



Featured Topics

Can the Business Cycles in the US Construction Industry be Used to Forecast Exports of Finnish Sawnwood?

Anne Toppinen and Riitta Hänninen

The number of new housing starts in the United States has for decades been regarded as a good indicator in forecasting total exports of Finnish sawnwood. But is the linkage still there?

1990s Growth in US Economy has Boosted Construction

More than half of the sawnwood consumption in the US is destined for use in new construction, and a majority of the demand for sawnwood is met by domestic production. Almost all imported sawn softwood to the US, amounting to about one third of consumption, is from Canada. Canada is also an important competitor of Finland and Sweden on the European sawn softwood market. As Canadian exports to Europe are very sensitive to cyclical fluctuations in Canada's main market, the US, it is worth taking a closer look at the economic fluctuations in the US construction industry and at how these fluctuations are reflected in exports of Finnish sawnwood.

The upward trend in the US economy during the 1990s boosted housing construction. In 1997, the US construction industry consumed about 120 million cubic metres of sawnwood, and new construction accounted for over half of the country's sawnwood consumption. New housing starts in 1999 numbered 1.66 million. Consumption of sawnwood in the US has grown during the last 30 years by an average of

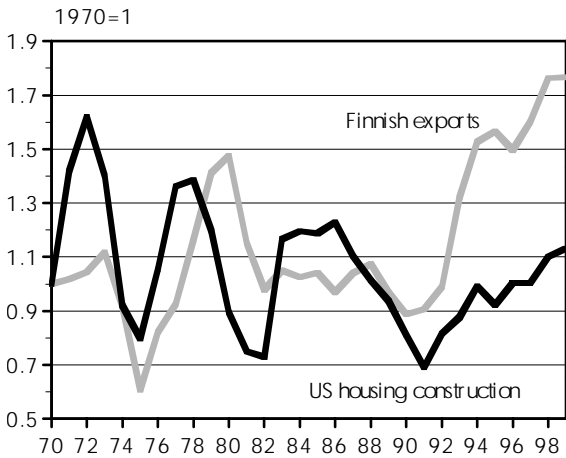
one per cent each year, but the trend in the number of new housing starts has been almost constant. The proportion of total sawnwood consumption used in new housing construction has fallen as consumption in repair and maintenance has increased. Use of OSB and MDF board has also increased in the 1990s, replacing sawnwood in construction.

A Change in the Link Between Finnish Sawnwood Exports and US Construction

The graph below illustrates how, in the 1970s and 80s, the fluctuations in total Finnish sawnwood exports quite clearly followed the cyclical trend in US housing construction (as measured by construction of single-family houses), with a time lag of about one year. This pattern changed in the 1990s and the link between the markets has weakened. The ability to forecast total Finnish sawnwood exports on the basis of US construction activity has thus been impaired.

There are several reasons for the weakening of the connection. The reduction of supplies to Europe from Russia in the 1990s was the most important factor boosting export opportunities for Finnish sawnwood. Indeed, total exports of Finnish sawn softwood doubled between 1990 and 1999.

The boom in the US economy in the 1990s led to an increase in the need for imported sawn softwood. This was not only because of the increase in demand

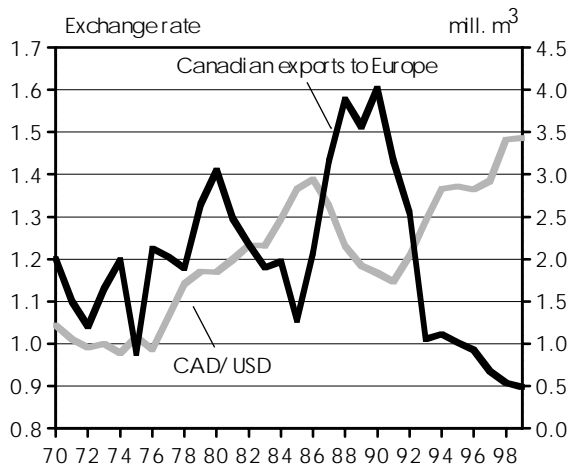


Finnish sawnwood exports and the number of construction starts of single-family houses in the United States (1000 starts), 1970 = 1

for sawnwood, but also due to a reduction in fellings to protect old-growth forests on the US west coast. The market share held by Canada in the US therefore grew considerably. Canadian exports to Europe have, correspondingly, declined since their record level of 4 million cubic metres in 1990 to about 0.5 million cubic metres in 1999. The proportion of Europe's imported sawn softwood originating from Canada thus fell during the 1990s from 14 per cent to less than two per cent.

