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Value Added Strategies and Forward Integration in the Swedish Sawmill Industry – Positioning and Profitability in the High Volume Segment

STAFFAN BREGE, TOMAS NORD, ROLAND SJÖSTRÖM and LARS STEHN

The changing market conditions for the Swedish sawmill industry place a focus on a better understanding of the pros and cons of value added and forward integration strategies. The purpose of this article is to describe and explain recent value added strategies in the Swedish sawmill industry. The study includes strategies from 13 of the 15 largest sawmill companies for the period between 2002 and 2005, describing the differentiation between value added in primary sawmill production and forward integration into secondary production. It also aims to relate some basic conditions, such as company size, company growth and corporate strategy, to value added and forward integration to profitability. The results show strong positive and significant correlations between forward integration, value added in primary production (somewhat weaker) and unit revenue, and profitability measured as return on investment. There were no strong or significant correlations between size and profitability, playing down the importance of economies of scale (among these already large companies). An interesting result is the much higher profitability of the buying sawmill companies compared to the forest corporations, stressing the importance of both a long-term strategy when investing in value added activities and ultimately the priorities of ownership.

Key words: forward integration, ownership, profitability, sawmill industry, value added strategy.

INTRODUCTION

There is still much to understand about strategic management in the sawmill industry. For the past 30 years, the relationship between value added strategies and profitability has been at the top of the strategic agenda of the Swedish sawmill industry. Value added strategies include additional production processes in primary sawn timber production as well as the integration and control of downstream operations to broaden product portfolio, both aimed at higher profit margins. Sawmill companies that initially adopted corporate strategies with a larger share of value-added products were so-called “buying sawmills”, i.e. mostly smaller and privately owned sawmill companies without their own forest resources. The other two main categories of sawmills – the forest owner association sawmills and the large forest conglomerate owned sawmills – were slower to develop from selling commodities (bulk) to increased value adding activities. With a broader strategic agenda at the corporate level, the ownership situation of larger sawmills created dilemmas, where value added strategies in the sawmill business were not a top priority, or not even the sawmill business as such (Roos et al., 2001). It was not until the financial crisis at the beginning of the 1990s when the entire sawmill industry in Sweden concluded that traditional bulk strategies were caught in a commodity trap (Brege & Överberg, 2000). In other important countries such as the USA, Canada and Finland, a similar trend occurred (Bush & Sinclair, 1991; Niemelä & Smith, 1996; Lee et al., 1999).

From the 1990s onwards, all large Swedish sawmill companies have implemented value added strategies of different kinds (Hugosson & McCluskey, 2008). However, value added strategies and in general increased market orientation are not the only aspects of profitable strategy development. Being at the forefront in technology development and investing in large-scale operations have also been of importance (Sinclair & Cohen, 1992; Nyrud & Bergseng, 2002; Mårtensson, 2003). Lee et al. (1999), especially, emphasise the important relationship between product innovation and process innovation.

However, the experiences of value added strategies of earlier decades have not been entirely positive (cf. Brege & Överberg, 2000). Several investments have resulted in major disappointments, even though they initially looked good. There could be several explanations, two of which are elaborated upon.

First, the sawmill industry has to handle problems related to the “divergent product logic”, i.e. the need to make full use of the entire saw-log (cf. Brege et al., 2004). This “restriction” on business development forces sawmill companies to employ more than one strategy, expressed in terms of the Porter (1980) classification into cost effective, differentiated and focus-oriented strategies. Hansen et al. (2002) show the negative effects on profitability by employing several strategies simultaneously, a conclusion that agrees with the Porter warning of not getting “stuck in the middle” (Porter, 1980, p.?).

Second is the problem of imitation and the low barriers to imitation within the sawmill industry. Adding value in terms of planing, special drying, stress-grading, etc. are too easily imitated and the differentiation factor can turn into a commodity rather quickly. It is often imperative to combine investments in tangible resources for value added strategies with the building up of intangible resources and capabilities in terms of marketing skills, market positions and even company and product branding, and thus create a more sustainable differentiation (cf. Brege et al., 2004; Tokarczyk & Hansen, 2006; L  thinen, 2007). In general, Day (1994), for example, supports this reasoning regarding the importance of building a wide variety of strongly market-oriented capabilities.

However, despite the problems above regarding the increasing of value-added activities, there is interesting evidence that value added strategies in sawmill industries have in general positive effects on profitability. From a Swedish perspective, Roos et al. (2001; 2002) have shown that sawmills with value-added strategies have higher profit margins. Internationally, research results from Hansen et al. (2006) and L  thinen and Toppinen (2008) indicate a similar direction i.e. that value added activities pay off. From a more general perspective, when broadening the empirical context beyond sawmills and forest products, Narver and Slater (1990) express a similar viewpoint.

Purpose of the article

The aim of this article is to further our understanding of Swedish sawmilling strategies. The purpose is divided into one descriptive and one explanatory. The descriptive purpose is to present an updated picture into the 21st century of the value added strategies among the largest Swedish sawmill companies (with an annual production capacity of more than 250,000 cubic meters, m³), including a differentiation between further processing in primary sawmill

production and further integration into the wood manufacturing business (called forward integration into secondary production).

