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Five Essays on Forest Raw Materials Use in an International Perspective

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Five Essays on Forest Raw materials Use in an International Perspective

by

Mats Nilsson

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To my beloved
Adina
Freja
Elisabeth

FIVE ESSAYS ON FOREST RAW MATERIALS USE IN AN INTERNATIONAL PERSPECTIVE

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ABSTRACT

This dissertation consists of an introduction and five self-contained studies analyzing different aspects of roundwood markets. Geographically it is focused on Sweden (paper 1-3) and Russia (paper 4-5). Four of the papers (1-2, 4-5) are explicitly considering international trade and its effects and possibilities in the domestic markets. The other paper (3), only implicitly takes account of the international market (for pulpwood), in that we see a loss of competitiveness in Sweden to foreign competition.

In **Paper 1** we consider the possibility of market imperfections in the Swedish pulpwood market. Two methods to measure market power are used, but the results reject market imperfections. In **Paper 2** we measure the substitution between imported and domestic pulpwood. Using a variable cost function for the wood raw material input, we find that the substitution possibilities between the wood raw materials input in most cases seemed high. Further, the own and cross price elasticities were generally high, strongly supporting the argument that it is the relative price that is the main factor behind the imported volumes. In **paper 3**, it is found that the responsiveness to economic stimuli such as prices and costs are very low, in both short and long run. There is evidence of a reduced responsiveness, lower in the in the period 1976-1996 than in the period 1958-1975.

Paper 4-5 investigates the possibilities for exploiting the vast Russian forest resources. **Paper 4** uses the Porter framework to analyze what has happened in the Russian forestry between 1990 and 1998. We describe demand and factor conditions, the conditions in related industries, the role of government and finally the role of ownership conditions for the future prospects of the Russian forest industry. The result is a conception of the Russian competitiveness in the forest sector as relying heavily on factor conditions. Our findings are that this makes the Russian competitive advantage frail and that this advantage may vanish with further changes in the other determinants of Porter's framework. Finally, in **paper 5**, we investigate the key factors determining Nordic foreign direct investments (FDI) decisions in the Russian forest industry. The responses indicate that the prime motivation for investments made has been to serve local and regional markets, and not to take advantage of low labor and raw material costs. Access to well-developed physical infrastructure and prior contacts with future Russian partners have been important factors determining the location of the

investment. The companies emphasize different institutional factors, such as an ambiguous legal system, difficulties in negotiating with local authorities, and general political instability. In paper 5 it is thus concluded that FDI into the Russian forest sector is likely to remain low until there is a fundamental change in the legal and political systems.

Keywords: Roundwood Market, Competitiveness, Pulpwood, Market Power, Demand, Supply, Oligopsony, International Trade, Foreign Direct Investment

LIST OF PAPERS

In addition to the following introduction, the dissertation includes the following papers:

1. Bergman, M. A., and M. Nilsson (1999) "Imports of Pulpwood and Price Discrimination: A Test of Buying Power in the Swedish Pulpwood Market" *Journal of Forest Economics,* Vol. 5, pp. 365-388.

2. Nilsson, M. (2000) "Substitution Effects and Pulpwood Imports into Sweden" 20 p.

3. Nilsson, M. (2000) "An inquiry into the Changing Pattern of Pulpwood Harvests in Sweden" 21 p.

4. Kleinhof, A. and M. Nilsson (1999) "Prospects for the Russian Forests after the Transition to a Market Economy" 36 p. Submitted.

5. Nilsson, M. and P. Söderholm (1999) "Nordic Foreign Direct Investment in the Russian Forest Sector" 34 p. Submitted.

Paper 1 is reprinted with permission.

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Mats Nilsson

INTRODUCTION AND SUMMARY

This dissertation consists of five self-contained papers focusing on different aspects of the pulpwood market in Sweden and the broader roundwood market in Russia. Even though three of the papers have co-authors, the initiative to the subject choice has been mine throughout.

I started my research effort seeking answers to the question why a country like Sweden, richly endowed with forest resources, imports forest raw materials such as pulpwood. In a West European perspective Sweden has very large forest resources, and ought to be amply self-supporting as well as exporting. Exploration of this issue led me to several additional questions. Early on in my work it was suggested that the domestic pulpwood price was suppressed by an oligopsony, so that domestic supply was lower than it would have been in a competitive market. This led me to investigate the pulpwood market in Sweden, trying to identify the prevailing degree of market imperfection, but also to study the possibilities to replace domestic forest raw materials by imported ones. Further, I was puzzled by the 'conventional wisdom' that pulpwood supply depended more on what happened in the sawtimber market, than on direct stimuli such as the price of pulpwood. Could it be true, as suggested by several studies, that forest owners in Sweden do not react to economic stimuli? To an economist, such a claim provides an irresistible challenge.

The question why Sweden imports pulpwood, directed my interest to one of the suppliers in Sweden's proximity, Russia, a country that possesses huge potential resources of forest raw materials. If the 'Russian giant' started to exploit its forest resources more fully, either by exporting on a larger scale, or by refining the forest raw material at home prior to exports, the impact on the European forest raw material market, including that of Sweden, would be truly enormous. This prompted my interest in gauging the Russian potential, and in speculating on likely developments in the next 10-15 years.

The forest sector in Sweden, comprising forestry and forest industry, plays a significant role in the Swedish economy. In 1996, the sector's export value as a percentage of total exports was 14.8%, and its share of value added in all manufacturing was 12.7% (SCB, 1999). It is therefore important for Swedish economists and policy makers to understand the dynamics of this market. The changes that have occurred in the pulpwood market in Sweden

over the past 20 years, with an increasingly high share of imports, and the shifts among the species used, have significant long-run implications to the forest owners, and to Swedish society at large.

As noted above, a lead theme in my investigations is to try to understand why Sweden with its large potential harvests does not meet its domestic demand of pulpwood. Several issues may be involved. First, it has been suggested that the imperfections on the demand side of the market may depress prices and supply. The limited number of buyers has plausibly been able to maintain a cartel to this effect (e.g., Nordvall, 1996 and Brännlund, 1988). Further issues to explore in this context involve the possibility to substitute imports for domestic raw materials, and the feasibility of using broad-leaved species, e.g. birch and eucalyptus, instead of pine and spruce. Finally, I am keen to improve my understanding about the ability of Swedish suppliers to switch between pulpwood and sawtimber, and about the impact that technological advances have had in this respect. Three of the five papers in my dissertation are devoted to these issues.

The Former Soviet Union's (FSU) forest industry has long been one of the world's most important suppliers of wood raw material to the rest of Europe. Within the FSU, I focus on Russia, because this country's forest base completely dominates the FSU total. Adding to my excitement, and to the complexity of my investigations, the profound transformation of Russia's political and economic system in the 1990s, created a number of uncertainties about the forest industry's viability and role in the emerging market economy setting.

In the two papers dealing with Russia we contrast the neoclassical idea of comparative advantage due to superior input factor conditions with a wide array of concepts of competitiveness and factors determining investments. Thus, we explore whether the large forests and other seemingly absolute advantages in factor inputs are enough to maintain a comparative advantage in the European roundwood markets. This issue is analyzed using Porter's "diamond" (Porter, 1990), which widens the neoclassical concept of competitiveness. Furthermore, the apparent superiority of factor conditions in Russia should plausibly attract sizable foreign direct investment flows into the Russian forest industry. In practice, such investments have been quite limited. I try to explain this paradox, and investigate in some detail what in fact determined foreign direct investments in the forestry field. We also explore the factors likely to determine the investment flows into the sector in future years.

The research objectives of the five included papers can be summarized as follows:

Paper 1:

- to test whether the Swedish pulp industry has oligopsony power in its wood input markets.

Paper 2:

- to estimate the elasticities of substitution and own- and cross price elasticities between imported and domestic pulpwood and relate these to the increase in wood raw material imports into Sweden.

Paper 3:

- to examine the Swedish supply of pulpwood in the short- and long-run.

Paper 4:

- to throw light on the relative importance of factor conditions in Russia and other determinants of the competitiveness of the Russian forest industry.

Paper 5:

- to gain empirical insights into the determinants of foreign direct investments in the Russian forest industry.

Investigating the above research problems is important, not only for the two countries involved, but also in a wider European and global perspective. In a long run perspective, the provision of raw material is likely to affect localization of pulp and paper production. In addition, if there is increasing competition in the pulpwood market, should Swedish forest owners seek other markets? Are the Swedish forest raw material producers supplying the right mix? Can and will Russia emerge as a dominant actor in the European roundwood market? If so, under which circumstances will this happen?

The approach of this dissertation is eclectic rather than comprehensive. The aim is not to develop a unified multi-purpose model of the forest sector but to gain a deeper understanding of some specific issues. This is manifested in the different choices of models and methods depending on the objective of each paper. A majority of the papers in this

dissertation build on earlier work by other authors, extending their analysis empirically in some directions.

The main characteristics of the two roundwood markets, in Sweden and in Russia, are briefly discussed in the next section of this introduction. The main methodological issues are then reviewed. Finally a short summary of each of the included five papers is given.

MAIN CHARACTERISTICS OF THE TWO STUDIED MARKETS

Sweden

The Swedish forest industry is for our purposes best divided into two parts, the sawmills and the pulp and paper industry. The sawmills are regarded to be the pulp mills' primary competitor for raw materials.

Prices are set through negotiations, every August-September, between organisations representing buyers and sellers. The prices agreed upon are the so-called list prices, and are normally valid for one year. These prices apply to the roundwood delivered roadside. Approximately 2/3 of the roundwood bought domestically is delivered roadside. The remaining 1/3 is bought as standing timber (Bergman and Löfgren, 1991).[1] In the market for standing timber, the price does not include felling and transportation costs. The buyer meets these costs. In contrast to the roundwood delivered roadside, the prices in the standing timber market are settled in each individual transaction and prices are negotiated per stand, not in cubic meter. Bergfors et al. (1989), claim that prices for standing timber (net of cutting costs) are generally higher than the list prices. They also claim that great variations in prices occur. The data on the standing timber market are not very reliable, but the bidding price in this market is often highly correlated with the list prices and list prices are often used as a retail price for standing timber (Brännlund, 1988).

Suppliers of roundwood in Sweden can be divided into four groups of owners: Non-industrial private forest owners (NIPFs), corporations, the Swedish government, and others (which include the Swedish Church, restricted common property ("allmänningar"), communal property etc.). During most of the period studied, NIPFs owned almost half of the forest area, 47%.[2] If the corporate ownership (25%) is added to this, then more than 70% of the forests in Sweden are privately owned. A heterogeneous group owns the NIPF holdings, differing in for example, holding size, age of the owner, whether she lives on her property or

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[1] The division between roundwood delivered roadside and roundwood sold as standing timber (stumpage) is not as clear-cut as presented here. In the quantities delivered roadside, the buyer may do the harvesting, and harvesting costs are then deducted from the paid price. It is also possible to sell standing timber at an agreed price per m^3sk, where measurement is done first at the mill. However for my purposes the above definition suffices.

[2] In 1995 this picture changed due to the fact that the government land, Domänverket, was "merged" with the state-owned company, ASSI. This increased corporate forests to almost 38% and "others" from 10 to 12%.

not, and if the property is the main source of income. The ownership shares have been stable over time, due to, among other things, the Land Acquisition Act. This Act has restricted transfers of forestland between the above groups over an extended period.

A "Forest Owners Association" exists, with the main goal of strengthening the sellers' position against the buyers. Its membership peaked[3] in the mid 1960s with 130 000 members. In 1989 the association only had 80 000 members. The heterogeneity of the group, and the fact that only one third of the NIPFs belongs to the association, probably restricts the association's market power. The corporate forest owners, on the other hand, are a homogeneous group with large holdings.

Theoretically, the NIPFs appear to have two choices; delivering roadside or selling standing timber. Due to high transaction costs, the international market is not easily accessible to them. Further they can supply pulpwood and/or sawtimber. The supply of pulpwood is dependent on the price *and* supply of sawtimber. An increase in the sawtimber price will have two effects (Brännlund et al., 1985); it will raise the profitability of final cuttings, i.e., cuttings that are aimed at solely supplying sawtimber, relative to thinning, which is "aimed" at supplying pulpwood.[4] However, the increased final cuttings also increase the volume of pulpwood cut. This effect then partly offsets the negative substitution effect.[5] Furthermore, the waste from the sawtimber industry is sold to the pulp industry. An increase in the price of sawtimber due to increased demand will lead to an increase in waste and therefore an increase of the supply of wood raw material to the pulp mills, again partly offsetting the price effect. The size of this source, the waste, depends on the quantity of sawtimber produced.

To what extent does the price of pulpwood affect the supply of pulpwood? In the late 1970s and early 1980s the argument was that many small owners, rather than profit maximizing, were trying to meet a target revenue, (in SOU 1981:81 this argument was made for the aggregated roundwood market). In the Swedish forestry economics literature this is often referred to as the Volvo-argument. When the forest owner wanted a new Volvo, he would simply cut enough trees to pay for it. The hypothesis of forest owners not maximizing profits, has been refuted, e.g., Brännlund et al. (1985). Thus we expect that pulpwood price should have a positive effect on pulpwood supply.

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[3] All numbers in this paragraph are taken from Bergfors et al. (1989).

[4] The quotation marks signifies that thinnings also are done to raise the quality of remaining trees. In other words, thinning produces good sawtimber in the final cutting.

The demand for pulpwood comes mainly from a few large companies. In 1975 the consumption of wood raw materials in pulp and paper industries was 42 million m^3sk, and it was 45.6 million m^3sk in 1993.[6] Ownership has become more concentrated. There were approximately 130 companies in the early 1950s. However, by the mid 1990s there were little more than 20, with five firms dominating the market of pulp and paper. The increasing concentration, and its effects on the demand for pulpwood, is considered in this study. The fewer the actors in a market, the better the possibilities of influencing the market price. The buyers of pulpwood were, during parts of the period 1974 to 1996 (the period considered in this study), organized in purchasing cartels or bought wood through purchasing companies that were mutually owned by several paper pulp companies ("Priset på massaved det lägsta på tre år", 1996). This could imply that prices in the pulpwood market have been non-competitive.

Russia

Russia holds 23 percent of the world's forest area, and 22 percent of the world's wood inventory, including 55 percent of the inventory of coniferous forests (Gareyev et al., 1997). Numerous authors have remarked upon the vast forest resources and the potential that these constitute.[7] In 1993, the FSU was the second largest gross exporter of industrial roundwood in the world, and the largest net exporter (FAO Yearbook of Forest Products, 1993). Total exports in 1993 amounted to 7215 thousand m^3 solid volume. A world price of Russian roundwood is hard to find but we can compare the prices paid for Russian softwood at the Swedish border with some of Russia's competitors' prices. In the case of pulpwood, the prices in US dollars per m^3 in 1993 were CIF at the Swedish border $34.1 for Russian pulpwood, $37.3 for German pulpwood, $49.7 for Danish, and $44.7 for Norwegian. For sawlogs the price was $303 for Russian sawlogs, $440 for Norwegian sawlogs, and $448 for Finnish.[8] The Russian CIF-prices seems very competitive but the price difference also reflects some differences in quality (see, for example, Bergforgs et al., 1989).

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[5] Brännlund et al. (1985) find that an increase in the price of pulpwood will have a clear-cut negative effect on sawtimber supply. This is because there will not be a "joint production" effect from thinnings, they will simply lead to a decrease in final cutting.

[6] Yearbook of Forestry Statistics, National Board of Forestry, various years. M^3sk means that the bark and other parts are included.

[7] See, for example, Backman (1994, 1996a, 1996b), Gareyev et al. (1997) and World Bank (1997).

[8] These are not really prices but are calculated as a per unit cost at the border, i.e., the total value of the roundwood imported from country *i* divided by the total quantity imported from country *i*. The data were taken from the Yearbook of Forestry Statistics (1996). When calculating this dollar price the official exchange rate 7.803 SEK/US $ was used.

Starting with the tenure of Mikhail Gorbachev, the Former Soviet Union (FSU) has gradually opened up for foreign investors to enter the country. For example, by resolution of the USSR Council of Ministers in 1987, foreign direct investment (FDI) and foreign ownership of Soviet equity became possible. The 1991 USSR law on foreign investment, which is still in force, permits foreign companies to set up wholly owned subsidiaries and to repatriate profit (Gareyev et al., 1997).[9] After the collapse of the Soviet Union in 1991 its legal successor, Russia, has intensified the transition from a command-based to a market-oriented economy. However, still very little 'supporting' legislation (e.g., adequate laws on foreign land ownership rights and import policy) that would further facilitate FDI exists (Stern, 1996). In addition, the profound transformation of the country's political and economic system has created a number of uncertainties about the future viability of a number of industries and their role in the transitional market setting.

As a consequence, actual FDI into Russia is likely to be determined by a variety of political and economic factors, which in turn will be region- and industry-specific. This potential should plausibly be able to attract foreign investors into the industry, but until 1998 foreign investment activity has been low and many of the investors have experienced problems. Moreover, the availability of information on FDI in Russian forestry is meager and mostly of an anecdotal nature. A mapping of current foreign activities, their main determinants and experienced obstacles is thus motivated.

One of the most important competitive advantage for Russia is probably the availability of resources and skills. At the same time a significant part of the Russian forest resources is physically and/or economically inaccessible. Due to the rapid development of industrial complexes as well as undeveloped network of roads and railroads, large parts of Siberia and Far East are in practice isolated from foreign as well as domestic timber markets.

In the Republic of Karelia (henceforth Karelia) and in Murmanskaya oblast (henceforth Murmansk) there were an estimated stock of 815 respectively 201 million m^3 standing timber in 1990, according to official figures.[10] In Karelia this stock increased to 859 million m^3 in 1995 whereas the inventory in Murmansk remained unchanged. This inventory can be compared with neighboring areas, for example, Sweden which had a total inventory in 1990 of 2471 million m^3, Finland 1679 m^3 and Poland 1380 m^3 (Yearbook of Forestry Statistics, 1996). However, the processing capacity of forest raw materials in Karelia and Murmansk is

[9] Some recent legislative Acts also include the 1995 law on "Additional Measures Toward Attracting Foreign Investment to Implement Large-Scale Projects in Material Production Industries," (Stern, 1996).

[10] I am grateful to Andris Kleinhof, Moscow University, for providing these numbers.

very low compared to those in Sweden and Finland. Thus the potential impact on the Nordic roundwood trade of the vast resources in North Western Russia, considering the inventory, is quite large. But the size of the inventory is of no importance if the resource is physically or economically inaccessible.

The economic inaccessibility of the North timber resources is mostly caused by the drastic economic changes, i.e., very high rises in energy prices, and obsolete equipment and machines. If the economic situation in Russia changes, with less volatility in input prices and lower interest rates making re-investments possible, these regions will be able to profitably harvest the forest resources. Further, the improvement of the economic situation should lead to a more effective forest management, e.g., better forest reproduction methods. During the transitional period from a command to a market economy, the silvicultural practices have declined in quality and intensity. For example, the percent of the maintenance of coniferous plantations in the age of final cutting as applied to the North Region is very low, only about 20-30%. As a result of this the share of economically inaccessible stands will increase. This is a long-term proposition unlikely to occur in the next 10-15 years, judging from the experience in the 1990s.

METHOD

The studies in this thesis are diverse, both in the nature of the data used and the methodologies applied. When a detailed and reliable set of data exists, econometric methods may give valuable insights. If data are lacking, a valuable contribution to the literature may be to collect and present new data. In addition, existing data may be used to emphasize a qualitative study of an economic phenomenon. We present all these approaches, depending on the research problem and the current availability of data. All five studies share one characteristic. Due to the nature of the research problems investigated, a partial equilibrium framework appears to be natural. The loss of 'realism' should be weighed against the possibility to focus more intensely on a few determining factors.

Studies 1-3 are all examples of the first method. The hypotheses put forward are tested using cross-sectional and time series data. For example, in paper 1, we wish to evaluate the extent of market power the pulp and paper industry can exert in the pulpwood market. This is done in two ways. First, using panel data and a single equation model we test market power. In this model we state that price in a perfect competitive market equals marginal cost, and we assume marginal cost can be approximated by a dummy variable for time. In this single equation framework, the hypothesis of no market power is rejected if we found that price depends on more than marginal cost. Second, we use more complex framework with a flexible form profit function to measure market power directly. This model includes four equations and covers both the supply and demand side of the Swedish pulpwood market. This means that data availability allowed us to test the same hypothesis using two different econometric models.

The lack of data makes econometric methods harder to use when studying the transition economies. Therefore, the main contribution here is the presentation of new data material. The data collection may be direct, by sending out a survey, as in paper 5. The advantages of this research method are the access to first-hand data, and the possibility to collect relevant information to the research question addressed. This methodology suffers from the drawback that only certain types of the respondents answer or that the answer rate may be low. Even so, the data material collected may give valuable hints of the answer to the research question. Finally one may use some data collected, and relate this to existing material to qualitatively

discuss some hypothesis. This is done in paper 4, where we put forward an effort to quantify the Porter (1990) framework for a single market.

SUMMARY OF THE PAPERS

This section summarizes the five papers included in the dissertation. This to make it easier for those readers that only plan to read parts of the dissertation. For the readers that plan to read the whole dissertation, this section can be skipped without any loss of context.

Paper [1] Imports of Pulpwood and Price Discrimination: A Test of Buying Power in the Swedish Pulpwood Market

In this paper our main concern is whether the pulp and paper industry are able to exert market power in the pulpwood market or not. We use a data set from 1970 to 1993 to estimate the Swedish' pulp and paper industry's market power over the suppliers of pulpwood.

This study is done within the "New Empirical Industrial Organization" framework, which aims at parametric estimation of market power using price and quantity data only, often applied to a single industry. This is in contrast with the earlier industrial organization literature, which focuses on cross-industry studies of concentration and profitability and relied on accounting cost data.

However, we first empirically test for imperfect competition in import markets using a single equation technique. Knetter (1989) suggested this technique and the existence of market power is assessed, using a reduced form single equation. We model the import price of pulpwood from a specific country as a function of the exchange rate, a country-specific dummy and a time dummy. If the international markets for this good were perfectly competitive, then the exchange rate and the country dummy should have no effect on the price. On the other hand, if the exchange rate and the country dummy affect price, this suggests that the market is characterized by imperfect competition.

Regressing import prices on exchange rates and country dummies, we find some initial evidence of market power. We then go on to test for market power directly, using a conjectural variation model in combination with a dual representation of the production structure. We assume that the shadow prices are equal for all markets and impose this as a restriction on the system. This appears to be a critical restriction, but follows from profit maximization.

We are not able to reject the hypothesis of a competitive market, neither in the domestic pulpwood market nor in the international market. The domestic supply has an estimated own price elasticity between 0.17 and 0.41, which is in accordance with supply price elasticities found in earlier studies. The world supply function (in reality a residual supply function) has an estimated own price elasticity that lies between 0.60 and 1.24. This difference is a necessary but not sufficient condition for price discrimination between markets. The market power estimate rejects the hypothesis of market power in three different estimations. Inconsistent with economic theory, the sign of the market power estimate coefficient was negative (when estimated freely). Therefore we tried to force this estimate to be non-negative. The coefficient then became virtually zero, suggesting a perfectly competitive market.

Our results are somewhat contradictory, but the main conclusion is that we find no strong evidence of pulpwood prices below the competitive level. This contradicts the apparent lack of competition in the market but accords, not surprisingly, with statements from the industry.

Paper [2] Substitution Effects and Pulpwood Imports into Sweden

The purpose of this paper is to see what insights can be derived from estimated substitution, own price and cross price elasticities on the imports of pulpwood to Sweden. Considering the vast Swedish forest resources, it is puzzling that we see an increase of wood raw material imports into Sweden.

We estimate a cost function from which we want to derive the substitution, own and cross price elasticities. When doing this, we desire a general functional form, which places few if any *a priori* restrictions on the input factor cost estimates. The translog cost function, allows considerable generality since it places no restrictions on the Allen elasticities of substitution and can be viewed as a second order approximation to any twice differentiable cost function. A translog demand model builds on the assumption that the Swedish pulp producing industry is cost minimizing. It is also assumed that it operates in competitive markets for its production inputs.

We find that the substitution possibilities between the wood raw materials input in most cases are quite high. The estimated cost share equations shows that relative price matters. The own and cross price elasticities are generally very high. All the above facts imply that the imports of pulpwood to Sweden are best explained by an increasing competition due to lower prices in the international market. If this situation prevails it means that the domestic suppliers of pulpwood in Sweden must either decrease harvesting costs further or enter other markets.

Paper [3] An Inquiry into the Changing Pattern of Pulpwood Harvests in Sweden

Since the 1920s, the Swedish forest inventories have grown by approximately 3% per year. This means that the inventory of standing timber has grown from 1.76 billion m^3sk (in 1930) to 2.74 billion m^3sk (in 1990). There are two interrelated reasons for this. The first is that industrial take has been well below new growth. The second is a conscious policy by the Swedish government that was initiated in the early 1900s aimed at regeneration measures and increased productivity in Swedish forestry. Yet, since the mid 1970s, the domestic supply of pulpwood in Sweden has not been enough to cover the domestic demand. The difference has been covered by imported pulpwood. The fact that, despite growing inventories, Swedish harvests of pulpwood have been inadequate to cover demand since the mid 1970s appears to be a mystery. In this paper we investigate the Swedish pulpwood supply, in a short and long run framework.

Before implementing policies that could increase domestic pulpwood supply, it is important to understand the responsiveness of pulpwood supply to economic stimuli. The main purpose of this paper is to estimate the short and long run elasticities of own price of pulpwood, but in addition the elasticities of the sawtimber price, the costs of harvesting and the growing stock of forest inventory are estimated and their impact upon pulpwood supply is explored. The focus is on the period from 1958-1996 but there are implications for the future as well.

Short and long run elasticities are estimated in a partial adjustment framework. In this framework, we assume that there exist some fixed long-run equilibrium level of harvests towards which adjustments are made. Supply of pulpwood is commonly depicted as a function of the price of pulpwood, the price of the substitute in production (sawtimber), cutting costs and the growing stock of timber.

The results imply that own price elasticities, both short and long run, are low. Further, the quantity supplied of pulpwood is positively affected by changes in the sawtimber price. Our results also indicate a low elasticity with respect to the felling costs. We were interested to see if there had been any change in the parameter estimates over time. This was tested by dividing the time series studied in to two series, before and after 1976.

When the sample was divided into two sub-samples, the results tentatively indicate a strong reaction to economic stimuli before 1975 and a sharp reduction of the elasticities after 1975. This suggests that in the absence of new changes, price or cost-based policies to increase the supply of pulpwood, will be inefficient. Rather, we need to investigate the

connection between the pulpwood and sawtimber markets, and the effects of different approaches to forest management.

Though our analysis have provided some illumination to the Swedish forest harvesting behavior, the experience of growing imports in the presence of growing stocks remain unexplained. This is a splendid issue for future research.

Paper [4] Prospects for the Russian Forests after the Transition to a Market Economy

The purpose of the fourth paper is to analyze the prospects of profitably harvesting the forests in North Western Russia in a long run sustainable manner, and to point to their potential competitiveness in the domestic and international markets beyond the turn of the century. The North region includes Republic of Karelia, the Republic of Komi, and the oblasts (subregions) of Archangelsk, Vologodsk and Murmansk. Insofar as data availability have admitted, the analysis include all these regions. Backman (1995) describes the growth of the forests in Russia and discusses production, consumption and export prospects, using a Forest Sector Assessment Model. He reports three main findings: First, the availability of new capital is crucial in order not to lose the 1995 harvesting capacity. Second, total exports from Russia will decline if the infrastructure is not expanded and new cutting technologies used. Finally, policies to assure high long run sustainable harvests need to be put in practice. To his contributions we add a more detailed discussion on costs, markets and firms' structure, as well as the impact of government policy (or in some cases lack thereof) on the forest enterprises in particularly North Western Russia.

The theory of comparative advantage has intuitive appeal, and historically national differences in factor costs have played a role in determining trade patterns in many industries. The Russian forests are among the largest in the world and labor costs do not seem to be prohibitive. Still exports of roundwood have gone down dramatically despite a collapsing domestic Russian market. Thus, using the theory of comparative advantage it would be easy to conclude that North Western Russia is highly competitive in the international roundwood market due to its vast forest inventories and its relatively cheap labor. Our claim is that this way of analyzing the potential competitiveness leaves several important issues unanswered. One of the more important issues that are left unanswered is the impact of the institutional setting within a country. The theory of comparative advantage implicitly assumes an efficient use of factors of production, and leaves little role for the effects of organizational structure and institutions on economic growth.

To investigate the threats and possibilities in Russian forestry we have chosen a systemic approach first suggested by Porter (1985, 1990). According to Porter (1990) the answer to whether a particular industry in a country is competitive or not lies in four broad attributes of the country. These attributes individually and as a system constitute the so-called the diamond of national advantage, the playing field that each nation establishes and operates for its industries. In this study we will use Porter's four determinants of competitive advantage to systematize the analysis. We will investigate *factor conditions, demand conditions,* the presence and status of *related and supporting industries, the firm strategy, structure and rivalry*. We will also add a fifth determinant, *government*, as suggested by van den Bosch and de Man (1994).

The survival and well being of the Russian forestry industry is ultimately dependent on its competitiveness, in relation to other roundwood suppliers in the international market. Competitiveness, in turn, depends on several factors. We have tried to evaluate the current status of several determinants of competitiveness, with some focus on costs and government policy. The prospects for the Russian forestry could be very good looking at the factor conditions prevailing in the mid to late 1990s. However, only if substantial problems with regard to government policy, clarifying of property rights, development and maintenance of the infrastructure and a stable and not too rapid increase in costs are solved. Further we think that domestic demand is a weak link and that for the Russian Forests to regain its earlier production and establish itself as the leading supplier of forest raw materials in Northern Europe a revitalization of the domestic demand is necessary.