Besides the level of demand in the United States, the orientation of Canadian exports may also have been influenced by short-term exchange rate fluctuations. Indeed, it appears that as the Canadian dollar weakened against the US dollar after the early 1980s, Canada's exports to the US grew in response to their increased price competitiveness. Simultaneously, Canadian sawnwood exports to Europe declined (see graph). As the Canadian dollar strengthened against the US dollar, the pattern was reversed: competition intensified on the European sawnwood markets as Canada increased its supply to Europe. Thus Canadian imports have also affected the equilibrium of sawnwood prices in Europe.

The structural changes that occurred on the European sawnwood markets following the dramatic



Exports of Canadian sawn softwood to Europe and the exchange rate of the Canadian against the US dollar

reduction in the supply from Canada and Russia in the 1990s have been more significant than exchange rates in influencing Finnish exports. US construction indicators can still be used in forecasting Finnish sawnwood exports, to the extent that they are used to illustrate the prospect of Canadian exports being directed towards Europe. The decline in the relative importance of the indicators during the 1990s must, however, be taken into account.

The slight reduction in construction activity in the United States in summer 2000 can be expected to increase the supply of Canadian sawnwood to Europe in 2001. However, the extent of this effect will depend on the price competitiveness of Canadian producers with respect to European producers.

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What Do the Share Prices of Forest Industry Companies Tell Us?

Esa-Jussi Viitala

Do Share Prices Anticipate Forest Industry Results?

If stock market investors acted rationally, the trend in the Helsinki Exchanges forest industry index would anticipate the performance of the three largest Finnish forest companies, UPM-Kymmene, Stora Enso and Metsä-Serla. So has this happened in practice?

A simple analysis shows that the index has anticipated the interim profits (before sales profits, extraordinary items and taxes) of the three companies quite well. The strongest indication has been for the profits of these companies six months hence. Correlations also suggest that investors tend to gaze into the near future: they attach greater weight to the next three interim results of forest companies than to their current performance.

In the first six months of 2000, however, the link between the stock market values of the forest companies on the Helsinki Exchanges and their anticipated profits appears to have been broken. Interest in the new technology companies and their growth expectations was at a peak during those months. Although the profit expectations in the forest industry were very good at the time, the HEX forest industry index fell significantly. It still remains to be seen whether this was an exceptional period or a permanent phenomenon.

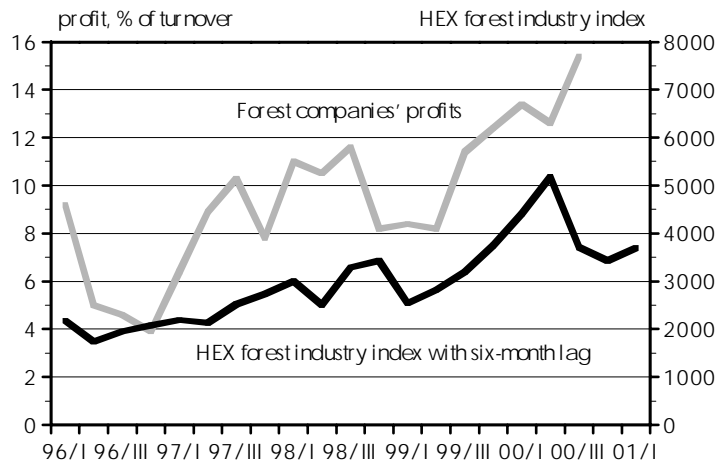
The excellent profit performance of the forest industry and the encouraging underlying trends in the sector are expected to continue over the next 18 months. If the above link is still firmly in place, it could be assumed that the share prices of Stora Enso, UPM-Kymmene and Metsä-Serla would rise, at least during the next few months.

Are Forest Companies Undervalued on the Stock Market?

Determining the 'correct' level for forest company share prices is, of course, an entirely different matter. The P/E values of the forest companies, which describe a company's stock market value in relation to earnings per share, are currently amongst the lowest of all the sectors on the Helsinki Exchanges. The corresponding values for telecommunications companies are many times greater. Based on the P/E values, the forest industry is in the same category as the construction and transportation industries – and surpassed by, for example, the food industry and the metal and engineering industry. On the New York Stock Exchange, the average P/E value of forest companies this year has been about 10, compared to the average of 30 for all listed companies.