The explanatory purpose is to relate some basic conditions, expressed as company size, company growth and corporate strategy, to value added strategies and forward integration and thereafter to profitability. Läthinen and Toppinen (2008) state that the insights into the relationship between sawmill strategies and profitability are still very low. Compared to studies from Roos et al. (2001; 2002), the unit of analysis in this study is the company level and not the specific sawmill level, and we distinguish between different types of value added strategies. A third difference is the longitudinal character of the study, covering the four-year period from 2002 to 2005.

MATERIALS AND METHODS

The study population consists of the largest Swedish sawmill companies with an annual production capacity exceeding 250,000 m³ (Skogsindustrierna, 2006). The population comprised 15 companies with a combined production volume of 10.9 million m³ in 2005, which was more than 60 per cent of the total Swedish production for that year. The lower boundary of the population was set somewhat subjectively, though we were interested in the largest buying sawmill companies and forest corporations and forest owners' association companies (the two latter categories bundled together as "forest corporation sawmills"). Note that even though conventionally larger companies have the resources to invest in value added activities, they also have large volumes to sell to the market, which forces them to operate on the open market with day-to-day prices.

The companies Stora Enso and Norra Skogsägarna were excluded due to data collection difficulties, resulting in a response rate for this study of 87 per cent. The international profile of Stora Enso (the largest company) made it difficult to obtain and estimate value added figures and profitability, and properly relate the company to their Swedish operations. In the case of Norra Skogsägarna, their organisational form rendered the structure of their operations and economic data incompatible to our structure. For analytical purposes we decided to keep Södra separate from Geijer Trä (Geijer Trä, a buying sawmill company acquired by Södra in 2003).

The study of this high volume segment was a description from 2002 to 2005. This period was chosen to obtain a normal market situation, e.g. the storm Gudrun had an effect on production and profitability from 2006 and onwards. Production and economic data were predominantly collected from income statements and annual reports. Direct or telephone interviews with representatives from all companies were conducted to fill in information gaps and to confirm the figures presented in company reports and our calculations.

Definition of variables used

Our definition of value added focuses on the additional activities that transform a bulk product (a commodity) into a more differentiated product. In other types of analysis, all activities that transform raw material into a product are termed value added or gross value added (cf. Lantz, 2003; L  thinen & Toppinen, 2008). Our definition is more in line with Roos et al. (2002), but with a somewhat different categorisation of different value added activities. We distinguish between value added in the primary sawmill production and forward integration.

- *Value added in the primary sawmill production* includes planing, finger-jointing, stress-grading and preservation as well as length and dimension adaptation and kiln-drying to specific MC. Our definition distinguishes between “basic” sawmill production and value added refining of the basic production further (cf. Roos et al., 2002).
- *Forward integration* includes ownership and control of businesses further down the value chain (secondary value added). Examples range from production of gluelam, cross-laminated timber and edge-glued panel to the production of structural building elements and system prefabrication to trading as wholesalers and manufacturing of timber frame houses.

The following variables have been analysed:

- turnover in MSEK (average 2002-2005),
- turnover growth in percentage (2002-2005),
- production capacity in m³ (average 2002-2005),
- capacity growth in percentage (2002-2005),
- unit revenue - turnover per capacity m³ (average 2002-2005),
- value added in primary sawmill production as a percentage of volume of total primary production (average 2002-2005),

- growth in value added measured as share of total primary production (2002-2005),
 - growth in value added measured in volume value added (2002-2005),
 - forward integration; percentage of turnover of secondary operations of total turnover (average 2002-2005)
 - profitability measured as return on investment, ROI (as an average of the period 2002-2005).
- ROI was calculated by dividing earnings before financial costs and taxes with total assets on the balance sheet.

Estimating the degree of value added and forward integration in the sawmill strategies is difficult even for the companies themselves due to the integrated character of sawmill production processes. Value added activities (primary) in sawmill production are not always organisationally separate from the “basic” sawmill activities; similarly, forward integration activities organisationally are not separate from primary production. Our estimations are based on the definitions of value added production and forward integration and from official data like company reports as well as internal information provided by the companies. We contacted each company to confirm our estimates of value added shares in primary sawmill production and forward integration, and we felt confident that the estimates of shares of value added in primary production were accurate. However, our estimates of forward integration were less certain, and we therefore excluded the calculation of forward integration growth during the period.

The explanatory part of this study was based upon the formulation of hypotheses of casual relationships between some basic conditions, such as company size, company growth and corporate strategy, related to value added strategies and profitability. A correlation analysis based on Pearson’s correlation test was conducted between the listed variables.

To test the hypotheses of differences between strategic groups, i.e. buying sawmill companies as a group and forest corporation sawmills (including larger forest companies together with forest owner’s association sawmills) as another group, an independent samples t-test was conducted. A Levene’s test was conducted to test the equality of variance in the strategic groups.

