INCREASING RATES OF PAPER RECYCLING AND THE LOCATIONAL BEHAVIOUR OF NEWSPRINT PRODUCING FACILITIES IN EUROPE

ROBERT LUNDMARK AND MATS NILSSON*

ABSTRACT

This paper determines the impact wastepaper recovery has on the investment decision for the European pulp and paper industry, with an emphasis on newsprint production. It begins by describing the changes in newsprint production and wastepaper recovery that occurred in the past two decades. A formal model to test the hypothesised implication of increasing wastepaper recovery on the locational choice is then outlined and empirically tested on data from 13 Western European countries. We find a clear correlation between wastepaper recovery and the locational choice for newsprint investment projects, and suggest that this should have policy implications for the recycling of paper. That is, policies that increase wastepaper recovery will have a positive effect on the probability to attract newsprint investment projects.

Keywords: conditional logit model, investment, location, pulp and paper industry, wastepaper.

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INTRODUCTION

Studies of business organisation and spatial behaviour emphasize that firms' general economic, social and cultural environments are important to the location of industrial enterprises. Beginning in the late sixties and early seventies, increasing environmental concerns led to an increase in wastepaper supply in Europe. Although wastepaper is not a new input in papermaking, this increase could be expected to have an impact on the location of paper production, and changes in the supply of wastepaper represent an important change for the European pulp and paper industry.

* Robert Lundmark, Luleå University of Technology, Division of Economics, SE-971 87 Luleå. Email: Robert.Lundmark@ies.luth.se. Mats Nilsson, Swedish Competition Authority, SE-103 85 Stockholm. Email: Mats.Nilsson@kkv.se.

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JOURNAL OF FOREST ECONOMICS, ISSN 1104-6899. © 2001 Department of Forest Economics, The Swedish University of Agricultural Sciences, SE-901 83 Umeå, Sweden. Manuscript received 2000-03-03. Revised manuscript accepted 2001-09-12.

Steed (1971) describes five major determinants of location: (1) cost conditions; (2) demand conditions; (3) governmental actions; (4) social and cultural *milieu* and; (5) influence of independent firms. An interrelationship between cost considerations and governmental actions is likely to exist. Governmental actions will, most likely, change the cost structure within a country. It can, however, be of interest to separate these factors to analyse causes and effects more precisely. There are, to our knowledge, no ranking of the importance of these factors. Neo-classical economic theory tends to emphasize the importance of cost conditions (1) for the location of firms (Wheeler & Mody, 1992; Bartik, 1985). Interestingly enough, some literature suggests that forest investment flows into the transition economies in Eastern Europe are driven by cost considerations, while other found that demand conditions (2) are generally more important (Justman, 1994; Nilsson & Söderholm, 1999). Governmental actions (3) range from clear-cut policies to attract firms, such as tax rebates, to more general infrastructural factors. There is a vast, but inconclusive, literature on the impact of taxes on the locational choice in different states in the US (Bartik, 1985; Carlton, 1983; Luger & Shetty, 1985; Wheeler & Mody, 1992). The last two components: social and cultural *milieu* (4) and influence of independent firms (5) are important, but their qualitative nature usually requires case study methods.

In this paper, we focus on the neglected effect that decisions on recycling rates and investments in infrastructure for paper recovery could have on locational decisions. We propose that these policy decisions will be manifested in, for example, higher recycling rates, thus a larger supply of raw material to the paper industry. We will not explicitly account for the differences in governmental policy concerning industry location in general and recycling of wastepaper in particular. In this study, we are going to assume that the firms involved consider the Western European countries' social and cultural *milieu* as well known, and thus there are no managerial preferences for one country over another. Further, we assume that all actors investigated have the same amount of influence on the industry. Although these assumptions are heroic, we still suggest that the remaining three components leave enough material to draw some policy implications and to

forecast structural changes in the Western European pulp and paper industry.