For investors, interest in the forest industry is influenced not only by the profit and dividend prospects for the near future but also by the companies' net worth, ownership base and the growth expectations for turnover and profits in the long term. The lacklustre trend in forest indices compared to the major stock exchange industrial and general indices is, in fact, partly due to the poor growth expectations associated with forest companies in relation to new technology companies.

Forest companies have, however, generally paid fairly high dividends compared to companies in other sectors and particularly the telecommunications sector. Although the Modigliani-Miller theorem popular in financial textbooks states that corporate dividend distribution policy should not influence the market value of companies, in practice this is not necessarily so when taxation and market imperfections are taken into account.



Forest industry profits and the HEX forest industry index, 1996–2000

UPM-Kymmene and Stora Enso have recently also practised a type of indirect dividend distribution policy by purchasing their own shares on the market and cancelling them. Whether or not this has been the best alternative from the shareholders' viewpoint is worth asking. In any event, considerable sums of money have been involved.

How Risky are Forest Industry Shares?

In the short term, the stock market interest in forest industry companies is also dampened by the great fluctuations in their economic performance. Traditionally, a rise in pulp and paper prices has led to major expansion in capacity, which has then led to a collapse in prices. This has been reflected in the volatility of forest company share prices.

Although forest industry shares are often regarded as a risky investment due to the cyclical nature of the sector, this has not necessarily reduced their interest to investors with a broad portfolio. How closely the cycles in the forest industry follow the general economic cycles – i.e. how well forest industry shares can be used to spread the risks in the investment portfolio – has often been of more importance than volatility.

Neither can the volatility of forest companies necessarily be regarded as high. On the contrary, forest companies on the New York Stock Exchange, for example, have beta values of market risk which are quite low (0.3–0.8). Put another way, the standard deviation of forest company share prices is around 30–80 per cent of the market average. Beta values should nevertheless be approached with caution because a large fluctuation in the share price may also indicate that the company is being targeted for corporate acquisition or takeover, or is vulnerable to such a move.

The shares of UPM-Kymmene and Stora Enso appear to have the lowest market risk (0.33 and 0.43). This may be the result of their product range, but may also be because these companies have not been quoted long on the New York Stock Exchange. The beta value for the world's largest forest company, International Paper, is 0.50, a little below the figure for Weyerhaeuser, the world's biggest producer of sawnwood, at 0.67. The company that appears to have the greatest fluctuation in its share prices is Willamette Industries, which manufactures paperboard, sack paper, fibreboard and uncoated fine paper mainly in the United States. The world's largest newsprint producer, Abitibi-Consolidated, and

the mainly US-based Boise Cascade also have a risk level greater than other forest companies.

It has also been suggested (Sorjonen 2000) that Finnish forest industry shares are, in practice, risk-free from the viewpoint of investors with a broad euro area portfolio. This conclusion was based on a comparison of the standard deviation of Finnish forest company share prices with the Eurobloc 300 share index, which describes the trend for Europe's 300 largest quoted companies. This conclusion should, however, be treated with caution, because the period examined was quite short (from the start of 1999 to February 2000) and featured an exceptionally strong rise in share prices. The trend in the stock market general indices was affected by powerful price swings in the new technology shares, which perhaps made the riskiness of forest industry shares appear low. However, it is clear that a significantly lower risk is associated with forest industry shares than, for example, IT shares.

On account of their relatively low risk, forest industry shares are an attractive alternative especially for institutional investors with a large investment portfolio. On the other hand, to commit capital in this way requires the acceptance of a relatively 'low' return. Perhaps partly for this reason, the share price trend for forest companies in recent years has been rather subdued compared to the general indices on the stock market. In the early 1990s the general and forest industry indices of the big stock exchanges differed very little from each other. The turning point was in 1996, when forest company profits fell slightly. Since then, the Dow Jones Industrial Average has doubled, but the forest and paper industry index on the New York Stock Exchange has remained almost unchanged.

The index movement on the Helsinki Exchanges has become differentiated even further: the forest industry index has doubled since the start of 1996, but the HEX general index has risen seven or eight-fold, with the influence of Nokia, in particular. However, since early 1997, the trend in the weight-restricted HEX Portfolio Index, where the influence of individual companies (in practice Nokia and Son-

era) is limited to 10 per cent, has been only slightly above the forest industry index. In addition, it should be noted that the share indices for many other traditional 'smokestack' sectors have risen on the Helsinki Exchanges quite modestly in recent years, compared to the technology companies.