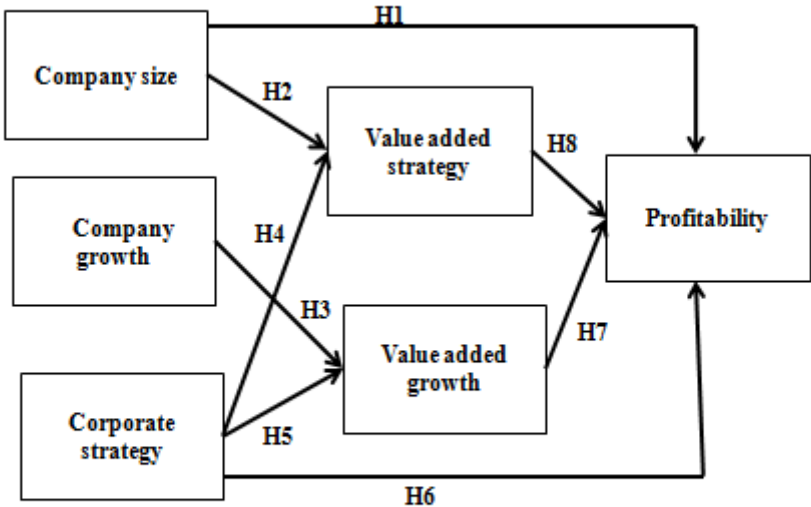
Generalizing our hypotheses from a population of sawmill companies in the high volume segment to the entire population should be done with great care. Some of the most successful

buying sawmill companies are in the high volume segment (otherwise they would not belong to this exclusive group), whereas almost all of sawmill divisions to forest conglomerates and forest owners associations belong to the high volume segment.

ANALYTICAL MODEL AND HYPOTHESES

The explanatory analysis of value added strategies and profitability is built on a model with three (independent) explanatory variables for value added and profitability – company size in terms of turnover and sawmill capacity, company growth in terms of turnover and capacity over the time period, and corporate strategy. Value added strategies and growth in value added are both treated as dependent and independent variables – dependent in the analysis of the causes of value added strategies and growth in value added and independent in the analysis of the relationship between value added and profitability.

Figure 1: Analytical frame of reference and hypotheses



When building upon this analytical model, we can formulate some hypotheses based on research within the forest and wood manufacturing industries and more general research from other empirical settings. Note that our hypotheses are principally related to the largest companies in the industry.

Hypothesis 1(H1): Size in terms of turnover or capacity is negatively related to profitability.

Hypothesis 2 (H2): Size in terms of sawmill capacity is negatively related to value added strategies in primary production.

Hypothesis 3 (H3): Growth in sawmill capacity is positively related to growth in value added in primary production, measured in cubic metres and in value added share.

In the literature, the relationship between size and profitability is unclear, and even more so if we delimit the population to the high volume segment. Roos et al. (2001) indicate that the largest sawmills (at the sawmill level) have lower profit margins compared to the somewhat smaller sawmills. L  thinen and Toppinen (2008) present empirical evidence that the 27 largest Finnish companies have higher profitability figures compared to the industry average. The kind of strategy being implemented is confusing the relationship between size and profitability. Scale economies in production-oriented sawmill strategies (cost-leadership) are often in a trade-off relationship with differentiation strategies in terms of value added and market orientation (cf. Porter, 1980; Bush & Sinclair, 1991). When formulating H1, we believed more in the negative aspects of size on profitability among the large sawmill companies.

Bush & Sinclair (1991) state that the “giant” companies most often apply cost leadership strategies and use price as a competitive weapon, and that “large” and “medium” sized companies have more mixed strategies between cost leadership and differentiation, focusing more on customer relations and product quality rather than price. In Roos et al. (2001), the largest sawmills (at the specific site level) and those belonging to large forest corporations, have lower value added figures than sawmills with somewhat lesser capacity and belonging to the buying sawmill category. Aggregated to company level, this implies that forest company sawmills (in the high volume segment) are larger in size and still more bulk-oriented, i.e. size is negatively related to value added strategies in primary production (H2).

Hypothesis 3 (H3 - the degrees of value added and forward integration are gradually increasing) is primarily linked to findings from the Swedish sawmill industry (cf. Roos et al., 2001; 2002; Nord, 2005; Hugosson & McCluskey, 2008). When sawmill companies grow most of their resources is channelled to value added strategies. Similar international trends are reported in Bush and Sinclair (1991), Niemel   and Smith, (1996) and Lee et al. (1999).

Hypothesis 4 (H4): Buying sawmill companies have a higher degree of value added activities in primary production and in forward integration (compared to forest corporation sawmills).

Hypothesis 5 (H5): Forest company sawmills have invested more in value added growth in primary production (from a lower value added level compared to buying sawmill companies).

Hypothesis 6 (H6): Buying sawmill companies are more profitable than forest corporation sawmills.