Paper [5] Nordic Foreign Direct Investment in the Russian Forest Sector

This paper investigates the key factors determining Nordic foreign direct investment (FDI) decisions in the Russian forest industry. A mail survey was sent to the 25 largest forest companies in Denmark, Finland, Norway and Sweden. The responses indicate that the prime motivation for investments made has been to serve local and regional markets, and not to take advantage of low labor and raw material costs. Access to well-developed physical infrastructure and prior contacts with future Russian partner have been important factors determining the location of the investment. The survey also asked about Russian projects that had been terminated in the recent past as well as planned investments that eventually were not carried through. In general, 'technical problems' (e.g., restructuring costs, quality of work force and local suppliers), had little to do with the decision to terminate past projects or not to invest in new projects. Instead the companies emphasize different institutional factors, such

as an ambiguous legal system, difficulties in negotiating with local authorities, and general political instability. The Russian Forestry Act of 1993 provides one example of the former. The paper thus concludes that FDI into the Russian forest sector is likely to remain low until there is a fundamental change in the legal and political systems.

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Paper I

IMPORTS OF PULPWOOD AND PRICE DISCRIMINATION: A TEST OF BUYING POWER IN THE SWEDISH PULPWOOD MARKET

MATS A. BERGMAN AND MATS NILSSON*

ABSTRACT

The Swedish pulp and paper industry's ability to exert monopsony power is tested both with a conjectural variation model, which parameterizes the firms' expectations about other firms' behavior, and with a model that estimates country-specific effects and effects of currency fluctuations on import prices. We use industry data for the 1970–1993 period and find only weak evidence of market power, in spite of the apparent lack of competition.

Keywords: conjectural variation, generalized Leontief, market power, monopsony, oligopsony, profit function.

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INTRODUCTION

We use a data set from 1970–1993 including major exporters of pulpwood to Sweden during this time, to estimate the Swedish' pulp and paper industry's market power over the suppliers of pulpwood. In doing so, we make use of two strands of the economics literature.

The first is the "New Empirical Industrial Organization" (NEIO), which aims at parametric estimation of market power using price and quantity data only, often applied to a single industry. This is in contrast with the earlier IO literature which focused on cross-industry studies of concentration and profitability and relied on accounting cost data.

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The second is a literature that tries to empirically test for imperfect competition in export markets. Knetter (1989) has suggested a technique for assessing the existence of market power, using a reduced form single equation. He models the export price of a good to a specific market as a function of the exchange rate, a country-specific dummy and a time dummy. If the international markets for this good were perfectly competitive, then the exchange rate and the country dummy should have no effect on the price. On the other hand, if the exchange rate and the country dummy affect the price, this suggests that the market is characterized by imperfect competition. Pick & Park (1991), Yerger (1996) and Alexius & Vredin (1996), among others, have employed the same technique on other markets. In all of these papers, the perfect competition hypothesis was rejected. However, Knetter suggested an alternative explanation for the effect of the exchange rate on prices: that variations in the exchange rate induce shifts of demand or supply. Buongiorno & Uusivuori (1992) argue that if the "law of one price" holds, i.e. if in the long run export prices of all commodities are the same across each pair of countries, then the apparent effects of exchange rates on prices are likely to have such other causes.[1] Using co-integration methods, Buongiorno and Uusivuori find that the law of one price does indeed hold for a sample of pulp and paper exports from the U.S.

An early example of the NEIO-literature is Appelbaum (1982), who estimated a (conjectural variation) parameter representing the market power exerted by the firms of an industry. The possibility of identifying such a parameter without the use of accounting data is clearly discussed by Bresnahan (1982) and Lau (1982). Empirical methods for estimating the parameter have been developed by, e.g., Atkinson & Kerkvliet (1989). Applications to the pulp and paper industry include Bernstein (1992), Bergman & Brännlund (1995), Murray (1995) and Yerger (1996). The structure of the pulp and paper industry motivates the estimation of mono*psony* power, instead of the monopoly-power parameter estimated in most of the empirical literature.

[1] Alternatively, the law of one price holds if, in the long run, one of the prices is a linear function of the other price, for each pair of prices.

The Swedish pulp and paper industry is highly concentrated. The four largest firms use 75 percent, and the seven largest firms 95 percent, of the pulpwood. Furthermore, most of the largest firms coordinate their purchases in jointly owned purchasing companies.[2] The production of pulp (6 percent of world production in 1994) and paper (3 percent of world production) in Sweden is approximately half of that in Canada. The turnover of the Swedish-owned industry, however, is comparable to that of the Canadian-owned industry, or almost 25 billion USD. About half of the turnover stems from subsidiaries located abroad. (Yearbook of Forest Statistics.)

Between 1973 and 1987, the pulp and paper industry were able to coordinate their investments with the help of the Building and Construction Act, which regulated investments in the pulp and paper industry during this period. The Act gave the firms in the industry influence over their competitors' investments.

Since 1906, when the Swedish pulp and paper industry was prohibited from acquiring forest land, it has owned 25 percent of the forest area. In 1994, however, this figure rose to 40 percent, when most of the state-owned forest was transferred to a state-owned producer of pulp and paper, which subsequently was partly privatized, although with the state retaining a majority of the shares. In 1965 the industry regained the right to acquire forest land. Half of the forest land is owned by private forest owners, while 55–60 percent of all domestic wood supply comes from private owners. During the last three or four decades, 40 to 50 percent of the private wood supply has been sold with the Forest Owner's Association acting as an intermediary. In the 1960s and early 1970s, the Association integrated forward into the pulp and paper and sawmill industries. In 1975, its cooperatives accounted for 15–20 percent of total production. The recession following the first oil crisis forced the Forest Owner's Association to shut down or sell half of its industrial capacity.

Clearly, the industry has the upper hand in the price negotiations with the Forest Owner's Association. There

[2] These were recently banned by the Swedish Antitrust Authorities under the new and stricter 1993 Competition Law. The purchasing companies are currently being restructured as transport optimization joint ventures.

have been concerns that the industry uses imports of pulpwood to exert downward pressure on the price, and reports of import prices far higher than the prevailing domestic prices. This would suggest price discrimination. However, Figure 1 shows that the average cost of imported pulpwood has not deviated much from the industry's total average cost of pulpwood (i.e., including both domestic and imported wood; no disaggregation into species and chips are made).

Before 1975 the trade in pulpwood across the Swedish border was small and balanced; since 1975 imports have accounted for 10–20 percent of the pulp and paper industry's input. The sudden increase coincides with what appears to be a downward shift in domestic supply (see Figure 2 below).

A look at the institutions of Swedish forestry suggests that the industry has substantial market power over the sellers of wood, while a comparison of domestic prices and prices of imported wood suggests otherwise. Attempting to resolve this puzzle, the aim of this paper is to estimate the oligopsony power using industry data for the Swedish wood pulp and paper industry. The findings of Bergman & Brännlund (1995) lend some support to the notion that the industry has market power vis-à-vis the supplier of pulpwood, although the results indicate that the market power may have varied over the years. The current paper uses a more recent data set. Another important difference is the inclusion of the market for imported wood. The results in-

TABLE 1. IMPORTS OF PULPWOOD IN 1000 M^3FUB, ANNUAL AVERAGES OVER THE PERIODS.

	Imports from							
Period	Norway	Denmark	Finland	FSU	Germany	Poland	UK	Holland
60-64	174	0	513	0	0	0	0	0
65-69	97	0	136	0	0	0	0	0
70-74	101	12	244	88	116	0	0	0
75-79	200	259	139	217	838	281	26	4
80-84	348	308	523	213	652	438	348	18
85-89	469	345	452	1282	1370	632	187	22
90-93	518	263	127	1395	937	231	45	3

Source: SOS Trade Statistics. FSU=(Former) Soviet Union.

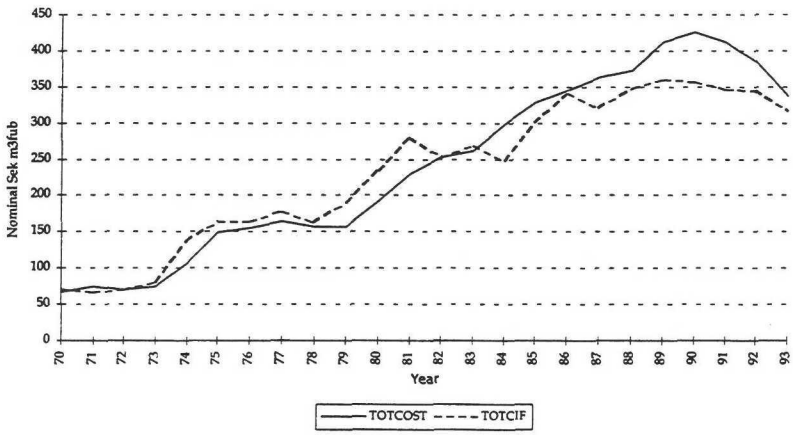

FIGURE 1. TOTAL COST AND COST OF IMPORTS.

Source: SOS Industry and Yearbook of Forest Statistics, various years. Domestic price (TOTCOST) is approximated with the average cost of all pulpwood at the factory, including imports. Import prices, IMPCOST are measured as CIF-prices plus 10 percent to account for unloading and transport costs. m^3fub means cubic meter solid volume excluding bark.

dicate that the Swedish domestic market for pulpwood is competitive, but for the imports the results are somewhat mixed.

IMPORTS AND MARKET POWER

The most important suppliers of pulpwood to Sweden are the Baltic Sea states, although imports from countries as far away as Chile occasionally occur. Table 1 shows the evolution of import volumes from the most important suppliers.

As can be seen in Table 1, the major exporters in recent years are Germany and the FSU (former Soviet Union). In the 1960's only Norway and Finland exported significant amounts of pulpwood to Sweden. One explanation for this increase in trade with new partners in the 1970s is falling bulk transport costs (Lundgren, 1996). Another explanation may be that because of increased concentration, the industry has become more prone to use imports to exert market power.

The average unit value of imports, hereafter referred to as the CIF-price, is closely correlated to the domestic price, whether this is measured as the domestic list price or as the average pulpwood cost at the factory (see Figure 1). One

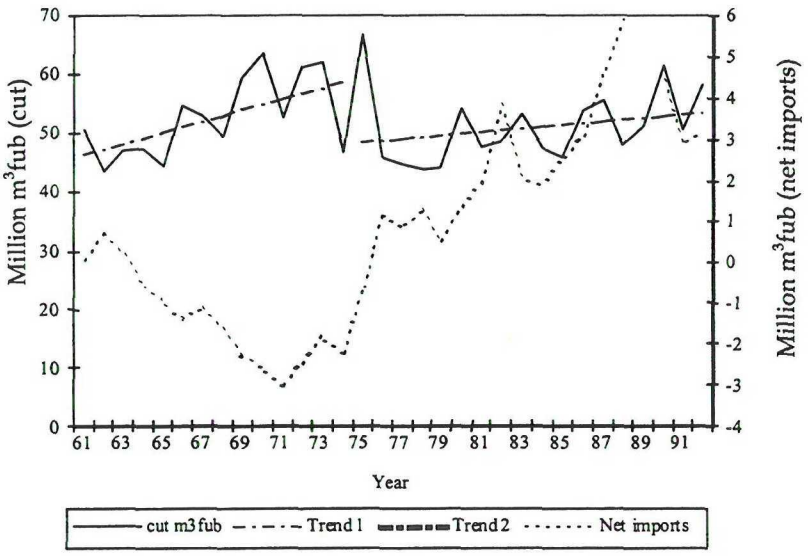

FIGURE 2. QUANTITY ROUNDWOOD CUT IN SWEDEN AND NET IMPORTS 1961–1992, TRENDS ADDED.

Source: Yearbook of Forestry Statistics 1996. m³fub means Cubic metre solid volume excluding bark.

should also note that according to our measures, since the early 1980's, the average CIF-price has been lower than the cost of domestic pulpwood at the factory. However, note that we are comparing average prices, while we should study prices at the margin. The correlations between CIF-prices, cost at factory and the list prices are presented in Table 2.

TABLE 2. CORRELATION OF PULPWOOD "PRICES".

	Average Cost at Factory	Domestic List Prices	CIF Price (unit value)
AC at Factory	1		
List Price	0.74	1	
CIF Price	0.87	0.67	1

Sources: SOS Industry, Yearbook of Forest Statistics, various years.

As a first step, we estimate the following equation to test for imperfect competition:

$$\ln w_{it} = \theta_t + \gamma_i + \beta_i \ln s_{it} + u_{it}, \quad (1)$$

where w_{it} is the price per unit of wood imported from country i at time t in Swedish Kronor (SEK), θ_t is a time effect, γ_i is a country effect, s_{it} is the price of country i's currency at time t, and u_{it} is the disturbance term. This is the monopsony version of Knetter's (1989) proposed specification for the monopoly case. If the market were perfectly competitive, then we would expect all γ_i and β_i to be zero, assuming that the marginal value products of wood from different countries are equal. If the supply elasticities are constant over time, but competition imperfect, then γ_i may vary across markets, but all β_i should be zero. Finally, under imperfect competition and non-constant elasticity of supply both γ_i and β_i may be non zero. We have tested this for the eight countries that are included in our study, using the nominal exchange rate. The exchange rates of the FSU and Poland were for most of this period not determined in free markets. We argue that they anyway to some extent reflect the economic conditions. Estimation results are shown in Table 3.

TABLE 3. COUNTRY AND EXCHANGE RATE EFFECTS ON THE CIF-PRICE. *Sample period is 1974–1993. All exchange rates are expressed as the export market's currency per SEK. Prices are CIF average, nominal SEK. Data sources: see data section below. Time effects not reported.*

	Exchange Rate	t-stat	Country Dummy	t-stat
Norway	-1.67	-2.18		
Finland	-2.73	-4.58	-0.79	-3.96
Denmark	-1.17	-2.53	0.078	0.68
Germany	0.04	0.17	0.03	0.09
FSU	0.03	1.13	0.13	1.20
Poland	-0.00	-0.17	-0.00	-0.00
UK	0.88	1.72	2.06	1.71
Holland	0.06	0.14	0.19	0.45
F=11.41	R^2adj.=0.70			

As can be seen, the exchange rate parameter is significant in three cases: Norway, Finland and Denmark. A significant exchange rate parameter suggests a non-constant elasticity of supply. Consider a depreciation of the foreign (exporting country's) currency relative to the domestic (importing country's) currency. The price faced by exporters then increases. If this causes supply elasticities to change, then the optimal import price, possibly set by the Swedish importers, will change. In other words, changes in the exchange rate may cause changes in the import price. The interpretation of that parameter is, for example, that if the Finnish currency becomes weaker compared with the Swedish, (i.e., the FIM/SEK rises) this results in a lower price for Finnish pulpwood imported to Sweden. It is interesting to note the fact that all the Nordic countries exhibit an elasticity of the CIF-price with respect to the exchange rate that is lower than –1. Surprisingly enough, in the case of the UK, a change in the exchange rate is more than offset by a rise in the export price in British Pounds, which means that a weaker Pound coincides with higher prices on wood imported from the UK.

The country specific effects suggest that Finnish pulpwood is less costly compared with Norwegian pulpwood (the reference country). The 'conventional wisdom' that Swedish pulpwood buyers prefer not to compete with the Finnish pulpwood industry, in order to reduce competition in domestic markets, accords with our results.

A CONJECTURAL VARIATION MODEL

Following Appelbaum (1982), Atkinson & Kerkvliet (1989), and others, we use a dual representation of the production structure. Thus, we estimate input demand and output supply instead of the production (or profit) function. In contrast to, e.g., Atkinson and Kerkvliet, we simultaneously estimate the input supply functions. If these latter functions are not also estimated, then the monopsony hypothesis can be rejected either because of competitive behavior, or because the input supply curves are highly elastic. In order to separate these two effects, input demand and input supply must be estimated simultaneously (or we must use prior information on input supply elasticities).

In the Appendix, we make a number of formal assumptions and derive the equations to be estimated. In short, we assume that inputs (pulpwood, labor and energy) are homogeneous, that competition in the pulpwood market is possibly imperfect, that other inputs are bought on competitive markets, that firms maximize profits, and that all firms have equal conjectural elasticities.[3] We then derive the input demand and output supply equations to be estimated by applying Hotelling's lemma on an industry profit function. This gives the output supply:

$$\frac{\partial \pi^*}{\partial p} = q(p, z, w_1 s_1, t) \tag{2}$$

and the input demand:

$$-\frac{1}{s_i}\frac{\partial \pi^*}{\partial w_i} = R_i(p, z, w_1 s_1, t) \tag{3}$$

$$-\frac{\partial \pi^*}{\partial z_i} = x(p, z, w_1 s_1, t) \tag{4}$$

where π is the profit function, p and w are the (actual) prices of pulp and pulpwood, z is the price vector of other inputs, ws is the shadow price of pulpwood, index 1 (i) refers to the home country (country i), q is pulp output, R is demand for pulpwood, x is demand for other inputs and t is time.

In addition, we make a conventional specification of the pulpwood supply in market i as:

$$w_i = w_i(R_i, y_i) \tag{5}$$

where y is a vector of exogenous variables that shift pulpwood supply.

Estimation of the system consisting of Equations (2) to

[3] A firm's conjectural elasticity is a measure of how much that firm expects market demand to change when it changes its own demand. See the Appendix for a definition.

(5) will provide us with an estimate of θ_1, the underlying market-structure parameter. The estimation will also give us an estimate of the supply elasticities on the different markets, γ_i. From the equality:

$$w_1(1+\theta_1\gamma_1) = w_1 s_1 = w_i s_i = w_i(1+\theta_i\gamma_i) \tag{6}$$

it follows that all θ_i can be estimated if we know all w_i and γ_i. Equation (6) imposes the restriction that the shadow price of pulpwood is equal across countries. Oligopsony power is measured by the product of θ and γ.

EMPIRICAL SPECIFICATION

We assume that firms use wood (r), labor (x_l), energy (x_e), and capital (K) as inputs. The inputs of labor and energy (corresponding to x in the previous section), and wood, are variable, while capital is fixed. Thus, the model should be interpreted as a short-run model. We assume that the markets for pulp, labor, and energy are competitive, i.e., that the price of pulp (p), the wage rate (z_l), and the price of energy (z_e) are parametric to the (Swedish) pulp industry.

We specify the behavioral profit function for the pulp industry as a Generalized Leontief (GL) profit function, which is a so-called flexible-form profit function. This means that it is a second-order differential approximation to an arbitrary profit function (Chambers, 1988). However, in order to save degrees of freedom, our specification is not flexible with respect to technical change. The profit function is given by:

$$\pi^*\left(p,z,w_1(1+\theta_1\gamma_1)K\right) = (1+g)^t\left[\sum_{a=p,l,e,w}\sum_{b=p,l,e,w} K\beta_{ab}y_a^{1/2}y_b^{1/2} + \sum_{a=p,l,e,w}\beta_a y_a\right] \tag{7}$$

where $y_p = p$, $y_l = z_l$, $y_e = z_e$, and $y_w = (1+\theta_1\gamma_1)w_1$. Since the Hessian of a profit function is symmetric, we require that $\beta_{ab} = \beta_{ba}$. A fundamental property of the profit function is homogeneity of degree one in prices – this is satisfied by Equation (7). In addition, we allow the profit function to be homogeneous of degree one in the fixed factor. This is the case if $\beta_{ab} = 0$ for a=p,l,e,w. (Bergman & Brännlund,

1995.)[4] Using Hotelling's lemma, Equations (2) to (4), on Equation (7) we obtain:

$$q = \sum_{a=p,l,e,w} \beta_{pa}(1+g)^t K\left(\frac{y_a}{y_p}\right)^{1/2} + \beta_p(1+g)^t \tag{8}$$

$$-x_l = \sum_{a=p,l,e,w} \beta_{la}(1+g)^t K\left(\frac{y_a}{y_l}\right)^{1/2} + \beta_l(1+g)^t \tag{9}$$

$$-x_e = \sum_{a=p,l,e,w} \beta_{ea}(1+g)^t K\left(\frac{y_a}{y_e}\right)^{1/2} + \beta_e(1+g)^t \tag{10}$$

$$-r = \sum_{a=p,l,e,w} \beta_{wa}(1+g)^t K\left(\frac{y_a}{y_w}\right)^{1/2} + \beta_w(1+g)^t \tag{11}$$

The GL profit function has the property that its derivatives, with respect to prices, are linear in the parameters. However, when one of its inputs is traded in a non-competitive market, as in this case, the function becomes nonlinear in the parameters.

To estimate the inverse of γ_i, namely the supply elasticity, we need to specify the forest owners' supply of wood. The specification of the Swedish forest owners' decision problem is very conventional. We also estimate a "foreign" residual supply of pulpwood. Data availability allowed us to include for example cutting cost in the Swedish supply of pulpwood, but not in the foreign supply. We represent the domestic supply of pulpwood as a log-linear function:

$$\ln R_1 = \gamma_{10} + \frac{1}{\gamma_{1w}}\ln(w_1)\gamma_{1I}\ln(I_1) + \gamma_{1c}\ln(C_1), \tag{12}$$

where I_1 is forest inventory and C_1 is harvesting cost.

We assume that the foreign forest owners' supply of

[4] Bergman (1993) shows how the GL profit function should be specified, with or without homogeneity in a fixed factor, in order for it to be a flexible form that is homogeneous in prices.

pulpwood is represented by the log-linear function:

$$\ln R_i = \gamma_{i0} + \frac{1}{\gamma_{wi}} \ln(w_i) \gamma_{ir(t-1)0_{it-1}} \qquad (13)$$

where R_{it-1} is imports from country i in period $t-1$.

The full model to be estimated is given by Equations (6) and (8) to (13). Two versions of the model will be considered: one in which the conjectural elasticity parameter q is zero and one in which q is constant over time.

DATA

The data we use are annual observations from 1970 to 1993, collected from Official Statistics of Sweden: Manufacturing (SOS Industry) and from the Yearbook of Forest Statistics. The data of the exporting countries are found in the FAO Yearbook of Forest Products. The countries used in the study are Holland, UK, the FSU, Denmark, Norway, Finland, Germany and Poland.

The price of pulp is the price of bleached sulfate pulp. Wood input is measured as the consumption of wood raw material at the pulp mills minus wood chips and other wood residuals used. The domestic pulpwood price used is the total cost of pulpwood at the factory divided by the quantity used. The price of imported pulpwood is the total CIF paid at the border divided by the imported quantity plus 10 percent to account for unloading costs and costs for transport from the harbor to the pulp plant. Labor cost per hour is calculated as the total labor cost divided by the numbers of hours worked, plus the social costs paid by the employer. The price of energy (electric power) is derived in the same manner (total cost divided by total quantity).

A problem with the data is that the capital stock in the pulp industry is not available on a time series level. There exists data on capacity utilization, from which production capacity can be calculated. This is in turn used as a proxy for the capital stock. The data on standing timber is taken from the Yearbook of Forest Statistics. Exchange rates are from International Financial Statistics, IMF.

TABLE 4. REGRESSION RESULTS.

The table presents NL3SLS estimates of pulp supply, pulpwood demand and domestic and foreign pulpwood supply parameters respectively. Market power is assumed to be Zero. t-ratios within parenthesis.*

Pulp Supply		Pulpwood Demand		Domestic Pulpwood Supply		Foreign Pulpwood Supply	
Parameter	Coeffcient	Parameter	Coeffcient	Parameter	Coeffcient	Parameter	Coeffcient
β_{pp}	0.33 (5.13)	β_{ww}	−1.08 (−6.21)	γ_0	557456 (0.61)	γ_0	0.03 (0.64)
β_{pw}	−0.021 (−1.72)	β_{wp}	−0.021 (−1.72)	γ_{PRICE}	0.22 (1.37)	γ_{CIF}	1.23 (3.01)
β_{pl}	−0.012 (−1.69)	β_{wl}	0.65 (3.15)	γ_{COST}	−0.33 (−2.55)	γ_{Rt-1}	0.88 (9.94)
β_{pe}	0.65 (2.25)	β_{we}	−1.16 (−0.12)	γ_{INVENT}	−0.42 (−1.81)		
Time	1.018 (2.40)						
DW	0.83		0.85		1.31		1.83
R^2	0.58		0.23				

* A model with a non-homogeneous fixed input did not change the results or parameter values significantly.

EMPIRICAL RESULTS

We have tried a number of alternative specifications. Primarily, we are interested in estimating q, the conjectural elasticity, as a measure of market power. In some regressions we estimate this parameter without restrictions, in some we add the restriction that it should be non-negative and for comparison we have estimated our set of four[5] equations with q set to zero.[6] The results obtained with the latter restriction are shown in Table 4. Unfortunately, the β parameters have no direct interpretation, while the γ variables can be interpreted as elasticities.[7] Previously we found

[5] Simultaneous estimations of all six equations yields similar results, although the t-statistics deteriorate. Since the time series are short, we have chosen to estimate only the four most crucial functions.

[6] The restriction imposed by Equation (6) has a degenerated solution when the expressions within parentheses are zero. This solution is achieved when $\theta_i=-1/\gamma_1$ and $\theta_i=-1/\gamma_i$. Besides the theoretical reasons for not allowing a negative θ, this is another reason for forcing θ to be positive.

[7] However, point estimates of demand and supply elasticities can be obtained by differentiating Eqs. (13) to (16) with respect to own prices and evaluating at, e.g., the sample mean of the variables, although the statistical significance of these estimates cannot be derived. Since, in addition to this, our results are not very robust, we have chosen not to report elasticities.

TABLE 5. REGRESSION RESULTS.
NL3SLS estimates of pulp supply, pulpwood demand and domestic and foreign pulpwood supply parameters. Market power estimated. t-ratios within parenthesis.

Pulp Supply		Pulpwood Demand		Domestic Pulpwood Supply		Foreign Pulpwood Supply	
Parameter	Coeffcient	Parameter	Coeffcient	Parameter	Coeffcient	Parameter	Coeffcient
β_{pp}	0.36 (5.42)	β_{ww}	−1.07 (−6.06)	γ_0	559803 (0.62)	γ_0	.036 (0.64)
β_{pw}	−0.05 (−1.06)	β_{wp}	−0.05 (−1.06)	γ_{PRICE}	0.23 (1.44)	γ_{CIF}	1.24 (3.03)
β_{pl}	−0.013 (−1.96)	β_{wl}	0.03 (2.06)	γ_{COST}	−0.33 (−2.56)	γ_{Rt-1}	0.88 (9.96)
β_{pe}	0.67 (2.47)	β_{we}	0.12 (0.21)	γ_{INVENT}	−0.42 (−1.84)		
				θ_{DOM}	−0.19 (−1.31)	$\theta_{iIMPORT}$	−1.04 (−2.29)
Time	1.018 (2.29)						
DW	1.01		0.79		1.35		1.69
R^2	0.60		0.27				

some evidence that the Swedish industry has market power only in the Nordic market. For this reason, we have used imports from the Nordic countries only as an alternative measure of imports in some regressions. [8]

Despite the fact that the sample size is small, a relatively large number of the parameters are significantly different from zero. The price elasticity of domestic supply is estimated to be 0.2, indicating a fairly inelastic supply. The foreign supply is more elastic, with an estimated supply elasticity of 1.23. This suggests that price discrimination between the two markets is possible. The domestic supply is estimated to be inversely related to the inventory of forests in Sweden, whereas the prior belief is a positive relation. Clearly, a better specification of foreign supply of pulpwood would be desirable. The time variable, which in some sense represents technology, indicates a productivity growth slightly below 2 percent.

[8] A test designed where we divided foreign supply into Nordic and 'Others', could not converge, if we estimated them jointly (not reported here).

Earlier evidence indicates that the price elasticity of the Swedish pulpwood supply is rather small (Brännlund, 1988, and Bergman & Brännlund, 1995). Bergfors, Bergman & Hultkrantz (1989) give some initial evidence to an elastic supply of imported pulpwood, confirmed by the present study, although our estimate is considerably below theirs.

In the estimates reported in Table 5 we impose the restriction that the shadow prices should be equal between the domestic and the international pulpwood market.

Compared to Table 4, the changes in parameter values are small. A puzzling result is that the estimated qs are negative. *A priori* we would expect the *qs* to be positive. Theoretically, a value larger than 1 is possible but theory rules out negative values. Therefore, we tried to estimate our system of equations with the qs restricted to be non-negative.[9] The results are reported below (Table 8).

Table 3 suggested that the Swedish industry primarily has market buying power in the Nordic market. Therefore, Tables 6 and 7 present the estimation results when imports from the Nordic countries is the measure of import.

Table 6 shows, first, a much lower supply elasticity in the Nordic market (0.60) than for all imports (1.23). Second, the Swedish price elasticity of supply increases from 0.22 to 0.32. A fundamental condition for price discriminating behavior is that the elasticity with respect to price differs between markets. Since the two supply functions (the Swedish and the 'residual supply') are not estimated using the same variables, they should be compared with caution. Still, to some extent this result supports the possibilities of market power. Table 7 reports the result of the estimation of market power in the Swedish and Nordic 'residual supply' case.

As in the earlier estimations of market power, the *q* parameters have negative signs. Taken at face value, the negative *q*'s suggest that firms may even be paying prices above the competitive level. The estimates are close to the degenerate solution (see note 6). To control for the possibility that this is the cause for these paradoxical results, we have esti-

[9] See also note 6.

TABLE 6. REGRESSION RESULTS.
NL3SLS estimates of pulp supply, pulpwood demand and domestic and Nordic pulpwood supply parameters. t-ratios within parenthesis.

Pulp Supply		Pulpwood Demand		Domestic Pulpwood Supply		Foreign Pulpwood Supply	
Parameter	Coeffcient	Parameter	Coeffcient	Parameter	Coeffcient	Parameter	Coeffcient
β_{pp}	0.41 (4.78)	β_{ww}	−1.13 (−6.18)	γ_0	$0.26*10^7$ (0.57)	γ_0	.60 (0.77)
β_{pw}	−0.026 (−1.82)	β_{wp}	−0.026 (−1.82)	γ_{PRICE}	0.32 (1.95)	γ_{CIF}	.60 (1.51)
β_{pl}	−0.0073 (−1.82)	β_{wl}	0.51 (2.17)	γ_{COST}	−0.42 (−3.18)	γ_{Rt-1}	0.76 (7.20)
β_{pe}	0.59 (1.85)	β_{we}	4.20 (0.41)	γ_{INVENT}	−0.65 (−2.59)		
Time	1.016 (2.24)						
DW	0.83		0.91		1.45		2.04
R^2	0.57		0.46				

TABLE 7. REGRESSION RESULTS.
NL3SLS estimates of pulp supply, pulpwood demand and domestic and Nordic pulpwood supply parameters. Market power estimated. t-ratios within parenthesis.

