

**Wilfried PUWEIN**

## **PRICE FORMATION ON THE MARKET IN ROUNDWOOD IN AUSTRIA**

*This study investigates the price formation process for roundwood in Austria. The prices of roundwood are determined mainly by the export prices for wood products and thus by the world market. This is particularly true for the highly competitive market in sawlogs where the fluctuations of export prices for sawnwood directly affect domestic roundwood prices. The strong market position of the domestic paper industry is the reason why international pulp prices have a delayed and weaker effect on pulpwood prices in Austria. The alternative uses of small diameter logs explain the influence of sawlog and energy prices on the price of pulpwood. Large-scale events that cause damage to forests hardly have any influence on the price formation of sawlogs. In the past three decades roundwood prices have risen less steeply than sawnwood and pulp prices.*

**Keywords:** price formation, supply, demand, roundwood prices, roundwood market, Austria

### **Introduction**

Austria is a relatively small country with open economy. Around 60 percent of sawnwood production and over 80 percent of paper production have been exported in recent years. One-third of the roundwood processed and worked in Austria came from outside the country. The domestic wood industry is thus strongly dependent on the world market. Under conditions of perfect competition, the price fluctuations of wood products on export markets would have a direct effect on roundwood prices in Austria. Structural divergences from this perfect environment could be an indication of a strong market position of buyers or sellers of roundwood in Austria. In short term the forced supply of timber due to natural disasters could pressure local roundwood prices. Of course the divergences should be within the scope of the margins for transport costs vs.

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foreign roundwood demand. Due to relatively low unit values of roundwood, the share of transport costs is high. Thus, structural and temporary regional price differences may be accordingly wide.

This study analyses the supply side and demand side in the roundwood market in Austria and presents a description of the price formation process. Based on monthly data, the influence of export prices for wood products on the domestic prices for roundwood has been tested. This permits conclusions to be drawn on the competitive situation on the supply and demand sides. Long-term changes in price relations between roundwood and wood products may arise due to the divergent developments in productivity of forestry and of wood processing and woodworking as well as due to the tendency for commodity shortages.

### The Roundwood Supply

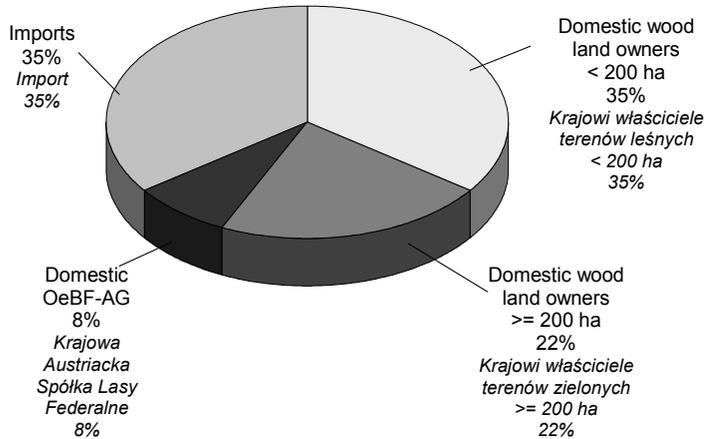
The roundwood supply and supply patterns vary widely from year to year. The following indicators represent the average values for several years. Wood consumers (and roundwood exporters) in Austria buy around 26 million m<sup>3</sup> of roundwood every year, of which:

- 35 percent is imported,
- 35 percent comes from “small forests” (i.e. 148,324 forest owners with a wooded area of less than 200 ha, average size 11 ha),
- 22 percent comes from “large forests” (1,439 forestry enterprises with forests of 200 ha and more wooded area, average size 683 ha, exclusive of the state owned *Austrian Federal Forests Enterprises – ÖBF-AG*),
- 8 percent comes from the *ÖBF-AG* (516,000 ha wooded area) (fig. 1).