The question of causal relationships between corporate strategy versus value added and value added growth is addressed in H4 and H5. Buying sawmill companies with a greater focus on the sawmilling business are expected to have higher value added and forward integration figures. As discussed under H2, Roos et al. (2002) show the linkage between high value added activities and larger sawmills owned by companies with no forest resources of their own. The rationale for H5 is that the forest company sawmills are trying to catch up in the race for increased value added, especially value added in the primary production. When focusing on the Swedish sawmilling industry, hypothesis 6 (H6 - implies that buying sawmill companies are more profitable than forest corporation sawmills, indicated that sawmills belonging to privately owned companies had a higher profitability than forest corporation and forest-owners association sawmills. Note that a positive relationship between corporate strategy and profitability is not only dependent upon a high degree of value added. Also important to profitability is market orientation in a broader sense, often relying upon a consistent and step-wise building of market positions and customer relationships (cf. Brege et al., 2004; Tokarczyk & Hansen, 2006; L  thinen, 2007)

Hypothesis 7 (H7): A high degree of value added in primary production and in forward integration is positively related to profitability

Roos et al. (2002) report a combination of value added and forward integration strategies of the Swedish sawmilling industry, and that significant differences in terms of value added and profitability between a cluster of large forest company sawmills (at the specific sawmill level) and a cluster of buying sawmill companies were established. Although Roos et al. (2002) do not separate primary production value added activities with forward integration, a positive relationship between value added and profitability (H7) can also be hypothesized at a company level.

In a similar study of the Finnish sawmill industry, Lätinen & Toppinen (2008) reported significant improved profitability and turnover growth among 27 large and medium-sized sawmill companies compared to the total industry (a study of fiscal data from 2000 to 2004). The study also showed that among the 27 companies, those with higher value added (as a function of gross value added and investments) were more profitable and displayed better performance in terms of liquidity and solvency.

Hypothesis 8 (H8): Higher growth in value added in primary production is negatively related to profitability.

H8 is formulated with reference to results from the Profit Impact of Market Strategy (PIMS) database, which stated that profitability is lower during the time period when a strategy change is implemented (Schoeffler et al., 1974; Buzzel & Gale, 1987;).

RESULTS

The categorisation of the value added strategies and profitability figures are presented in Figure 1 below:

- Eight companies are referred to as the “buying sawmill companies”, indicating the lack of their own forest resources and thus their dependence on purchasing roundwood. Six of these companies are privately owned and two are traded on the Stockholm stock exchange (even though many of the shares are in the hand of one owner). The buying sawmill companies started value added activities and forward integration early on partly due to a lack of their own forest resources. With the exception of the Vida-group, they are relatively small in terms of sawmill production capacity (though still large compared to the industry average). Derome and Karl Hedin are the companies with the highest forward integration, including building merchant subunits, and in the case of Derome prefabricated house production.
- Five companies are referred to as the “forest corporation sawmills” and four are among the largest in terms of production capacity (we keep the forest owner’s sawmills together with the forest conglomerates). Setra Group and Moelven are more focused upon sawmilling and forward integration into wood manufacturing. SCA

Timber is part of a forest conglomerate that includes pulp and paper and forestry. Södra and Norrskog Wood Products (NWP) are entirely owned by forest owner associations. Södra Timber is also part of a forest conglomerate that includes large-scale pulp production, whereas NWP is a smaller company with a focus on sawmilling. With the exception of Moelven, this group has been slow in adding value to primary production and forward integration, probably due to being owned by forest owners, being part of a conglomerate or both. Still, during the period studied they are trying to catch up.

- Four of the companies with a high degree of forward integration – Derome, Karl Hedin, Martinsons and Geijer Trä – also show the highest figures of internal sales, with percentages ranging from 25 to 40 per cent of primary production. Moelven is the exception, with a high degree of forward integration and a low degree of internal sales (not shown in the table below).

Company	Turnover Average MSEK	Turn- over Growth %	Capacity Average 000 m3	Capacity Growth %	Turn- over/ Capacity Average SEK/m3	Primary Value added average %	Primary Value added growth % share	Primary Value added growth volume %	Forward integration Average %	Profitability ROI Average %
			Buying	Sawmill	Comp.					
Derome	1,107	55	296	43	3 740	84	6	62	45	10.0
Geijer	1,230	62	415	44	2 960	80	0	44	35	9.4
Vida	2,216	30	931	14	2 380	90	-1	10	25	10.5
Karl Hedin	1,214	41	440	0	2 760	23	0	0	50	11.2
Berg- kvist	724	3	274	5	2 635	45	19	25	10	7.5
Martin- son	690	22	311	45	2 215	41	36	100	40	4.0
Rörvik Timber	1,444	57	551	33	2 620	54	43	91	10	3.6
Bergs Timber	302	41	222	94	1 360	50	6	107	10	0.9
			Forest	Corp.	Sawmills					
Setra	5,190	14	2,271	4	2 330	12	0	20	20	0.1
Moelven Timber	4,800	30	1,608	4	2 985	42	19	22	50	6.8

SCA Timber	2,617	110	1,263	115	2 070	19	50	230	10	2.1
Södra Timber	1,834	12	952	25	1 925	40	67	108	10	-4.5
NWP	532	148	301	109	1 770	29	19	57	10	2.2
	1,838	48	756	41	2 440	47	20	67	25	4.9

Table 1. The sample of sawmilling companies with financial and production data for the period 2002-2005

Correlation analysis

A correlation analysis was made between the variables listed in an earlier section of this article.