Since wastepaper is becoming an increasingly important raw material in paper production, the present study constitutes an enquiry on how the location decisions of new capacity investment projects in newsprint production will be affected. Our proposed hypothesis is that wastepaper recovery is a significant determinant in the location decision. It is important to reveal the size and direction of this variable, particularly in the sense that one wants to describe the effects on society of increased paper recycling. The impact on economies such as Sweden and Finland, that are heavily dependent on the forest industry, may be considerable. Hence, the purpose is to estimate the relative significance that wastepaper has on the location decision for newsprint investment projects.[1] In this paper we try explicitly to measure the effect that the supply of wastepaper has on locational choices in the paper industry in Western Europe.

We begin by describing investments in newsprint production in Western Europe from 1962 to 1998. Further, we briefly survey the literature on locational choice with particular focus on the pulp and paper industry. We then present a model to test the proposed hypothesis, describe the data, and then analyse the empirical results of the model.

INVESTMENTS IN NEWSPRINT PRODUCTION AND THE DEVELOPMENT OF PAPER RECYCLING IN WESTERN EUROPE

Newsprint production in Western Europe has more than doubled between 1961 and 1998 (Figure 1). This development, which applies to all important paper qualities, has implications for the demand and supply of raw materials used in the papermaking process. On the demand side of the market, there has been an increase in demand for raw

[1] As investment variable we use the actual number of investment projects, not the size of these investments. This discrete variable is chosen in an attempt to lessen the chance to include investments that are done only to maintain a certain level of production. Since we are interested in increases in production capacity, and its causes, it is inappropriate to use the size of investments instead of the frequency distribution of investment projects.

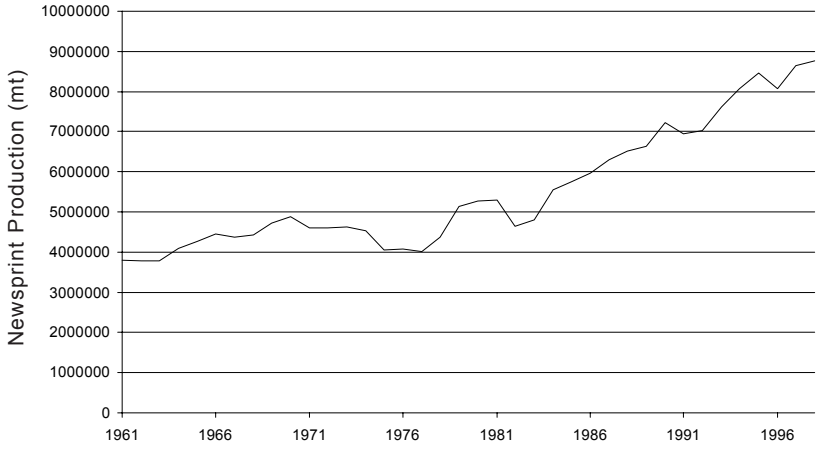

FIGURE 1. THE DEVELOPMENT OF NEWSPRINT PRODUCTION, EC 15, 1961–1998. SOURCE: FAOSTAT.

materials. At the same time, the increase in production of newsprint also generates a larger potential supply of secondary fibre for papermaking. Generally, recycled paper is less expensive than forest raw material, so the paper industry is interested in using more recycled paper and less virgin fibres. The technological constraints on the use of recycled paper are the length and strength of the recycled fibre. This makes the requirements of the recycled paper used in, for example, kraftliner more stringent than the recycled paper used when making newsprint. Further, the less rigorous requirements on recycled paper in newsprint production also increases potential supply, thus lowering the price.

This increase in newsprint production is partly the result of the capacity expansion by the 52 reported investment projects that were carried out between 1985 and 1995. The changes in the industry are characterised by inertia, since once the capital investments are made they usually have a lifetime of at least 25–30 years. Hence, it is of interest to study particularly the investments and re-investments that have taken place within a longer time period. We have accessed capacity investment data for 11 years in the newsprint industry. The frequency distribution of capacity investment projects is presented in Table 1. For the sake of convenience, investments resulting in less than 10,000 metric tons per year in increased capacity are dropped.