Concentration in the Pulp and Paper Industry Reduces Risk for Investors

Concentration in the forest industry will continue actively over the next few years. With ever fewer companies in the sector controlling every greater market shares, control over capacity and prices may well be easier than before. Provided other factors remain unchanged, this should reduce the volatility or risk inherent in forest shares in the future. This could then be expected to induce a rise in the value of forest shares. However, if the capital markets operated efficiently, the effects of the concentration trend would already have been discounted, at least in part, in the forest companies' current value.

Concentration is also occurring in other sectors, and so the relative value of forest companies in relation to other listed companies will not necessarily change. The result will ultimately depend on which sectors can improve company profitability the most by increasing control over capacity and price, benefiting from economies of scale and combining product development and logistics. For forest and paper products, the question is largely one of price elasticity of demand and substitution amongst competing commodities. Both of these will continue to be of key importance in relation to the competition between printed and electronic communications, and the competition amongst different construction products.

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Problems with Measuring the Profitability of Forestry

Esa Uotila

In forestry, the long time horizon for roundwood production and the role of the growing stock as both production machine and end-product make it difficult to estimate profitability. The value of capital employed (mostly growing stock) is substantial compared to income. On the other hand, expenditure used to obtain income is relatively low and the importance of depreciation and external capital is small in relation to most other sectors. Many business profitability indicators are poorly suited to forestry activities, and their interpretation must take into account the special features of forestry.

There are other factors involved besides business profitability in the decisions taken by forest owners and by policy-makers. Profitability is, however, the basis for sustainable timber production. The main considerations in measuring the actual level of profitability in forestry are presented below.

Net Earnings – Absolute Profitability

The usual and simplest way of determining actual profitability is to do a balance sheet calculation, which identifies the absolute profitability for the financial period, or the difference (profit, surplus, net earnings) between income and expenditure. In forestry, the net earnings of timber production have traditionally been calculated by subtracting from the gross stumpage earnings the difference between gross costs and state subsidies. Calculation of profitability per unit area has a long tradition in Central Europe. In Finland, the per hectare net earnings in 1989–1998 before direct taxes and external capital costs were an average of FIM 420 (at 1999 prices); the range was from FIM 208 per hectare in 1993 to FIM 616 per hectare in 1998.

As a measure of profitability, net earnings is imperfect. It is largely dependent on stumpage earnings and takes no account of maximum sustainable removal or the amount of operating capital. It can be used to make internal profitability comparisons for forestry between different years and regions, but

comparison with other sectors is difficult. It really only gives a measure of long-term profitability in cases where fellings and the increment in growing stock correspond with each other (e.g. a so-called normal forest). Straightforward maximisation of net earnings would lead to excessive felling in relation to the needs of sustainable forestry and to cost minimisation. Profit would be made by selling forest capital and without concern for future fellings.

Relative Profitability

Comparing income from operations against capital employed gives the percentage return, which is a general measure of relative profitability. In forestry, its use is hampered by the need to define the value of capital, i.e. of the growing stock and forest land. A solution is to multiply the estimated quantities of different types of standing stock by the actual stumpage price. This will overestimate the value of the growing stock because actual stumpage prices are based on harvested stock, which is, on average, more valuable than trees left standing. The value of land, on the other hand, is left out of the calculation completely.

The estimated value of the growing stock in Southern Finland in the years 1996–1998, which were part of the cyclical upturn, was approximately FIM 19 000 per hectare. For the same period the net earnings in forestry were about FIM 720 per hectare. On this basis, a return of 3.8 per cent before taxes and external capital costs was obtained for the capital employed in the growing stock. In 1991–1993, the worst years of the recession, the corresponding return was 1.8 per cent.

Estimating the relative profitability of forestry based on returns and capital does not, however, resolve the problem of taking account of sustainability. A simple way of quickly increasing the percentage return would be to overcut, thus increasing the numerator in the ratio, i.e. income, and at the same time to reduce the denominator, i.e. value of capital employed.