Pulp Supply		Pulpwood Demand		Domestic Pulpwood Supply		Foreign Pulpwood Supply	
Parameter	Coeffcient	Parameter	Coeffcient	Parameter	Coeffcient	Parameter	Coeffcient
β_{pp}	0.52 (3.81)	β_{ww}	−0.34 (−0.60)	γ_0	$0.23*10^7$ (0.55)	γ_0	.60 (0.77)
β_{pw}	−0.48 (−1.81)	β_{wp}	−0.48 (−1.81)	γ_{PRICE}	0.41 (2.38)	γ_{CIF}	.60 (1.51)
β_{pl}	−0.0029 (−0.024)	β_{wl}	0.023 (0.58)	γ_{COST}	−0.44 (−3.08)	γ_{Rt-1}	0.76 (7.20)
β_{pe}	0.67 (1.98)	β_{we}	0.02 (0.02)	γ_{INVENT}	−0.67 (−2.56)		
				θ_{DOM}	−0.41 (−2.37)	$\theta_{iIMPORT}$	−0.55 (−1.44)
Time	1.013 (1.93)						
DW	0.87		0.77		1.43		2.04
R^2	0.49		0.29				

TABLE 8. REGRESSION RESULTS.

*NL3SLS estimates of pulp supply, pulpwood demand and domestic and total pulpwood supply parameters. Market power estimated, forcing θ to be positive. t-ratios within parenthesis.**

Pulp Supply		Pulpwood Demand		Domestic Pulpwood Supply		Foreign Pulpwood Supply	
Parameter	Coeffcient	Parameter	Coeffcient	Parameter	Coeffcient	Parameter	Coeffcient
β_{pp}	0.37 (5.45)	β_{ww}	−1.03 (−5.85)	γ_0	547278 (0.62)	γ_0	.041 (0.64)
β_{pw}	−0.02 (−2.04)	β_{wp}	−0.02 (−2.04)	γ_{PRICE}	0.17 (1.11)	γ_{CIF}	1.21 (2.98)
β_{pl}	−0.014 (−1.98)	β_{wl}	0.63 (3.00)	γ_{COST}	−0.30 (−2.35)	γ_{Rt-1}	0.88 (9.97)
β_{pe}	0.84 (3.07)	β_{we}	−3.42 (−0.34)	γ_{INVENT}	−0.40 (−1.75)		
				θ_{DOM}	0.00 *(see fn. 6)*	$\theta_{iIMPORT}$	0.09 *(see fn. 6)*
Time	1.016 (2.49)						
DW	0.69		0.82		1.29		1.70
R^2	0.52		0.21				

* We forced the θs to be positive by estimating the square root of each respective θ. Then the θs are calculated by squaring the estimated parameter thus making θ positive. Due to the transformation the θs change distribution. The original values of the parameter estimate were (with t-ratios within parenthesis) for the domestic variable 0.027 (0.097) and for the 'foreign' variable 0.09 (2.00).

mated the system without Equation (6), separately for Swedish and foreign supply. This results in a positive but insignificant θ for domestic supply and a negative and almost significant θ for foreign supply.

Table 8 reports the results when the θ parameters are restricted to be non-negative. Now the estimated supply elasticity is higher in the Nordic market and lower in the domestic market than before. The restriction causes substantial changes in the pulpwood demand parameters.

To sum up, we find no support for the notion that the imported pulpwood is used to exercise monopsony power in the domestic market. We find some evidence that Nordic supply differs from the rest of the world, but this cannot be confirmed when market power is estimated.

Conclusion and Discussion

The aim of this study was to test whether Swedish pulpwood buyers exercise oligopsony power or not. Regressing import prices on exchange rates and country dummies, we find some initial evidence of market power. Buongiorno and Uusivuori (1992) have demonstrated one way in which to proceed from this point: to confront the data with a test for the "law of one price". We have chosen instead to test for market power directly, using a conjectural variation model in combination with a dual representation of the production structure. We assume that the shadow prices are equal for all markets and impose this as a restriction on the system. This appears to be a critical restriction, but follows from profit maximization.

We are not able to reject the hypothesis of a competitive market, neither in the domestic pulpwood market nor in the international market. The domestic supply has an estimated own price elasticity between 0.17 and 0.41, which is in accordance with supply price elasticities found in earlier studies. The world supply function (in reality a residual supply function) has an estimated own price elasticity that lies between 0.60 and 1.24. This difference is a necessary but not sufficient condition for price discrimination between markets. The market power estimate rejects the hypothesis of market power in three different estimations. Inconsistent with economic theory, the sign of the market power estimate coefficient was negative (when estimated freely). Therefore we tried to force this estimate to be non-negative. The coefficient then became virtually zero, suggesting a perfectly competitive market.

We suggest a few explanations for our results. One important objection to our model is the specification of foreign supply of pulpwood. Our specification may not give an accurate estimate of the foreign price elasticity of supply. Second, one may venture the explanation that the Swedish firms are not acting rationally, i.e. they are paying to much for the domestic supply. It follows that we would have to discard the assumption of profit maximizing firms. However, we tend to believe that firms *will* approach a profit maximizing behavior over time. Third, we use average prices to estimate the market power although the relevant prices are the prices on the margin. If average

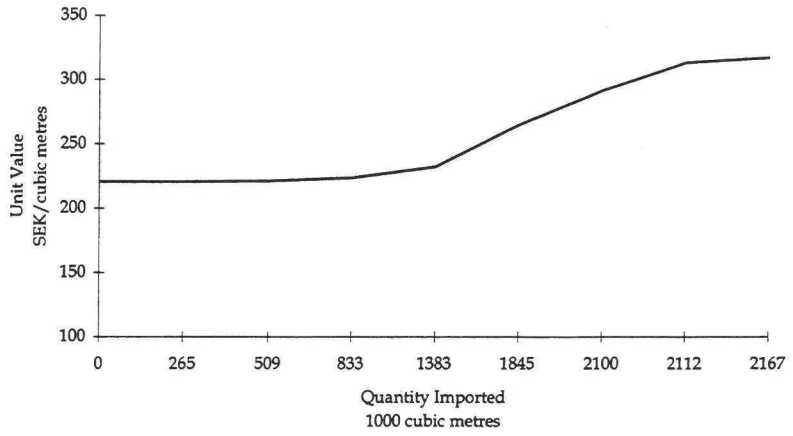

FIGURE 3. PRICES OF IMPORTS TO SWEDEN FROM EIGHT COUNTRIES 1983.
Source: Yearbook of Forestry Statistics 1984 and 1985. m^3fub means Cubic metre solid volume excluding bark. The countries used in the study are Holland, UK, the FSU, Denmark, Norway, Finland, Germany and Poland.

prices are proportional to marginal prices this would be an innocuous approximation. However, assume that the difference between the average and marginal import prices are bigger than the difference between the domestic average and marginal prices. Then we would systematically underestimate the price on the margin for imported pulpwood. To further explore this idea we plotted the imported quantities against the CIF unit value, thus creating a foreign pulpwood "supply" curve (see Figure 3).

One of the conclusions from Figure 3 is that the average import price may differ significantly from the marginal price. Although this is likely to be true also for domestic supply, some of our results may be due to measurement problems. Having pointed out these caveats we still believe our results carry some interest.

In Table 3 there is some evidence of market power in the pulpwood trade with the Nordic countries, especially the trade with Finland. This suggests that Swedish and Finnish buyers keep out of each others 'territories.' Therefore, we tried to estimate market power in the domestic market and in the rest of the Nordic countries. The estimation, shown in Table 7, rejects the hypothesis of market power.

Our results are somewhat contradictory, but the main conclusion is that we find no strong evidence of pulpwood prices below the competitive level. This contradicts the apparent lack of competition in the market, but accords, not surprisingly, with statements from the industry. Although a richer international data set would strengthen the power of this empirical assessment of market power, we believe the present study to be a first step in evaluating price discrimination between domestic and foreign pulpwood markets.

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APPENDIX

Assume that we have an industry in which N firms produce a homogenous good, pulp, using two different kinds of homogeneous inputs, r and x. Alternatively, r and/or x could be seen as vectors of inputs. The state of technology is assumed to be a function of time, t. Firm j's output is then:

$$q_j = f(r_j, x_j, t) \tag{A1}$$

where $f(\cdot)$ is a twice continuously differentiable production function. Input (vector) x_j represents inputs that are used in other industries (labor, energy et cetera), while r_j is an input that is used to produce this particular good only (pulpwood). Thus, we assume that each firm takes the price of x as given, while the

price of r depends on the quantity purchased. Pulpwood can be bought from M different countries, including the home country which is represented by index 1. Let w_{ij} be the price paid by firm j for pulpwood imported from country i. Assuming that all firms pay the same price in a given market makes index j redundant. Firm j's total purchase of pulpwood is the sum of purchased quantities over all markets, *i.e.*,

$$r_j = \sum_i r_{ij} .$$

Let the inverse supply function on market i facing the industry be given by:

$$w_i = w_i(R_i, y_i) \tag{A2}$$

where

$R_i = \sum_j r_{ij}$ is the sum of all Swedish firms' purchases from market i,

y_i is a vector of exogenous variables that shift pulpwood supply, and $\frac{\partial w_i}{\partial R_i} \geq 0$. Firm j's maximization problem is then:

$$\max_{x_j, r_{1j} \cdots r_{mj}} \pi_j = pf\left(x_j, \sum_i r_{ij}, t\right) - zx_j - \sum_i w_i(R_i, y_i) r_{ij}, \quad j = 1..., N, \tag{A3}$$

where p is the exogenous price of the final product and z is the exogenous price (vector) corresponding to x. The first order conditions for profit maximization are:

$$p\frac{\partial f}{\partial r_{ij}} = w_i(1 + \theta_{ij}\gamma_i), \quad i = 1,...,M; j = 1,...,N, \tag{A4i}$$

$$p\frac{\partial f}{\partial x_j} = z, \quad j = 1,...,N, \tag{A4ii}$$

where

$$\theta_{ij} = \left(\frac{\partial R_i}{\partial r_{ij}}\right)\left(\frac{r_{ij}}{R_i}\right)$$

is the conjectural elasticity of firm j in market i with respect to buyers from country 1, and

$$\gamma_i = \left(\frac{\partial w_i}{\partial R_i}\right)\left(\frac{R_i}{w_i}\right)$$

is the inverse supply elasticity in market i of imports to Sweden (where $i \neq 1$ for imports, $i = 1$ is domestic supply). Each firm wants to equate marginal revenue with perceived marginal cost in each market. It appears reasonable to assume that the marginal product of pulpwood bought on different markets is the same, i.e., that for any j,

$$p\frac{\partial f}{\partial r_{ij}}$$

is equal for all i. Profit maximization and Equation (A4i) then imply that, for any j, $w_i(1+\theta_{ij}\gamma_i)$ is equal for all i. In other words, the shadow price of pulpwood must be equal on all markets for a given firm.

If $\theta_{ij} = 1$ for all i and all j, then we have a pure monopsony in all markets,

and if $\theta_{ij}=0$ for all i and all j, then all markets are perfectly competitive. Cournot behavior implies that

$$\frac{\partial R_i}{\partial r_{ij}}=1 .$$

In the domestic market, where only the domestic firms are assumed to operate, θ_{1j} is then the input share of firm j; in the other markets θ_{ij} would be firm j's share of imports from country i to country 1.

The monopsony version of the Lerner index of monopoly power will be:

$$L_{ij}=\frac{VMP_{ij}-w_i}{w_i}=\frac{p\partial f/\partial R_i-w_i}{w_i}=\theta_{ij}\gamma_i \tag{A5}$$

The degree of oligopsony power in the industry is the weighted sum of (A5). We have only access to aggregated data; in order to proceed, we assume that all firms have equal conjectural elasticities on a given market.* From Equation (A5) it is then clear that the firms behave as if they optimized against shadow prices $w_i s_i = w_i(1+\theta_i\gamma_i)$, where $s_i=1+\theta_i\gamma_i$. We can now define the industry shadow, or behavioral, profit function as:

$$\begin{aligned}\pi^* &= pq(p,z,ws,t)-zx(p,z,ws,t)-\sum_i w_i s_i R_i(p,z,ws,t)\\ &= pq(p,z,ws,t)-zx(p,z,ws,t)-w_1 s_1\sum_i R_i(p,z,ws,t)=\pi^*(p,z,w_1 s_1,t)\end{aligned} \tag{A6}$$

where $ws=(w_1,w_2,...,w_M)(s_1,s_2,...,s_M)'$ are the vectors representing the pulpwood shadow prices. According to the argument following Equation (A4), $w_1s_1=w_2s_2=...=w_Ms_M$. Therefore, we only have to use one of the shadow prices in the reduced form profit function. The output-supply function is given by $q(\cdot)$, and the inputs-demand functions by $x(\cdot)$ and $R_i(\cdot)$.

Applying Hotelling's lemma, the industry output-supply function is:

$$\frac{\partial\pi^*}{\partial p}=q(p,z,w_1s_1,t), \tag{A7}$$

and the input demand functions are:

$$-\frac{1}{s}\frac{\partial\pi^*}{\partial w_i}=R_i(p,z,w_1s_1,t) \tag{A8}$$

$$-\frac{\partial\pi^*}{\partial z_i}=x(p,z,w_1s_1,t) \tag{A9}$$

Note that π^* is equal to the actual profit function p if s_1=1. Estimation of the system consisting of equations (A2), (A7), (A8) and (A9) will provide us with an estimate of θ_1, the underlying market-structure parameter. The estimation will also give us an estimate of the supply elasticities on the different markets, γ_i From the equality:

$$w_1(1+\theta_1\gamma_1)=w_1s_1=w_is_i=w_i(1+\theta_i\gamma_i) \tag{A10}$$

it follows that all θ_i can be estimated if we know all w_i and γ_i. Oligopsony power is measured by the product of these two parameters, i.e., by the Lerner index.

* See, e.g, Bergman & Brännlund (1995).

Paper II

[paper 2]

SUBSTITUTION EFFECTS AND PULPWOOD IMPORTS INTO SWEDEN

by

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ABSTRACT

The purpose of this paper is to estimate substitution, own-price and cross-price elasticities for imported and domestic pulpwood to Sweden. Considering the vast Swedish forest resources, it is puzzling that we see an increase in wood raw material imports into Sweden. The empirical results in this paper allow us to gain some insights to why this has been the case. Using a variable cost function for the wood raw material input, we find that the substitution possibilities between the wood raw materials input in most cases are quite high. The results confirm that the Swedish pulpwood market is very sensitive to what nearby suppliers do, and that relative prices plays an important role.

Keywords: Translog, Pulpwood, Substitution, Imports

JEL classification: D24, O39, F14

THE RESEARCH QUESTION AND ITS IMPORTANCE

Introduction

Since the 1920s, the Swedish forest inventories have grown from 1.76 billion m^3sk (in 1930) to 2.74 billion m^3sk (in 1990).[1] There are two interrelated reasons for this. The first is that industrial take has been well below new growth. The second is a conscious policy by the Swedish government. It was initiated in the early 1900s and aimed at regeneration measures and increased productivity in Swedish forestry (Wibe and Jones, 1991).

Yet, since the mid 1970s, Sweden has been a net importer of pulpwood. In 1988, a year when imports peaked, Sweden imported 10.2 million m^3sk roundwood, valued at 3 billion SEK. That year almost 18% of the domestic consumption of pulpwood and chips was supplied by imports. The fact that Sweden imports pulpwood despite growing inventories appears to be a mystery.

One of the issues to investigate, is the possibility to replace domestic pulpwood with imported pulpwood. Further, it is important for forestry owners and policymakers to understand how sensitive the Swedish supply of pulpwood is to changes in the price of pulpwood sold in the international market. We approach these issues in this paper by estimating the substitution possibilities and the price elasticities on the input side of the pulp industry.

Previous Research.[2]

Several authors have approached the issue of rising imports of pulpwood to Sweden. One suggestion is that imports are used as a backstop to reduce swings in domestic supply. Bergman and Löfgren (1991) have rejected this hypothesis. Hultkrantz and Wibe (1989) find that both the imperfect market explanation and, using imports as a protection against changes in Swedish supply, lack the power to explain all of the imports. They instead conclude that the most important factor explaining imports

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[1] m^3sk denotes forest cubic meter including bark.

[2] For a more extensive review of the literature on the Swedish roundwood market, see Nilsson (1997).

is falling world market prices of pulpwood. Nordvall (1996) derives input factor demand equations for pulpwood in Norway and Sweden. He finds that the important determinants of pulpwood imports are lagged prices of pulpwood (which he assumes capture inertia in trade) and the prices of other inputs in pulp production. Nordvall also claims that imports are a result of a market imperfection even if his model assumes exogenous prices.

"Conventional wisdom" has it that the domestic pulpwood prices are depressed by the oligopsonistic situation prevalent in the Swedish pulpwood market.[3] The implication of this is that the oligopsony needs imported pulpwood to depress the prices in the domestic market. Bergman and Brännlund (1995) try to measure the oligopsony power in the paper pulp industry. They devise a method to test for market power and apply it to the Swedish pulpwood market. Their answer is ambivalent. The null hypothesis of competitive behavior cannot be rejected when posed against a constant degree of oligopsony power. When the degree of oligopsony power was allowed to vary, however, the null hypothesis could be rejected. Bergman and Nilsson (1999) try to measure the market power of Swedish pulpwood buyers by including imports into the analysis, using first a simple model, and then a Generalized Leontief model. Overall they reject market power. In this paper we build on this result and assume a fully competitive market.

There are several studies investigating the production structure of the pulp and paper industry. Most related to this study are Stier (1980, 1985), Sherif (1983), Singh and Nautiyal (1984), Martinello (1985), de Borger and Buongiorno (1985), Wibe (1987) and Quicke, Caulfield and Duffy (1990). These studies all use a translog cost function to estimate own and cross price elasticities between labor, energy, wood raw material (and in some cases capital). Their estimates of own price of pulpwood elasticities range from –0.026 (Martinello, 1985) to –0.31 (Stier ,1980). These low own price elasticities probably reflect that in the short run changes in the planned production are costly, and there are few alternatives to virgin fibres.

In this paper we will investigate the demand side of the Swedish pulpwood market with respect to substitution and own- and cross-price elasticities. Our contribution to the cited Swedish roundwood market studies and the cited translog cost

[3] This assumption has some support in the evident institutionalia, such as the high capital cost in the pulp industry (being an entry barrier), and the few buyers of pulpwood.

literature is to investigate the material input in a disaggregated manner. To achieve this we estimate a system of six demand equations, using as one dimension three species (pine, spruce, and broadleaved) and as the other dimension whether the pulpwood is imported or domestic. The aim is to add to the above literature by estimating the degree of substitutability between imported roundwood and domestic roundwood, as well as the substitutability between the different species.

BACKGROUND

The dominant hypothesis put forward by other researchers (e.g. Hultkrantz and Wibe, 1989 and Bergfors et al., 1989), is that imports are in many cases cheaper than domestic roundwood. Let us first do a brief inquiry into the relative price development of domestic pulpwood. In figure 1 the relative prices of imported and domestic pulpwood, divided into three species are plotted against time.

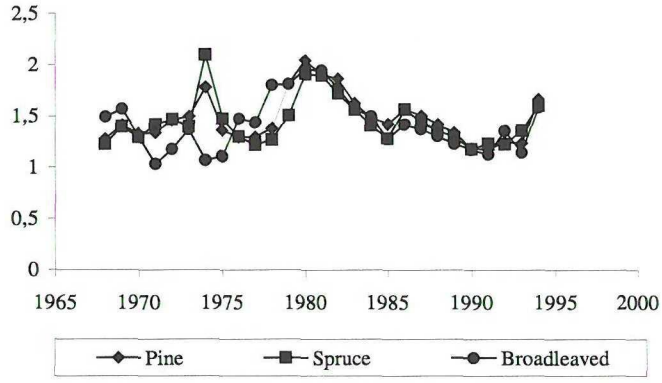

Figure 1 Relative Prices of Imported and Domestic Pulpwood (Unit Cost of Imported/ List Price Domestic, Spruce, Pine, Broadleaved) 1968-1994.
Source: Yearbook of Forest Statistics.

In figure 1 we compare the average unit costs of imported pulpwood with the domestic list prices. Thus we are the domestic price without transport costs with the unit value of imported pulpwood CIF. Given that, and the two caveats discussed below, all species under consideration exhibit a similar pattern. The price of imported pulpwood, relative the domestic, exhibits a downward trend from 1980 until 1994. Two caveats are however necessary to point out. First, we are interested in the prices at the margin, not average prices, which is what figure 1 shows. Our assumption is that the movements of the average prices and the domestic list prices also will reflect the

movements of the prices of these two goods on the margin. Second, both imported and domestic pulpwood needs to be transported. Conventional wisdom in the pulp industry says that the domestic transport costs are higher than those for the imported volumes. Thus, if we add transport costs for the domestic volumes, we would get a relative price of the domestic versus imported pulpwood, that would favor imported pulpwood.

Import prices should decrease relative to the domestic Swedish prices, if prices are to explain the increase in imports. Figure 1 and 2 confirms the results in Nilsson (1997) in this regard.

In figure 2 we have plotted the share of imported pulpwood out of domestic consumption of pulpwood.

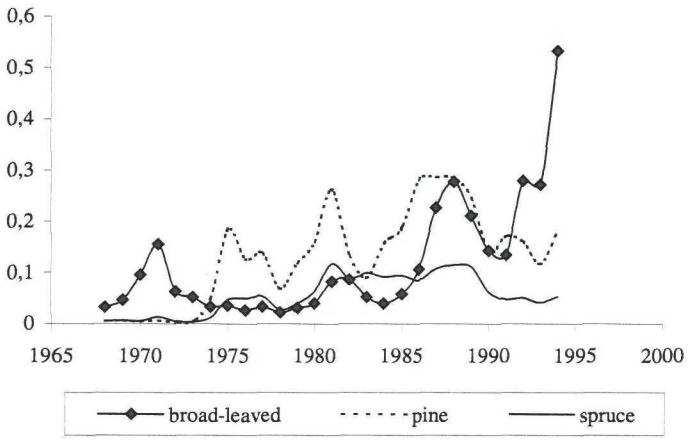

Figure 2 Imports of Pulpwood as a Share of Domestic Pulpwood Use (Spruce, Pine, Broadleaved) 1968-1994)
Source: Yearbook of Forest Statistics.

Figure 2 shows that the share of imported pulpwood has increased over time. Further, we observe that the shares of broad-leaved pulpwood and pine are mostly higher than spruce. This could suggest that the spruce market is less sensitive to international competition, or more simply, it is more competitive than the pine and broad-leaved market. A casual inspection of figure 1 and 2 confirms the notion that we import more as it becomes cheaper relative the domestic supply.

METHODOLOGY AND ESTIMATION TECHNIQUES

Developing the Model

The technology of a firm or an industry can be described by a production function. Duality theory indicates that under the assumption of cost minimization, any well-behaved cost function is dual to the primal production function in the sense that either is capable of completely defining the essential parameters of the underlying production technology (Silberberg, 1990). While one major advantage of duality is the freedom of choice in the approach to empirical work, estimation of the dual cost function offers several advantages. For example, the cost function takes as arguments factor prices rather than quantities. The formers are more likely to be exogenous to an industry and are less likely to exhibit multi-collinearity.

In this study, the pulp industry is viewed as a single firm that operates under the technical constraint of a production function of the general form:

$$Q=Q(\mathbf{W},L,K,E,T) \tag{1}$$

where Q is gross output of pulp for paper, $\mathbf{W}$ is a vector of wood raw material input, L is labor input, E is energy input, K is capital input and T is a time trend. Corresponding to this production function is the cost function:

$$C=C(\mathbf{P}_w, P_L, P_K, P_E, T, Q) \tag{2}$$

Where $\mathbf{P}_w$ is a vector of input prices for wood. P_L, P_K, P_E, are the input prices of labor, capital and energy, respectively. The product used here, pulp, is not a homogeneous good. There are several varieties e.g., different kind of chemical pulp and mechanical pulp. These different kinds of products require different kind of input mix. We therefore would like to control for the changes of the product mix that has occurred over time. As sulphate pulp is the dominant type, we have created an index where the

percentage of sulphate pulp over total production of pulp is used. This index will be denoted *M*.

A translog demand model builds on the assumption that the Swedish pulp industry is cost minimizing. It is also assumed that it operates in competitive markets for its production inputs. It is realistic to believe that the pulp producers know the price of domestic pulpwood before they enter the international market as buyers. During the period 1968 to 1994, Swedish domestic prices were established every autumn through annual negotiations. This so called list price then suggested to the forest owners the "going rate". One problem for the demanders of pulpwood was that only the price was agreed upon at these yearly negotiations. The forest owners could decide to sell standing timber, and each individually negotiate a price. Bergman and Löfgren (1991) have investigated the effect of this uncertainty. Their conclusion is that the pulp mills inventory of pulpwood and standing timber decreases the risk of uncertain of deliveries.

We will further assume that the cost function is weakly separable in its aggregates, i.e., the mix of pulpwood qualities is independent of the non-pulpwood inputs. Basically this assumption is made because the estimation of a large system of input demand equations is not feasible given the short time series available. This is of course a critical presumption. Thus we assume that the wood raw material make up a separable and homogeneous cost function, *Cw*, so that:

$$C_W = C(\mathbf{P}_w, T, Q, M) \tag{3}$$

The prices are for pulpwood, domestic and imported. We are going to use three different 'species', pine, spruce and broadleaved, thus we will use six prices. When estimating (3) we desire a general functional form that places few *a priori* restrictions on the input factor cost estimates. The translog cost function, developed by Christensen et al. (1971) allows considerable generality since it places no restrictions on the Allen elasticities of substitution and can be viewed as a second order approximation to any twice differentiable cost function. Specify the translog cost function for the wood raw material sub-model as:

$$\ln C_W = \ln \alpha_0 + \sum_{j=1}^{6} \alpha_j \ln P_j + \tfrac{1}{2} \sum_{i=1}^{6} \sum_{j=1}^{6} \beta_{ij} \ln P_i \ln P_j + \phi_a \ln Q + \tfrac{1}{2} \phi_b (\ln Q)^2$$
$$+ \sum_{j=1}^{6} \phi_j \ln Q \ln P_j + \tau_a T + \tfrac{1}{2} \tau_b T^2 + \sum_{j=1}^{6} \tau_j T \ln P_j + \gamma_a \ln M + \gamma_b \ln(M)^2 + \sum_{j=1}^{6} \gamma_j M \ln P_j \quad (4)$$

where P_1 equals the price of imported pine, P_2 the price of imported spruce, P_3 the price of imported broad-leaved, P_4 the price of domestic pine, P_5 the price of domestic spruce and finally, P_6 the price of domestic broad-leaved pulpwood. By differentiating equation (4) logarithmically with respect to input prices and then employ Shephard's lemma, one obtains the cost share equations of the form[4]:

$$s_i = \frac{\partial \ln C_w}{\partial \ln P_i} = \frac{P_i}{C} \frac{\partial C}{\partial P_i} = \frac{P_i X_i}{C} = \alpha_i + \sum_{J=1}^{6} \beta_{ij} P_j + \phi_i \ln Q + \tau_i T + \gamma_i \ln M \quad (5)$$

where s_i is the cost share of input factor *i*. The parameters in (5) must obey certain conditions for the translog approximation to be well-behaved. First since the cost shares must sum to unity, the following equality must hold

$$\sum_{i=1}^{6} \alpha_i = 1 \quad (6)$$

Further the following equalities must hold

$$\sum_{j=1}^{6} \beta_{ij} = \sum_{j=1}^{6} \phi_i = \sum_{j=1}^{6} \gamma_j = \sum_{j=1}^{6} \tau_j = 0 \qquad j=1\ldots6 \quad (7)$$

That is, the translog function must be homogenous of degree 1 in input prices. We also require that there be cross equation symmetry, that is

$$\beta_{ij} = \beta_{ji} \qquad i,j=1\ldots6 \quad (8)$$

[4] For a more extensive review of the steps from the production function to the cost share equations see Söderholm (1997) or Berndt (1991).

The assumptions of monotonicity and concavity of the wood raw material cost aggregate may not be met for the estimators found in (5) since the translog model need not be well-behaved at all data points. In particular, increases in wood raw materials prices should lead to increases in C_W. This requires positive fitted cost shares. This test is referred to as monotonicity. In addition, equation (5) must be concave in prices implying that the Hessian matrix must be negative semi-definite.

Of interest in this study are the substitution elasticities, σ_{ij}, between the six different wood raw materials input. These can be calculated as follows:

$$\sigma_{ij} = \frac{\beta_{ij} + s_i s_j}{s_i s_j} \qquad \underset{i \neq j}{i, j = 1...6} \tag{9}$$

Cross- and own-price elasticities of demand for factor inputs can in turn be calculated as follows:

$$e_{ij} = s_j \sigma_{ij} \text{ and } e_{ii} = s_i \sigma_{ii} \tag{10}$$

Finally, we would like to estimate the impact of the time trend on the different pulpwood qualities. In several studies this is called the technology bias. Since we are using a cost equation, which only considers the wood raw material part of inputs into the pulp-making process, this would not be accurate. Rather, we would *a priori* expect the time trend to show that the technology changes are saving domestic raw materials and using more of the imported wood raw material. The bias of the time trend, b_i, on factor shares when factor prices are held constant is calculated in the same manner as in Binswanger (1974):

$$b_i = \frac{\partial s_i}{\partial T} \times \frac{1}{s_i^*} \quad \text{i=1...6} \tag{11}$$

where s_i^* is the change that we would have observed had relative input remained constant. s_i^* is unobservable but may be approximated using the mean factor shares over the sample period.

These equations are estimated in a stochastic framework with a vector of additive disturbance terms, e_i. When estimating the translog cost share equations, one has to drop one of the equations. If the full model were estimated, the covariance matrix would be singular. Since the system of equations are estimated by the method of maximum likelihood estimator the results are invariant to the choice of equation to be dropped (Berndt, 1991).