TABLE 1. NEWSPRINT INVESTMENT PROJECTS, 1985–1995. SOURCE: FAO, PROJECTED PULP AND PAPER MILLS IN THE WORLD.

Country	Year											
	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	Total
Austria	0	0	0	0	0	1	0	0	0	0	0	1
Belgium	0	0	0	0	0	0	0	0	0	0	0	0
Finland	0	0	0	2	1	0	0	0	1	0	1	5
France	0	0	1	3	0	2	2	0	0	0	1	9
Germany	0	0	0	0	2	0	0	0	0	4	0	6
Greece	0	0	0	0	0	0	0	0	0	0	0	0
Italy	0	0	0	1	0	0	0	0	0	0	0	1
Netherlands	0	0	1	0	1	0	0	0	0	0	0	2
Norway	0	0	0	2	0	0	1	1	0	0	0	4
Spain	0	0	0	0	0	1	1	1	1	0	0	4
Sweden	2	1	0	3	1	0	1	1	0	2	0	11
Switzerland	0	0	1	0	0	0	0	0	0	1	0	2
UK	1	1	0	0	2	0	1	0	0	0	2	7
Total	3	2	3	11	7	4	6	3	2	7	4	52

The amount of recycled paper has drastically increased in all studied countries between 1985–1995. In Greece, for example, the amount of recycled paper increased 356 percent. Even though Greece started at a comparatively low level, considering its population and paper consumption, there has been a tremendous increase in recycled paper. On the other hand, Sweden was the country that had the smallest increase of 50 percent. This can be explained by Sweden's early and extended recycling programs which made the starting levels in 1985 high compared to other countries.

PREVIOUS RESEARCH

There is a large literature focusing on different aspects of investments. Disciplines such as economics, geography, finance, strategic management, marketing and organisational behaviour have all contributed to our understanding of investment behaviour. In this section, we briefly review previous research that deals with why firms wish to locate in certain regions or countries, and what might prevent them from doing so. For our purpose, many of the

TABLE 2. A SAMPLE OF EARLIER EMPIRICAL AND THEORETICAL STUDIES ON LOCATIONAL CHOICES.

Study	Scope	Method	Main findings and contributions
Townroe (1969)	Theoretical paper	N.A.*	Both new plants and expansion of existing plants matter.
Steed (1971)	Theoretical paper	N.A.*	Identifies environmental considerations facing plant adaptations.
Nishioka & Krumme (1973)	Japan and the USA	Survey of case studies	In which stage in the location decision the survey is made matters (ex post or ex ante).
Carlton (1979)	USA, 1967-1971, 1972-1975SIC 3079,3662,3679	Econometric, Conditional Logit model	One of the first econometric estimations on locational choice. Uncovers some significant economic effects.
Bartik (1985)	USA, 1972-1978 Manufacturing industry	Econometric, Conditional Logit model	Corrects for two problems in applying conditional logit to business location decisions: the implausibility of the independent-of-irrelevant alternatives and the use of aggregated choices. Tax and unionisation rates matter.
Luger & Shetty (1985)	USA, 1979-1983SIC 283,355+356,371	Econometric, Logit model	Agglomeration economies, effect of promotional policy differs between industries, the effect of tax rates is unclear.
Wheeler & Mody (1992)	Selected countries, 1982-1988, Total manufacturing, Electronics	Econometric, OLS	Incorporates 'classical' location factors as well as agglomeration benefits and risk. Use OLS to fit a translog expenditure function. Concludes that the risk factors are of minor importance.
Friedman, Gerlowski & Silberman (1992)	FDI** into the US, 1977-1988 Manufacturing	Econometric, Logit model	Access to markets, labour market conditions, taxes and promotional efforts are significant factors.
Justman (1994)	USA, 1977, 1982, 1987, Manufacturing	Econometric and statistical analysis	Industries for which transportation costs of both material inputs and final product are only a small fraction of production cost, nevertheless tend to locate near the market due to information externalities that impart an advantage.

*Notes: * Not Applicable, ** Foreign Direct Investments.*

TABLE 3. EARLIER EMPIRICAL STUDIES ON LOCATIONAL CHOICES IN THE PAPER INDUSTRY.