	Turnover average MSEK	Turn- over Growth %	Production Capacity average 000 m3	Capacity Growth %	Unit Revenue Average SEK/m3	Primary Value added average %	Primary Value added growth % share	Primary Value added growth volume %	Forward integration average %
Turnover Growth %	-.236 .437 13								
Capacity average 000m3	.972** .000 13	-.200 .512 13							
Capacity Growth %	-.392 .185 13	.794** .001 13	-.291 .335 13						
Unit Revenue average SEK/m3	.170 .578 13	-.186 .543 13	-.006 .984 13	-.519 .069 13					
Primary Value added average %	-.317 .291 13	-.131 .669 13	-.413 .161 13	-.129 .674 13	.444 .128 13				
Primary Value added growth % share	-.061 .844 13	.077 .803 13	.035 .911 13	.245 .420 13	-.313 .297 13	-.305 .310 13			
Primary Value added	-.154	.400	-.029	.729**	-.407	-.240	.693**		

growth volume %	.614 13	.176 13	.925 13	.005 13	.168 13	.430 13	.009 13		
Forward integration average 02-05 %	.181 .554 13	-.221 .469 13	.009 .978 13	-.451 .122 13	.682* .010 13	.222 .466 13	-.432 .141 13	-.455 .118 13	
Profitability ROI average %	-.145 .635 13	-.043 .890 13	-.307 .308 13	-.353 .237 13	.704** .007 13	.533 .060 13	-.649* .016 13	-.530 .062 13	.655* .015 13

Table 2: Correlation matrix. Presented figures: Pearson correlation; Sig (2-tailed) and Number of cases. * = $p < 0.05$; ** = $p < 0.01$

The highest correlation is between turnover and scale of production capacity (.972 at $p < 0.01$). There is also a very strong correlation between growth in turnover and growth in capacity (.794 at $p < 0.01$). These results indicate the closeness between turnover and sawmill production capacity. Regardless of the build up of value added activities in primary and secondary production, the more “basic” investments in large-scale sawmills are still the most important explanation for company size in terms of turnover. There are neither strong, nor significant correlations between size, either measured as turnover or capacity, and profitability in terms of ROI. The same is exhibited for the correlation between growth in company size, either measured in turnover or capacity, versus ROI.

During the period studied, we also found a strongly positive and significant correlation between the capacity growth and value added growth in primary production measured in volume (.729 at $p < 0.01$). This result indicates the strategic intention of focusing most new investments on value added activities. SCA Timber, Setra, Martinsons and Bergs Timber all have more than doubled their value added capacity. We also find a negative and significant correlation between value added growth measured as an increase in the share of primary production and profitability (-.649 at $p < 0.05$). The correlation between value added growth measured as increased volume and profitability is also negative (-.533), though at $p < 0.06$, it was interpreted as a strong tendency.

Another strong correlation is between unit revenue and forward integration (.682 at $p < 0.05$). These results are in line with what could be expected, i.e. the higher degree of forward integration and value added in primary production, the higher the unit revenue. However, note that high unit revenue could also be a consequence of finding “the right customers” for a

standard product range (i.e., Japanese customer segments) or as an “extra turnover” from a complementary business such as the trading of timber.

We also find a very strong and significant correlation between unit revenue and profitability in terms of ROI (.862 at $p < 0.01$). This is one of the most important results from our study. First, this result emphasises the importance of price and revenue management and not only focusing on cost, and tells us that large-scale bulk strategies, primarily focused on cost efficiency, are not profitable (at least not during the studied period). Secondly, in scrutinizing our material closer, we could find three avenues for good revenue management.

1. Profitable management of low value added product ranges. There are strong indications that three companies with relatively low value added in primary production – Karl Hedin (25 per cent value added), Bergquist i Insjön (30 per cent) and Moelven (20 per cent) – have very good profitability in primary production (above 7-8 per cent ROI as an average between 2002 and 2005).
2. Profitable management of value added in primary production. Three companies with very high value added figures are Derome (90 per cent value added), Vida (90 per cent) and Geijer (80 per cent). Their profitability ranges from 9 per cent ROI and up.
3. Profitable management of forward integration. The three most successful companies seem to be Karl Hedin (50 per cent forward integration), Derome (50 per cent) and Geijer Trä (35 per cent), with profitability figures about equivalent to the top three value added in primary production (Derome shows up in both categories).

A somewhat weaker correlation at a lower significance level is found between forward integration and profitability as ROI (.657 at $p < 0.05$). However, this result must be interpreted with slight caution. In examining our cases one by one, we can conclude that forward integration does not always lead to increased profitability and it is not even the most profitable part of a sawmill corporation. What we have shown is that there is more than one avenue to profitability – and forward integration is one. Moelven is perhaps the most interesting example with a high degree of forward integration (50 per cent), as well as (from their annual reports) a better profitability in the sawmilling business than in forward integration.