Only 40 percent of the small forest owners are traditional forest farmers, that is persons who still do most of the forestry work themselves. The number of forest owners who have hardly any relation to forestry is growing; these owners delegate harvesting and marketing of timber to *Waldverbände* (forestry associations), which are cooperative organizations of forest owners. The group of the largest forest owners are private landowners, monasteries, dioceses and regional government bodies (including the *Länder*) with up to 27,000 ha forest. The *ÖBF-AG* has the legal form of a stock corporation owned by the Republic of Austria.

Due to the fragmented structure there are almost 150,000 forest owners that sell roundwood; thus, the supply side of the roundwood market meets the criteria of a competitive market. Roundwood suppliers are price-takers, i.e. they must accept the market prices resulting from worldwide wood supply and demand. Only the *ÖBF-AG* is able to set regional prices in regions where their share of forest areas is very high (such as in *Salzburg Land*) within the scope of price

margins defined by roundwood transport costs from regions outside their sphere of influence.



**Fig. 1. Roundwood supply in Austria, average 2000–2006**

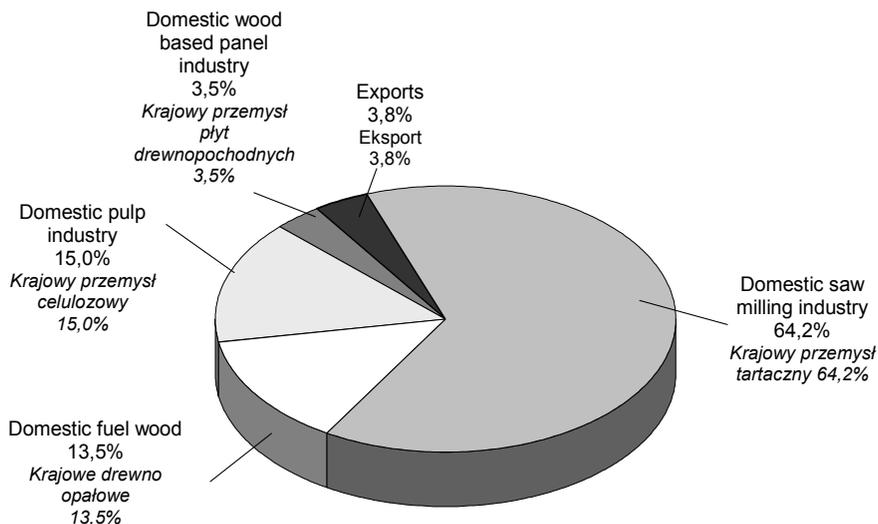
*Rys. 1. Podaż drewna okrągłego w Austrii, średnia w latach 2000–2006*

## Roundwood Demand

Roundwood comes in various qualities; its quality and the price that can be paid by buyers determine the type of use. The entire supply of timber could be used for fuel. However, given today's prices, demand for fuel wood is restricted to those types of wood that are not suitable for use by sawmills and for which the pulp and particleboard industry is not able to pay more than buyers of fuel wood. As energy becomes more expensive, but also due to state subsidy schemes for "heating systems using renewable energy sources", the use of roundwood for fuel is also becoming more competitive.

Sawmills manufacture from sawlogs (logs greater than 20 cm diameter) sawnwood (planks, beams, rafters, joists, boards, laths, scantlings, sleepers). There is competition with the pulp and wood-based panels industry concerning the supply of roundwood with diameters smaller than 20 cm. This type of wood is processed mostly into mechanical and chemical wood pulp, particle board and fibreboard. This sawing of thin logs currently produces less valuable sawnwood types and more processing residues (slabs, edgings, trimmings). Decisive for the profitability of cutting thin logs is the price of sawlogs, sawnwood and sawmill rejects, on the one hand, and pulpwood on the other.