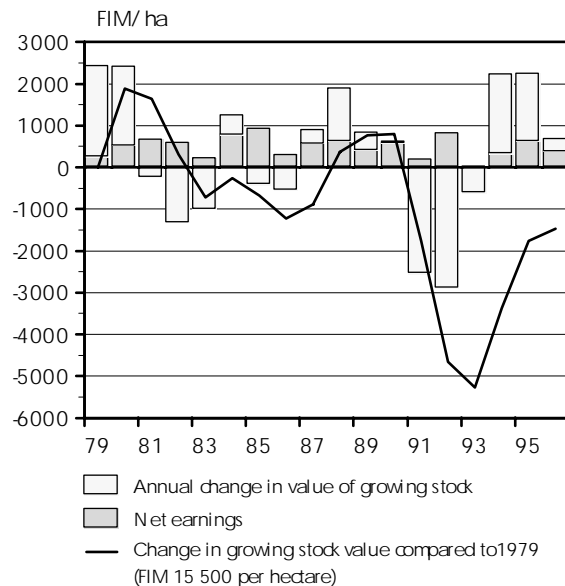
Including Change in Value of Assets in the Calculations

A better picture of profitability is gained by looking at the changes in the value of growing stock capital, alongside the actual income and expenditure. The problem is that the annual fluctuations in stumpage prices are often so large that the actual income and expenditure in forestry are lost in the changes in value of the standing stock estimated on this basis. In analysing profitability, the annual fluctuation in the value of the growing stock, which is dependent on stumpage prices, can be reduced by using constant stumpage prices or moving averages. The traditional alternative to taking account of changes in the value of the growing stock capital is to examine only the difference between the planned cut and the actual harvests. This way the changes in the value of capital would be of the same order of magnitude as income from roundwood sales, but the profit would be related to a planned harvest defined on the basis of many factors, some of them subjective.

A profitability calculation method incorporating fluctuations in the value of growing stock has been developed based on both net earnings and a separate analysis of changes in volume and market prices affecting the growing stock value. This allows attention to focus not only on the profit and loss account but on the longer term trend and short-term fluctuations in growing stock value.

The graph illustrates a forest holding profitability analysis using both the profit and loss account and changes in the value of the growing stock. In this case, the forestry net earnings are positive in all years except 1993, although within the aggregated data the net earnings in Southern Finland are actually always positive. Inclusion of the value change in the growing stock improves the annual profit considerably in 1979 and 1980 and also in 1994 and 1995, but weakens it especially at the start of the 1990s.

Inclusion of the value change in the growing stock gives a more profound picture of the long-term profitability. In the period examined (1979–1996), the real value of the growing stock owned in the example holdings fell by about FIM 1500 per hectare. The combined net earnings for the period were



Profitability analysis based on net earnings and changes in the value of the growing stock. The data is from the accounts for 12–15 forest holdings

FIM 8500 per hectare, which means the inclusion of the growing stock value reduces the profit for the period examined by almost one fifth (17 per cent). Conclusions should not be drawn too hastily, however, as the analysis period chosen has a significant effect on the result.

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Changes in the Structure of Finnish Private Forest Ownership in the 1990s

Heimo Karppinen, Harri Hänninen and Pekka Ripatti

Non-industrial private forest (NIPF) owners control 62 per cent of Finnish forest land. They provide around 80 per cent of the domestic roundwood used by the forest industry. Therefore up-to-date information on private forestry is of particular interest.

Since the end of the 1960s, private forestry has been in a state of transition. Changes in the ownership structure continued during the 1990s, in some respects at an increasing pace. Changes in the structure of ownership have traditionally raised the threatening prospect of diminishing supplies of roundwood, as forest owners become less dependent on regular forest income and the aims of forest ownership become more varied. However, studies conducted over the last ten years have concluded that the impact of changes in the ownership structure on the supply of timber has been only minor. The results presented here are consistent with those studies and are based on a nationwide postal questionnaire survey conducted by the Finnish Forest Research Institute (METLA) in 1999, in which responses were obtained from 4821 forest owners.

Fewer Farmers

The main changes occurring in the structure of forest ownership have been a decline in the number of farmer owners; forest owners moving house to somewhere outside the forest holding; migration to urban areas; an ageing of the population of forest owners; and a growing proportion of female forest owners. Polarisation has also occurred in the size distribution of forest holdings, so that there are now a greater number of small and large holdings. The driving force behind these changes has been the changing economic structure of society, the exacerbation of regional development disparities, and migration pat-

terns within the country. Moreover, Finland's accession to the European Union has brought farmers many changes and imposed new requirements, which are also reflected in forest ownership.