Data

The data used to estimate the model are annual time series covering the period 1968-1994. They have been extracted from the *Yearbook of Forest Statistics*. The variable used as a CIF-price is the average of the total cost CIF divided by the quantity imported for that species. The prices of domestic pulpwood are the so-called list prices, agreed upon during yearly negotiations. Although approximately one third of the domestic supply comes through the stumpage market, Bergman and Löfgren (1991) find that the stumpage price is highly correlated with the negotiated domestic price. The pulpwood prices are *delivered roadside* domestically and *at the border* for imported pulpwood. This will introduce some error into the estimates since the domestic pulpwood in some cases is transported at considerably higher transport costs. We are however interested in the changes of the prices over time, not their absolute levels and believe that the changes are correctly reflected in the data. The productions of pulp used are those reported to the Swedish official statistics, and can be found in *Yearbook of Forest Statistics.* The quantities of domestic and imported pulpwood are also found in the *Yearbook of Forest Statistics.*

Empirical Results

Parameter estimates of the cost share equations are presented in table 1. The monotonicity condition, was not fulfilled for the imported spruce and pine at one point respectively, and for imported broad-leaved at five points (that is, it was not fulfilled in 7 out of 162 cases). Further, the test of concavity implies that the function is not globally concave. For six out of the 27 data points the Hessian determinant turned out positive. In addition, the model suffer from residual autocorrelation as indicated by the low Durbin-Watson statistics. The adjusted R^2 were ranging from 0.49-0.66 in all but the domestic broad-leaved equation. This measure should not be given too much

significance since the maximum likelihood estimator maximizes the likelihood of the *system of equations* rather than any of the share equations. The *t*-statistics generally exhibit a low significance level, which is not surprising, considering the high amount of parameters to be estimated and the short time series. *All these weaknesses of the empirical measurements make any conclusions drawn from this little more than guesses or hints.* The βs may be interpreted as the elasticities of input price i on a certain cost share. Likewise ϕ may be interpreted as the elasticity between the total production and the cost share i and γ describes a similar relation between the output mix and the cost shares.

Table 1

Parameter estimates for the cost share model

Imp. pine		Imp. Spruce		Imp. broadl.		Dom. pine		Dom. Spruce		Dom. broadl.	
α_1	-0.11 (-0.10)	α_2	-0.09 (-0.21)	α_3	1.02 (1.76)	α_4	0.87 (0.89)	α_5	-0.23 (-0.29)	α_6	-0.45 (-0.77)
β_{11}	0.10 (1.86)	β_{22}	0.0062 (0.26)	β_{33}	-0.0039 (-0.14)	β_{44}	0.012 (0.07)	β_{55}	0.16 (1.07)	β_{66}	-0.0018 (-0.05)
β_{12}	0.038 (1.22)	β_{21}	0.038 (1.22)	β_{31}	0.02 0.80	β_{41}	0.013 (0.20)	β_{51}	-0.082 (-1.39)	β_{61}	-0.090 (-3.27)
β_{13}	0.020 0.80	β_{23}	0.022 (1.38)	β_{32}	0.022 (1.38)	β_{42}	-0.067 (-1.46)	β_{52}	-0.0070 (-0.15)	β_{62}	0.0083 (0.44)
β_{14}	0.013 (0.20)	β_{24}	-0.067 (-1.46)	β_{34}	-0.083 (-2.48)	β_{43}	-0.083 (-2.48)	β_{53}	-0.0071 (-0.22)	β_{63}	0.05 (1.98)
β_{15}	-0.082 (-1.39)	β_{25}	-0.0070 (-0.15)	β_{35}	-0.0071 (-0.22)	β_{45}	0.012 (0.076)	β_{54}	0.012 (0.076)	β_{64}	0.11 (2.40)
β_{16}	-0.090 (-3.27)	β_{26}	0.0083 (0.44)	β_{36}	0.05 (1.98)	β_{46}	0.11 (2.40)	β_{56}	-0.081 (-1.98)	β_{65}	-0.081 (-1.98)
ϕ_1	0.0046 (0.03)	ϕ_2	0.012 (0.24)	ϕ_3	-0.12 (-1.85)	ϕ_4	-0.046 (-0.41)	ϕ_5	0.078 (0.085)	ϕ_6	0.074 (1.09)
τ_1	0.0053 (2.46)	τ_2	0.00085 (0.94)	τ_3	0.0049 (4.36)	τ_4	-0.0029 (-1.46)	τ_5	-0.0070 (-4.38)	τ_6	-0.0011 (-1.01)
γ_1	-0.02 (-0.28)	γ_2	0.041 (1.33)	γ_3	-0.09 (-2.42)	γ_4	0.012 (0.16)	γ_5	-0.015 (-0.28)	γ_6	0.77 (1.90)
D-W	1.11		0.84		1.27		1.18				1.35
Adj. R^2	0.60		0.54		0.66		0.49				0.15

t-statistics within parenthesis The following notation is used: 1=imports pine, 2=imports spruce, 3=imports broadleaved, 4=domestic pine, 5=domestic spruce, 6= domestic broadleaved.

To achieve a more transparent view of the model and to be able to put the results in a setting where it can be used to answer the research questions, the parameters above has been used to calculate the elasticities of substitution.[5] These are shown in table 2.

Table 2

Elasticities of substitution calculated at mean

	Imported pine	Imported spruce	Imported broadleaved	Domestic pine	Domestic spruce
Imported spruce	16.53				
Imported broadleaved	10.24	27.81			
Domestic pine	1.46	-5.30	-7.61		
Domestic spruce	-1.75	0.37	0.29	1.08	
Domestic broadleaved	-7.21	3.03	14.99	3.34	-0.60

The substitution elasticities reported in table 2 are higher than one in 50% of the cases where the substitution involves an imported quality. In five out of nine possible cases, imported pulpwood for certain qualities are estimated as a substitute for some domestic quality. In table 2 we note that the highest substitution elasticities are for imported pine and spruce and, for imported spruce and imported broad-leaved.

In table 3 we also report the own price elasticities of the six species. Interestingly enough, only in the case of domestic spruce is the own-price elasticity inelastic (we avoid here to discuss the own-price elasticity of the imported pine since that is hard to interpret using sound economic theory). Since the cross-price estimates to some extent are a reflection of the substitution elasticities (see equations 10 and 11) the results in table 3 is hardly surprising. It is worth to note that some of the cross-price elasticities are extremely high such as in the case of the domestic and imported broad-leaved

[5] Here it should be pointed out, however, that we cannot tell whether any of these elasticities are significantly different from zero, because of the problems of obtaining relevant estimates of the standard errors. Judging from the low significance levels for most of the estimated parameters in table 1, any calculated elasticity should be regarded with an healthy amount of skepticism.

pulpwood. Again, we think that this rejects the idea that the imported broad-leaved is bought only to supplement a too small domestic supply. This sub-market seems to be extremely sensitive to what goes on in the other market. That is, a price increase of the domestic broad-leaved will have a strong positive effect on imports of broad-leaved pulpwood.

Table 3

Own and cross price-elasticities calculated at mean

	Imported Pine	Imported spruce	Imported broad-leaved	Domestic pine	Domestic spruce	Domestic broad-leaved
Imported Pine	4.21	6.19	3.46	6.43	-8.11	-12.19
Imported spruce	44.11	-25.34	25.11	-62.23	4.66	13.68
Imported broad-leaved	30.27	30.81	-41.08	-98.91	4.00	74.90
Domestic pine	0.33	-0.45	-0.58	-1.72	1.15	1.28
Domestic spruce	-0.38	0.031	0.021	1.03	-0.49	-0.21
Domestic broad-leaved	-4.27	0.67	3.00	8.70	-1.65	-6.45

If domestic supply is preferred to imports, imports may then be explained by insufficient domestic supply. This have been claimed by various sources, see e.g. annual reports from Modo for the years 1974 and 1991, STORA (1985) and SOU (1981). That is, one buys domestic pulpwood if possible and then adds the imported volumes, implying that the imports are price insensitive and that the cross-price elasticities would be low. Our results reject this description in six out of the 18 estimated cross-price elasticities. Again, in five (we look at an elasticity smaller than –1) of the eighteen cases we get the results that some imported quantities are complements. Overall we would, given the caveats of all the weaknesses discussed in connection with table 1, say that it seems like the quantity of domestic spruce is the least sensitive to price changes in its own price, but also the prices of its substitutes and

complements. Imported qualities and both domestic and imported broad-leaved exhibits extremely high own and cross-price elasticities.

We can note that the own price elasticity of imported broad-leaved pulpwood is about six times higher than that of the domestic broad-leaved pulpwood. Four of the six own price elasticities are high (in absolute numbers), implying that the quantity changes to a change in price is at least a 17% of the quantity changed upon a 10% price change. Only in the case of domestic spruce do we find an own price elasticity that implies the inelastic demand one would expect, *a priori*, due to the small possibilities in the short run to change the capacity of the pulp and paper mills.

Finally, we would like to estimate the effects of the time trend on the cost shares of the different species, both domestic and imported The results of the calculations according to equation 12 are shown in table 4.

Table 4

Time trend bias	
Imported pine	0.07
Imported spruce	0.03
Imported broad-leaved	0.18
Domestic pine	-0.008
Domestic spruce	-0.018
Domestic broad-leaved	-0.009

The technological bias expresses the influence of a time trend on factor shares when factor prices are held constant. A positive value for the bias indicates that it is factor *i* using whereas a negative value indicates that is factor *i* saving. Values for the aggregated use of wood raw material as compared with other inputs, as energy, capital and labor, are reported in Quicke, Caulfield and Duffy (1990) [-], Wibe (1987) [+], Martinello (1985) [-], Sherif (1983) [-], Stier (1985) [+], and Borger and Buongiorno (1985) [-]. These studies are thus inconclusive whether the bias is using [+] or saving [-] on wood raw material as compared with other inputs. Observe that the estimates span from a yearly saving of wood raw material of 8.4% (Martinello, 1985) to an estimate that indicates a yearly increase of the wood raw material of about 1.4% (Stier, 1985).

What are the sizes of the time trend bias of using imported rather than domestic wood raw material? We find that the bias over time is to save on domestic wood raw materials, and using more imported pulpwood. Thus, our estimates are showing a bias towards an increase in use of imported pulpwood.

CONCLUSIONS

The main purpose of this paper has been to estimate substitution, own- and cross-price elasticities between imported and domestic pulpwood. These elasticities, we argue, may shed some light over the puzzling increase of wood raw material imports into Sweden. Using a variable cost function for the wood raw material input, we find that the substitution possibilities between the wood raw materials input in most cases seemed high. But our results suffer from such weaknesses that it is impossible to draw any conclusions. For example, the significance level of the estimated parameters is generally very, neither the monotonicity condition nor the concavity conditions were fulfilled, and the model suffers from auto-correlation. Even with these caveats, we do think that the estimated cost share equations, and the material presented in figure 1 and 2, shows that relative price matters. The own and cross price elasticities are generally very high. Further, a time trend reveals a bias in favor of imported pulpwood. Our result weakly suggests that the Swedish forest owners should expect strong competition from imported pulpwood even in the future.

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Paper III

[paper 3]

AN INQUIRY INTO THE CHANGING PATTERN OF PULPWOOD HARVESTS IN SWEDEN

by

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ABSTRACT

This paper presents an analysis of Swedish pulpwood production from 1958 until 1995. The development of pulpwood harvests is first described. The short and long run dynamics in the pulpwood market are then investigated, using a partial adjustment model. It is found that the supply responsiveness to economic stimuli such as prices and costs is low, in both the short and long run. We then continue to investigate whether the elasticities were constant over time. Our findings reveal possibilities of decreasing responsiveness over time. Our results imply that policies aimed at affecting the pulpwood supply should be based on other measures than price. Further, we suggest that any policies concerned with pulpwood supply need to incorporate the interaction between the pulpwood and sawtimber markets.

Keywords: Supply, Pulpwood, Partial Adjustment, Long and Short Run Elasticities

JEL classification: D20, Q23, Q31

INTRODUCTION

Since the 1920s, the Swedish forest inventories of standing timber have grown from 1.76 billion m^3sk in 1930 to 2.74 billion m^3sk in 1990.[1] There are two interrelated reasons for this. The first is that industrial take has been well below growth. The second is that a conscious policy by the Swedish government, initiated in the early 1900s, aimed at regeneration measures and increased productivity in Swedish forestry, has speeded up growth. In figure 1 the steady expansion of the forest inventory and the more erratic pattern of roundwood[2] harvests are shown.

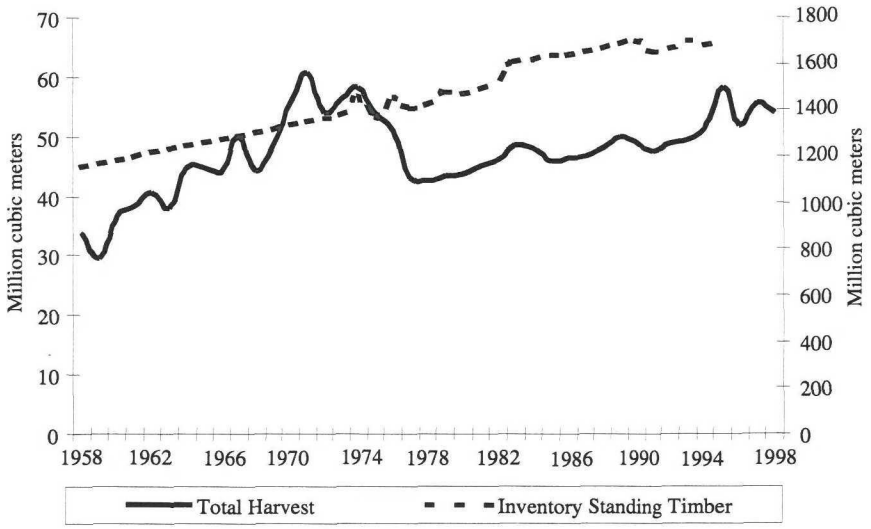

Figure 1. Inventory of Standing Timber 1958-1995 and Harvests in Sweden 1958-1998.
Source: Yearbook of Forestry Statistics, various years.

[1] m^3sk denotes forest cubic meter including bark.

[2] Roundwood consists of both pulpwood and sawtimber. Basically pulpwood is aimed at the pulp industry and sawtimber is aimed at the sawmills.

We observe that both the inventory of standing timber and roundwood harvests were increasing before 1995. Yet, since the mid 1970s, the domestic supply of pulpwood in Sweden has not been large enough to cover the domestic demand. The difference has been covered by imported pulpwood. The fact that, despite growing inventories, Swedish harvests of pulpwood have been inadequate to cover demand since the mid 1970s appears to be a mystery. In this paper we investigate the Swedish pulpwood supply, in a short and long run framework.

Before implementing policies that could increase domestic pulpwood supply, it is important to understand the responsiveness of pulpwood supply to economic stimuli. The main purpose of this paper is to estimate the short and long run elasticities of own price of pulpwood. In addition the elasticities of the sawtimber price, the costs of harvesting and the growing stock of forest inventory are estimated and their impact upon pulpwood supply is explored. The focus is on the period 1958-1995. After a brief description of actual harvests, there follows a short survey of the literature and in the rest of this study we investigate the short and long run responses to prices, costs and the growing stock of forest.

Pulpwood harvesting in Sweden *1958-1995*

Forest owners are supplying roundwood, which can be divided into two kinds of forest raw materials, sawtimber and pulpwood. For the suppliers of roundwood, there is the limited possibility of switching from supplying sawtimber towards pulpwood. Thus it is of interest to study the development of roundwood harvests disaggregated into sawtimber and pulpwood, see figure 2.

Sawtimber harvests appear to have experienced a shift in 1974-75, but have slowly recovered to the same level as in the early 1970s and are from 1995 and onwards higher than before. Pulpwood harvests were higher than sawtimber harvests before 1974. After 1976, the harvests of pulpwood have been about 22-24 million m^3, which is considerably below the harvests the decade before.

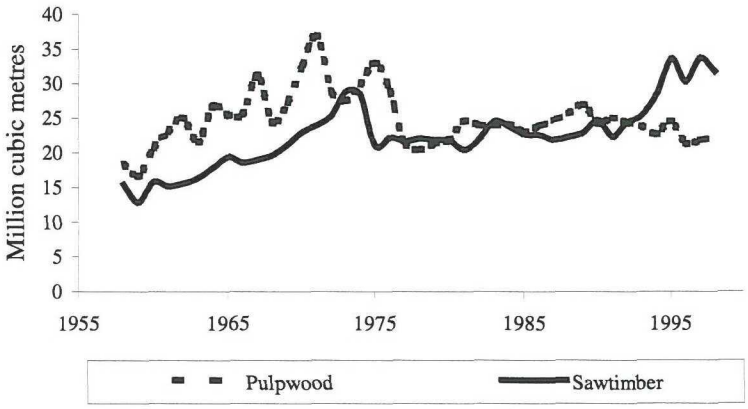

Figure 2. Quantity cut sawtimber and pulpwood million m^3 1958-1995
Source: Yearbook of forestry statistics, various years.

We suggest two factors that may have caused this shift in the harvest level of pulpwood. First, anecdotal evidence tells us that in the 1960s, a general pessimism over the future prevailed among the forest owners.[3] Substitutes such as plastics and aluminum were expected to lower demand for forest products. This was manifested in, for example, Zivnuska (1955) and the Swedish Government report, SOU 1973:14 (1973) in which a dark picture of the forest owners' future was painted. This may have led to an increase in harvests during the 1960s as it was important to realize the gains as fast as possible. This changed with the oil crisis. Substitutes such as plastics, made mainly from petroleum products, now got less of a competitive advantage towards wood products. Thus the oil crisis may have lead to a changing attitude of the possibilities for the forest owners, which at least temporarily forced the prices to increase sharply. The official view on forestry and its future potential for forest products changed drastically, partly manifested in a new government report SOU 1978:6-7 (1978). It could be that the shift actually reflects a change in the discount rates of the forest owners, due to an altered expectation of future demand. Second, the shift appearing in the middle of the 1970s may be explained by a general rise in input factor costs that occurred, see figure 3. Part of this is of course the rise in oil prices occurring in the mid 1970s but wages also rose quite dramatically.

Given the above two explanations to the downward shift in harvest levels of pulpwood and sawtimber, it appears that pulpwood supply at least would recover at the

[3] I am grateful to Lars Nilsson, Swedish Forest Agency in Luleå, for pointing this out to me.

same rate as sawtimber supply. Partially, we may explain why it did not with changes in technology in the sawtimber industry. In the middle of the 1970s, the technology used in the sawmills changed, allowing for smaller diameters to be used profitably as sawtimber. As this 'new' technology became established, some of the roundwood earlier used as pulpwood now became a raw material for the sawmills.[4] Thus, a larger share of the output from the forests was sold as sawtimber.

Changes in real prices of sawtimber and pulpwood have been offered as an alternative explanation to the decrease in pulpwood harvests (e.g. Hultkrantz and Wibe, 1989). The development of these prices and the harvesting costs (for final fellings) can be seen in figure 3.

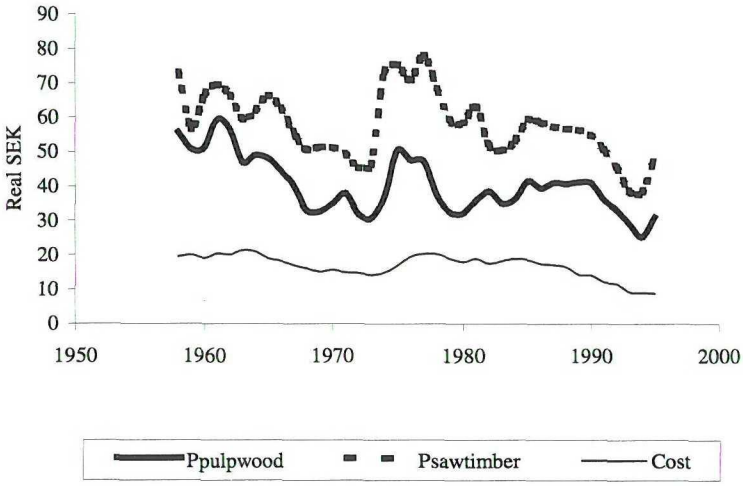

Figure 3 Real Costs, Pulpwood and sawtimber prices 1958-1995, Swedish SEK
Source: Yearbook of Forestry Statistics, various years

When comparing the sawtimber and pulpwood prices it is clearly visible that they follow similar patterns, with no substantial changes in their relative levels. In the 1970s, prices and costs almost doubled. This can partly be explained by increasing costs in input prices, such as energy. The cost remained at the higher level until the oil price decreased sharply in 1986, and has steadily fallen since. Hence we do not find the relative price explanation to the declining pulpwood harvesting credible.

[4] Personal communication Katarina Eld, ASSIDomän, Skinnskatteberg.

EARLIER STUDIES OF THE SWEDISH ROUNDWOOD MARKET[5]

This brief survey of earlier literature concerning the Swedish roundwood market is divided into three separate parts. First we present the papers concerning the supply and demand of the sawtimber and pulpwood. Second two studies mainly investigating the pulpwood market, allowing for imports of pulpwood, are reviewed. Finally, we gain some insights of the characteristics of the forest owners, i.e., the suppliers of pulpwood.

Several authors have approached the issue of the decreasing domestic harvests of pulpwood. One of the earliest studies is the governmental study SOU 1981:81 in which it was concluded that the forest owners do not react in an expected manner to economic stimuli. Several later studies have rejected this controversial result. Brännlund et al. (1983) point out that in any market one has to consider movements in supply and demand simultaneously. When doing that, they cannot reject the hypotheses that the supply curve has the standard upward slope, and that an increase in the price of pulpwood has a positive effect on the quantity cut (Brännlund, 1988, Brännlund et al., 1983).[6] Even though Hultkrantz and Aronsson (1989), claim that harvests have been low among non-industrial private forest owners, *compared to potential cut,* during the late 70s and the 80s, they find that the main driving forces to harvest was harvest costs and forest inventories. Brännlund et al. (1985) use a model of the Swedish pulpwood and sawtimber market to measure whether subsidies to regeneration have had any effect on short run wood supply. They, quite unexpectedly, found that the regeneration subsidy has had a negative effect on sawtimber supply and a negligible effect on pulpwood supply. Brännlund et al. (1985) suggest that the short run effect of the subsidy is explained by an inter-temporal substitution, such that the cut during the studied period was taken from stands with lower stocking levels, thus decreasing supply. That is, the forest owners, suspecting that the subsidies were a temporary

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5 For a more extensive review of the literature and of public policy that may have affected both supply and demand of pulpwood, see Nilsson (1997).

6 This is also confirmed in several studies on the Finnish roundwood market, e.g., Kuuluvainen et al. (1988).

measure, may have chosen to cut forests that would be less profitable or of no interest, under a regime without subsidies.

One explanation that has often been suggested is that imported pulpwood is cheaper than domestic pulpwood. This has been the focus of some studies, more recently Nordvall (1996) and Nilsson (1997). Nordvall (1996) derives demand functions for the imports of pulpwood (spruce, pine and non-coniferous) to Sweden. He finds that important determinants of imports of pulpwood are lagged prices (which he assumes indicate inertia in trade) and the prices of other inputs in pulp production. Nordvall does not find that the relative price of pulpwood (price of domestic pulpwood/price of imported pulpwood) was significant as an explanatory factor to the demand for each. In his study, Nordvall claims that imports are a result of a market imperfection even if his model assumes exogenous prices. Nilsson (1997) failed to show any conclusive results on the importance of prices for the demand of domestic and imported pulpwood.

We end this survey of studies on the Swedish roundwood market with two studies that in some detail investigates the effects characteristics of the forest owners may have on the supply of roundwood. Lönnstedt (1986) aims at identifying the groups of non-industrial forest owners with a low harvesting intensity. He finds that forest estates with more than one owner had an especially low harvesting intensity. Older owners, on pure forest estates, tend to cut less than younger ones. If there is a combination of farming and forestry, age of the owner does not have any impact on harvesting of roundwood. Three groups of owners have a higher level of harvesting than the others: 1) owners that work elsewhere, 2) owners of a small forest estate, or 3) forest estates owned by young or middle aged persons. There has been some concern that people not living on their property tend to cut less intensively than others. Lönnstedt (1986) and Carlén (1990) found no evidence that the latter concern has any empirical support. Carlén's (1990) study of the non-industrial private forest owners' harvest behavior, partly confirms the results of Brännlund et al. (1983), namely that economic stimuli do affect the supply of roundwood in an expected way. He concludes that younger owners cut more than older, and that the size of the estate matters.

The aim of this paper is to add to the above literature by estimating supply of domestic pulpwood, and explore the significance of economic stimuli, in a short and long run perspective. The results may have implications for the type of policies that we

expect to be useful in this market. For example, would a policy that managed to raise pulpwood have any effect in the short run? What effects may we expect from such a policy in the long run? Further, by dividing the data sets into two time periods, we wish to gain some insights to what may have happened to the responsiveness of supply of pulpwood over time.

THE MODEL

In his pioneering work, Nerlove (1958) uses a partial adjustment model to estimate supply of an agricultural good.[7] His model uses the concept of some target supply that assumes adaptive expectations. This model has been extensively used (see Askari and Cummins, 1977 for a survey). According to Nerlove (1979), a simple partial adjustment model results from the minimization of a single period loss function, L, which takes the form:

$$L = \theta_1 (q_t - q_t^*)^2 + \theta_2 (q_t - q_{t-1})^2 \tag{1}$$

where q_t^* is a fixed long-run equilibrium or desired value of a given variable towards which adjustments are made (Nerlove, 1979, Hallam and Zanoli 1993). The variable in our case is the supply of pulpwood. It is defined according to static expectations of some conditioning variables. The first component of the loss function in (1) is a disequilibrium cost, and the second component is an adjustment cost. If L is minimized with respect to q_t, the following partial adjustment model results:

$$q_t - q_{t-1} = \Delta q_t = \frac{\theta_1}{\theta_2}(q_t - q_t^*) \tag{2}$$

where q_t^* is usually parameterized in terms of expected product and input prices. Static expectations of the above model result in a fixed target for q towards which the actual value adjusts. The idea of a fixed target has been widely criticized in the economic literature (e.g., Nerlove, 1979, Hallam and Zanoli, 1993, Abdulai and Rieder, 1995). This is due to the fact that time-series of agricultural data tend to be trended, and one

[7] Brännlund (1991) investigates the Swedish sawtimber market using a partial price adjustment model to assess whether it is in a state of disequilibrium.

may expect that the target is changing over time. Thus, a proper test to assure that the data is stationary is needed to avoid some of the pitfalls pointed out.[8]

As is shown above, the partial adjustment model assumes that q_t denotes the actual supply at time t, and q_t^* the long-run equilibrium supply at time t. The lagged response captured in the partial adjustment model is illustrated in figure 4.

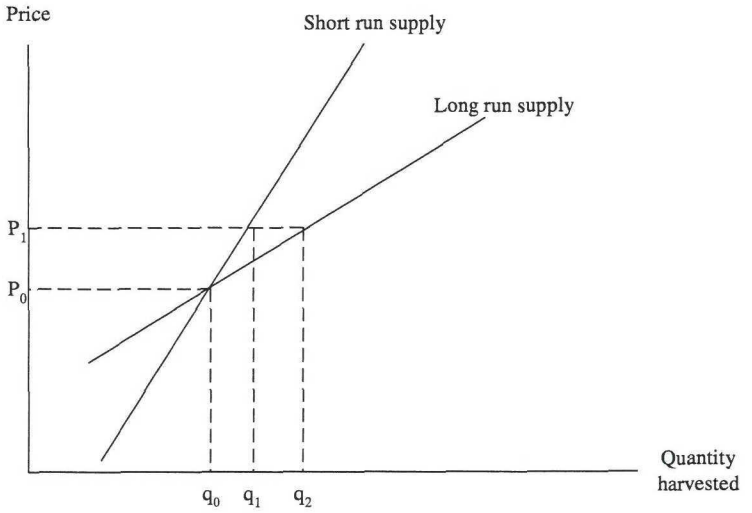

Figure 4 The Short- and Long-run Supply Assumptions of a partial Adjustment Model

When the price changes from P_0 to P_1, the short run change in supply (q_1-q_0) is only a fraction of the long run change (q_2-q_0).

This long-run relationship between the dependent variable and a set of independent variables may be written as:

$$\ln q_t^* = \alpha_0 + \sum_{i=1}^{n} \alpha_i \ln X_i \quad i=1...n \tag{3}$$

[8] See also Toppinen (1998) for an extensive discussion on these matters in connection with econometric models on the Finnish roundwood markets.

where X_i is a vector of independent variables. The α_is are the long-run elasticities. Define $\frac{\theta_1}{\theta_2} = \lambda$ and use (2) and (3) to get:

$$\ln q_t = \lambda \ln \alpha_0 + (1-\lambda) \ln q_{t-1} + \sum_{i=1}^{n} \lambda \alpha_i \ln X_i \quad i=1...n \tag{4}$$

where $\lambda\alpha_i$ represent the short run elasticities and λ measures the speed of adjustment towards the long run equilibrium that is implied in the model. Since the data in equation (4) is observable this equation can be estimated and the long-run elasticities can be computed. The estimated coefficient are the short run elasticities which are $\lambda\alpha_i$. In the case of the lagged quantity variable the estimated parameter is (1-λ). Using this information we receive the long run elasticities by dividing the short run estimates by the calculated λ.

Empirical Specification

Supply of pulpwood is commonly depicted as a function of the price of pulpwood, the price of the substitute in production (sawtimber), harvest costs and the growing stock of timber.

As mentioned in the introduction the pulpwood and sawtimber markets are often modeled as interrelated. To our knowledge, there is only one study, Lin (1986), which denies this interdependence, purely on the grounds of statistical estimates. Empirical observations of the more or less 'joint' production of sawtimber and pulpwood strongly suggest that some impact is expected from the sawtimber market upon the pulpwood market. For example, if the forest owners increase their thinning activities the effect will usually be more pulpwood. The output of thinnings can rarely be used as sawtimber. On the other hand, final fellings are mainly done to produce sawtimber, even if some of the final fellings are obviously pulpwood. Thus supply of pulpwood is dependent on the price *and* the supply of sawtimber. An increase in the sawtimber price will have two effects (Brännlund et al., 1985). First, it will raise the profitability of final harvests, i.e. harvests that are aimed at primarily supplying sawtimber, relative to

thinnings, (which "generates" pulpwood[9]). Second, the increased final harvests also increase the volume of pulpwood cut. This effect then partly offsets the negative substitution effect.[10] We include the price of sawtimber in our model to control for the impact of the sawtimber market on the pulpwood market.