Study	Scope	Method	Main findings and contributions
Lindberg (1953)	Sweden 1830-1939	Spatial allocation	Closeness to transportation network more important than closeness to forests when locating within Sweden.
Hunter (1955)	US 1880-1950	Spatial allocation	Structural changes caused largely by development in new technologies.
Barr & Fairbairn (1974)	Kraft pulp mills, B.C., Canada, 1961-1970	Interviews	Analyse backward and forward linkage and governmental contribution to locational decision. Conclude that all three are of significance.
Hayter (1978)	B.C., Canada, 1960-1970	Interviews	At regional scale mainly raw material orientated location decisions. Within regions, wood supply was identified as one of six principal location factors.
Zavatta (1993)	European pulp & paper industry	Descriptive	Describes the structure, market conditions and relevant factors for the European pulp and paper industry.
Lyndhurst (1997)	Global pulp & paper 1980-90s	Case Study	Environmentalism matters for spatial patterns of production and international wastepaper trade.
Nilsson & Söderholm (1999)	FDI* in Russia, 1990-1999	Survey	Access to markets and institutional stability most important determinants of FDI.

*Note: * Foreign Direct Investments.*

issues raised in this literature may be neglected. Nevertheless, a rough theoretical framework will be helpful. Our literature survey is divided into two parts. First we review earlier empirical studies that are of interest methodologically, or are often cited. The second part concerns all the studies dealing with locational choices in the pulp and paper industry. Table 2 presents a sample of earlier empirical and theoretical studies on locational choices.

The studies in Table 2 are often cross-sectional in nature, thus lacking the insights that industry studies may offer; but the results are more general. In our case, more emphasis can be added to the types of raw materials used in the pulp and paper industry. A vast majority of the studies concerns the US, with the particular environment that is prevalent there (e.g. same language and currency in all the states). This makes it, in our view, more urgent to conduct European studies. Most US studies put some emphasis on tax issues, or other related location promotion variables. Table 3 summarises earlier empirical studies on locational choices in the paper industry.

The larger part of previous research, on location of pulp and paper mills (Table 3), was focused on specific location conditions, such as markets, taxes, local subsidies, transportation, personal preferences and the like, with the objective of establishing or rejecting their significance as location determinants. Our contribution to the above mentioned literature is to focus on paper recycling and its effect on locational choice for newsprint production. Recycling of paper may have this often unaccounted effect on investments and employment, an effect that, to our knowledge, has never been estimated. Lyndhurst (1997) and Zavatta (1993) argue that wastepaper should have an impact on the structure of paper production in Europe, and hence, on the location of newsprint investment projects. Lyndhurst (1997) claims that such a structural change is under way, but provides little empirical evidence.

AN ECONOMETRIC MODEL OF THE SPATIAL DISTRIBUTION OF INVESTMENT PROJECTS IN THE NEWSPRINT INDUSTRY

In this section, a model for the country-level determinants of the frequency distribution of newsprint investments across 13 European countries between 1985 and 1995 is developed, without country specific dummy variables.[2] It is assumed that a firm will choose to invest in a particular country if doing so will maximise profits.[3] In this frame-

[2] By omitting country specific dummies we deliberate assumes that cultural considerations, etc do not affect the location decision.

[3] We use a static model of the investment decision. It is appropriate if firms discount future profits heavily or if they base expectations of future values of the independent variables for each country on current values (Head, 1999).

work, country attributes are observed rather than the characteristics of individual firms. Furthermore, in the discrete choice framework, the observed dependent variable is an indicator of which country was preferred by the investor. All that is known about the other countries is that they were judged inferior to the chosen one. The underlying functional form for **x** is assumed to be log linear.