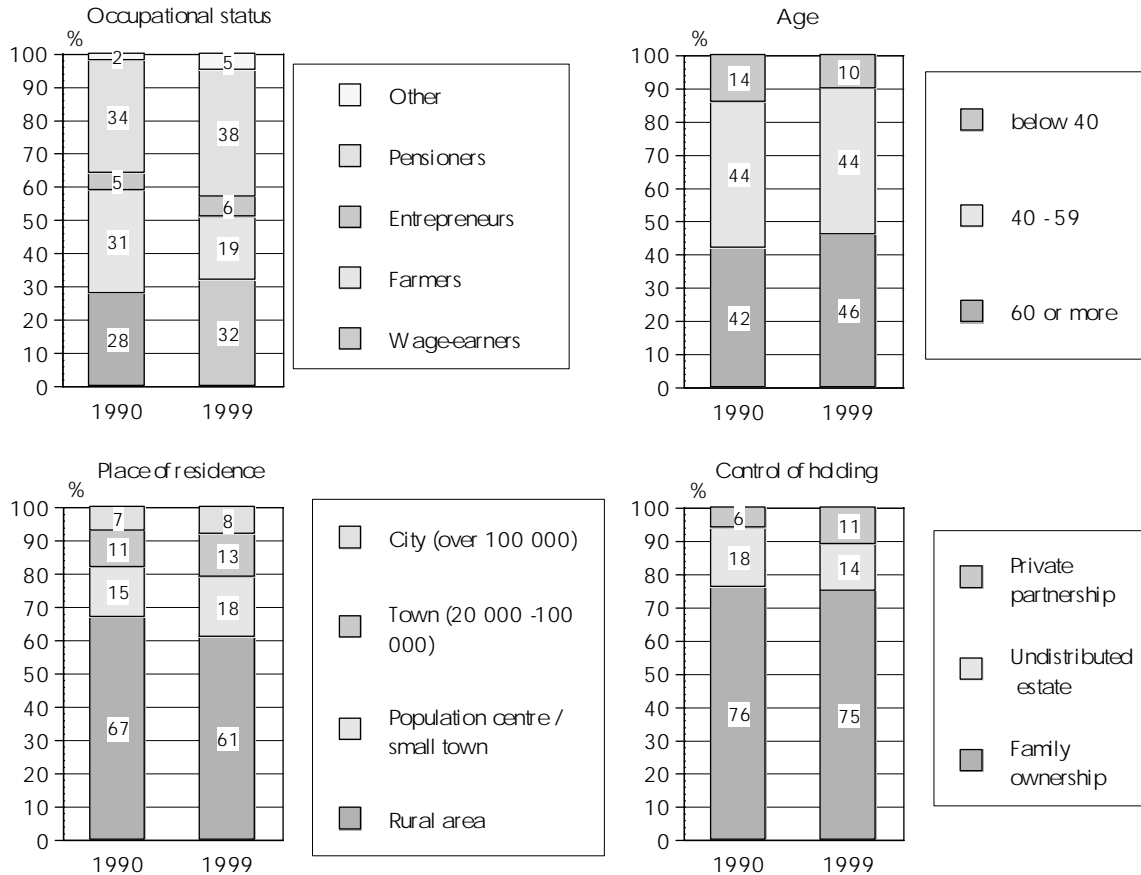
The proportion of forest owners who are active farmers declined during the 1990s from one third to one fifth (see graph). This is no surprise, as the number of farms has decreased as a result of EU membership, for example. However, farmers do still own almost one third of the total area of non-industrial private forests.

Forest ownership by wage-earners and pensioners has increased over the last ten years. Almost half of all forest owners are 60 years of age or more, and only one in ten is below 40. Indeed, the average age of forest owners has risen in the last ten years from 54 to 57.

Only One Fifth of Forest Owners Live in Urban Areas

Public discussion on forest ownership has often exaggerated the proportion of forest owners who are town and city dwellers. In part, this has been due to a blurring of the definition of urban areas, as many rural municipalities have become towns. A further reason may be that the powerful rural-urban migration pattern of recent years has not affected forest owners to the same extent as the rural population at large. Despite the general move to towns and cities seen in Finland as a whole, 61 per cent of forest owners still live in sparsely populated rural areas, and almost one fifth live in a village or small town. Only 21 per cent of forest owners live in urban areas of more than 20 000 inhabitants.

Almost half of all forest owners still reside permanently on their forest holding, and almost one



Trend in composition of forest ownership in the 1990s (% of owners)

fifth live outside it but in the same municipality. Consequently, only one in three forest owners live outside the municipality of their forest holding.