Around 1,400 sawmills are the mainstays of roundwood demand in Austria. Of the annual average demand of 26 million m<sup>3</sup> roundwood, sawmills account for 64.2 percent (fig. 2). Over the course of recent decades there has been a strong tendency for concentration in the sawmill industry. Currently ten largest businesses account for 65 percent of sawn timber production. Nonetheless, the demand side of the sawlog market may be described as highly competitive.



**Fig. 2. Roundwood demand in Austria, average 2000–2006**

*Rys. 2. Popyt na drewno okrągłe w Austrii, średnia w latach 2000–2006*

The paper industry consists of seven companies that process 15 percent of roundwood supply (mainly logs of small diameters). Another 3.5 percent of the roundwood supply (also thinner logs) goes to the plants for the production of particle boards and fibreboards that are in turn owned by ten companies. The low number of buyers and the relatively high sensitivity of pulpwood to transport costs, as measured by the relation of unit value-to-freight rates for pulpwood, gives the wood processing companies a strong position in the regional markets for thinner logs.

Around two million households in Austria are capable of heating with wood. The possible uses are open fireplaces, wood-burning stoves, sauna stoves, tiled stoves and fuel-saving stoves as well as fully automated wood pellet heating systems. The number of wood-fired large plants for district heating and electricity generation is also growing. This fragmented demand accounts for 13.5 percent of roundwood supply, mainly the types that are not suitable for sawmills or the pulp and particle board industry.

Only 3.8 percent of the supply of wood is exported; this is mainly due to the high degree of international competitiveness of the domestic sawmill industry.

## The Price Formation Process

Fig. 3 illustrates the price formation mechanism. Austria exports up to 90 percent of wood in the form of sawnwood, pulp, paper and wood-based panels. Export prices for these wood products depend on world market prices as determined by:

- demand in large importing countries (USA, Japan, Great Britain, Italy, Germany, and now also China and India),
- supply from exporting countries (Canada, Sweden, Finland, and in the area of coniferous sawnwood also Austria).

Export prices for timber products CIF border of Austria in Euro is determined by:

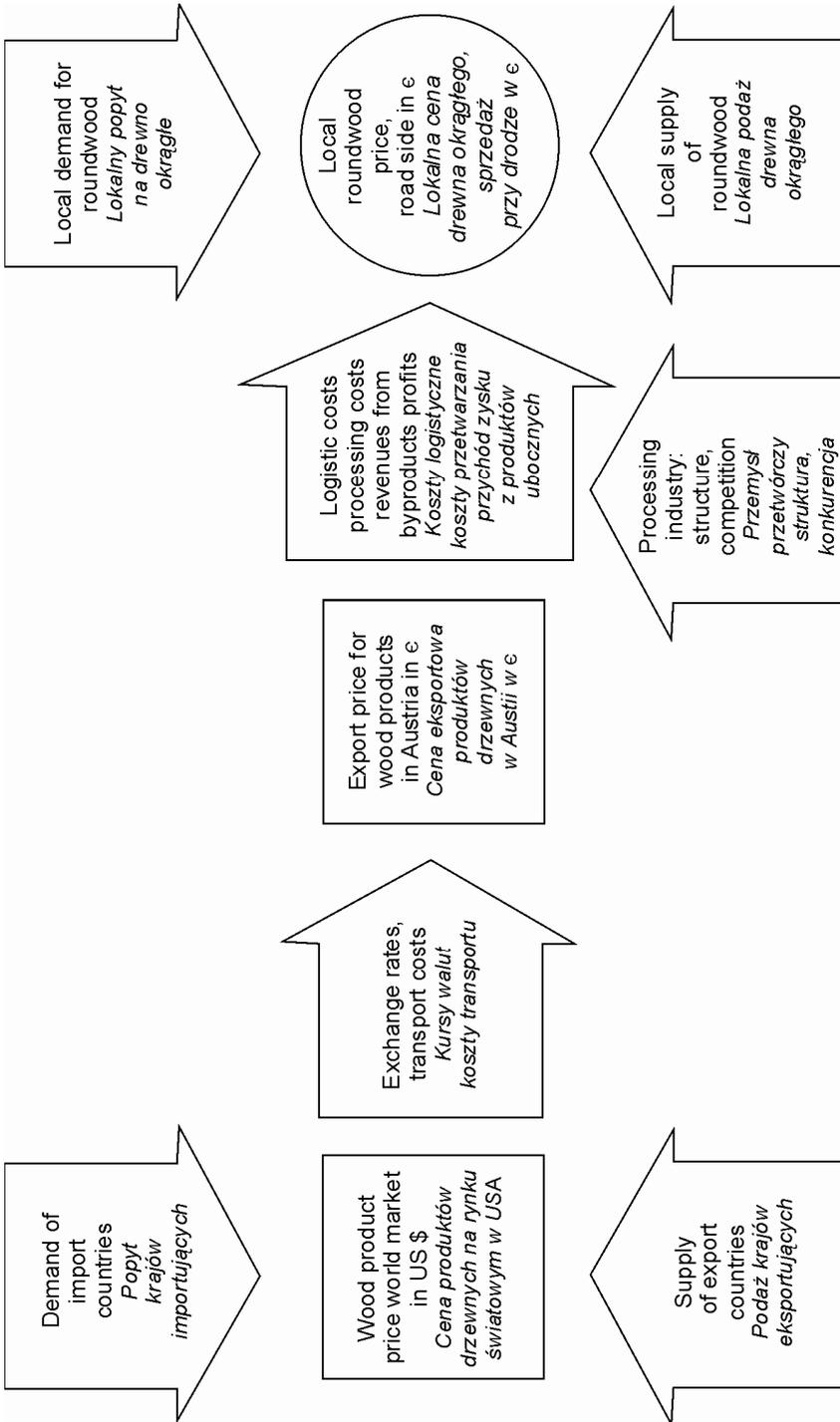
- the exchange rate vs. the USD,
- transport costs to demand markets.

Austria's most important export market is Italy. The burden of the costs for the transportation of sawnwood FOB from sawmill in Austria to Northern Italy is only a fraction of the costs that competing suppliers would incur importing from Canada or Sweden. Therefore, sawnwood export prices are accordingly higher CIF border of Austria. At times, certain transportation situations arise that result in low freight costs due to the uneven loads that make transport to even very distant markets also competitive. This explains, for example, the shipment of sawnwood from Austria to Japan: In the relation Europe-Japan, very low freight rates are charged due to the free transport capacities.

The products of the pulp industry, and in part of the wood-based panel industry, have a much higher unit value than sawnwood. This is why these wood processing companies benefit less from the advantages of the transport costs to the close-by demand markets than the sawmill industry and the suppliers of pulpwood in Austria have accordingly smaller location advantages.

The following costs are decisive for roundwood prices forest roadside:

- logistic costs for wood products FOB works to CIF Austrian border and for roundwood forest roadside to CIF works,
- the costs of wood processing and wood working,
- the revenues from rejects from wood processing and working,
- profits due to strong market positions.