$$\pi \text{ (country } j \text{ for firm } t) = \pi_{jt} = \boldsymbol{\beta}'\mathbf{x}_j + u_{jt} \qquad (1)$$

where p is profit and $\mathbf{x}_j$ is the vector of observed attributes for country j and $\boldsymbol{\beta}$ is the parameter vector to be estimated. If a firm chooses country j it is assumed that p_{jt} is the profit maximum among the rest of the countries. The model is made operational by a particular choice of distribution for the disturbances. McFadden (1974) has shown that if the J disturbances are independent and identically distributed with Weibull distribution then the probability of choosing country a is

$$\text{prob}[y_t = a] = \frac{\exp(\boldsymbol{\beta}'\mathbf{x}_a)}{\sum_{j=1}^{13}\exp(\boldsymbol{\beta}'\mathbf{x}_j)} = P_a \qquad (2)$$

where y_t is the frequency of the choice made - a random variable that indicates the choice made. The maximum likelihood estimate of $\boldsymbol{\beta}$ is obtained by maximizing the likelihood function

$$L(\boldsymbol{\beta}) = \prod_{j=1}^{13}\text{prob}(j) \qquad (3)$$

The probability of choosing a specific country for investments depends on the level of the attributes that affect its profits relative to the levels of these attributes in other countries. The location decision for the investment is based upon factors that affect revenues and costs and how they vary over space.

EMPIRICAL IMPLEMENTATION OF THE MODEL

The problem of location of industrial plants has traditionally been restricted to new plants, where the location decision is seen as the last one of a series of investment decisions. A more comprehensive approach, however, does appear, in many respects, to be more valuable (Townroe, 1969). That is, one that covers the location of all new productive capacity including both expansion and new plants. Hence, we study the 52 capacity increasing newsprint projects that began (or were scheduled to begin) between 1985–1995, as recorded by the Food and Agriculture Organisation of the United Nation (FAO). For each

TABLE 4. SUMMATION OF THE DEPENDENT AND INDEPENDENT VARIABLES (EXPECTED SIGN OF ESTIMATED PARAMETER WITHIN PARENTESIS).

Variable	Definition	Unit	Source
Invest	Newsprint investment projects	Number of occurrences	FAO, Projected Pulp and Paper Mills in the World.
Waste (+)	Wastepaper recovery	1,000 metric tons	Paper Europe Reference Manual. Paper European Data Book.
Forest (+)	Standing volume of forest	Millions cubic metre over bark	Paper Europe Reference Manual. Paper European Data Book.
Eprice (–)	Real electricity price	US cents per kWh (including tax)	IEA, Energy Prices and Taxes.
Wage (–)	Real hourly wage	US$ per hour	ILO, Yearbook of labour statistics. UN, Industrial Statistics Yearbook. ISTAT, Italy in Figures.
Income (+)	Real GDP per capita	Millions, GDP per capita (at market prices, constant 1987 US$)	World Bank, World development indicators (CD-ROM). UN, Demographic Yearbook.
Papcap (+)	Paper consumption per capita	1,000 metric tons per capita	CEPI Annual Statistics. UN, Demographic Yearbook.
Tax (–)	Tax on income, profit andcapital gains	Percentage of revenue	World Bank, World development indicators (CD-ROM).

investment project, information is given on the year of completion, type of product and net capacity increase. For the sake of convenience, investments resulting in less than 10,000 metric tons per year in increased capacity are dropped. The independent variables are the characteristics of the 13 countries as viewed by the firms. Table 4 summarises the dependent and independent variables.

Cost Considerations

When considering the first of Steed's (1971) location determinants, the cost conditions, it is important to, not only identify, but also to quantify, relevant cost variables facing the newsprint production in particular.

First, we have the raw material inputs. The emphasis of this study is placed on the relative impact that recycled paper has on the probability for locating investments in a specific country. The newsprint producer has the choice between wastepaper and forest-based virgin materials. The production of newsprint does not have the same stringent technological requirements as, for example, the production of kraftliner. This motivates the use of a wastepaper aggregate.

Forest resources, the traditional raw material used in paper making, are measured by the standing volume of forest. This is a superior measure compared, for example, to total forest area since it captures the growth and actual availability of forest resources. Whether wastepaper and forest resources are viewed as substitutes or complements, they both should have a positive effect on the probability of attracting investments. The choice of using quantities instead of prices for the two raw material variables is linked to the nature of the wastepaper market. This market is characterised by various regulations, legislations, subsidies, etc., which makes the pricing of wastepaper a poor indicator when choosing investment site. This choice of variable also helps in providing clearer policy implications. For good comparisons, the forest resources variable is also measured in quantities.