From Undistributed Estate to Private Partnership

The relative decline in holdings under family ownership came to a halt in the 1990s and has stabilised at three quarters of all holdings. An interesting change has occurred, however, in the proportion of jointly owned holdings which are managed by undistributed estates (i.e. by the heirs to a deceased's undistributed estate) and by private partnerships. Ownership in the form of an undistributed estate has increasingly often

been converted to a private partnership, which is perhaps desirable from a forestry viewpoint. An undistributed estate is not intended to be a permanent form of ownership and is sometimes a difficult one. Holdings managed by private partnerships already constitute almost as large a share of the total as those in the hands of undistributed estates.

The proportion of female forest owners has traditionally been rising along with changes in society at large. This trend has now levelled off and stabilised at one quarter of all forest owners. This proportion did in fact decline slightly during the 1990s, despite women's life expectancy being higher than men's and the rise in average age of forest owners. One explanation might be the increase in the proportion

of holdings turned into private partnerships which were formerly undistributed estates 'controlled' by widows.

Change in Ownership Structure Will Not Reduce Timber Supplies

More timber per hectare is sold each year, on average, by farmers than by other occupational groups (see table). This was also the case in the 1980s, although to a lesser extent. It is probable that the rationalisation of farms has led to more efficient farming and forestry operations, and that forest income has been used to fund further investment in agriculture. Even if the already low proportion of farmer forest owners were to continue to decline, this would not seriously affect the supply of timber.

There is scarcely any difference amongst the other occupational groups in average sales volumes. Pensioners, for instance, no longer differ from wage-earners in this respect. The period analysed (1994–1998) was, however, one of economic boom, which may have evened out the sales differences between the groups.

An urban lifestyle has often been considered to signify a low dependence on forest income, which would be reflected in roundwood supply. However, forest owners living in cities and other built-up areas appear to have been selling even more timber than those living in rural areas. This is not surprising, because besides farmers actively engaging in timber trade there are also many wage-earners and especially pensioners living in sparsely populated rural areas.

Timber sales on holdings managed by undistributed estates are practically as high as sales on private partnership holdings and not far short of those on family-owned holdings. The increase in felling activity on undistributed estate holdings may be due not only to the prospering economy but also to the fact that many inactive undistributed estate holdings have been turned into private partnerships.

Earlier studies found that sales volumes fall as forest owners become older. The reasons may be the change in the owner's consumption patterns at different stages of life, and consumption differences

between generations. No conclusive explanation has yet been determined.

The effect of age appears to have remained unchanged during the 1990s: elderly owners sell less than middle-aged and younger owners. The fact that female owners are less active in felling than male owners is also expected. One explanation given for this is women's longer life expectancy than men's.

On the basis of timber sales behaviour in the 1990s, it cannot be concluded that changes in the

Actual timber sales 1994–1998 and sales intentions 1999–2003, by forest owner group

	Sales volume 1994–98 m ³ /ha/yr	Have sold timber 1994–98 % of forest owners	Intend to sell timber 1999–2003
Occupational status			
wage-earner	3.8	59	43
farmer	4.4	84	69
entrepreneur	3.7	56	43
pensioner	3.7	60	30
other	3.7	54	35
Place of residence			
rural area	3.7	68	49
population centre / small town	4.0	58	38
town (20 000–100 000)	4.3	58	36
city (over 100 000)	4.1	56	32
Control of holding			
family ownership	3.9	67	45
undistributed estate	3.7	54	37
private partnership	3.8	61	41
Age			
below 40	4.2	69	57
40–59	4.0	66	51
60 or more	3.7	62	34
Sex			
male	3.9	68	49
female	3.7	52	26
Overall	3.9	64	44

structure of forest ownership have had the effect of decreasing the supply of timber. It should be noted, however, that the analysis period was one of economic boom.

Enthusiasm for Timber Sales Fading?

Two thirds of forest owners sold timber from their holding at least once during the period 1994–1998, but less than half of all forest owners intended to sell timber during the next five year period, 1999–2003 (see table). The same declining trend is evident in all owner groups. Amongst farmers, however, as many as four in five had sold timber in 1994–1998 and two in three intended to do so in 1999–2003, which is a higher proportion than for the other occupational groups. Most pensioners intended not to sell, even though they had earlier sold timber to the same extent as wage-earners. On forest holdings in the possession of undistributed estates, the projected sales frequency was only slightly below the average. The male-female difference in timber sales will probably further widen in the future.

Both actual and intended timber sales were greater on forest holdings subject to site productivity tax, regardless of the ownership group, than on holdings subject to sales revenue tax. In other words, in

all ownership groups there is an attempt to take advantage of the change in the taxation system during the transition period 1993–2005.