The costs of harvesting differ among the technologies used when harvesting e.g., the more capital-intensive methods of the large companies versus the small private forest owners' more labor intensive harvesting. Further, these costs will also depend on the activity, as thinning activities tend to be more costly per m^3 than, for example, final fellings. Since pulpwood is a result of both thinning activities and final fellings, this makes it hard to measure the actual costs of pulpwood harvests in a given year. Data availability limits us to use only the costs for final fellings. As long as the costs for the different types of activity change in approximately equal proportions, we expect no bias of the results. We find no strong reasons to believe that that the costs of final fellings will follow a different trend than that of thinnings.

The standing stock of roundwood (inventory)[11] has increased in Sweden since the early 1900s. We expect the impact of this growing inventory to be positive upon the supply of pulpwood. That is, at each price more will be supplied, as the forest inventory grows.

Based on (4), the following equation is estimated:

$$\ln q_t = \beta_0 + \beta_1 \ln q_{t-1} + \beta_2 \ln P_{pulpwood} + \beta_3 \ln P_{sawtimber} + \beta_4 \ln Cost + \beta_5 \ln Inventory + \varepsilon_t \tag{5}$$

Before we end this section, we need to discuss one more thing. Agricultural time series tend to be trended and regressions of trended data, even though giving high R^2 and significant *t*-ratios, may be spurious and cause misleading conclusions and recommendations for policymakers (Granger and Newbold, 1974). Thus, to confirm

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9 The quotation marks signify that thinnings are done to raise the quality of remaining trees. In other words thinning is needed to produce good sawtimber in the final cutting.

10 Brännlund et al. (1985) find that an increase in the price of pulpwood will have a clear-cut negative effect on sawtimber supply. This is because there will not be a "joint production" effect from thinnings.

11 We will use *inventory* to mean the stock of standing timber in the Swedish forests. This follows the definition used by for example, Brännlund (1988).

that the methods used, which are based on the assumption that all data are stationary, a casual inspection of the quantities harvested in figure 1 rejects the hypothesis of non-stationarity, were done. Further, the null hypothesis of a unit root was rejected for all time series used when tested econometrically.[12]

Data

The data used to estimate the model are annual time series data covering the period 1958-1995. They have been extracted from the *Yearbook of Forestry Statistics* (various years). The prices of domestic pulpwood and sawtimber often used in studies on the Swedish pulpwood market are the so-called list prices, agreed upon during yearly negotiations.[13] Although approximately one third of the domestic supply comes through the stumpage market, Bergman and Löfgren (1991) find that the stumpage price is highly correlated with the negotiated domestic price. Since the costs of harvesting for thinnings are not available for the whole time series we have chosen to use the costs for final fellings as a proxy. Further, we only have access to cost data for the large forest companies. This is less of a problem before the mid 1970s when the harvest technology (chainsaw) was similar for all suppliers. A remarkable increase in capital use in harvesting has occurred since the 1970s in the large forest companies. Thus, in the 1990s there was a large discrepancy between costs of fellings for the two groups. In practice this may be of less significance when we consider the fact that the companies also do some of the harvesting for the small non-industrial forest owners. The inventory variable used is the growing stock of trees with a diameter larger than 200 mm.

Empirical Results

The model was estimated using OLS. The results from the estimations are found in table 1 for the short run estimates:

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[12] This was tested using Dickey-Fuller's augmented test with an intercept and a trend. The null of a unit root was rejected in all cases. The test statistics were –3.94 for the quantity harvested, -2.77 for the price of pulpwood, -1.88 for the costs of harvesting, -2.25 for the price of sawtimber and –1.49 for the inventory.

Table 1

Results from estimating (5), Pulpwood quantity the dependent variable

Constant	Price of pulpwood	Price of Sawtimber	Cost	Forest Inventory	$Quantity_{t-1}$
-5.47	0.21	-0.19	-0.14	1.04	0.54
(-1.00)	(1.35)	(-1.50)	(-1.30)	(1.28)	(4.30)
	N=38	Adjusted R^2 =0.50		*Durbin's h* = 0.73	

(t-statistics in parentheses)

Since this is estimated as a Cobb-Douglas supply function with constant elasticities, the parameter estimates equal the short run elasticities. The t-statistics are generally low, although the parameters have the expected signs. The *Durbin h* statistic cannot reject the null hypothesis of no serial correlation. The issue here is to compare the long and short run elasticities and try to find out the magnitudes of the responses of the suppliers of pulpwood to economic stimuli. As can be seen in table 2 the estimated elasticities are generally low, indicating modest responses in quantity pulpwood supplied to changes in prices and costs. In the short run we have an almost unit elastic response to the inventory variable. Table 2 also presents the long run elasticities.

Table 2.

Short and Long Run Elasticities of Quantity Supplied of Pulpwood

	Short run elasticities	**Long run elasticities**
Own price of pulpwood	0.21	0.46
Price of sawtimber	-0.19	-0.41
Cost of harvesting	-0.14	-0.30
Inventory	1.04	2.21

As was expected a priori, the elasticity with respect to the price of pulpwood is positive and the elasticity with respect to the price of sawtimber is negative. A reduction in felling costs will increase aggregate supply of pulpwood. Thus, the estimations done here do not reject the conclusion that economic stimuli matter.

13 Price area III, quality I, excluded bark, delivered roadside.

However, in the case of pulpwood, one can clearly see that economic stimuli only have small short run effects. Our estimate is well below those estimated in, for example, Brännlund (1988) who reports estimates between 0.45-0.81 for the own price elasticities of pulpwood supply. Contrary to some earlier research we find that the costs of harvest elasticity is low (compare with for example, the -0.60 reported in Brännlund et al. (1985), -1 in Hultkrantz and Aronsson (1989), and -0.59 in Brännlund (1988)).

For both the elasticity of supply with respect to own price and cost, this may be an effect of the fact that the set of data used here is newer, we have a longer period of lower harvests than the earlier studies. If something happened to responsiveness in the mid 70s, this would appear in the data set used earlier as a few data points, where in this study, the longer time series gives more weight to a possible lower responsiveness of the 1980s and 1990s. We will investigate an eventual change in responsiveness below.

Table 2 clearly shows that the short- and long-run elasticities of forest inventory, the stock of growing timber is such that a 1% increase in the inventory leads to a more than 1% increase in harvesting. The short run estimate is easy to interpret, i.e. a one percent increase in the forest inventory will increase supply by one percent, *ceteris paribus*. It is more difficult to interpret the long run estimates. The forest owner may in the long run affect the stock of standing timber (inventory). For example, with intensive care, the amount of cubic meters per hectare may be a higher, than if the forests were left unmanaged. This means that in the long run there may be a connection with prices and costs of managing the forest inventory, which the partial adjustment model here fails to account for. We would for example expect that if the forest owners expect demand for sawtimber to rise in the future, they would certainly try to increase future forest inventories. The partial adjustment model that is used in this study, by construction, gives estimates of short run elasticities, which are easily recomputed to long run estimates. In the case of the forest inventory variable, we suggest that emphasis should be put on the short run estimate, and that the long run estimate has no meaningful interpretation.

To test whether we have a parameter inconstancy over the period 1958-1995, we used a Chow-test. The test-statistic rejected the null hypothesis of the parameters being

constant over the whole period.[14] This led us, in order to investigate whether supply responsiveness changed in the mid 1970s, and what this means for the short run elasticities, to divide the sample into two periods and estimated the elasticities for these two periods.[15] The results are shown in table 3.

Table 3.

Short run elasticities for the sample periods 1958-1975 and 1976-1995

Elasticity	1958-1975	1976-1995
Price of pulpwood	1.09	0.08
	(1.93)	(0.31)
Cost	-1.03	0.05
	(-2.03)	(0.30)
Price of sawtimber	-0.48	0.08
	(-1.30)	(0.53)
Forest inventory	4.06	0.63
	(1.59)	(1.28)
R^2 adjusted	0.64	0.51
D-W[a]	1.93	1.43

t-statistics within parentheses

[a] Due to restrictions on the calculations of *durbin's h*, this was not possible to calculate.

All *t*-statistics are too low to support any strong conclusions. This is not surprising considering the few degrees of freedom this short time series admit. Even so, the difference between the two periods is striking. Not only are the estimates for the earlier periods larger (in absolute values), they all reveal a higher significance level. This gives a picture of forest owners reacting more to economic stimuli during the 1960s and early 1970s than is the case during the 1980s and early 1990s. Note that the significance level in the latter period is low so that these results can only be seen as a hint of what is going on. Further, it is interesting to note that the reaction to the price of pulpwood and of sawtimber have the same sign, during the latter period. A heroic conclusion, based on the results shown in table 3, is to interpret this as support for the idea that the pulpwood supply depends as much on sawtimber price as its own price. This is reasonable since sawtimber is more profitable to the forest owners. According

[14] The test was suggested by Chow (1960). Our computed F-value is 3.36. At 5% level of significance the critical value is 2.45, and at 1% it is 3.53. Thus, at the 5% level, we can reject the null hypothesis that there is no structural change in the parameter values.

[15] Long run estimates were not possible to calculate since the coefficient for lagged quantities in the latter period was negative.

to the elasticities for the latter period, the supply will increase when the forest inventory increases, but will be insensitive to price and cost changes.[16]

The results in tables 2 and 3, if correct, have important policy implications. It has been suggested that the level of pulpwood prices is kept low by the pulp industry, thus an increase in these is necessary to increase supply. Our results, especially for the latter period, show that price and cost stimuli will have very small effects on supply. Policies aimed at increasing the forest inventory and support forest management that increases the quality of the standing timber (e.g. when and how to do thinnings) may however be effective measures.

Let us briefly explore what our results imply if we assume that the elasticities of costs, prices and forest inventory would remain unchanged even in an imperfectly competitive market. In several instances the apparent imperfect market structure of the pulpwood market have been investigated (e.g. Bergman and Brännlund, 1995, Bergman and Nilsson, 1999) or assumed (e.g., Brännlund, 1988, Nordvall, 1996). If there were such market imperfections, a stronger policy stance against the buying cartels, would raise prices, and increase domestic pulpwood supply. Even though theory suggests that the breaking up of the buyers' cartel in the pulpwood market, should lead to an increase of the pulpwood prices, our estimates shows that the expected results in supply, will be modest.

16 Another attempt to capture the seeming change in harvest behavior in the mid 70s was to add a dummy for the period 1976 and after. The parameter estimate for this dummy was small and the t-statistics of all other variables deteriorated, and several of the variables changed signs.

CONCLUSIONS

In this paper we started out by briefly discussing the development of the inventory of standing timber which has increased steadily since the 1920s. Despite this steady increase, we fail to observe similar patterns for the harvests of forest raw materials after the mid 1970s. Our aim has been to investigate the responsiveness of pulpwood supply to economic stimuli such as prices and costs, but also to the increase in inventory. In order to estimate short- and long run elasticities a partial adjustment model was used.

The results imply that the own price elasticities short and long run are low. Further, the quantity supplied of pulpwood is negatively affected by changes in the sawtimber price. Our results also indicate a low elasticity with respect to the harvesting costs.

We were interested to see if there had been any change in the parameter estimates over time. This was tested by dividing the time series studied into two series, before and after 1976. When the sample was divided into two sub-samples, the results tentatively indicate a strong reaction to economic stimuli before 1976 and a sharp reduction of the elasticities from 1976 and onwards. This suggests that in the absence of new changes, price or cost-based policies to increase the supply of pulpwood, will be inefficient. Rather, we need to investigate the connection between the pulpwood and sawtimber markets, and the effects of different approaches to forest management.

Though our analysis has provided some illumination to the Swedish forest harvesting behavior, the experience of growing imports in the presence of growing stocks may perhaps best be explained in the fact that Swedish pulpwood suppliers seems "uninterested" in the pulpwood market. This may be due natural conditions, Swedish suppliers have more to gain in acting on the sawtimber market. This is a splendid issue for future research.

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Paper IV

[paper 4]

PROSPECTS FOR THE RUSSIAN FORESTS AFTER THE TRANSITION TO A MARKET ECONOMY

by

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ABSTRACT

This paper maps the functioning of the Russian forest market. Drawing on a framework developed by Porter, we describe demand and factor conditions, the conditions in related industries, the role of government and finally the role of ownership conditions for the future prospects of the Russian Forest industry. The result is conception of the Russian competitiveness in the forest sector as relying heavily on factor conditions. Our finding is that this makes the Russian competitive advantage frail and it may vanish with further changes in the other determinants of Porter's framework.

Keywords: Forestry, Competitiveness, Porter, Russia

JEL classification: P23, P27, Q23

INTRODUCTION

Forest Resources in Russia

Former Soviet Union's (FSU) forests and forest industry has since long been one of the most important suppliers of wood raw materials in Europe. The vast forest resources in the FSU could have an enormous potential impact on the forest raw material trade in Northern Europe. We will concentrate on the Russian part of the FSU. The Russian share of the FSU's total growing stock is about 94% and 96% out of the allowable harvest in FSU (*The forecast of Forest Resource Use and Reproduction in the USSR to the year 2010,* 1991). In 1993, the FSU was the second largest gross exporter of industrial roundwood in the world, and the largest net exporter (FAO Yearbook of Forest products, 1993). Total exports in 1993 amounted to 7215 thousand m^3 solid volume. A world price of Russian roundwood is hard to find but we can compare the prices paid for Russian softwood at the Swedish border compared to some of its competitors' prices. In the case of pulpwood the prices in US Dollars per m^3 in 1993 were CIF at the Swedish border $34.1 for Russian, $37.3 for German, $49.7 for Danish, and $44.7 for Norwegian. For sawlogs the price was and $303 for Russian, $440 for Norwegian, 448 for Finnish.[1] The Russian CIF-prices seems very competitive but the price difference also reflect some differences in quality, (see for example Bergfors, Bergman and Hultkrantz, 1989. This was also confirmed in a personal communication with Ronny Andersson, 5/11 1997). The profound transformation of the country's political and economic system that begun in the late 1980s and early 1990s has created a number of uncertainties. For example, what is the FSU's forest industry's viability and role in the emerging market economy setting? In this paper we will define forest industry in a wider sense, including the harvesting enterprises and the next level in the development chain such as fibre board, saw mills or pulp and paper plants. What we call forest enterprises are mainly concerned with harvesting operations.

[1] These are not really prices but are calculated as a per unit cost at the border, i.e. the total value of the roundwood imported from country i divided by the total quantity imported from country i. The data were taken from the Swedish Yearbook of Forestry Statistics (1996). when calculating the dollar price the exchange rate 7.803 SEK/$ was used.

The purpose of the present study is to analyze the prospects of profitable harvesting the forests in North Western Russia in a long run sustainable manner, and to point to its potential competitiveness in the domestic and international markets beyond the turn of the century. The North Western region includes Republic of Karelia, the Republic of Komi, and the oblasts (subregions) of Archangelsk, Vologodsk and Murmansk. Insofar as data availability has admitted, the analysis includes all these regions. Backman (1995) describes the growth of the forests in Russia and discusses production, consumption and export prospects. He reports three main findings: First, the availability of new capital is crucial. Second, total exports from Russia will decline if the infrastructure is not expanded and new harvesting technologies used. Third and last, policies to assure high long run sustainable harvests need to be put in practice. (Backman has covered the physical availability of the forest resources in the FSU in some detail, see Backman 1994, 1995, 1996a and 1996b). To his contributions we add a more detailed discussion on costs, markets and firms' structure, as well as the impact of government policy (or in some cases lack thereof) on the forest enterprises in particularly North Western Russia.

The Northern Economic region plays a leading role in the Russian forest sector development. Its share in the Nation's forest industry output was in 1997 for roundwood about 35% and for saw-timber more than 13%. These regions also produced almost half of the total production of paper and, 49.8% (Forest Complex of the Russian Federation,1998).[2]

We would like to point out that the current social and economic crisis in Russia is an effect of the earlier administrative command system. Most of the industries in the FSU began to lag behind developed countries already in the early seventies (*Tendencies of World Development and Russia,* 1995). The forest industry in Russia was not an exception. One of the results of ignoring the requirements of a "normal" market economy was irrational locational decisions concerning large forest industry capacities for roundwood processing (e.g. several enterprises in the Far East and Siberia). The transition to a market economy immediately revealed such flaws and "punished" badly located enterprises with high transportation and energy costs.

[2] The Northern regions share in Russia's total output in 1997 was 4.7%

Scope

The following section will discuss and present the concept of competitiveness in general and the theoretical framework developed by Porter (1990) in particular. It will present Porter's "original" model and the somewhat modified model used in the present analysis. This section will also discuss how Russia fits into this framework, discuss the choice of variables investigated and the strengths and weaknesses of the chosen approach.

The subsequent section deals first with the factor conditions prevailing in Russia in the late 1990s. Special emphasis is on the development of costs of harvesting and the existing capital stock. A second part deals with the domestic demand in Russia. Domestic production of pulp and paper and saw-timber is described and its role for the survival of the Russian forest enterprises is highlighted. This part includes a discussion on future scenarios of domestic demand. In the following part we explore the size and quality of the industry that is related to forestry. We also discuss implications of the dismantling of the research and development in Russian forestry. The two last parts maps the strength and weaknesses of the enterprises after the transition begun in the early 1990s, and links the changes of government policy to the present situation and to future possible scenarios. Finally the last section concludes our investigation and elaborates qualitatively on the results.

COMPETITIVENESS IN AN INTERNATIONAL PERSPECTIVE AND THE PORTER FRAMEWORK

Introduction

There is a long history of efforts to explain competitiveness in international trade. The classical theory is the theory of comparative advantage. That is, if a country is relatively well endowed with a resource such as labor, or in the Russian case vast forests, this gives the country its comparative advantage. This theory predicts that a country will be competitive and produce in industries where it has a comparative advantage, recognizing that market forces will allocate a nation's resources to those industries where it is relatively most productive. The theory of comparative advantage, based on factors of production, has intuitive appeal and historically national differences in factor costs have played a role in determining trade patterns in many industries. We can point out already the fact that the Russian forests are among the largest in the world. Labor costs do not seem to be prohibitive (both these facts will be described in more detail below). Still, exports of roundwood have gone down dramatically despite a collapsing domestic Russian market. Thus, using the theory of comparative advantage, it would be easy to conclude that North Western Russia is highly competitive in the international roundwood market due to its vast forest inventories and its relatively cheap labor. Our claim is that this way of analyzing the potential competitiveness leaves several important issues unanswered. One of the more important issues that are left unanswered is the impact of the institutional setting within a country. The theory of comparative advantage implicitly assumes an efficient use of factors of production, and leaves little role for the effects of organizational structure and institutions on economic growth. In Russia are examples of such issues the issue of property rights within forestry and the impact of the New Forest code on harvests. Further, even though we are analyzing a raw material, roundwood, the customers are increasingly demanding high quality products (freshness and correct harvesting and measurement methods being among the criteria). Domestic demand plays an important role in this. First, if domestic demand requires high quality roundwood, it puts pressure upon the suppliers, "helping"

them to meet increasingly tougher international quality requirements. Also one may in the Russian case propose the hypothesis that there is a critical mass of domestic demand needed for the commercial forest enterprises to survive. Further enhancing the analysis would be to bring in supporting and related industries in the analysis. If these are strong in an international perspective this should strengthen the competitiveness in the studied market. A newer form of competitive advantage theory called "resource based theory" has been developed during the 1990s (Westgren, 1994). The core concept in this resource-based theory is the firm's resources. These resources include the physical, financial and human capital within a firm. Westgren (1994) claims that an analysis of competitiveness starts with aggregate and firm level performance. The second step is to isolate the resources that led to the firm's superior performance. The third step of the analysis is to identify if the source of these resources originate from firm specific or government drivers. As we will see, a large part of what Westgren (1994) proposes fits well in to the analysis we aim to present.

The Porter Framework

To investigate the threats and possibilities in Russian forestry we have chosen a systemic approach first suggested by Porter (1990). According to Porter (1990) the answer to whether a particular industry in a country is competitive or not lies in four broad attributes of the country. These attributes individually and as a system constitute the "diamond" of national advantage, the playing field that each nation establishes and operates for its industries. These attributes are:

- *Factor Conditions.* The nation's position in factors of production, such as labor and capital.
- *Demand Conditions.* The nature of the domestic market.
- *Related and supporting industries.* The presence or absence of such industries and its impact upon competitiveness.
- *Firm Strategy, Structure and Rivalry.* The conditions in the nation governing how companies are created, organized and managed, as well as the nature of domestic rivalry.

The model is shown in Figure 1.

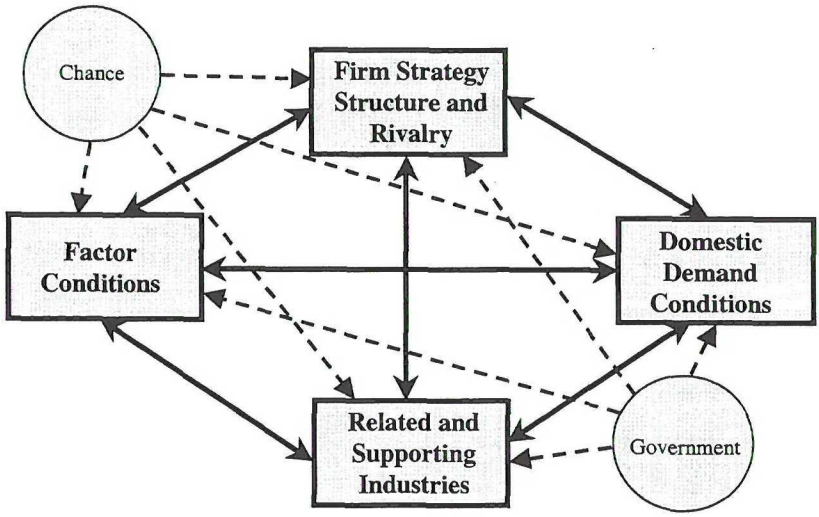

Figure 1 Porter's Diamond Model
Source: Porter (1990)

Included in the model is a node, chance. It influences the determinants but is not, according to Porter, a determinant itself. Chance includes events like oil shocks and wars that change the conditions inside the diamond and put pressure on the determinants. An oil shock, for example, raises input costs, lowers demand, and creates a disadvantage in "factor conditions".

Porter also considers government to be a node outside the diamond. He considers the government to be "part of the game" influencing the four determinants with, for example, subsidies, education, and policies related to the financial markets, with its basic role of supporting innovation and upgrading. The government can act as a major buyer of goods influencing domestic demand. It can also use regulations and standards to influence the quality or production process. Substantial changes inside the diamond can also trigger actions from the government. Higher production cost can, for example, lead to a devaluation of the currency.

Strength in a determinant, for example being relatively well endowed with forests and skilled labor, means that this part of the diamond will strengthen the international

competitiveness. But as the diamond works as a system, a weak determinant e.g. if the firms' structure does not promote productivity and upgrading quality, then this could be enough to seriously impede competitiveness.

Porter´s approach to competitiveness in certain industries has been used earlier, e.g. Hellmer (1997). Hellmer indeed found that several aspects of the "diamond-analysis" were applicable on the explanation of LKAB's (A Swedish mining company) survival despite toughening international competition.

Some of the critique that Porter's model has been subject to is that his "*...perspective sits uncomfortably with the timeless, parametric nature of some of the competitive advantages described by him*" (Auerbach and Skott, (1994). Further, the view that an advanced domestic demand is crucial for success has been criticized. Auerbach and Skott (1994) mention the example of the Japanese audio industry, which in the beginning met a quite unsophisticated domestic demand yet, upgraded and are now world leaders. Further, Auerbach and Skott (1994) criticize the way Porter more or less dismisses the notion that low prices on factors of production can lead to a long run competitive advantage. To this criticism we would like to add the lack of clear definitions of the determinants that weakens the theory largely. Yet there has also been ample support for Porter's theory. Ergas (1984) identified several of the factors that Porter incorporates in his diamond and Kogut (1991) seems to agree with Porter almost completely, to mention a few.

The Modified Diamond

In this study we will instead use five determinants of competitive advantage to systematize the analysis. We will investigate *factor conditions, demand conditions,* the presence and status of *related and supporting industries, the firm strategy, structure and rivalry* and finally, we add the impact of the *government* on the industry, following van den Bosch and de Man (1994). They criticize Porter's way of placing the government outside the diamond. Instead they argue that this node could very well be inside the diamond in that micro-economic policies aimed at specified industries through a product's life cycle could qualify the government as a fifth determinant. This criticism seems valid and we think that it is crucial to include the government actions (and sometimes its inability to act) into the analysis of Russian forestry. The government's actions are especially important to competitiveness in a transitional

economy where the institutional setting is created, i.e. the rules of the market are changing thus changing the incentive structure of the participating actors. In Russia the government impact on the forest industry may be direct through legislation and fiscal policies but it is obvious that it affects the transactions through the way the informal rules currently existing in Russian business sphere are being accommodated. Thus, our "Russian Forest Industry Diamond" will be analyzed using the model in Figure 2.

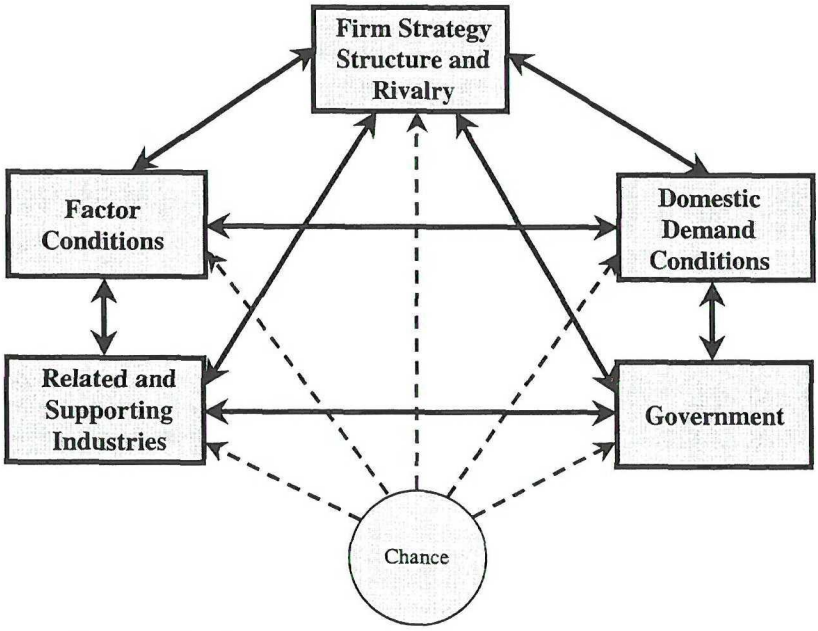

Figure 2 The Modified Diamond

In Figure 2, the factor conditions and endowments in the home country, the domestic demand and the interactions with related and supporting industries, firm strategy, structure and rivalry, and last, government policy, interact and create what we will define as "competitive advantage".

The Diamond and Russia

Porter has been used ordinarily for developed market economies, to mainly explain success stories (see e.g., Porter, 1990). We now apply it in Russia and on a raw material supply industry.

Despite the shortcomings of the diamond framework, we think that a viable analysis within this framework is possible, and in our case necessary. The framework will help to put the rather good factor conditions and endowment of the Russian forests into a perspective. Although partial analysis appears to be the most natural, when studying a single industry, it simultaneously involves a loss of realism. This loss should be weighed against the necessary abstractions and aggregation in a general equilibrium framework. The use of a general equilibrium in this study would probably add only marginally to the conclusions. Another consideration is of course the rapid changes in Russia which make a general equilibrium analysis even more unobtainable. But by putting our partial analysis of the forest market in Russia within the "Diamond model" we hope to overcome some of these shortcomings.

The diamond summarizes the interdependence between the five determinants. The first determinant, factor conditions, comprise labor, land, natural resources, capital, and infrastructure. The second determinant focuses on domestic demand conditions. Domestic demand is assumed to be more dynamic with its demand for quality more important than quantity in the process of creating global competitive advantage. We would like to add a dimension to the domestic demand analysis we find is important. For the forest enterprises to survive we think there is a critical mass of domestic demand that is necessary. Whereas Porter discusses the quality issues of demand, innovation and upgrading of products, we think in our case that even the demand for "low quality" roundwood would help the Russian forest enterprises.

The third determinant, related and supporting industries, emphasizes the importance of an internationally competitive supplier industry. In Russia there are several aspects of this to consider. First its the aspect that Porter considers, the synergy effects between vertically and horizontally related industries that may share ideas and cooperate to develop new technologies. In our case, it is also important to explore the status of the related industries due to the fact that most capital equipment is Russian, and maintenance and repair is heavily dependent on the functioning of these industries. The fourth determinant, firm strategy, structure and rivalry, summarize the influence of

firm strategy, organization, management, and domestic rivalry on competitiveness. This can, for example, be the role of company goals (individuals' or investors') and ideology. Several of the forest enterprises has been privatized, often as joint stock companies. Currently the ownership structure in Russia is quite mixed, see table 1.

Table 1

Ownership of Russian Forests

Ownership Category	Share
State	10.4%
Municipal	0.9%
Private	37.2%
Mixed Private and State without Foreign Participants	44.2%
Mixed Private and State with Foreign Participants	7.1%
Public Organizations	0.2%

Source: *The Forest Complex of the Russian Federation* (1998).

What has happened in practice is that the old nomenclature has remained in power (see for example Backman, 1996a), i.e. we still have the same employees and the same management.

Our added fifth determinant, government, is important from two aspects. How is the government treating the forests over time? And how is the government interacting with firms and regions? In doing the analysis in this manner we follow van den Bosch and de Man (1994) and shift the focus from macro-economic issues to micro-economic issues. All these determinants interact and the key words for this interaction are innovation and upgrading. Changing domestic demand puts pressure on surrounding determinants. The ability to adapt to this new domestic demand depends, for example, on the ability and possibility to use related and supporting industries to innovate and upgrade the production process. It might also involve developments of new products. Porter's and similar studies were done in a dynamic setting, often considering the changes over time in several factors. What they could disregard, which we cannot, is that we are exploring an industry in a post communist market. This industry suffers in some sense from the remaining institutions and structure of the command economy, it

has not yet adapted to the new conditions of a market economy, further what the future government policies and regulations in this industry are quite uncertain.

Using the diamond analysis we hereby assume that the ability to find a competitive position in roundwood trade in the short and to maintain this position in the long run depend on the strength of the five determinants in the diamond, their interdependence and their interaction with each other. Our analysis will cover the short to the intermediate run, with some extensions to the long run possibilities of Russian forestry.