Second, another important cost consideration facing the newsprint producer is the relative energy price. The production of newsprint is considered energy intensive. It is recognized that many mills produce a large part of their

own energy needs. About half of the industry's energy requirement is generated internally (Zavatta, 1993), but the balance must be purchased in the form of electricity or fossil fuels. The energy variable is measured by the electricity price charged to the industry and expressed in US$ per kWh. The prices are average revenues per kWh received by all public utilities from all industrial sectors. Higher electricity prices are expected to deter investment projects.

Third, the industry specific wage level measures labour market conditions. It is believed that higher wages deter investment. To obtain a comparable measure between countries, the data is first transformed into hourly wages and then converted to US$ and deflated using CPI indices.

Demand Conditions

Steed (1971) subdivides the demand conditions into two aspects. First, demand attributes, such as extent, elasticities and steadiness, on the markets in which the firm is a seller are considered. This is measured by two variables, the gross domestic product per capita and paper consumption per capita. The first variable will capture the overall economic activity in the respective country and is measured in constant 1987 US$. Both variables are expected to attract investment projects. The second variable is more industry specific and will capture unique demand considerations for the relevant industry. Second, the behaviour of competitors are more difficult to measure and is therefore omitted from the estimation.

Government Actions

Since the focus of this study is on the raw material choice facing newsprint production only a simple tax variable is included. Today's multinational corporations are able to 'move around' profits in such a manner that we find that these issues are probably of minor importance. Theoretically, taxes have a detrimental effect on the investment decision. Empirically, few studies have shown that the intuition is correct,[4] making it difficult, *a priori*, to have any assumption regarding the effect of taxes. For the purpose of this study the tax variable is the percentage of revenue

[4] For a further discussion regarding the influence of taxes on location decisions see Papke (1986).

that is based on the actual net income of individuals, on the profits of firms and on capital gains. Revenue includes all revenues from taxes, from the sale of land, intangible assets, government stocks, or fixed capital assets, or from capital transfers from nongovernmental sources. It also includes fines, recoveries, inheritance taxes and non-recurrent levies on capital. A finer, more industry specific, choice of data set would have been preferred, but lack of data prevents this.

Following Friedman *et al* (1992), we have normalized the independent variables relative to the cross-sectional mean in each year. The normalisation allows the relative ranking of countries for each determinant to change over time as countries experience uneven periods of growth and decline, while removing systematic drift in the variables due to growth trends over the sample period. The normalization, moreover, aids in the interpretation of the coefficients and in their estimation.

RESULTS

The results from the conditional logit model are presented in Table 5. Overall, the model shows significance for the variables that *a priori* were believed to be important for the location decision for newsprint investment projects. Both raw material variables are statistically significant and have the expected sign while both demand variables for finished newsprint are insignificant. This indicates that newsprint production is raw material orientated. Both the wage and tax variables are statistically insignificant and do not

TABLE 5. CLM RESULTS WITH RANDOM EFFECTS.

	Independent Variables						
	Waste	*Forest*	*Eprice*	*Wage*	*Income*	*Papcap*	*Tax*
Coefficient	0.64	0.28	–1.53	0.11	0.22	0.79	0.06
T-ratio	2.98	1.93	–2.1	0.13	0.22	0.92	0.13
Likelihood function: –119.3							

exhibit the expected sign. The energy variable is statistically significant and exerts the expected pull on investment projects.