Although the evaluations made by forest owners themselves indicate that they will not be doing as much business on the timber markets in the early years of the new century as in the late 1990s, the continuing high level of timber sales in 1999 and in the current year suggest that forest owners may have underestimated their future timber sales.

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Accuracy of Forecasts for the Years 1994–1999

The Finnish Forest Sector Economic Outlook was first published in autumn 1991, under the name *The Finnish Forest Sector Review* (in Finnish only). The publication has since appeared every year at the end of October in Finnish, and in December in English (since 1998). The first issue mainly focused on the year's trends so far and contained no actual forecasts for the following year. Over the years, increasing attention has been paid to forecasting, and absolute numerical forecasts have been prepared for the following year.

Below is an analysis of how accurate the forecasts of a numbers of key variables have been over the last six years (1994–1999). The forecasts for the

following year (Jan-Dec) have always been made on the basis of the information available at mid-October. In practice, the forecast horizon has therefore been 1.3–1.5 years ahead, depending on the latest publication date of the data used in a particular forecast.

The table presents two key statistics for comparison. The first of these is the absolute value of the forecasting error (deviation) as an average over the six-year period. The smaller this value, the better the forecasts have been. For instance, the value of 4.5 per cent for the stumpage price of spruce sawlogs indicates that the forecasts of the following year's stumpage price made during the last six years has

Forecasting errors for selection of key variables, 1994–1999

Variable	Absolute value of forecasting error, average (%)	Accuracy of forecasting the direction of change (% of forecasts)
1. Sawnwood production (m ³)	9.1	67
2. Paper production (tonnes)	7.2	67
3. Unit price of sawnwood exports (FIM/m ³)	10.4	50
4. Unit price of paper exports (FIM/tonne)	7.5	33
5. Capacity utilisation rate of paper and paper-board industry (%)	4.9	33
6. Capacity utilisation rate of sawnwood industry (%)	5.6	33
7. Stumpage price for spruce sawlogs (FIM/m ³)	4.5	67
8. Stumpage price for pine sawlogs (FIM/m ³)	1.7	100
9. Stumpage price for spruce pulpwood (FIM/m ³)	3.2	83
10. Stumpage price for pine pulpwood (FIM/m ³)	4.6	50
11. Commercial fellings (1000 m ³)	4.1	100

deviated from the actual stumpage price by an average of 4.5 per cent. The second statistic presented is the success in forecasting the direction of change. For example, the figure of 67 per cent indicates that for four out of the six forecast rounds, the direction has been correctly predicted. Correspondingly, a figure of 50 would indicate that the direction of change has been forecast incorrectly as often as it has been forecast correctly.

The figures in the table show that stumpage prices and commercial fellings have been forecast most accurately of all. The forecasting errors are relatively small and the direction of change has, on average, been forecast quite well. The stumpage price for pine sawlogs and the direction of change for commercial fellings have always been forecast correctly. Most difficult of all, as expected, has been the forecasting of the export prices for forest industry products. The changes in markka-denominated export prices depend on many factors which are difficult to predict, such as exchange rates. The average forecasting error has been highest for the unit price of sawnwood, at about 10 per cent. This result is also somewhat expected, as the business cycles in saw-

milling are greater than for the paper industry. Although the change in the capacity utilisation rate for the different sectors has been forecast correctly only one time in three, the forecasting error has been relatively small.

A more extensive analysis than presented here indicated that for some variables there has been a small systematic forecasting error. The *Economic Outlook's* forecasts have, for the most part, been a little too pessimistic regarding production and exports of sawnwood and plywood, exports of pulp, and stumpage prices for sawlogs. Only the stumpage price of birch pulpwood has incorporated a small systematic overestimation.

It would also be interesting to compare these forecasts with those made by other institutions. Unfortunately this is rather difficult to do, because the other institutions (e.g. Pellervo Economic Research Institute (PTT), the Research Institute of the Finnish Economy (ETLA), the Ministry of Finance, and the Finnish Forest Industries Federation) have not produced forecasts for the forest sector to the same degree of detail and/or as systematically.

'The System of Forecasting Business Cycles in the Forest Sector'

A research project of the Finnish Forest Research Institute (METLA)

Project tasks

- To produce the *Finnish Forest Sector Economic Outlook*
- To develop models for forecasting exports of Finnish forest industry products
- To develop forecasting models for roundwood markets
- To produce market reviews on the forest sector
- To develop and maintain the MESU database

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