APPROACHING THE ISSUE OF COMPETITIVENESS IN RUSSIAN FORESTRY

Factor conditions and Endowments

The most important competitive advantage for Russia is the availability of resources and skills. At the same time a significant part of the Russian forest resources is physically and or economically inaccessible. Due to the hypertrophied development of industrial complexes as well as undeveloped network of roads and railroads, a large part of Siberia and Far East is in practice isolated from foreign as well as domestic roundwood markets.

In the Republic of Karelia (henceforth Karelia) and in Murmanskaya oblast (henceforth Murmansk) there were an estimated stock 815 respectively 201 million m^3 standing timber in 1990, according to official figures. In Karelia this stock increased to 859 million m^3 in 1995 whereas the inventory in Murmansk remained unchanged. This inventory can be compared with neighboring areas for example Sweden which have a total inventory in 1990 of 2471 million m^3, Finland 1679 m^3 and Poland 1380 m^3 (Yearbook of Forestry Statistics, 1996). Thus the potential impact on the Nordic roundwood trade of the vast resources in North Western Russia, considering the inventory is quite large. But the size of the inventory is of no importance if the resource is physically or economically inaccessible.

In the North region a significant part of the forest resources are of low quality. In Murmansk unproductive stands of low quality occupy 55% of the forested area. In the republic of Komi and Archangelsk such stands occupy about 30% and finally, in Karelia and Vologda the corresponding figure is about 7%. Significant parts of the rest are physically and economically inaccessible (for example, the northern part of Komi and Archangelsk). The economic inaccessibility of the Northern forest raw material resources is mostly caused by the drastic economic changes, i.e. very high rises in energy prices, and obsolete equipment and machines. If the economic situation in Russia converges to a long run equilibrium with less volatility in input prices and lower interest rates making re-investments possible, we believe that these regions will be able

to profitably harvest the forest resources. Further we think that one possible improvement due to a more stable economic situation could be a more effective forest management, e.g. better forest reproduction methods. During the transitional period from command to a market economy, the silvicultural practices have declined in quality and intensity. For example the percent of the maintenance of coniferous plantations in the age of final harvesting as applied to the North Region is very low, only about 20-30%. As a result of this the share of economically inaccessible stands will increase. We follow the practice of others, for example, Obersteiner (1995), and use annual allowable harvest (AAH) as a guide for potential harvest. As is seen in table 2 the harvests are far below the allowable harvests.

Table 2

Percent of actual over annual allowable harvests in the Northern region

Subregion	Actual Harvest Over Annual Allowable Harvest	
	All species	Coniferous
Archangelsk	0.37	0.41
Vologodsk	0.30	0.45
Murmansk	0.17	0.18
Republic of Karelia	0.60	0.62
Republic of Komi	0.18	0.21

Source: Translu project (1996)

The above figures correspond quite well with what has been stated earlier. For example in Murmansk much of the forests have a low commercial value. It could be that the allowable harvests used are remnants from the old administrative system and have not yet been adapted to the new conditions prevailing. What is surprising is the comparatively high figure of the Republic of Karelia and the relatively low figure of Vologodsk. The Government of the Republic of Komi has made futile attempts to support the harvesting enterprises in the Republic of Komi. In 1996 a program for restructuring and modernization of Komi's forest sector to the year of 2005 was elaborated. As an eventual result of a successful implementation, the output of wood pulp, paper, paperboard, plywood and other wood products are expected to increase 2-4 times. The drawback is that the program requires investments of about 1.7 billion $US (using average exchange rate for 1997, 5.9 Rubles/$US). This gives an important insight into the scale of necessary investments for restructuring and modernizing the Russian

forest sector as a whole. As we will discuss later, the investment need is urgent, but the lack of financial resources usually means that programs as the one discussed in Komi, are never implemented.

The starting point for our cost analysis is the careful compilation of data undertaken by Russian Academy of sciences, institute for productive forces and natural resources, detailing product volumes and costs. Official exchange rates are used throughout in converting the ruble figures into US dollars. Although the Ruble exchange rate was not determined fully in a free market, the Russian authorities adjusted it during this time, thus it in some sense reflects underlying economic conditions.

We have costs for four enterprises in Karelia and average costs in Murmansk. The costs cover roundwood and chips production, see table 3.

Table 3

Costs of Roundwood and Chips Production selected Forest Enterprises

Location	Roundwood		Chips	
	1990	**1995**	**1990**	**1995**
Northwest, average	24.82	23.74	18.72	16.00
Karelia, average	23.75	23.74	18.13	16.00
Kem	27.60	21.51	19.88	-
Kondopoga	25.13	27.60	18.38	16.44
Pudozh	20.38	19.96	17.50	15.89
Soujarvi	19.88	24.44	16.38	14.89
Murmansk	34.63	23.64	26.25	-

Source: Translu project (1996)

The numbers in table 3 show that the costs have gone down in most cases. In the case of Murmansk these changes are the most dramatic. If these cost figures are correct this region may have become relatively more competitive, compared to Karelia. These numbers should be compared with other countries, with similar conditions, see table 4.

Table 4

Harvesting Costs Selected Regions

	1990	1995
US NW	19.00	28.00
Canada, W	19.00	22.00
Canada, E	16.40	14.00
Germany	29.95	23.00
Sweden	18.60	12.10

unit: US$/m3.

Source: personal communication Håkan Ekström, *Yearbook of Forestry Statistics* (1996)

It is obvious in table 4 that the harvesting costs in North West Russia are at the same level as the US North West and the Canadian West, which is natural considering that the conditions in climate and quality of the forests are somewhat similar. But whereas costs in nominal dollars in these two regions have gone up, we see a phenomenon of decreasing costs in North Western Russia. This of course in part is a reflection of the problems with the exchange rate we are using. In 1990 the Soviet Government fixed the exchange rate of the Ruble. This exchange rate was overstated in comparison with its purchasing power. In contrary, the exchange rate 1995 may be undervalued, in order to increase exports. But we believe that the exchange rate is only a part of the explanation.

The economic crisis and the transition have led to an increase in specific input costs, e.g. energy and capital see table 5.

The costs of the trees themselves (included in materials as the stumpage cost) are about 2-3% of the total costs. As can be seen in table 5 the fuel cost share has in most cases almost doubled. Materials share of the costs has in some cases more than doubled. Only in Murmansk has the share of wages gone up. We have some problems of interpreting the reported rises in other costs, and think that if the column *other costs* represent more than 15% of the total costs there are errors in the data, for example, that costs have been inflated to hide profits. Backman (1996a) reports that the US company Weyerhauser expected raw material input prices to rise. This is clearly correct in the case of fuel but stumpage prices seem consistently low, as does wages.

Table 5

Timber Production Costs Structure by Area and Enterprises and Main Cost Categories, 1990 and *1995* (per cent of total costs, 1995 in *italics*), costs delivered at central yard.

Area/Enterprise	Total costs	Materials	Fuel	Other	Wages	Depreciation	Other
Karelia, average	100	20.9 *32*	4.1 *7.8*	1 *1.9*	37.8 *32.3*	28:4 *8.8*	7.8 *17.2*
Kem	100	13.5 *30.1*	4.9 *8.0*	0.8 *2.0*	33.0 *35.1*	36.6 *13.7*	11.2 *11.1*
Kondopoga	100	18.0 *28.0*	3.1 *7.3*	1.2 *1.8*	42.2 *31.3*	26.4 *12.0*	9.1 *19.6*
Pudozh	100	19.7 *34.1*	3.9 *7.0*	0.5 *1.7*	30.9 *30.5*	31.2 *7.0*	13.8 *19.7*
Suojarvi	100	25.0 *32.3*	5.2 *7.7*	1.4 *3.1*	39.9 *33.7*	27.2 *7.2*	1.3 *16.0*
Murmansk, average	100	23.3 *20.7*	7.8 *15.4*	1.5 *2.4*	39.5 *41.9*	30.8 *9.6*	6.4 *10.0*

Source: Translu project (1996)

There are a few reasons why certain care should be taken when using the enterprise accounting data above. First, we believe that the costs are inflated to avoid tax. In addition a significant part of the enterprises' volumes is sold in barter, thus in part avoiding taxes. (In practice barter is a rather costly way of trading. For a good analysis of the effects of barter on the restructuring of the Russian enterprises see Linz and Krueger, 1998).

A very important factor in the extraction of the Russian forests is the accessibility of the resource. The network of roads, railroads and waterways plays an important role. It does seem that earlier exports have been indirectly "subsidized" because of the long-standing communist practice to undercharge for transport costs. This had an especially significant impact on bulk commodities such as roundwood. An important task to clarify is how a fuller account of economic transport charges will impact on the competitiveness of FSU roundwood exports. Therefore the distances to the port and the costs of transportation is important when analyzing the factor conditions. As railways are one of the more prominent means of transporting roundwood and chips the analysis that follows will focus on this.

Currently the railways are experiencing a significant excess of the carrying capacity of freight. This is related to a sharp drop in the freight transportation and the numbers of passengers carried by railways in 1992-1996. In spite of the fact that a significant part of the railroad vans and locomotives is outdated, and beyond or close to their physical life limit, the relatively young part of the railroad vehicles is sufficient to

accommodate current volumes as well as the increases in volumes that are expected before the year 2000 (Translu project, 1996). Table 6 compares some of the costs of delivery and tariffs paid for railway transports in Karelia and Murmansk.

Table 6

Railway Transports Costs and Charges to Border, Area and Enterprises in Karelia and Murmansk 1990 and *1995* (in $US/ton, 1995 in *italics*)

Departure Station/Region	Port	Transport Costs	Transport Tariffs
Loukhi	Severomorsk	1.42 *3.72*	2.44 *5.59*
Kem	Kandalaksha	1.89 *2.74*	2.89 *4.27*
Yushkozero	Viartsila	2.78 *3.89*	3.52 *5.51*
Segezha	Belomorsk	0.83 *1.08*	1.84 *2.20*
Suojarvi	Viartsila	0.97 *1.27*	1.95 *2.40*
Pitkiaranta	Viartsila	0.83 *1.08*	1.84 *2.18*
Medvezhegorsk	Viartsila	2.47 *3.51*	3.32 *5.51*
Kandalaksha	Alakurtti-Salla	0.90 *1.20*	1.91 *2.33*
Monchegorsk	Alakurtti-Salla	1.80 *2.63*	2.83 *4.15*
Kirovsk	Severomorsk	1.37 *1.99*	2.44 *3.39*

Source: Translu project (1996)

Furthermore transport tariffs in this industry rose by 28% 1995-1996. But if there exists unused capacity as stated earlier a equilibrium price should be lower. (Not confirmed sources in 1998 deny that this has happened. Prices have instead risen to prohibitively high levels).

Finally in this section we will have a brief look of what has happened to the exported volume in the 1990s in table 7.

Table 7

Russian Roundwood export

Year	Volume 1000 m^3	Value $US 1000	Average Price, $US/$m^3$
1990	31400	1720	54.8
1995	18400	1065	57.8
1996	15914	945.4	59.0
1997	17699	1016.9	57.0

Source: Kozhukov (1998)

Despite the obvious advantage of trading in the export market (the risk of default is less and the payment is in hard currency) exports have gone down. As we will see in the next section this is quite puzzling since domestic demand has all but vanished! However, the rate of decrease of exports is much slower in comparison with the corresponding rate of production output decrease. As a consequence the share of exports to total roundwood production has increased from 10.3 % in 1990 to 21.3% in 1997. For chemical pulp the corresponding figures are 35.8% and 81.9% (Forest Economic Bulletin, 1998).

The main conclusion of this section is that although North Western Russia is well endowed with forest resources and the costs of harvesting seems competitive in international comparison, still exports have gone down. We thus suggest that the factor endowment theory provides only part of the answer to the question of Russia's competitiveness in forestry.

Domestic demand

Domestic demand is important to the harvesting enterprise since it will be decisive of the mix of forest harvest and regenerated and also what kind of harvesting are made, i.e. if its thinnings for pulpwood or final harvest to make saw-timber.[3] Since the domestic consumers historically has been consuming 98% in 1961 slowly declining to 86% in 1994 (FAOSTAT) of the final harvest in the FSU, it is important for the continuity of the forest enterprises to investigate what happens with domestic demand.

The domestic demanders of roundwood in Russia has historically not paid a lot of attention to quality issues but concentrated on quantity. This causes problems in the current situation when the forest enterprises seek to export a rising share of its production. The buyers of saw-timber in Western Europe demands high quality roundwood and are often met by Russian firms that fail to understand these requirements. Although the know-how is there it has proven somewhat difficult to meet high demand from outside when domestic demand is still quite low quality oriented. Eronen and Simula (1993) report that the Soviet paper industry produced more than 800 different types of paper, but most of it was of rather low quality. The lack of test

[3] This is a blunt picture of the reality since some of the final harvests will be pulpwood as well. Thinnings are also generally done to improve the quality of the remaining stands, not provide pulpwood.

equipment and market orientation at the Russian pulp and paper mills severely restricts their competitiveness.

In table 8 we have summed up the production capacities and production volume for some of the larger enterprises in the North Western part of Russia. Although this data consists of several deficiencies such as aggregation of different types of pulp and lumber it gives a picture of the present situation.

Table 8

Production of Forest Products in some North Western Russian Enterprises 1996

Region	Product	Production Capacity	Production Volume	Capacity Utilization
Republic of Karelia				
	wood pulp	127.5	40.9	0.32
	paper	995	551.1	0.55
	sawn wood	1098	270.4	0.25
Republic of Komi				
	wood pulp	345	212	0.61
	Paper	468.5	313	0.67
	sawn wood	200	147	0.73
Arhangelskaya oblast				
	wood pulp	1503.4	1021.3	0.68
	Paper	1038.3	541.5	0.52
	sawn wood	0	0	
Vologodskaya oblast				
	wood pulp	106.8	26.5	0.32
	Paper	109.4	28.2	0.39
	sawn wood	200	30.1	0.34
Leningradskaya oblast				
	wood pulp	599.5	180.8	0.30
	Paper	446.5	180.5	0.40
	sawn wood	0	0	

Source: Translu project (1996)

These figures give a rough idea what has happened with domestic demand. As can be seen the republic of Komi and Archangelskaya oblast use only between 50-75% of total capacity. The decline in capacity utilization is dramatic. Still they use far more of the existing capacity than Leningradskaya oblast, Vologodskaya oblast and the republic of Karelia. Because of the decreasing demand for wood and the final products made of

wood a significant part of the production capacities are unused. For the Russian forest sector as a whole the capacity utilization figures (partly) corresponding to table 7 are for fibre board 43%, particle board 35%, plywood 50%, pulp 38%, paper 49% and paper board 29% (Moiseev et al., 1997). Some of the largest pulp mills operated for only between 1 to 6 months in 1997. In the short run (and possibly in the long run) the heavy drop in capacity utilization in the forest industry, *ceteris paribus,* should mean that more roundwood is available for exports. In the short run, the same factors that caused the drop in pulp and lumber production (such as insufficient monetary system, missing markets, and insufficient domestic demand) also caused a drop in roundwood production. The economic implosion that Russia has suffered may result in valuable infrastructure being lost as well as forest enterprises disappearing due to lack of domestic demand. We suggest that there is marginal quantities exported. These marginal quantities add important profits to the forest enterprises but are not in many cases the bulk. The export demand is limited in volume, to some extent for quality reasons. The prevailing part of the Russian forest sector enterprises does not have equipment that is modern enough to handle the requirements of the export markets. Therefore, an implosion of domestic demand, could lead to a distinct decrease in volumes exported such as is seen in table 7. But in the medium to long run the lesser need for capital restructuring in roundwood production, i.e. harvesting, compared to the needs of the forest raw material processing industries, makes the latter less sensitive to the ongoing changes.

If we adopt an optimistic view of the economic growth in Russia it reached it's lowest in 1998 and the economy can only grow given the resources and the possibilities. A more pessimistic view is that the Russia would not be the first country that is well endowed with resources but still fails to achieve the economic growth necessary to raise the standards to western European level. In either case, the interesting question is: Will it grow before the forest industry is dead? As of the end of 1998, the domestic demand for quality wood is still declining, in part the effects of the declining purchasing power of the Russians. This is the crucial issue for one of our proposed suggestions that there may exist a necessary critical mass of domestic demand that makes it possible for the forest industry to survive.

One solution to the problems of low know-how and a worn out capital stock in the Russian forest industry would be foreign direct investment (FDI). According to the

State Committee of Statistics, foreign investments in Russian industry in 1995 was $US 1.2 billion[4] or roughly 3% of total investment. The preferred objects are in food (24%), fuel and energy (22%) and in forest and forest products (13%).

Unfortunately there are several reports of failures of FDI in Russia. We report three such failures here. There are some success stories, but our initial feeling is that up until 1999, they more represent the exception rather than the rule. Backman (1996a) briefly describes the American company Weyerhauser's joint venture in Russia. Weyerhauser's main interest was in raw material supply from the Russian Far East. One of the problems for Weyerhauser was that a good deal of the old "nomenclatura" remained in power, both in the regional authorities and as managers of the newly formed forest companies. Weyerhauser based their offered stumpage prices on a vector of costs and prices linked to the global market, believing in sharp rises in costs and prices of inputs when the Russian markets adjustment continued. The Russian counterparts, "*raised in an environment surrounded by administered costs and prices, the thought of a rapidly rising cost and price structure was difficult to accept*" (Backman 1996a), failed to come to an agreement with Weyerhauser. The crumbling state planning system seemingly made it possible for Weyerhauser to negotiate on the enterprise level. Finally, this turned out to be incorrect, and the lack of clear property rights became another hurdle, hard to pass. The second case described here is the Korean company Hyuandai's joint venture. Tak (1994) describes the logging operation (the lease discontinues in 2020). He claims that the Korean counterpart quickly fulfilled its obligations, buying logging equipment and mobilizing the necessary labor force. However, according to van Fossen (1995) the joint venture clear cut thousands of acres of timber despite promises to use selective cutting techniques. This led to a legal conflict, which more than anything did show that it was very difficult to determine which government body had the legal right to dispose of land and resources. Still, the joint venture has so far been a disappointment for the Koreans. Hyundai had mainly two problems; first the choice of joint venture partner turned out to be important. The Russian partner was the regional forest sector industry organization. But political change led to the emergence of new power structure. A change in the regime effectively negated years of effort, freezing the joint venture in an early stage (Backman 1996a). Finally the Swedish company ASSIDomän opted to pull out of their investment in

[4] In 1994 the corresponding figures are $US 1.05 billion of which direct investment was $US 549 million.

Karelia (Segezhabumprom) reporting a loss of more than $US 70 million. Even the success stories have some backsides. Some of the Swedish companies with whom we discussed reporting having fairly good operations going in Russia but still had problems with corrupt public officials or an unclear legal situation. Myllynen (1996, p 111) reports of Finnish (and to some extent Swedish) firms acting in Russia: "*Many problems face Finnish timber harvesting contractors. The working conditions are different due to the inadequacy of the infrastructure; roads communication facilities, etc. Also the forests differ from the Finnish forests; the are very dense, the trees are of different development classes, and in different conditions. Decaying trees should be left in the forest when complying with the Finnish directives, but in Russia the harvester will be penalized for doing so. As a result, timber extraction work is technically more complicated in Russia, especially thinnings*".

The core conclusions of this chapter are that domestic demand for forest products is under heavy competition from imports due to the low quality of Russian products. This could be overcome by FDI, but since this has been more hindered than accommodated, up until the late 1990s, this have not proven to be a possible solution. Thus, the domestic demand for roundwood is weak, both in helping raising the quality of the harvesting operations but also in a lack of demand, an effect of the implosion of the Russian economy.

Related industries

The presence of competitive industries in a nation that are related often leads to an advantage in keeping a competitive position. Examples of this are the Swedish and Finnish forest industries with very competitive manufacturers of forest machinery, which have helped keeping the productivity in forestry high, thus keeping the costs of harvesting in the Nordic countries competitive. Porter (1990) defines the related industries as industries in which firms, or in our case forest enterprises, can coordinate or share activities in the value chain when competing. In our case examples of this can be technological development of harvesters or skidders, adapted to local conditions. It is also possible to consider that technological breakthroughs in pulp or sawmills lead to a change in the needs of quality of the raw material. This could prepare the domestic raw material suppliers insofar that they earlier than the international competitors are able to meet changing demand conditions. One of the stronger findings in Porter's (1990) study

of competitive advantage was that competitive industries often were associated with specialized research institutes or university departments. It is a well-known fact that the financial problems of the Russian state has had a devastating impact on the Russian universities. We therefore add a description of what is happening to some of the forest institute and the forest research that is (or in some cases was) done at Russian universities.

There are manufacturers of forest equipment in Russia, producing machinery such as chain-saws, skidders, harvesters, pulp boilers, etc. However, Russia lacks an industry making machinery and equipment for production of veneer sheets, structural composite goods and various kinds of high quality paper and paperboard. Large parts of these latter industries should still be considered local monopolies (i.e. they are the only manufacturers within the Russian Federation and few foreign firms have chosen to enter the Russian market). Only part of the existing forest equipment industry can be considered as state of the art (one estimate is that about 20% of the products made are competitive with comparable products outside Russia (Moiseev et al 1997). This situation differs between different branches.

The rate of increase in input prices has created problems. In 1996 the prices of roundwood had risen 12% (compared to 1995) which was quite small compared to electricity and oil that rose 35 respectively 40% (ibid). In the long run if these relative changes correctly reflects the long run equilibrium (or at least the direction), we should expect a more roundwood intensive use, relative energy. But these rises in inputs have meant in many cases negative profits and the forest sector as a whole is in debt (ibid). Many enterprises are forced to borrow money at rates as high as 30-50%. (The high interest rates of course reflect the high risk of default, that the demand for credit is high, etc.).

In Western Europe and Northern America where there has been a pressure on all silviculture and manufacturing to be environmentally sound, this has only recently become an issue in Russia. Thus Russian manufacturers of pulp, paper and paperboard do not fulfill reasonable environmental standards. Further a significant part of this branch of the forest industry has an obsolete capital stock (40-50 years old).

In the case of fiberboard production, most part of the equipment for making fiberboard was imported. Currently the lack of funds in Russian firms makes it

impossible to re-invest and even buy spare parts, thus the capacity slowly decreases capacity in this industry.

The most favorable position is probably in the logging equipment industry. The prices of the domestic equipment are often three to four times lower than foreign competitors (e.g. Finnish or Canadian). At the same time the Russian equipment (logging as well as woodworking) are inferior regarding productivity, labor working conditions and safety. Furthermore, the relatively lower costs of domestic machinery are largely based on low level wages (about ten times lower than developed countries). In the long run severe increases in productivity is needed to keep the industry competitive when facing an expected increase in labor costs.

The educational level and skills of the workers in the logging industry is good (one of the Swedish companies actively logging in Russia confirmed this, Clas Boström, personal communication). But the sector is drained of forest scientists due to the missing payments to universities and research institutes. For example the research of pulp and paper has all but vanished. Another example is that at the end of 1998 the department of forestry mechanization at the All-Russia Research Institute for Silviculture and Forestry Mechanization has decreased dramatically in size. Their main source of financing the Central Design Bureau has gone bankrupt. Often, important research projects in forestry is postponed or discarded due to the lack of finances. In the beginning of the nineties, a co-operation of the former Soviet states, including Russia, concerning silvicultural and logging equipment was working. In the general mayhem, this has been terminated, perhaps leading to a lost potential domestic market for forest machinery. Only a small part of the few professors and lecturers of the forest institutes and universities are currently engaged in any research. There is some hope though, for example, at VNILM, a forest institute outside of Moscow, the number of graduate students has increased by four to five times.

The related and supporting industry, as they are defined in Porter (1990), exists in Russian forestry. Quite a few problems with these appeared to us when we casually studied these. First, in several cases there exist imperfect market structure with monopoly situations. Second, these industries, as most industries, have been hard hit when costs rose according to what the "new" market situation demanded. Until the necessary transformations in production and business planning has been made, this will remain a very weak point. Finally, only about 20% of the industry produce state of the

art products. All the above considered, this is clearly a very weak determinant in Russia's "forest diamond".

Firm Structure and Rivalry

This part of Porter's diamond is the context in which firms are created, organized and managed. This is interesting in the Russian case since the forest enterprises in some cases seemingly had not as late as 1998 found a satisfactory structure of ownership and organization. The changes in ownership structure as reported in table 1 has not led to the rise of effectiveness that is badly needed. This may be an effect of the domination of insiders, that is, no real change of management has taken place. Although we cannot report a certain number but our conception is that the 48% of insider dominated firms reported in Earle and Estrin (1996) seems to be a lower bound for the forest industry. In contrary to higher effectiveness, the share of unprofitable enterprises in the forest industry has risen from 45.5% in 1994 to 84.2% in 1997 (The Russian Statistic Yearbook, 1998). The government's role in the privatization process remains fuzzy, up until 1996 a law concerning the registration of private enterprises did not exist. Thus the control of the state of the privatization process was hard to maintain. The property rights remain unclear, and the incomplete legislative basis and the great share of joint state/private ownership (51.3%) are preconditions for growing corruption, and economically groundless state subsidies. To quote Stiglitz (1994, p.136): "*more important in many cases than changing the 'ownership' is changing the market structure - subjecting these enterprises to competition.*" Our feeling is that this has hardly happened in the Russian forest industry. Further, the existing law of bankruptcy has not been implemented. Many enterprises' debts are huge and increasing, and seemingly with the current owners there is no future. In the North Western Region the share of unprofitable enterprises ranged from 70.4% in Vologodsk to 89.7% in Komi (Russian Statistic Yearbook, 1998). Still, these companies do not go bankrupt. Thus even though most parts of the forest enterprises are unprofitable, a restructuring process is severely hampered.

The way in which the forest enterprises in Russia choose to operate is affected by government policies, one of the other determinants in our Russian diamond, and which operational rules (or the rules in use) that will emerge in the Russian transitional economy. Yet, the common theme of the transition literature is the successful

restructuring of firms to transform from plan to market (Linz and Krueger, 1998). It seems that Russian forest enterprises in many cases have adopted a defensive restructuring mode. That is, they seek to "*change as little as possible while retaining insider control*" (Ash and Hare, 1994, p. 633).

What has happened in practice is that the old nomenclature has remained in power, i.e. we still have the same employees and the same management.[5] The stock was in many cases sold to a thousand times below the value of possible production. In general it should be noted that the forest enterprises has not adapted to the market in the sense that they have functioning marketing. In this area these enterprises are often in the learning stages. With the beginning of the second stage of privatization and the articulation of a different set of government policies, firm survival required a different set of actions. As a consequence, some firms began to shift their attention from short-term actions to formulating strategies for long-term viability (Clark and Baglione, 1998). The Russian forest enterprises have developed a sense of orientation towards costs not towards market. As many Russian firms (for a good example see Clark and Baglione), these enterprises rely on their ability to respond to the market in cost reducing manner, but little is done to create a market or change the output. It is usually seen as beyond the possibilities of the individual enterprise to tackle the severe shortage of financial capital.

It is hard to conceive of a Russian low cost strategy. If they want to stay competitive in a long run perspective they either need to accommodate foreign leases and harvesting crews or increase their own quality. What we can observe in both the saw-timber market and the pulpwood market in Northern Europe is an increasing call for good quality. This makes us believe that the Russian enterprises need to spend quite an effort on improving their "products".

Before 1992, international trade in forest products in Russia, was highly centralized and carried out by specialized foreign trade organizations. Efforts to liberalize trade policies began in 1992. The exchange rate was unified and convertible for most account transactions. The role of the centralized organizations has been reduced, some of them have been privatized or abolished, and now enterprise to

[5] See also Backman (1996a) for the effects this can have upon the smoothness of the transition to market economy. His finding is that this impedes the development seriously.

enterprise trade is allowed. The former export taxes and export quotas have been phased out (World Bank, 1997).

One of the more serious problems of international trade policy is the lack of stability. There is no guarantee that the existing customs tariffs, as well as other rules will remain unchanged. Many small exporters, including logging enterprises characterize the situation in 1998, in trade with forest products. These small companies often neither have knowledge of the functioning of the international markets, nor do they have information of the price trends in the foreign markets. For these reasons the export prices from different regions may vary substantially. For example the price of birch veneer logs, in December 1998, varied between 25-50$US per cubic meter. This ignorance of the foreign markets quality requirements and the changes in prices and trends, may be one of the explanations to the fact that the Russian prices remain substantially lower than its competitors (Russian Statistics Yearbook, 1998).

In many cases in Russia there is a lack of competition. This prolongs the time it will take for the Russian companies to become internationally competitive. Further, there is some indication that firms concentrate too much on cutting costs of what they are producing, forgetting that they need to sell something that is demanded. In this section we have found another weak determinant in our Russian "diamond".

Government

The New Forest code, adopted by the state Duma in January 1997, can be considered a new stage in forest legislation. Unfortunately, in several important aspects it is out of line with the current social, economic and environmental thinking.

The fundamental issues of land and forest ownership and management responsibilities are hard to address until appropriate land legislation is in place. The current lack of discussion of these important issues in the new code leaves a lacuna that will add to the already existing confusion. The Russian constitution provides for possibilities of various forms of ownership related to natural resources, including land and forests, be it private, state, municipal or other. Moreover some subjects (for example, The Republic of Tatarstan, the Saratov Region) of the Russian Federation (hereafter the Federation) have declared some land as privately owned. The current legislation of many of the republics and regions (krai, oblasts) propose that all state owned forestland should be owned by these republics. On the contrary, the Forest Code

proposes that all state forest fund forests remain under federal ownership (article 19). The Forest Code allows only a transfer of parts of the state forest fund forests to the republics. Moreover, there is an imbalance between ownership rights and responsibilities of the Federation and its subjects. Although the Federation owns all forest fund forests, the republics and regions are responsible for forest resource use, protection and regeneration.

The Forest Code declares that a fundamental requirement of the forest managers is to use the forests in a long run sustainable manner. However, it fails to provide legal or economic mechanisms for the implementation of such policies. Generally the Forest Code has a regulatory nature, lacking the incentives to increase the effectiveness of forest resource use and reproduction. Despite the great differences in natural and economic conditions in various parts of the Russian Federation, the Forest Code considers one kind of management system, based on the Canadian Legislation.