The coefficients can be interpreted as elasticities,[5] meaning that a one percent increase in independent variable *k* relative to the cross-sectional mean will cause approximately a *b* percent change in the estimated probability. A one percent increase in wastepaper recovery would increase the probability for a country to attract investment projects by 0.64 percent. Similarly, a one percent increase in the standing volume of forest would increase the probability for a country to attract investment projects by 0.28 percent. Since the forest is, in a way, self generating, time itself would affect the probability, given the absent of external effects. The electricity elasticity has by far the largest impact on the probability. A one percent increase in electricity price would decrease the probability for a country to attract investment projects by 1.53 percent. This is indeed a large impact. Previous research has found elasticities for electricity ranging between –1.3 to –0.035 (Bartik, 1989; Papke, 1986). However, Carlton (1979) estimates the impact of electricity price for US states without natural gas on the establishments of new plants for fabricated plastic products and finds similar high elasticities.

Table 6 presents the estimated probabilities for a specific country being the target for a investment project. The probabilities ranges from 0.013 (Greece) to 0.211 (Sweden). Thus, *ceteris paribus,* Sweden has the highest probability of attracting new investment projects. Furthermore, the model does a good job in predicting the investment projects location. The correlation between the actual and predicted location is 0.90, which must be considered good.

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[5] The coefficients have the following elasticity-like interpretation:

$$\frac{\partial \ln P_a}{\partial \ln x_{al}} = \beta_l x_{al}\left(1-\overline{P}_a\right)$$

where $\overline{P}_a$ is the average estimated probability ($\overline{P}_a \approx 0.077$), x_{al} is the lth element of the attribute vector $\mathbf{x}_a$ and β_l is the lth element of the coefficient vector $\boldsymbol{\beta}$. Because the means of the independent variables equal unity, an effect of the normalisation, the estimated coefficients can roughly be interpreted as elasticities.

TABLE 6. PROBABILITIES AND PREDICTED VERSUS ACTUAL INVESTMENT PROJECTS.

	Countries						
	Austria	Benelux	Finland	France	Germany	Greece	Italy
Probability	0.041	0.033	0.08	0.179	0.138	0.013	0.049
Predicted	2	2	4	9	7	1	3
Actual	1	0	5	9	6	0	1

	Countries					
	Netherlands	Norway	Spain	Sweden	Switzerland	UK
Probability	0.05	0.057	0.037	0.211	0.029	0.083
Predicted	3	3	2	10	2	4
Actual	2	4	4	11	2	7

DISCUSSION

The purpose of this study was to find the relative impact wastepaper recovery has on the location decision for newsprint investment projects. When analysing wastepaper, the usual approach is from a consumer or society perspective. However, this paper focuses on the paper industry and how it will be affected as a consequence of increasing wastepaper recovery. We believe that we have managed to identify the major input factors used by the newsprint industry. There are others, but they constitute a small fraction of the total usage and, hence, should not in any significant way alter the results obtain herein.

The results indicate that wastepaper recovery has a positive effect on the number of investment projects that a country receives. It also implies that paper recycling has broader implications than mere environmental concerns and resource scarcity. By increasing paper recovery, a country might experience economic growth due to an increasing number of investments. However, no attempt is made to try and measure this contribution, which could become a future research project.

Furthermore, the results show that the newsprint investments are input orientated, with raw materials playing an important role. This should come as no surprise to those involved in the industry, even in the absence of supporting empirical results. The fact that both demand variables were statistically insignificant supports this conclusion. Given the smallness of Europe and the free trade agreement, demand in a specific country is not of significance.

REFERENCES

Barr, B. M. & Fairbairn, K. J., 1974. Some Observations on the Environment of the Firm: Locational Behavior of Kraft Pulp Mills in the Interior of British Columbia. *Professional Geographer*, 26 (1), 19–26.

Bartik, T. J., 1985. Business Location Decision in the United States: Estimates of the Effects of Unionization, Taxes, and Other Characteristics of States. *Journal of Business & Economic Statistics*, 3 (1), 14–22.

Bartik, T.J., 1989. Small Business Start-Ups in the United States: Estimates of the Effects of Characteristics of States. *Southern Economic Journal*, 55 (4), 1004–1018.

Carlton, D. W., 1979. Why New Firms Locate Where They Do: An Econometric Model. In *Interregional Movement and Regional Growth*, edited by William Wheaton (Washington D.C.: The Urban Institute), 13–50.