The correlation between value added in primary production and profitability is lower than the correlation between forward integration and profitability, and is only significant at the 0.06 level (.533 at $p < 0.06$). However, the result could be viewed as a strong tendency, since the significance level is strongly related to the number of cases and this is a small sample of 13 firms. Furthermore, Pearson's correlation analysis and Independent samples t-test are rather sensitive to "outliers" (such as Bergs Timber in our sample) and hence, we have compared with Spearman's rank correlation and Mann-Whiney U-test. Not surprisingly, we received, though with some small differences, the same correlations and differences in means (rank-sum). Therefore, it must be stated that high correlation figures are interesting, despite not being significant in the traditional sense.

Comparison between buying sawmill companies and forest corporation sawmills

In this analysis, we compare eight buying sawmill companies with five forest corporation sawmills.

	Sawmill type	N	Mean	Std. Deviation
Turnover MSEK	Buying	8	1115	577.9
	Forest corporation	5	2994	1976.9
Turnover growth, %	Buying	8	39	19.9
	Forest corporation	5	63	62.3
Production capacity, 000 m ³	Buying	8	430	228.5
	Forest corporation	5	1 279	733.9
Production capacity Growth, %	Buying	8	35	30.0
	Forest corporation	5	51	56.0
Unit revenue, SEK	Buying	8	2584	674.9
	Forest corporation	5	2216	476.8
Value added primary production, %	Buying	8	58	23.7
	Forest corporation	5	28	13.0
Value added growth – share, %	Buying	8	14	17.3
	Forest corporation	5	31	26.9
Value added growth – volume, %	Buying	8	55	41.7
	Forest corporation	5	87	87.3
Integration forward (secondary production), %	Buying	8	28	16.7
	Forest corporation	5	20	17.3

Profitability ROI, %	Buying	8	7.1	3.8
	Forest corporation	5	1.3	4.0

Table 3: Group statistics of sawmill sample, period of 2002-2005.

Equal variances		Levene's Test for Equality of Variances	t-test for Equality of Means		
		Sig.	Sig. (2-tailed)	Mean Difference	Std. Error Difference
Turnover MSEK	assumed	.005	.026	-1.87873E3	728.67550
	not assumed		.100	-1.87873E3	907.42007
Turnover, growth	assumed	.001	.326	-23.92500	23.25744
	not assumed		.447	-23.92500	28.73907
Production capacity	assumed	.047	.010	-8.489E5	2.729E5
	not assumed		.059	-8.489E5	3.380E5
Production capacity Growth, %	assumed	.021	.495	-16.650	23.599
	not assumed		.565	-16.650	27.204
Unit revenue, SEK	assumed	.691	.313	367.750	347.953
	not assumed		.276	367.750	320.003
Value added primary production, %	assumed	.109	.026	29.975	11.687
	not assumed		.014	29.975	10.214
Value added growth – share, %	assumed	.173	.181	-17.375	12.154
	not assumed		.245	-17.375	13.516
Value added growth – volume, %	assumed	.130	.379	-32.525	35.497
	not assumed		.470	-32.525	41.738
Integration forward, %	assumed	.629	.417	8.125	9.642
	not assumed		.427	8.125	9.735
Profitability ROI, %	assumed	.740	.025	5.7975	2.2365
	not assumed		.034	5.7975	2.2736

Table 4: Independent samples t-test of the groups – Buying sawmills and Forest corporation sawmills period 2002-2005. The confidence interval does not include zero for neither Profitability ROI nor Value added primary production.

There are two statistically significant, and for our analysis, very relevant differences between the buying sawmill companies and the forest corporation sawmills.

- Value added in primary production, where the buying sawmill companies on the average have double the percentage in value added (58 per cent vs. 28 per cent at $p < 0.05$, table 3).
- Profitability, where the buying sawmills are on the average almost 5.5 times as profitable (7.1 percent vs. 1.3 percent ROI at $p < 0.05$).

Summing up the hypotheses

H1: Size in terms of turnover or capacity is negatively related to profitability.

The correlation analysis showed very weak negative and not significant correlations between size, in terms of both turnover and capacity. Based on the population of the Swedish high volume segment, H1 is rejected.

H2: Size in terms of sawmill capacity is negatively related to value added strategies in primary production.

There were no strong or significant correlations between size, expressed either as turnover or capacity, and value added in primary production. Based on the population of the Swedish high volume segment, H2 is rejected.

H3: Growth in sawmill capacity is positively related to growth in value added in primary production, measured in cubic metres and in value added share.

The correlation analysis shows support for H3 when value added growth is measured in terms of volume growth (.729 at $p < 0.01$). However, this is not the case when measured as value added share.

H4: Buying sawmill companies have higher degrees of value added activities in primary production and in forward integration.

The analysis of strategic groups gave significant support for H4, that buying sawmill companies have a higher degree of value added in primary production compared to forest corporation sawmills (58 per cent vs. 28 per cent on the average, and significant at $p < 0.05$). There was no significant difference between the two groups regarding forward integration.

H5: Forest company sawmills have invested more in value added growth in primary production (from a lower value added level).

