Kovieh (wholesale cattle organization) of Bolzano province (Italy), from January 2003 to December 2005. Dataset of weekly auctions has been reduced to calves sold at auction at an age between 7 and 50 days, a weight from 29 to 122 kg, and a commercial value above 0.4 \in /kg. Only calves with registered breed of sire and dam have been considered. After data editing, 58,877 calves sold during 143 weekly auctions were analyzed. Age at auction (23 ± 8 d) has been classified into three classes, low ($x \le \bar{x} - SD$), medium ($\bar{x} - SD < x < \bar{x} + SD$), and high ($x \ge \bar{x} + SD$). Calves were progeny from six paternal breeds: Brown Swiss (BS), Holstein Friesian (HF), Simmental (SI), Alpine Grey (AG), Limousin (LI) and Belgian Blue (BB), and four maternal breeds (BS, HF, SI, AG). Cross effect was defined as breed sire and breed dam (e.g. a BBxBS calf had BB as sire breed and BS as dam breed).

Analysis of variance was performed using PROC GLM of SAS (SAS Institute, 1999) according to a linear model that included the effect of cross, sex and age of the calf, year and month of the auction, and all interactions of first order between effects considered.

RESULTS AND CONCLUSIONS – The average age at auction was similar for all crosses with values ranging between 22 and 25 days and SD of about 8 days.

The average weight and price values of calves were 65.6 ± 9.75 kg and 4.5 ± 1.91 /kg, respectively (data not shown). Descriptive statistics for weight at auction are shown in Table 1.

The effects included in the model of analysis accounted for a large proportion of variation. The coefficient of determination (R^2) and root mean square error (RMSE) were 0.84 and 0.78, respectively. All effects resulted highly significant (P<0.001), and the most important were the cross and sex effects. Table 2 show the commercial values least square means (LSM) of cross effect. All contrasts among the crossbreds LSM were statistical significant (P<0.001) with the exception of LIxBS and LIxHF. The BBxSI crossbreds showed the highest commercial value (7.01 /kg), while the BSxBS purebreds the lowest one (2.74 \in /kg). Both for purebreds and crossbreds, the calves produced by dairy BS and HF cows had the lowest prices and the ones calved by dual purpose Simmental ones the highest. Both LI and BB beef breeds used as sire breeds improved significantly the value of calves. The greatest commercial prices were obtained when semen of the two beef breeds was used to inseminate the dual purpose cows SI and AG than the dairy cows BS and HF. However, for both beef breeds, the calf price improvement was higher on BS. AG and HF cows than on SI ones. Results presented here are in agreement with those reported by Tonietto (1990) and Carnier (1992). Between the paternal breed BB showed a much higher positive effect than LI for all maternal breeds. Concerning the mean sex effect, male calves showed greater commercial values than female ones (5.16 vs. 4.44 €/kg) with a significant interaction with genotype. In dairy purebreds (HF and BS) the commercial value of males and females were similar (about 0.20 €/kg more for females), while for other purebreds (SI and AG) and for all crossbreds there were important differences between sexes (about $1 \in /kg$ more for males) as shown in Figure 1. This interaction is explained by the destination of calves. In fact, while almost all the purebred dairy calves, both males and females, are used for veal production, in all the other genotypes the majority of females are used for veal production and the majority of males are fattened for beef production.

	of different genotypes.							
Maternal breed								
Paternal	E	BS HF		IF	SI		AG	
breed	calves	weight	calves	weight	calves	weight	calves	weight
BS	15588	62.8						
HF			5927	58.8				
SI					8874	67.8		
AG							6083	64.6
LI	1006	67.1	310	64.5	164	68.7	170	68.5

66.6

4891

69.9

2178

71.1

Table 1.Descriptive statistics for number of calves sold (n) and weight (kg) at auction
of different genotypes.

BS: Brown Swiss; HF: Holstein Friesian; SI: Simmental; AG: Alpine Grey; LI: Limousin; BB: Belgian Blue.

3439

Table 2.	east square estimates and standard errors of the genotype effect of calves ommercial value (\in /kg).								
Maternal breed									
Paternal breed	BS	HF	SI	AG					
BS	2.74 ± 0.02								
HF		2.99 ± 0.02							
SI			4.55 ± 0.01						
AG				3.44 ± 0.02					
LI	4.20 ± 0.03	4.20 ± 0.06	4.97 ± 0.08	4.77 ± 0.09					
	BB 6.07 ± 0.01	5.88 ± 0.02	7.01 ± 0.01	6.76 ± 0.02					
BS: Brown Swis	s; HF: Holstein Friesia	n; SI: Simmental; AG:	Alpine Grey; LI: Limousi	n; BB: Belgian Blue.					

BB

10247

68.5

Figure 1. Differences between males and females least square estimates on calves commercial value (\in/kg) , for different purebred and crossbred calves.



BS: Brown Swiss; HF: Holstein Friesian; SI: Simmental; AG: Alpine Grey; LI: Limousin; BB: Belgian Blue.

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