Carlton, D. W., 1983. The Location and Employment Choices of New Firms: An Econometric Model with Discrete and Continuous Endogenous Variables. *Review of Economics and Statistics*, 65, 440–449.

CEPI., 1991–98. *Annual Statistics* (Brussels: CEPI).

FAO., 1985–95. *Projected Pulp and Paper Mills in the World* (New York: UN).

Friedman, J., Gerlowski, D. & Silberman, J., 1992. What Attracts Foreign Multinational Corporations? Evidence From Branch Plant Location in the United States. *Journal of Regional Science*, 32 (4), 403–418.

Hayter, R., 1978. Locational Decision-Making in a Resource-Based Manufacturing Sector: Case Studies from the Pulp and Paper Industry of British Columbia. *Professional Geographer*, 30, 240–249.

Head, C., Ries, J. C. & Swenson, D. L., 1999. Attracting Foreign Manufacturing: Investment Promotion and Agglomeration. *Regional Science and Urban Economics*, 29, 197–218.

Hunter, H., 1955. Innovation, Competition, and Locational Changes in the Pulp and Paper Industry: 1880–1950. *Land Economics*, 31, 314–327.

IEA., 1992–97. *Energy Prices and Taxes* (Paris: OECD).

ILO., 1995. *Yearbook of Labour Statistics* (Geneva: ILO).

ISTAT., 1997. *Italy in Figures* (Rome: ISTAT).

Justman, M., 1994. The Effect of Local Demand on Industry Location. *Review of Economics and Statistics*, 79 (4), 742–753.

Lindberg, O., 1953. An Economic – Geographical Study of the Localization of the Swedish Paper Industry. *Geografiska Annaler*, 35 (1), 28–40.

Luger, M. I., & Shetty, S., 1985. Determinants of Foreign Plant Start-Ups in the United States: Lessons for Policymakers in the Southeast. *Vanderbilt Journal of Transnational Law*, 18, 223–245

Lyndhurst, C., 1997. Environmentalism and Restructuring of the Global Pulp and Paper Industry. *Tijdschrift voor Economische en Sociale Geografie*, 89 (4), 401–415.

McFadden, D., 1974. Conditional Logit Analysis of Qualitative Choice Behavior. In *Frontiers in Econometrics,* edited by P. Zarembka (New York: Academic Press), 105–142.

Nebebe, F. & Kira, D., 1992. Estimating Elasticities in Pulp and Paper Industry: An Econometric Analysis of Canadian Regions. *Journal of Quantitative Economics*, 8 (2), 451–466.

Nilsson, M. & Söderholm, P., 1999. *Nordic Foreign Direct Investment in the Russian Forest Sector*. Luleå University of Technology. Unpublished manuscript.

Nishioka, H. & Krumme, G., 1973. Location Conditions, Factors and Decisions: An Evaluation of Selected Location Surveys. *Land Economics*, 43, 195–205.

Paper Europe Reference Manual, Annual issues (England: Whitmar Publications Limited).

Paper European Data Book, Annual issues (England: Benn Publications Limited).

Papke, L. D., 1986. The Location of New Manufacturing Plants and State Business Taxes: Evidence from Panel Data. *Proceedings of the 79th Annual Conference of the National Tax Association*, November 1986, 44–55.

Steed, G. P. F., 1971. Plant adaption, Firm environments and Location analysis. *The Professional Geographer*, 23, 324–328.

Townroe, P. M., 1969. Locational Choice and the Individual Firm. *Regional Studies*, 3, 15–24.

UN., 1991. *Industrial Statistics Yearbook* (New York: UN).

UN., 1993–97. *Demographic Yearbook* (New York: UN).

Wheeler, D. & Mody, A., 1992. International Investments Location Decisions: The Case of US Firms. *Journal of International Economics*, 33, 57–76.

World Bank. *World Development Indicators*. CD-ROM.

Zavatta, R., 1993. The Pulp and Paper Industry. In *The Structure of European Industry*, edited by H. W. de Jong (Netherlands: Kluwer Academic Publishers), 91–119.