Regarding H5, there was no significant difference between the two groups, despite the difference in value added share growth of 31 per cent for the forest corporation sawmills and 13 per cent for the buying sawmill companies. This was due to the wide distribution of the strategic groups

H6: Buying sawmill companies are more profitable than forest corporation sawmills.

There was also significant support for H6, that buying sawmill companies are more profitable than forest corporation sawmills (7.1 per cent vs. 1.3 per cent ROI on the average at $p < 0.05$). As mentioned before, H6 proposes a broader causal relationship between corporate strategy and profitability than value added only strategies. Included in this broader concept was a clearer focus on the sawmill business, more long-term strategy development and more explicit demands on profitability, as well as an overall more market-oriented approach.

H7: A high degree of value added in primary production and forward integration is positively related to profitability.

The correlation analysis showed the clearest and most significant support to the positive relationship between forward integration and profitability (.655 at $p < 0.05$). The correlation between value added in primary production and profitability was also strong, but not fully significant (.533 at $p < 0.06$, interpreted by us as a strong tendency, especially when there are so few companies in the population). The major weakness with our analysis was that we have been unable, with enough accuracy, to relate the share of value added in primary production to profitability in primary production and the degree of forward integration to profitability in forward integration. With our additional calculations, we feel rather confident that profitability in value added in primary production is related to overall profitability. However, we are somewhat uncertain about the profitability figures for forward integration. Therefore, interpreting the causality between value added in primary production and forward integration versus profitability should be done with great care.

H8: Higher growth in value added in primary production is negatively related to profitability.

The correlation analysis indicates a strong and significant support for the negative relationship between growth in value added shares of primary production and profitability (-.649 at $p < 0.05$). This is in line with the broader experience from the PIMS database, but caution

should again be taken when interpreting the causality. It seems as though the least profitable companies (in the beginning of period) are those that have invested the most to increase the value added share in primary production.

DISCUSSION

The results from our study show neither strong nor significant correlations between size and profitability (the correlations are slightly negative). Among the largest companies in our sample, two have good/high profitability – Moelven (a forest corporation company) and Vida (a buying sawmill company), but the other large sawmill companies found in the category with forest corporations all have low profitability. Among the smaller sawmill companies, some have low profitability, such as Bergs Timber (a buying sawmill company) and NWP (a forest corporation company). From this, our results from the correlation analysis can be used to falsify two hypotheses. The hypothesis that size is strongly negatively correlated to profitability is presented above. However, the opposite hypothesis is also falsified, i.e. size is strongly positively related to profitability. From the latter hypothesis, large investments in cost-efficient production capacity have not resulted in profitability (at least not during the period studied).

However, our results show strong and significant correlations between unit revenue, forward integration and value added in primary production and profitability. Besides value added and forward integration, unit revenue could also be reached by obtaining higher prices from specific customer segments (though with a low value added percentage) or from complementary businesses like trading. These results point to the importance of the management of revenues (and not only the management of costs).

From above, it is implied that standardized bulk strategies (with a low degree of value added) are not profitable. We can also indicate a trend away from these bulk strategies towards more value added in primary production. Companies with low value added from the beginning are showing a higher growth rate in investing in value added activities. The privately owned buying sawmill companies are still on top, but others are investing more heavily to catch up. In the literature on sawmill strategy, there is empirically based evidence that the largest companies are those that invest the most in value added activities (cf. Niemelä & Smith, 1997; Läthinen & Toppinen, 2008). Our results from a population of high volume companies

indicate the opposite. From our sample of the largest sawmills, the very largest are the least oriented downstream in value added and forward integration. These results are more in line with the results of Roos et al. (2001; 2002).

The relatively strong and negative correlations between growth in value added and profitability show no immediate pay-offs for this behaviour. The negative relationship between periods of heavy investments and profitability is shown in the PIMS-results (Buzzel & Gale, 1987), which give a more general perspective on the problem. Two reasons are that the high capital cost is a burden to company profit and that it takes time to exploit the benefits of the investments, especially on a market such as sawn timber with prices almost set on a global basis.

In our case data, there are examples of forward integration that are unprofitable, but also that two companies can run about the same business with different profitability. Of course, this is no surprise, but should be considered in discussing the advantages and challenges with value added strategies and forward integration. Studies on outsourcing in the wood manufacturing industry have, for instance, shown the difficulties for sawmill companies to take over component production from customers (cf. Andersson et al., 2007).

The comparison between buying sawmill companies and forest corporation sawmills highlights the importance of a long-term strategy and ultimately on priorities among the owners. Investments in value added strategies in primary production and in forward integration are not only a question about physical equipment, acquiring new companies downstream in the value chain or both. It is very much a laborious question about building customer relationships, market positions and even a brand reputation. It is also a question about exploiting synergies in terms of internal integration (briefly mentioned in this article). These results point in the direction of a certain capability to run value added businesses (cf. Brege et al., 2004; Hansen et al., 2006; Tokarczyk & Hansen, 2006).