Some mentioning of the effects of the exchange rate is unavoidable. First we should note that the exchange rates issues belong to what Porter issues that makes Government a node and not a determinant. The problem with discussing the effects of the exchange rate in the long run is that in the long run the exchange rate should convert to a level which neither helps or hinder Russian exporting industries. In the long run what should matter is the relative advantage between the different industries (even widely interpreted in "Porter-context"). We therefore follow Wibe (1987) and leave this issue.

According to the Russian General procurator office about half of the commercial banks, 40% of the state, and 60% of private enterprises are under the control of criminal elements (organized crime) (TV-News, Moscow, 27th of December). There is reason to believe that this informal controlling element may hamper the government's possibilities to implement policies.

To summarize this section we conclude that the role of the government is extremely important in a transitional economy. Yet, in some cases we see a appalling lack of policy. In other the institutional setting of the old communist system with gifts to administrators and widespread corruption remains. We think that this determinant is as important as the factor conditions in the Russian case. Its weakness may unfortunately counterbalance the strength of the factor conditions prevailing in Russia.

DISCUSSION

The survival and well being of the Russian forestry industry is ultimately dependent on its competitiveness, in relation to other roundwood suppliers in the international market. Competitiveness, in turn, is dependent on several factors. We have tried to evaluate the current status of several determinants of competitiveness, with some focus on costs, and government policy. The prospects for the Russian forestry could be good only if substantial problems in regards to government policy, clarifying of property rights, development and maintenance of the infrastructure and a stable and not too rapid increase in costs are solved. Further we think that domestic demand is a weak link and that for the Russian Forests to regain its earlier production and establish itself as the leading supplier of forest raw materials in Northern Europe, a revitalization of the domestic demand is necessary. In table 9 the conclusions of this paper is summarized.

Table 9

Russian Forest in a Diamond Context

Part of the Diamond	good	ok	bad	Comment
Factor Conditions and endowment		X		
natural conditions	X			Large inventory
infrastructure		X		good railway network, but some doubts of its maintenance
know how		X		
Demand			X	Quality problems, lack of critical mass domestically
FDI			X?	Not good compared to other transitional economies
Related and supporting industries		X?		Monopolies, low productivity and fairly low quality
Firm strategy, structure and rivalry			X	Few changes and lack of renewal of management
Government			X	Unstable, at which level should decisions be taken?
legal setting			X?	Corruption,, taxation, new forest code unclear
property rights			X?	Unclear, disputes between regional and federal level

Table 9 gives a rather dark picture of the competitiveness of the Russian Forests. The only real strength being in factor conditions and endowments. We doubt whether

this is enough for Russian forestry to be competitive. If not the other determinants of this system is strengthened, most important property rights, the environment for foreign investors and the firm structure, we believe that the industry could be at least in the near to medium run, producing roundwood far below what would be sustainable in the long run.

It is not enough for a country to just being able to harvest the trees, the whole system with transports and quality assurance must work if the country is to have a competitive forest industry. To be able to manufacture pulp and lumber of high quality freshness of the raw material as well as the treatment from the first moment of the harvesting to the arrival to the factory gates are important. This means that the education of the personnel involved and the imports of know-how from western economies are crucial factors. The prospects for such transfers are good, one example is the Swedish company STORA's operations in Russia. The two critical factors to this development is the bad investment climate and the unstable institutional setting. Furthermore in a recent study Linz and Krueger (1998) find that the labor productivity in their sample of firms (wood/forestry/pulp/paper, 1992-95) have gone down in the worst case by 59.6% and in the best case by "only" 11.6%.

We can see several important changes (or as important lack of changes). We will end this paper by briefly, in a rather free manner, discuss a few of these and suggest further research efforts.

We could be seeing a return to a stronger central planning. One example of this is when the central authorities have regained power over the exports. Under the assumption that the forests would not be plundered (again assuming clear property rights) this would be a step in the wrong direction and could mean a less effective use of the resource that the Russian forests are.

If the property rights stay continuously weak and unclear, this could lead to an overuse of the resource (Pöyry, 1988, is briefly discussing this in his paper on Scandinavian future competitiveness. His claim is that this has partly already happened in Canada). It can also lead to FDI being done elsewhere and being terminated. We confer with Backman (1996a) that the influx of fresh capital is crucial for the forest enterprises at this stage. Thus this issue should be of utmost importance to solve for the Russian Duma.

In addition, the wood products and pulp industry is suffering from some quality problems. Clearly there are reasons to worry about the development of the domestic demand.

Last, but not least important is the long run development of harvesting and transportation costs. Most of the forest raw material will need to be transported long distances and the communist practice of heavily subsidizing bulk transports must most likely cease. The heavy increase in transport tariffs in 1995-96 should be seen as a warning. Further the Russian forest enterprises must increase productivity as well the quality of its products.

All the above issues are of utmost importance and should be submitted to further research efforts to further clarify the position and long run possibilities of the Russian forest industry.

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Paper V

[paper 5]

NORDIC FOREIGN DIRECT INVESTMENT IN THE RUSSIAN FOREST SECTOR

by

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ABSTRACT

This paper investigates the key factors determining Nordic foreign direct investments (FDI) decisions in the Russian forest industry. A mail survey was sent to the 25 largest forest companies in Denmark, Finland, Norway and Sweden. The responses indicate that the prime motivation for investments made has been to serve local and regional markets, and not to take advantage of low labor and raw material costs. Access to well-developed physical infrastructure and prior contacts with future Russian partner have been important factors determining the location of the investment. The survey also asked about projects that have been terminated in the recent past as well as planned investments that eventually were not carried through. In general 'technical problems' (e.g., restructuring costs, quality of work force and local suppliers) had little to do with the decision to terminate past projects or not to invest in new projects. Instead the companies emphasize different institutional factors, such as an ambiguous legal system, difficulties in negotiating with local authorities, and general political instability. The Russian Forestry Act of 1993 provides one example of the former. The paper thus concludes that FDI into the Russian forest sector is likely to remain low until there is a fundamental change in the legal and political systems.

JEL classification: F21, Q23

Keywords: Foreign Direct Investment, Russia, Forest Industry

INTRODUCTION

Starting with the tenure of Mikhail Gorbachev, the Former Soviet Union (FSU) has gradually opened up for foreign investors to enter the country. For example, by resolution of the USSR Council of Ministers in 1987, foreign direct investment (FDI) and foreign ownership of Soviet equity became possible. The 1991 USSR law on foreign investment, which is still in force, permits foreign companies to set up wholly owned subsidiaries and to repatriate profit (Gareyev et al., 1997).[1] After the collapse of the Soviet Union in 1991 its legal successor, Russia, has intensified the transition from a command-based to a market-oriented economy. However, still very little 'supporting' legislation (e.g., adequate laws on foreign land ownership rights and import policy) that would further facilitate FDI exists (Stern, 1996). In addition, the profound transformation of the country's political and economic system has created a number of uncertainties about the future viability of a number of industries and their role in the transitional market setting.

As a consequence, actual FDI into Russia is likely to be determined by a variety of political and economic factors, which in turn will be region- and industry-specific. Unlike many previous studies on FDI behavior this study focuses on one specific industry, namely FDI into the Russian forest sector. Russia has 23 percent of the world's forest area, and she holds 22 percent of the world's wood inventory, including 55 percent of the inventory of coniferous forests (Gareyev et al., 1997). Quite a few authors have remarked upon the vast forest resources and the potential that these constitute.[2] This potential should plausibly be able to attract foreign investors into the industry, but so far foreign investment activity has been low and many of the investors have experienced problems (see further section 2). Moreover, the availability of information on FDI in Russian forestry is meager and mostly of an anecdotal nature. A mapping of current foreign activities, their main determinants and experienced obstacles is thus motivated.

[1] Some recent legislative Acts also include the 1995 law on "Additional Measures Toward Attracting Foreign Investment to Implement Large-Scale Projects in Material Production Industries," (Stern, 1996).
[2] See, for example, Backman (1994, 1996a, 1996b), Gareyev et al. (1997) and World Bank (1997).

There are several reasons why FDI is particularly important for industrial sectors and countries in transition. McMillan (1995) points out that the beneficial effects are not only economic but to a vast extent institutional. FDI may, for example, increase the skills of domestic managers. Under the central planning era active management in the areas of product development, quality control and marketing was more or less non-existent (Ibid.). In other words, foreign investors can subject managers for commercial rather than administrative criteria. Moreover, FDI can also contribute financially; it can fill the gap of insufficient domestic savings. Finally, foreign investments often raise productivity by introducing new and more efficient technologies.[3] The problem is however that the present risks and uncertainties involved in investing in Russia in general and in the Russian forest sector in particular often are substantial (see further section 2). Before a strategy for increasing FDI in the sector can be formed, the most important factors that determine the willingness of companies to invest or to abstain from investments have to be explored.

For the above reasons, the primary purpose of this paper is to investigate what are the most important factors determining Nordic foreign investments in the Russian forest industry, including obstacles and problems to FDI. A secondary purpose is to briefly explore what characterizes the investments that have been made (types of operations, ownership control etc.). A mail survey, directed towards 25 forest companies in Denmark, Finland, Norway and Sweden, was conducted, and out of these 19 responded. Out of these 19, we have used 18. We left out one Finnish company that simply answered that they "neither had nor would invest in Russia". Our focus on 'all' companies, regardless of whether they have invested in Russia or not, allows us not only to understand why certain firms have chosen to invest in the sector, but also why others have refrained from doing so.

The focus on *Nordic* FDI into the Russian forest sector is motivated by the dominant role played by Nordic forest companies in the European market. For example, in 1997 total wood pulp capacity in the Nordic countries amounted to approximately 70 percent of the corresponding capacity in EEC plus the Nordic countries (FAO, 1998).[4]

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[3] However, all foreign investments do not have solely positive effects. Newell and Wilson (1996) note, for example, that in the extractive sectors of the Russian economy (including forestry), some foreign investments have had detrimental effects on the environment. This issue was also the concern for some forest interest groups described in Tak (1994).

[4] FAO defines EEC as Belgium/Luxembourg, Denmark, France, Germany, Greece, Ireland, Italy, Netherlands, Portugal, Spain, and the UK. The Nordic countries are defined as Finland, Norway and Sweden. In calculating the above shares, we deducted Denmark from EEC's total wood pulp capacity and added it to the wood pulp capacity of the Nordic countries.

Moreover, several of the pulp and paper factories in the EEC are subsidiaries to Nordic firms, making the above figure an understatement of the real weight of the Nordic pulp and paper industry in Western Europe. It is thus reasonable to presume that the strategies pursued by the Nordic forest companies will be important in determining overall West European FDI levels in the Russian forest sector. Further, their general attitudes towards FDI in Russia are likely to affect the views of the European industry as well.

The paper proceeds as follows. In section 2 a review of the Russian forest sector is provided and some recent experience of FDI in the industry is presented. Section 3 presents the recent literature on FDI in transition economies, and the relevance of these earlier studies for the Russian forestry case is discussed. In section 4 the results of the survey are presented and analyzed. The paper ends with some concluding remarks in section 5.

THE RUSSIAN FOREST SECTOR AND FOREIGN DIRECT INVESTMENT

In three recent articles Backman (1994, 1996a, 1996b) thoroughly maps the physical accessibility of forest resources in Russia. According to Backman (1994) the change in the economic conditions in Russia has led to an increase in the annual growth in the forest inventory from 500 to 600 million cubic meters (CUM) between the late 1980s and the early 1990s. The threat of a forest fiber shortage in other regions of the world has increased the interest in regions with an apparent surplus, such as Russia. Figures 1-2 summarize the historical development of the forest sector in the FSU and Russia. Figure 1 shows production and exports of roundwood from the FSU, and from 1992 and onwards the data include Russia only.[5]

Harvesting and exports have been closely related until the late eighties. Up until that point the surplus harvest was exported. The decrease in volumes in the mid to late seventies is partly explained by the extremely difficult harvesting conditions due to severe winters (Blandon, 1983). The level of cutting decreased dramatically in the beginning of the 1990s, and only a fraction of this can be explained by the fact that the data from 1992 and onwards exclude, for example, the Baltic States. Rather production declined as a result of falling demand domestically, following the macro-economic shock in 1990. Initially exports of roundwood followed the drastic drop in production but in 1997 they recovered.

If we look at processed material (pulp and paper production and trade), the overall pattern tends to be the same as that for the raw material sector. Figure 2 shows Russian pulp and paper production and trade figures. The increase in production of pulp is more distinct than that of harvests of roundwood. This increase in production and exports of pulp for paper however ceased in the late eighties. Following the Communist collapse, domestic production has basically imploded, but exports have recovered from the initial drop in the early 1990s. For the Russian suppliers exports have one important advantage to trading in the domestic market. Most of the deliveries are paid for in hard currency whereas a substantial amount of domestic trade in Russia takes place as barter (or remain unpaid). Another reason for the

increase in exports is the fact that the depressed Russian economy has led to decreased domestic demand.

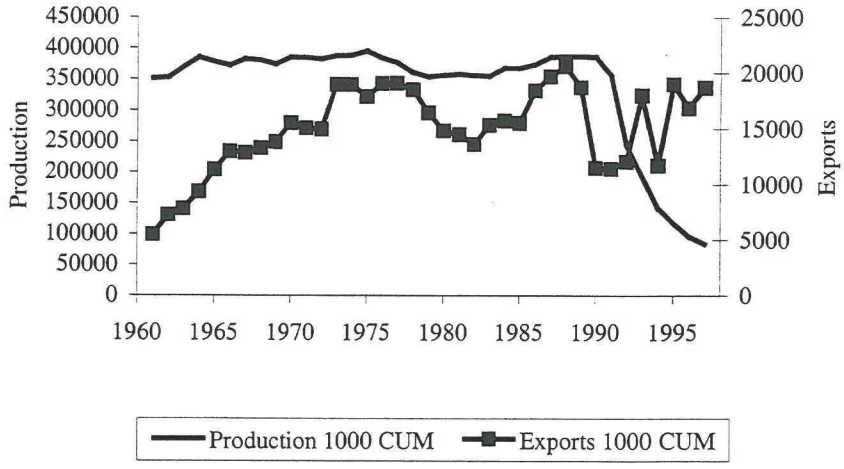

Figure 1: Production and Exports of Roundwood in FSU and Russia
Source: FAOSTAT.

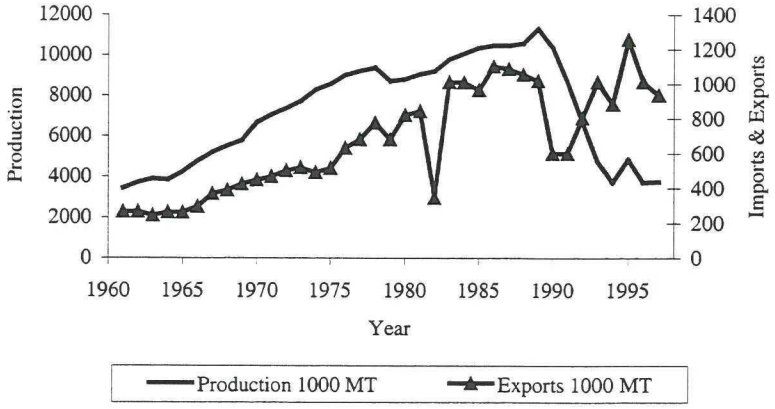

Figure 2: Russian Domestic Production and Trade with Pulp for Paper
Source: FAOSTAT.

[5] This does not affect the overall figures to any great extent. For example, in 1991 the Russian share of FSU's total growing stock of roundwood was 94 percent, and for the allowable cut the corresponding share was 96 percent (Kleinhof and Nilsson, 1999).

It is clear that the Russian forest sector is currently undergoing dramatic changes, and some of the main problems tend to be lack of modern equipment and technology as well as necessary management skills. For these reasons, FDI is often seen as one way of increasing productivity in the sector (e.g., Backman, 1994), and Russian executives frequently invite Western companies to become joint venture partners (e.g., Clarke, 1996). However, the level of FDI in Russia has so far been very low (compared to other transition economies), and the forest sector has not been an exception to this general trend. Meyer (1998) notes that during the period 1993-1995 overall FDI only constituted 0.3 percent out of GDP in Russia. The corresponding shares for the Czech Republic, Hungary and Poland were 3.7, 6.5 and 2.1 percent respectively.[6] In 1996 the Russian FDI/GDP ratio had increased, but only to a modest 0.4 percent (ECE, 1998). Data on FDI into the Russian forest sector is meager and hard to come by. Still, Stern (1996) reports that from the time Russia declared independence (end of 1991) to the first quarter of 1995, the total (cumulative) value of FDI into Russia amounted to USD 2840 million, and out of this total 7 percent (USD 198 million) went into the wood and paper industry. According to Gorbatschov (1998) FDI into the Russian forest sector was about USD 112 million over the two-year period 1996-1997.[7] On an annual basis this indicates an increase in FDI activity during the 1990s. However, it is generally hard to compare the results of different sources as they might use different definitions of FDI (see section 3). Even if the figures indicate a significant increase FDI activity into the forest sector it is still far from reaching the levels necessary for an efficient change of the existent capital structure.

As was noted above, the poor FDI outcome in Russian forestry more likely reflects uncertainty about the political and the business-related environment rather than an inherent absence of natural resource endowments. In EBRD (1995) Russia gets low 'scores' (compared to other countries in transition) on important issues such as the effectiveness of legal rules on investment and financial institutions, which all have remained unstable and undeveloped. Moreover, according to Standard and Poor's international credit ratings only Kazakhstan is lower rated than Russia (ECE, 1998). Still, to understand the specifics of FDI into the forest sector of the country we have to go beyond these macro-economic indicators. A brief review of the experiences of foreign forest companies investing in Russia can be useful as an initial

[6] Out of the 13 transition countries reported in Meyer (1998, Table 2.4), only Ukraine had a lower FDI/GDP ratio (0.2 percent) for the period.

[7] We are indebted to Andris Kleinhof, VNILM (Moscow), for this information and the reference.

attempt to trace some of the obstacles to FDI into the industry. In the following we discuss three important foreign investments in the Russian forest sector.

First, in early 1996 the Swedish pulp and paper company ASSIDomän (hereafter ASSI) announced that they had joined Stratton Investments and bought the Segezhabumprom (hereafter Segezha) paper and sack mills in Karelia, North Western Russia. The mills were in serious need of maintenance and re-investments; the paper mill produced low-quality paper given the available raw material ("ASSIs riskabla Rysslandsköp", 1996). Still, the investment seemed to fit well into a strategy of meeting an increasing demand for paper sacks in Eastern Europe, and it also made ASSI the largest producer of paper sacks in Europe. In the beginning of 1997 ASSI appointed a Swedish manager to run the operations in Segezha, but at most times the pulp and paper mill did not operate due to disputes with the local government about tax issues, social arrangements and rights to cut forests. The main argument was the disparate views of ASSI's commitment to the town Segezha. A Russian 'enterprise' often includes nearby villages, which means that enterprises in Russia also have a responsibility for the overall social welfare in the nearby villages/towns. This could mean that the enterprises 'include' schools, hospitals, etc. This cultural difference in how to define what ASSI had bought, and what obligations that followed with the agreement, turned out to be crucial. After a short time the Russian counterpart went to court to solve a dispute about the legal aspects of ASSI's investment. ASSI finally decided to leave Segezha in February 1998, taking a loss of 549 Million SEK (USD 68 million). Interestingly, ASSI has also invested in a new corrugated paper plant near St. Petersburg, which seem to run 'smoothly' (ASSIDomän, 1998). ASSI claims that the regional governments' willingness to accommodate FDI is crucial for whether the investment will be successful or not. It therefore becomes important to analyze the local and regional political environment before undertaking a major investment.

Second, Backman (1996a) briefly describes the American company Weyerhaeuser's joint venture in Russia. Weyerhaeuser's main interest was in the raw material; the company wanted to buy timber and ship it out of Russia. Its main interest was in forests in the Far East of the country. In order to avoid problems with transportation Weyerhaeuser located its facilities near the Pacific coast. The company based their offered stumpage prices on a vector of costs and prices linked to the global market, believing in sharp rises in costs and prices of inputs as the Russian market adjustments continued. However, for the Russian counterparts, "raised in an environment surrounded by administered costs and prices, the thought of a rapidly rising cost and price structure was difficult to accept" (Ibid., p. 15). Seemingly the

crumbling state planning system made it possible for Weyerhaeuser to negotiate at the enterprise level. However, in reality the senior members of the old forest sector in Russia were still in power, and the uncertainty of with whom to negotiate and the lack of clear property rights turned out to become crucial hurdles, hard to pass.

The *third* case described here is the South Korean-based Hyundai's joint venture. Tak (1994) and van Fossen (1995) describe the development of this project beginning with the signing of the contract between the Hyundai Group and two local logging companies in 1990. As in the case of Weyerhaeuser this is a logging operation (the lease discontinues in 2020). Tak (1994) claims that the South Korean counterpart quickly fulfilled its obligations, buying logging equipment and mobilizing the necessary labor force. However, according to van Fossen (1995) the joint venture clear cut thousands of acres of timber despite promises to use selective cutting techniques. This led to a legal conflict, which more than anything did show that it was very difficult to determine which government body had the legal right to dispose of land and resources. The joint venture has so far been a disappointment for the South Koreans as well. Apart from the above confusing legal controversy, the choice of joint venture partner turned out to be crucial. The Russian partner was the regional forest sector industry organization, which initially backed the project with support from the federal government. However, political changes led to the emergence of a new power structure. A change in the regime effectively negated years of effort, freezing the joint venture at an early stage. Still, the joint venture did not shut down, and has begun to engage in a program of selective logging rather than in clear cutting practices (Ibid.).

As the examples above illustrate the main factors impeding FDI in the country tend to be the ambiguous Russian legislation, ill-defined property rights and Russian counterparts that are unused to acting in a market economy environment. However, the empirical evidence on FDI in Russian forestry and, also important, information on investment that for some reason or other has not been made are at best scattered. Thus a more thorough mapping and analysis of the issue is needed. The Russian forests constitute a vast natural renewable resource that could play an increasing role in the world's forest industries, and there ought to exist favorable opportunities for foreign investors.

FOREIGN DIRECT INVESTMENT IN THE LITERATURE

FDI is generally defined as ownership of assets by foreign residents for purposes of controlling the use of these assets. Actual control over what is owned thus distinguishes direct investment from portfolio investment. There is however no fully established definition of FDI (e.g., Brewer, 1994). For example, there remains the question of what share of ownership brings with it actual control. For our purposes FDI involves the purchase of a 10 percent (or more) equity stake (stock or full or partial ownership), with the expectation of active participation in firm management. The 10 percent limit, although arbitrarily chosen, is the most commonly used criterion among researchers (e.g., Stern, 1996) and institutions (e.g., US Department of Commerce).

There exists a large literature focusing on different aspects of FDI. Disciplines such as economics, finance, strategic management, marketing and organizational behavior have all contributed to our understanding of FDI behavior. In this section we primarily review previous research that deals with why firms wish to engage in FDI in transition economies, and what might prevent them from doing that. For this reason many of the issues raised in the above literature may be neglected. Nevertheless, a rough theoretical framework will be helpful.

One can usefully distinguish between two classes of FDI motives, and assert that a foreign rather than a domestic firm will invest in a new factory either because it *expects higher returns* or because it *requires lower returns*. The *first* class is often referred to as the "industrial organization" (IO) explanation to FDI.[8] This approach recognizes that even if the foreign firm has some disadvantages compared to its domestic rivals (e.g., language, cultural traditions etc.) it may have some firm-specific knowledge or other assets that enable it to be more profitable. It may also be the case that the factory has greater value to the foreign firm because it has a potential role in that firm's global strategy (e.g., vertical integration) that it does not have for the domestic firm. The *second* class of FDI motives notes that the foreign firm might be willing to pay more for the factory only because it applies a lower discount rate to expected cash flows.

[8] The seminal study in this field is Hymer (1976), originally a doctoral dissertation from 1959.

This can be referred to as the "cost of capital" explanation to FDI, and essentially it recognizes that FDI "is simply a matter of resources in search of the highest return," (Graham and Krugman, 1991, p. 36). However, a foreign investor seeking higher return can achieve that aim through portfolio investment instead. Moreover, many firms engaging in FDI finance their investment locally, something which is hard to explain had they been motivated by capital cost differences in the first place. For the above reasons the empirical literature generally concludes that IO considerations rather than costs of capital explain most FDI.

Still, even within the IO paradigm there are a large number of theories that emphasize different aspects of FDI motives.[9] John Dunning (1980, 1981, 1988, 1994), who has done both important theoretical and empirical work within the IO paradigm, suggests that the reasons for FDI are diverse and thus that no one theory can account for all such investment. He therefore proposes to integrate the different IO explanations into a general paradigm of international production. According to this framework FDI is undertaken only if three conditions are met (if not exports, for example, may be a better strategy). *First*, the investing firm needs *ownership advantages* that make it competitive compared to local firms. *Second*, the host country must possess *locational advantages*, so that it represents a favorable location for foreign firms. *Finally*, internalization incentives must make it advantageous for the foreign firm to use its competitive advantage by selling components internally rather than in the market place. Markusen (1995, p. 173) explains the above conditions in more detail;

> A firm's *ownership advantage* could be a product of or a production process to which other firms do not have access, [...]. It could also be something intangible, like a trademark or reputation for quality. Whatever its form, the ownership advantage confers some valuable market power or cost advantage on the firm sufficient to outweigh the disadvantages of doing business abroad. In addition, the foreign market must offer a *location advantage* that makes it profitable to produce the product in the foreign country rather than simply produce it at home and export it to the foreign market. Although tariffs, quotas, transport cost and cheap factor prices are the most obvious sources of location advantages, factors such as access to customers can also be important. [...] Finally, the multinational enterprise must have an *internalization advantage*. This condition is the most abstract of the three. [...] That is, the product or process is explored internally within the firm rather than at arm's length through markets.

Our investigation focuses primarily on motivational factors and obstacles to FDI. In other words, we devote our attention almost entirely to the location advantages in Dunning's

so-called OLI-framework. Location advantages could be low input costs, access to markets and government policies (e.g. barriers to imports, investment incentives). Further, when discussing the transitional economies in Eastern Europe, it is also important to consider the risks involved. *Political risks* are related to the behavior of legislative and regulatory authorities. These risks are normally outside the firm's range of control. *Business risks* derive from the decisions taken by actors in the market or within the firm. (Eliasson et al., 1993). Further, business risks can normally be regulated by contractual arrangements, while political risks causes uncertainty about these arrangements (Svensson, 1995).

Earlier empirical research on motives and determinants of FDI in transition economies has employed both econometric techniques, case studies and survey studies among Western firms with investments in Central and Eastern Europe (CEE). Table 1 summarizes the choice of method and the main findings in some of the most important empirical studies during recent years. The table is ordered by method. Many of the early studies focused on the potential importance of factor cost advantages as main drivers of FDI into CEE. The emphasis has been on differences in labor costs, which have remained low in CEE, not the least in Russia (Meyer, 1998). Still, in general previous studies conclude that factor costs, and labor costs in particular, hardly help explain FDI flows into the region. Rather Western firms have been motivated mainly by market size, expected growth and in some cases by so-called first-mover advantages. For example, Lankes and Venables (1996) review seven previous case studies and conclude, "[...] one pattern that emerges very clearly is the predominance of market-seeking activities as the prime investment motive [in transition economies]. Factor cost considerations appeared to be of less importance for the majority of investments," (p. 334).

The most frequently reported obstacles to FDI relate to the uncertain political environment and the volatile macro-economic situation. Problems in implementing a market economy together with unclear property rights are normally perceived as particularly important difficulties. Additional obstacles include administrative complexity and the bureaucracy. It is however important to note that in most cases "bureaucracy-related problems arise from inconsistent guidelines for decision-making within the bureaucracy as well as from interests of the local administration and, in some countries, corruption," (Meyer, 1998, p. 45). In other words, bureaucracy normally reflects deeper-rooted problems such as ambiguous delineation of authority within the political systems of the former Communist countries.

[9] For a brief survey of this literature, see Graham and Krugman (1991).

Table 1.

Earlier Empirical Studies on FDI in Central and Eastern Europe

Study	*Scope*	*Method*	*Main findings*
Wang and Swain (1995)	FDI into Hungary and China 1978-1992.	Econometric model	FDI mainly determined by market size, cost of capital and political stability.
Lansbury et al. (1996)	FDI from OECD countries in Central Europe, 1991-93.	Econometric model	Past trade linkages, infrastructure and privatization encourage FDI.
Andreff and Andreff (1997)	FDI into FSU compared to FDI into CEE, early 1990s.	Econometric model	The macro-economic environment is an important obstacle to FDI.
NERA (1991)	Western firm FDI in CEE, East Germany and the FSU, 1991.	Survey	Market potential primary FDI motive. Main obstacles are political and economic uncertainty.
Collins and Rodrik (1991)	Western firm FDI in CEE and the FSU, 1990-1991.	Survey	New markets and first mover advantages main motives. Political risk and unclear property rights primary obstacles.
OECD (1994)	Western firm FDI in CEE and the FSU, 1993.	Survey	Key motive is market share gains, rather than low wage considerations. Main obstacles are administrative and legislative issues.
Radulescu (1996)	British firms' FDI into Romania.	Survey	Implementation of market economy crucial for encouraging FDI.
Lankes and Venables (1996)	Western manufacturing firms FDI in transition economies.	Survey	Transition progress, political stability and perceived risk influence FDI activity.
Pye (1998)	Western firm FDI in Central Europe in 1989-1996.	Survey	Market factors in host country main motives. Low labor costs and first-mover advantages also important.
Meyer (1998)	British and German firms' FDI into five transition countries.	Survey and logit model	Attractive markets more important than factor costs in explaining FDI. Inertia in the legal system most important obstacle.
Tak (1994)	Hyundai's joint venture in the Russian Far East.	Case study	Political instability causes uncertainty about the validity of contractual agreements
van Fossen (1995)	Hyundai's joint venture in the Russian Far East.	Case study	Ambiguous delineation of authority in Russian legislation important obstacle.

Our contribution to the above literature is primarily of an empirical nature. The main justification of the paper is the need for more sectoral analyses of FDI to complement the growing volume of research conclusions relating to the macro aspects of the subject as well as to the manufacturing industry as a whole. For example, we would expect that in the forest sector infrastructure and property right issues will be particularly important in determining FDI behavior. Finally, in our survey we pay attention not only to investments actually conducted, but also to those investments that were once considered but eventually not carried out.