In conclusion, the results for the high volume segment show that neither company size nor growth has any relationship to profitability, although the data shows a strong relation between value added strategies and profitability. Companies that have gradually pursued further processing activities and diversification into downstream operations are more profitable than companies that have greatly invested recently. Hence, consistency in strategy and

management of revenue pays off. The results of the study add to our understanding of the role of strategic management to overcome the divergent product flow in the sawmill industry.

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REFERENCES

- Andersson, D., Brege, S., Rehme, J. & Nordigården, D. (2007). Outsourcing of Wood-Based Component Manufacturing: Driving Forces Found in Scandinavian Companies. *Journal of Forest Products Business Research* 4: 1-19.
- Brege, S., Johansson, H.-E. & Pihlqvist, B. (2004). *Wood Manufacture – the System Breaking Innovation System (in Swedish: Trämanufaktur – det systembrytande innovationssystemet)*. VINNOVA Report VR 2004:02.
- Brege, S & Överberg, I. (2000). *Sawmill strategies for value added activities – a pilot study (in Swedish: Strategier för sågverks vidareförädling – en pilotstudie)*, internal report, Linköping university.
- Bush, J. R. & Sinclair, S. A. (1991). A multivariate model and analysis of competitive strategy in the U.S. hardwood lumber industry. *Forest Science* 37: 481 – 499.
- Buzzell, R. and Gale, B. (1987) *The PIMS Principles: Linking Strategy to Performance*, Free Press, New York.
- Day, G. S. (1994). The Capabilities of Market-Driven Organizations. *Journal of Marketing* 58 (Oct): 37-52.
- Hansen, E., Seppälä, J. & Juslin, H. (2002). Marketing Strategies of Softwood Sawmills in Western North America. *Forest Product Journal* 52 (10): 19-25.
- Hansen, E., Dibrell, C. & Down, J. (2006). Market orientation strategy and performance in the primary forest industry. *Forest Science* 52 (3): 209-220.

- Hugosson, M. & McCluskey, D. (2008). Strategy transformations of the Swedish sawmilling sector 1990-2005. *Studia Forestalia Suecica* No. 217.
- Lähtinen, K. (2007). Linking Resource-Based View with Business Economics of Woodworking Industry: Earlier Findings and Future Insights. *Silva Fennica* 41 (1): 149-165.
- Lähtinen, K. & Toppinen, A. (2008). Financial performance in Finnish large- and medium sized sawmills: the effects of value-added creation and cost-efficiency seeking. *Journal of Forest Economics* 14 (4): 289-305.
- Lantz, V. (2005). Measuring scale, technology and price effects on value-added production across Canadian forest industry sectors. *Forest Policy and Economics* 7: 333-344.
- Lee, L., Cohen, D. & Maness, T. (1999). Market and technology in Western Canadian sawmills. *Forest Product Journal* 49: 36-42.
- Mårtensson, J. (2003). Economies of scale in the Swedish sawmill industry. *Journal of Forest Economics* 9 (3): 169-179.
- Narver, J. D. & Slater, S. F. (1990). The effect of a market orientation on business profitability. *Journal of Marketing* 54 (4): 20-35.
- Niemelä, J. S. & Smith, P. M. (1997). A multinational analysis of competitive strategies of softwood sawmills. *Scandinavian Journal of Forest Research* 12(3), p 295-301.
- Niemelä, J. S. & Smith, P. M. (1996). A cross-national investigation of softwood sawmill marketing strategies. *Forest Science* 42: 290-299.
- Nord, T. (2005). *Structure and Developments in the Solid Wood Value Chain - Dominant Saw Milling Strategies and Industrialized Housing*, licentiate thesis, Civil and Environmental Engineering, Luleå University of Technology, Luleå
- Nyrud, A & Bergseng, E. (2002). Production Efficiency and Size in Norwegian Sawmilling. *Scandinavian Journal of Forest Research* 17: 566-575.

- Porter, M. (1980). *Competitive strategy – techniques for analyzing industries and competitors*. The Free Press. New York.
- Roos, A., Flinkman, M., Jäppinen, A., Lönner, G. & Warensjö, M. (2001). Production strategies in the Swedish soft-wood industry. *Forest Policy and Economics* 3: 189-197.
- Roos, A., Flinkman, M., Jäppinen, A., Lönner, G. & Warensjö, M. (2002). Value added strategies in the sawn wood industry. *Scandinavian Journal of Forest Research* 17: 90-96.
- Schoeffler, S. Buzzell, R. and Heany, D. (1974). Impact of Strategic Planning on Profit Performance. *Harvard Business Review* 52(2).
- Sinclair, S. A. & Cohen, D. H. (1992). Adaptation of continuous processing technologies: Its strategic importance in standardized industrial product markets. *Journal of Business Research* 24 (3): 209-224.
- Skogsindustrierna. (2006). *The Swedish forest industry – facts and figures*. Retrieved from Skogsindustrierna website:
<http://www.skogsindustrierna.org/documentation/publications>
- Tokarczyk, J. & Hansen, E. (2006). Creating Intangible Competitive Advantage in the Forest Industry. *Forest Products Journal* 56 (7/8): 4-13.