SURVEY RESULTS AND ANALYSIS

The survey was sent out in early September 1998 to the 25 largest pulp and paper firms in the Nordic countries.[10] It was addressed to the managing directors of the respective companies, primarily since these top executives ought to be the most reliable sources of information regarding foreign investment motives and obstacles. From the 25 firms originally contacted, 19 firms (76 percent) responded to the survey. All Nordic countries are represented in this sample, with eight respondents from Sweden, seven from Finland, three from Norway and one from Denmark. In most cases the respondents answered all questions in the survey, but in a few cases we note that some firms have left out some questions.

As was indicated in section 3, the survey focuses primarily on investments in projects where long-term continuing interest and an actual managerial control are key guidelines, i.e., it does not consider pure portfolio investments. The questions in the survey partly reflect the above OLI-framework, but focuses primarily on investment willingness, the determinants of investment location (location advantages), and problems experienced in investing in Russian forestry. We thus leave aside the question of what has made some pulp and paper investments more successful than others[11] and we touch only briefly on issues such as entry mode, ownership and internalization advantages.

The survey is divided into three basic parts, where the first investigates current investment activity. This first part includes questions concerning important determinants of the choice of location, motivational factors, as well as certain basic characteristics of the investment. The main purpose of the second part is to find out why certain investments have been terminated and why some planned investments eventually were not carried out. The last and third part focuses on the future willingness to invest in the Russian forest sector. A summary of the entire survey can be found in Appendix A.

[10] Companies with an annual production of less than 50 thousand tons of pulp and paper were excluded from the investigation.

[11] Still, some important lessons for future potential investors do come out of the analyses. See the concluding section 5.

Current Investment Activity

Most of the companies indicate that they are currently engaged in some kind of business relationship with/in Russia.[12] Normally these relations take the form of exports and/or imports, but direct investments into the country's forest sector are also prevalent (see below). The companies were asked when these business links were first established. Here two distinct groups emerge. The companies in the first group have done business with Russia (or the FSU) for a very long time (some for over 100 years),[13] while the other group consists of companies that only recently (mid-1990s and later) have established business relationships with Russia. The latter indicates that the final collapse of the Communist system has provided an important incentive for foreign investors to enter Russia. Still, companies that have a lot of previous experience in the region, one might suspect, will find it easier to adapt to the specific characteristics of Russian society. Some of our survey results suggest that this might be the case (see below).

Eight of the companies report that they have made a direct investment (defined as in section 3) in Russia during the last ten years. Four of these claimed that their investments were mainly directed towards raw material supply (e.g., logging), while the other four primarily had invested in the production of pulp and/or paper in Russia. There is thus no clear pattern whether the investments made have been more aimed at securing raw material supply rather than directed toward refining wood raw material in Russia. What is clear, however, is that almost all companies (7) have preferred to remain in control of the investment project, either through a majority owned joint venture (51-95 percent) or through a wholly owned subsidiary or branch (more than 95 percent share).[14] Only one company reports that it owns a minority share (10-50 percent) in a Russian joint venture. In addition, two of the companies were also engaged in turnkey projects, which involve the building of a plant so that it is completely ready for use.

We started this paper by noting that FDI can have important beneficial impacts on the Russian economy. This requires, however, that the transfers from the foreign investor are of the 'right kind', preferably involving efficient technology and know-how. The eight investors in our sample were confronted with a list of seven alternative transfers, and they were asked to tick all alternatives that were judged to be important transfers in their specific case. The

[12] Only two companies testified explicitly that they have no business links whatsoever with Russia.
[13] This first group consists primarily of Finnish pulp and paper companies.

transfers from the Nordic investors to their Russian counterparts are presented in Table 2. (For a description of the distribution of the answers between the different respondents, see appendix B).

Not surprisingly, the most important transfers from the Nordic investors include know-how about marketing and management issues. These are likely to be very important transfers in the ongoing transition process. Clark and Baglione (1998) show that for Russian firms to become profitable in the long run it is probably more important to adjust to changes in the market (e.g., changes in consumer preferences and the resource base) rather than simply to try to cut costs. One way of building up this competence is to learn from foreign partners that have a lot of experience in free markets. Transfers of technology, which are also a part of improving the institutional setting on a micro level, are common among the respondents. This is an important response to the deteriorating capital stock in the forest sector and the urgent need to modernize production and harvesting methods in Russia (e.g., Perez-Garcia and Backman, 1995).

Table 2.

Transfers from the Nordic Investor to the Russian Partner*

Type of transfers	*Number of responses*
Marketing know-how	6
General management know-how	5
Technology transfer	5
Final goods	5
Raw materials	4
Intermediate goods	3
Permission for using brand names	1

* The number of respondents is eight.

Of course, important transfers from the Russian firms to the foreign investors exist as well, and one question in the survey asked what characterized these. The most important transfer from the Russian companies to their foreign counterparts is, according to the Nordic pulp and paper companies, information about the local business environment (e.g., etiquette, culture, laws etc.). This was reported to be important in four out of the eight cases. The Russian partner also supplies raw materials (four cases) and final goods (two cases). In many

[14] This is consistent with the result of a study of Finnish FDI into Russia (reported in a Swedish newspaper article), which concludes that the Finns prefer to undertake small self-financed projects ("Försiktigt och Finurligt När Finska Företag Investerar," 1999).

respects the above pattern of transfers reflect a traditional flow between a developing and a developed country. However, our results also tend to reflect local circumstances. For example, because of the lack of a mature domestic market system, non-monetary transactions (i.e., barter) are a significant feature in parts of the Russian forest sector (e.g., Carlsson et al., 1999). In trying to adopt to this system the investing firm need to learn from the experiences of their Russian partner. Thus, information about the local business environment becomes particularly important in a post-communist country like Russia.

A lot of the earlier research on FDI in transition economies has dealt with the question of whether the primary function of investment projects has been to serve local and regional markets, or if they have been aimed mainly at utilizing low cost opportunities (primarily for export purposes). As was noted in section 3, previous research most often concludes that in general investors tend to follow market-seeking motives. This seems to be the case for the Russian forest sector as well. Our eight investors were confronted with two questions, where the first asked whether the company invested in Russia to utilize low factor cost opportunities and the second asked whether the investments had been made primarily to supply local markets. Only one company responded positively to the first question, while seven of the companies confirmed that Russia offers interesting new market opportunities and that these motivated their investment decision. It is worth noting that the one company that answered that low factor costs were important to the decision also answered that the market opportunities mattered (in two of the cases, neither low factor costs nor new market opportunities seemed to have mattered). Thus, we conclude that the primary function of Nordic FDI in the forest industry in Russia is to serve local markets. Given the collapse of the domestic market in Russia this may at first glance seem paradoxical. However, the time frame of the investments are long enough (30-40 years) to give the domestic market a chance to recover and grow, and the investors apparently expect a major recover in domestic demand.

Once the decision to invest in Russian forestry has been made, the exact location must be chosen. We asked the Nordic investors to what extent a number of factors had influenced the location of the investment. The companies were given a list of 20 potential factors, and were then asked to grade the importance of each of these from 1 to 4, where 4 means that the factor played a very important role and 1 means that it was not important at all. This type of exercise is not only important for understanding regional differences in forest-related FDI, but it also provides important implications for policies directed towards encouraging FDI into the

sector. Table 3 reports the answers to this question, both the mean grade and the exact number of high (4) and low (1) grades for each factor.

Access to important physical infrastructure, the skills of the labor force, and prior contacts with future partner appear to be the most important factors. The latter most likely reflects a desire to reduce risk. The volatile political situation in Russia requires that investors have close contacts with 'insiders' that have proven trustworthy in the past. For example, reliable Russian partners can substantially facilitate negotiations with local authorities, something that the Nordic forest companies in our survey also tend to value highly. The importance of well-developed infrastructure both reflects the fact that some forest resources are remotely located from important markets (something which brings with it high transportation costs), and that important personnel easily can fly in and out of the country.

Table 3.

Factors that Influenced the Location of the Russian Investment*

Factor	*Mean*	*"4"*	*"1"*
Physical infrastructure (access to roads, railways, airports)	3.0	4	1
Prior contacts with future partner	2.6	4	3
Size of population in the region	2.6	3	1
Quality and education level of local work-force	2.6	2	1
Ease of negotiations with local authorities	2.5	2	2
The existence of trade barriers	2.5	2	1
Number of competitors present in the market	2.5	1	1
Labor costs	2.4	1	0
Average level of income in the region	2.4	1	1
Availability of information	2.1	2	3
Political stability in the region	2.1	1	3
Cost of raw materials	1.9	1	3
The legal system (e.g., property rights rules)	1.9	0	3
Quality of local suppliers	1.8	0	3
Regional conflicts	1.6	1	6
Tax levels and/or tax enforcement	1.5	0	5
Presence and success/failure of other FDI in the region	1.4	0	6
Offers by privatization agencies	1.2	0	7
Protection of trademarks	1.2	0	6

* The number of respondents is eight.

Three factors that in different ways mirror market size all obtain high scores as well. These are the size of the population, the number of competitors present and the average level of income in the region. On the other hand, labor costs, cost of raw materials and tax levels tend to be important for the location decision. This is consistent with our above finding that market-seeking motives are important, and that at best low factor costs appear as a complementary motive. Still, given the vast forest resources of Russia, and given the important share of wood raw materials in the paper and/or pulp mills' budgets (about 50 percent) the relatively low score for raw materials is somewhat surprising. This indicates that if the Nordic pulp and/or paper mills were to choose between investing close to the raw material source or import the raw material, they would tend to opt for the latter.[15]

Furthermore, we find that the existence of trade barriers has a quite high rank, to some extent supporting the view that multinational firms invest abroad to circumvent tariffs and quotas. According to this view investment serves to replace home country exports with foreign production. Again this would reflect the desire to serve local instead of international markets.

It is also worth noting that political stability, the legal system and tax levels/enforcement in the region tend to be less important for the investment location decision. This is in contrast with the general views in the FDI debate. However, our results do not necessarily imply that these factors are unimportant for the investment decision. The latter can be seen as a two-stage process. First the company decides whether at all to invest in Russia, and at this stage the above three factors are likely to be influential (something that is confirmed below in this paper). However, at the second stage, when it comes to the question of *where in Russia* to invest, other factors become more important as Table 2 indicates.

Business relationships that have been terminated in the past or not carried through

In order to understand the determinants of and the obstacles to FDI into the forest sector, it is not only important to look at current investment activity. It is equally important to learn from projects that have been terminated in the past, and consider planned investments that, for one or more reasons, were not carried through. Seven of the respondents (37 percent) claimed that they have terminated a business relationship with a Russian partner during the last ten years. This group was confronted with a list of 20 potential reasons for their decision. The companies were asked to tick all alternatives that were of fundamental importance to their

[15] To some extent this is already the case. See for example, Nilsson (1997).

specific case. Table 4 indicates the most important motivations for ending the business relationship with the Russian partner.

Table 4.

Motives for Ending Business Relationship with Russian Partner*

Motives	*Number of responses for each reason*
The Russian partner did not fulfill its obligations	5
Economic risks were too high	3
Legal system too ambiguous (e.g., property rights rules)	3
Tax levels too high	2
Security of working staff could not be guaranteed	2
Negotiating with local authorities too problematic	2

* The number of respondents is seven.

Our main finding is that in most cases the investors felt that the Russian partner failed to fulfill its obligations. ASSI's above-mentioned problem regarding their commitments to the town Segezha is a good example of this dilemma. The second most common answers are that the risks involved are too high and that the legal system is unclear. One example of the latter problem is the Russian Forestry Act of 1993. In many areas the Act simultaneously grants jurisdiction to both the central and the local governments. For this reason it is hard to identify the legitimate Russian partner, and often "politics will be played out at a very local level," (van Fossen, 1995, p. 550). For the foreign investor this can be devastating as federal approval can turn out to mean very little. It is also worth noting that in two cases the Nordic firms chose to withdraw because the security of their working staff could not be guaranteed.

We have further an interesting bimodal distribution of the answers, where four companies 'only' gave one or two motives for the termination, while three Swedish companies reported at least four and even up to eight reasons for their decision to end the business relationship. We suggest one reason why this tends to be the case. Finland belonged to the Russian Empire until 1919, and after World War II the Finns agreed to have extensive trade with the Soviet Union. This may have given Finnish companies unique experience in doing business in the Communist system. It is striking that only the Swedish firms note that they have problems both with the legal structure and when negotiating with local authorities, problems that none of the Finnish firms report.

The companies were further asked whether during the last ten years they had considered an investment project in Russia that they eventually decided not to carry out. Nine of the

Nordic companies reported that this was indeed the case, and most of these planned investments were in pulp and paper production. The nine companies were confronted with a list of 20 potential reasons for their decision not to invest. Also here they were asked to grade the importance of each of these factors, from 1 to 4. Table 5 summarizes the responses.

Table 5.

Factors that Influenced the Decision Not to Invest in Russia*

Factor	*Mean*	*"4"*	*"1"*
Economic risks too high	4.0	6	0
Tax levels and tax enforcement too high	2.5	1	1
Legal system too ambiguous (e.g., property rights rules)	2.4	1	1
Negotiation with local authorities too difficult	2.2	2	3
Security of working staff could not be guaranteed	2.2	2	3
Other FDI in the region had been unsuccessful	2.2	1	3
Lack of physical infrastructure (roads, railways etc.)	2.0	1	4
Environmental liabilities too high	2.0	0	1
Political environment too uncertain	2.0	0	2
No appropriate Russian partner was found	1.8	1	4
Costs of raw materials too high	1.7	0	2
Restructuring costs of local facilities too high	1.7	1	5
Quality and education level of local workers insufficient	1.6	1	5
Financial constraints within own company	1.5	1	5
Production processes could not be relocated	1.5	1	5
Insufficient information about the market	1.5	0	3
Trade barriers existed for important markets	1.5	0	4
Quality of local suppliers insufficient	1.5	0	3
Labor costs too high	1.3	0	4
Problems in repatriating profits	1.3	0	4

* The number of respondents is six. Added to these six are three respondents that chose only to grade a few of the 20 potential reasons. For the first company these were "legal system too ambiguous", "restructuring costs of local facilities too high", "financial constraints within the company", "quality and education level of local workers insufficient". The second company ranked the "economic risks too high" and that the "political environment were too uncertain". The third company graded "legal system too ambiguous", "lack of physical infrastructure" and "quality and education level of local workers insufficient".

Not surprisingly the results show that for all companies unacceptable economic risks were the main cause for choosing not to invest. Of course, this is a reflection of deeper-rooted problems and it is useful to look at the other factors as well. Table 5 reveals that 'technical' problems (e.g., high restructuring and relocation costs, quality of work-force and local suppliers etc.), have in general had little to do with the decision to cancel the investment

plans. Rather the companies emphasize different institutional factors, such as an ambiguous legal system, difficulties in negotiating with local authorities and political instability. These results confirm our above notion that when it comes to deciding whether or not to invest in Russia at all, legal and political issues become important. If one considers especially that many of the firms considered investment in pulp and paper production, which involve considerable capital expenditures and long-term commitments, it is essential that the political risks involved are small. In the above cases they were thus not judged to be sufficiently low.

The weight given to high tax levels and strict tax enforcement is related to the above institutional obstacles. The elaborate accounting procedures of most foreign investors make it easier for the Russian authorities to claim taxes from foreign firms than from Russian counterparts, of which the Russian authorities have little cost control. In addition, foreign firms normally have a much greater ability to pay the taxes. For the above reasons foreign firms often face very strict (sometimes brutal) tax enforcement, and in some cases this tends to discourage FDI.

Potential Future Investments in Russia

As was noted above, Russia's ability to attract future foreign investments is important for many reasons; among the more important is the transfer of technology and managerial know-how. 12 out of the 19 companies that responded claimed that they still seriously consider Russia a potential target for a forest sector investment before the year 2010. Regardless of whether the companies were potentially interested in future investments or not, they were asked to what extent a number of factors were likely to influence their decision to proceed or abandon an investment project in Russian forestry, *if* they were to consider such a project. Again the importance of each factor was graded from 1 to 4. Table 6 summarizes the responses to this question.

The responses to this question reflect many of the above-mentioned motives and obstacles. The highest ranked factors are mainly of an institutional or fiscal nature. These institutions relate not only to formal rules and laws but also to more informal relationships with Russian counterparts. For example, the high rank given to 'ease of negotiations' most likely reflects a more general plea for political stability and a transparent legal system in the country. It is thus probably safe to conclude that FDI into the Russian forest sector will remain low until there is a fundamental change in legal and political institutions. The strict and in

some cases unfair tax policy also need to be revised (see above). It is however hard to foresee any real change in this latter field until the Russian federal budget has improved substantially.

Table 6.

Factors Influencing the Willingness to Invest in the Near Future*

Factor	*Mean*	*"4"*	*"1"*
Development of the legal system (e.g., property rights)	3.7	10	0
Political environment	3.6	10	0
Tax levels and/or tax enforcement	3.4	8	0
Ability to repatriate profits	3.4	6	0
Physical infrastructure (roads, railways, airports etc.)	3.3	7	0
Ease of negotiations with local authorities	3.0	4	0
Availability of information	3.0	4	0
Quality of forest raw material	2.9	6	3
Costs of raw materials	2.8	4	1
Quality and education level of local work-force	2.8	2	0
Trade barriers	2.7	4	2
Presence and success/failure of other FDI	2.7	2	1
Prior contacts with future partners	2.6	4	2
Quality of local suppliers	2.6	3	0
Size of population in the region	2.6	3	1
Labor costs	2.4	2	1
Number of competitors present in the market	2.4	2	3
Average level of income in the region	1.9	0	2
Offers by privatization agencies	1.7	0	6
Protection of trademarks	1.6	0	6

The number of respondents is fourteen.

Table 6 also shows that in general *quality* issues seem to be more important than *costs*. This difference is most striking when it comes to the labor force. In other words, it seems to be more important for Russia to offer potential investors a well-educated labor force rather than simply cheap labor. Also for raw material inputs quality characteristics are regarded as (at least somewhat) more important than pure input costs. Finally, we note once again that even if market seeking motives are the main drivers of foreign interest in the Russian forest sector (see above), market size-related factors (e.g., size of population, average level of income etc.) tend to be less important for the foreign firm's overall willingness to invest in Russia. As was shown above they are, however, more important when it comes to choosing the exact location of the investment (see Table 3).

CONCLUDING DISCUSSION

This paper has tried to identify the most important factors determining the Nordic FDI behavior in the Russian forest sector. A number of case studies show that foreign forest companies often experience problems and face institutional and political obstacles when investing in Russia. In order to obtain a more thorough understanding of current and potential FDI activity in the Russian forest a survey was sent to the 25 largest forest companies in the Nordic countries, out of which 19 responded. The survey investigated three general issues; (1) current investment activities and their determinants; (2) investments that have been terminated in the past or not carried through at all; and (3) potential future investment.

Almost half of those that responded to the survey had made an investment in the sector during the last ten years. The prime motivation for these investments has been to serve local and regional markets, and not to utilize low cost opportunities. This is in line with the conclusions of previous research on overall FDI behavior into former Communist countries. We further find that access to important physical infrastructure and prior contacts with future partners were some of the most important factors when deciding on the exact investment location within Russia. The location decision was also largely influenced by the region's market size, and less by the often-mentioned and favorable factor conditions (e.g., low labor and material costs).

Our survey confirms that FDI provides countries in transition with both marketing and management know-how as well as modern technology. Important transfers from the Russians to the foreign investor also exist, and the most important of these is information about the local business environment. This is likely to be very important, especially since negotiation with local authorities is regarded as a major obstacle to FDI and since large parts of the forest sector has few of the features that characterizes a mature market economy.

In order to understand FDI behavior in the Russian forest sector it is also important to learn from projects that have been terminated in the recent past as well as planned investments that eventually were not carried through. The most important motivations for ending a business relationship with a Russian partner are that the Russian partner failed to fulfill its obligations and that the legal system was unclear. In most cases the latter reflects an

ambiguous delineation of authority between the federal and the local governments in Russia. The Russian Forestry Act of 1993 provides one example.

Unacceptable economic risks were the main cause for choosing not to invest. Of course, this answer reflects deeper-rooted problems and our survey reveals that 'technical' problems (e.g., high restructuring and relocation costs, quality of work-force and local suppliers etc.), have in general had little to do with the decision to cancel the investment plans. Rather the companies emphasize different institutional factors, such as an ambiguous legal system, difficulties in negotiating with local authorities and political instability in general.

The final issue investigated in this paper is the factors that will determine future investment into Russian forestry. Institutional and fiscal factors were given particularly high ranks by the Nordic firms. The future development of the legal system, the political environment and tax policies will thus largely influence the future willingness to invest in the sector. The survey results also indicate that in general *quality* issues seem to be more important than *costs*. This difference is most striking when it comes to the labor force.

Several policy implications follow from the above analysis. In general FDI into the Russian forest sector is likely to remain low until there is a fundamental change in the legal and political systems. In particular future Russian FDI laws have to avoid the present ambiguity about the different levels of jurisdiction. They need also to include clear definitions of property rights and sanctions that support contractual agreements. Further, Russian authorities need to adopt a tax policy that treats foreign investors and domestic companies equally. In other words, laws that simply allow FDI, foreign ownership and the ability to repatriate profits are not sufficient conditions for encouraging FDI. Furthermore, our survey shows that there is probably little to gain in trying to attract FDI by referring to low labor and raw material costs. Apart from the above institutional reforms it is also adivicable to try to improve the physical infrastructure and the education level of the domestic work force. These are undertakings that are likely to encourage badly needed foreign investments into the Russian forest industry.

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APPENDIX A: A SUMMARY OF THE SURVEY

1. Current Business and Investment Activity in Russia

Which of the following business links do you currently have with/in Russia? Please note that more than one answer may apply to your company.
Exporting; importing; licensing; franchising; outward processing or 'subcontracting'; management contract; turnkey project; other contractual forms of cooperation or technology transfer; minority share in joint venture (5-50%); majority owned joint venture (51-95%); wholly owned subsidiary or branch (more than 95% share in equity); other business links; no business links whatsoever with/in Russia.

When did you first establish your current business links with/in Russia?

Have you made any investment in Russia during the last ten years? Investment here means the purchase of a (10 % or more) equity stake (stocks or full or partial ownership), with the expectation to active participation in firm management.

Have you made any investment in raw material supply in Russia?

Have you made any investment in production of pulp and/or paper in Russia?

What kind of transfers is your company supplying to its Russian partner or subsidiary?
final goods; intermediate goods; raw materials; technology transfer; marketing know-how; general management know-how; permission for using brand names; other transfers.

What kind of transfers does your company receive from your Russian partner or subsidiary?
final goods; intermediate goods; raw materials; technology transfer, information on the local business environment (e.g., etiquette, culture, laws etc.); other transfers.

It is often said that Russia offers opportunities for low cost production for export to Western markets, because costs of inputs in production (labor, capital, raw materials etc.) are

substantially lower than in Western Europe. Did you invest in the country to utilize such low cost opportunities?

It is often said that Russia offers interesting new market opportunities. Did you invest in the country to supply local markets?

When you look back at your decision to invest in Russia, to what extent did the following factors influence the exact location of the investment? Please grade the importance of each factor from 1 to 4. 4 means it was *very important*, and 1 means that it was *not important at all*.
availability of information; prior contacts with future partner; physical infrastructure (access to roads, railways, airports); political stability in the region; the legal system (e.g. property rights rules); offers by privatization agencies; tax levels and/or tax enforcement; ease of negotiations with local authorities; presence and success/failure of other foreign investors in the region; labor costs; cost of raw materials; quality of local suppliers; quality and education level of local work-force; average level of income in the region; size of population in the region; the existence of trade barriers; regional conflicts; number of competitors present in the market; protection of trademarks; other important factors.

2. Business relationships that have been terminated in the past or not carried through

Have you had business relationship(s) with Russia that have been terminated during the last ten years?

Which of the following problems primarily led to the termination of the business relationship(s)? Please note that more than one answer may apply to your situation.
economic risks were too high; exchange rate risks were too high; problems in repatriating profits; the Russian partner did not fulfill its obligations; financial constraints within our own company; political environment too uncertain; lack of physical infrastructure (roads, railways, airports etc.); legal system too ambiguous (e.g., property rights rules); negotiating with local authorities too problematic; production processes could not be relocated; quality of local work-force insufficient; labor costs too high; tax levels too high; quality of local suppliers insufficient; quality of forest raw material too low; trade barriers existed or were introduced for important markets; costs of raw materials too high; the environmental liabilities too high; restructuring costs of local facilities too high; security of working staff could not be guaranteed; other problems.

Have you, during the last ten years, considered an investment project in Russia, that you eventually decided not to carry out?

In what type of project/projects did you consider investing?
pulp and/or paper production; raw material supply; other project.

When you look back at your decision *not* to invest in Russia, to what extent did the following potential problems influence this decision? Please grade the importance of each problem from 1 to 4. 4 means it was *very important*, and 1 means that it was *not important at all.*
economic risks too high; insufficient information about the market; no appropriate partner was found; financial constraints within our own company; political environment too uncertain; lack of physical infrastructure (roads, railways, airports etc.); legal system too ambiguous (e.g., property rights rules); negotiation with local authorities too difficult and/or unreliable; production processes could not be relocated; quality and education level of local work-force insufficient; labor costs too high; tax levels and tax enforcement too high; problems in repatriating profits; quality of local suppliers insufficient; trade barriers existed for important markets; costs of raw materials too high; environmental liabilities too high; restructuring costs of local facilities too high; security of working staff could not be guaranteed; other foreign investors in the region had been unsuccessful; additional problems.

3. Potential Future Investments in Russia

Is it likely that you will seriously consider an investment project in Russia before the year 2010?

If you were to consider a new investment project in Russia, to what extent would the following factors influence your ultimate decision on whether to proceed or not? Please grade the importance of each factor from 1 to 4. 4 means it was *very important*, and 1 means that it was *not important at all.*
availability of information; prior contacts with future partners; physical infrastructure (roads, railways, airports etc.); political environment; development of the legal system (e.g., property right rules); offers by privatization agencies; ease of negotiations with local authorities; ability to repatriate profits; presence and success/failure of other foreign investors; labor costs; costs of raw materials; tax levels and tax enforcement; quality of local suppliers; quality of forest raw material in the region; quality and education level of local work-force; level of income in the region; size of population in the region; number of competitors present in the market; protection of trademarks; trade barriers; other factors.

APPENDIX B: A SUMMARY OF THE DISTRIBUTION OF THE ANSWERS TO THE SURVEY

Table 1 B.

The Distribution of the Answers to the Survey

Company and Country	Invested in Russia[b]	Table 2[b]	Table 3[b]	table 4[b]	table 5[b]	table 6[b]
1 (Sw)	No					X
2 (Sw)	No			X	(X)[d]	
3 (Sw)						
4 (Sw)	Yes	X	X	X		X
5 (Sw)						
6 (Sw)	No				(X)	
7 (Sw)	Yes	X	X	X		X
8 (Sw)	Yes	X	X	X	X	X
9 (Dk)						X
10 (Fi)			X		X	X
11 (Fi)	Yes	X	X	X	X	X
12 (Fi)	Yes	X	X		X	X
13 (Fi)	Yes	X	X		X	X
14 (Fi)	No[c]					
15 (Fi)	Yes	X	X		X	X
16 (Fi)	Yes			X		X
17 (No)						X
18 (No)						X
19 (No)	Yes	X	X	X	(X)	X

[a] Sw is for Sweden, Fi for Finland, DK for Denmark, and No is for Norway.

[b] " " signifies that the respondents have not answered the question.

[c] This company gave this information in a letter accompanying the return of our survey.

[d] The parenthesis is to clarify that this company gave an incomplete answer to the question

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FIVE ESSAYS ON FOREST RAW MATERIALS USE IN AN INTERNATIONAL PERSPECTIVE

Författare
Mats Nilsson

Språk
Engelska

Sammanfattning
This dissertation consists of an introduction and five self-contained studies analyzing different aspects of roundwood markets. Geographically it is focused on Sweden (paper 1-3) and Russia (paper 4-5). Four of the papers (1-2, 4-5) are explicitly considering international trade and its effects and possibilities in the domestic markets. The other paper (3), only implicitly takes account of the international market (for pulpwood), in that we see a loss of competitiveness in Sweden to foreign competition. In Paper 1 we consider the possibility of market imperfections in the Swedish pulpwood market. Two methods to measure market power are used, but the results reject market imperfections. In Paper 2 we measure the substitution between imported and domestic pulpwood. Using a variable cost function for the wood raw material input, we find that the substitution possibilities between the wood raw materials input in most cases seemed high. Further, the own and cross price elasticities were generally high, strongly supporting the argument that it is the relative price that is the main factor behind the imported volumes. In paper 3, it is found that the responsiveness to economic stimuli such as prices and costs are very low, in both short and long run. There is evidence of a reduced responsiveness, lower in the in the period 1976-1996 than in the period 1958-1975. Paper 4-5 investigates the possibilities for exploiting the vast Russian forest resources. Paper 4 uses the Porter framework to analyze what .....(cont.)

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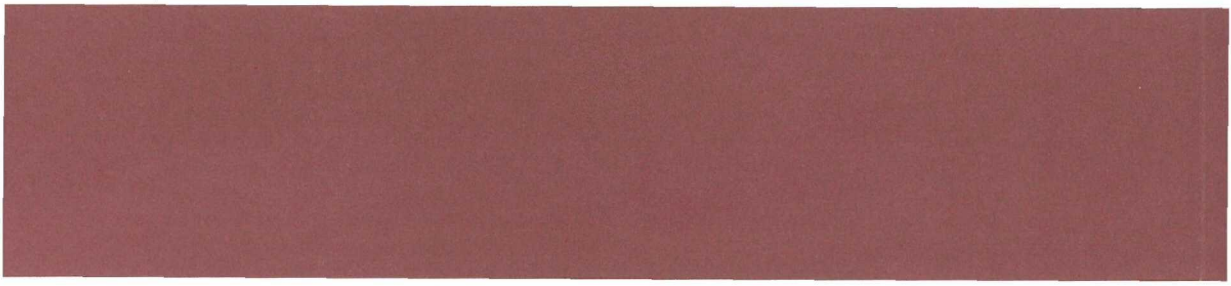

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