**Fig. 3. Price setting in general**  
**Rys. 3. Ogólny mechanizm kształtowania cen**

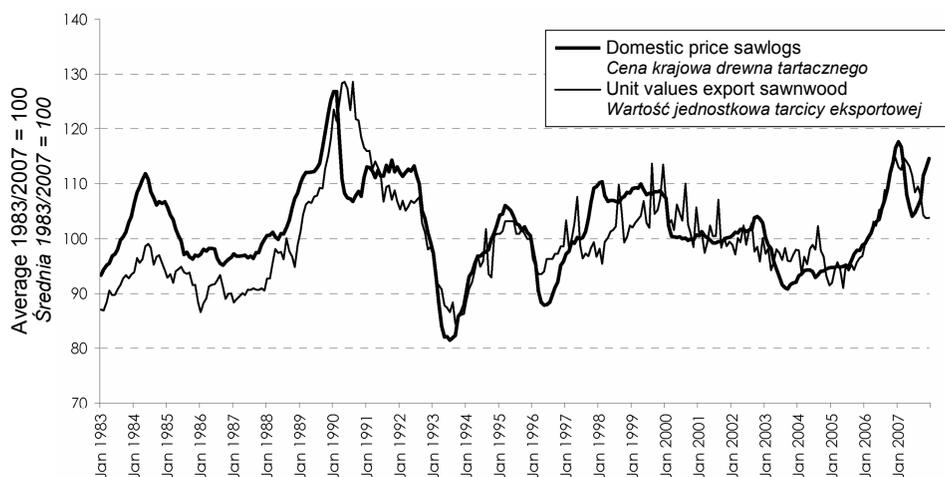
Austria has a technically well equipped and very productive sawmill industry. Sawmill rejects that were originally waste products are now in demand from the domestic pulp and particle board industry, and increasingly used for energy production (heating plants, pellets). The rejects creates revenues for sawmills that lowers the costs of sawnwood production in certain sense. Good roads and short transport distances keep the costs of transport low for wood products and roundwood. The differences in the local roundwood prices can be explained by local supply and demand relations and the transport costs to regions with other price levels. For example, the costs of transporting sawlogs by truck over 300 km are around 20 percent of the value of the freight. Under the conditions of fierce competition, companies with low wood processing and working costs and attractive sales possibilities for by-products are able to pay higher prices for roundwood and thus displace competitors from the roundwood market.

## **Factors of Influence on Roundwood Prices**

This section looks at the influence of changes in export prices (unit values) for timber products on the domestic prices of roundwood. It may be expected that the fiercer the competition and the higher the level of information of market participants, the faster domestic roundwood prices will adapt to international business cycles. The question was investigated using regression analysis with the relative differences of the monthly values versus the preceding years for the period 1982 to 2007. Furthermore, an analysis was made of whether the pressure of large quantities of damaged wood - in Austria usually the consequence of winter storms - lowers roundwood prices. To avoid infection with beetles, the damaged wood must be removed as quickly as possible. Wet storage of wood that involves, of course, manipulation and capital costs, helps to ease the selling pressure. As there are no monthly reports on damaged wood, the effects of extreme quantities of damaged wood were tested by using dummy variables. Damaged wood burdened the market for roundwood in the period investigated, especially in the first six months of the years 1990, 1994, 1996, 2003, 2004, and 2006.

### **Sawlog Prices**

In a competitive export market with efficient information flows, the fluctuations in export prices for sawnwood should have a direct effect on the domestic prices of roundwood (fig. 4). This hypothesis was investigated with respect to the dependence between coniferous sawlog prices, forest roadside (spruce, pine, "Kl. B, Media 2 B") and the export unit values of soft sawnwood, CIF Austrian border (coniferous sawnwood, > 6 mm, SITC 24820).



**Fig. 4. Monthly prices of domestic soft sawlogs and unit values of export soft sawnwood, 1983–2007**

*Rys. 4. Miesięczne ceny krajowego drewna tartaczego iglastego oraz wartości jednostkowe iglastej tarcicy eksportowej. 1983–2007*

Source: Statistik Austria, WIFO-Calculations.

*Źródło: Statistik Austria, WIFO-Calculations.*

The regression analysis (table 1) reveals a close correlation ( $R^2 = 0.48$ ) between export prices for sawn softwood and domestic prices for softwood sawlogs: 48 percent of the fluctuations of the previous year's differences in sawlog prices can be explained by the fluctuations in the differences to the previous years of sawn timber export prices. The statistically significant regression coefficient of 0.758 reveals that during the period of investigation, a 10 percent increase in sawn wood export prices in the same month made domestic roundwood more expensive by 7.58 percent on average versus the previous year. A delay in the export price variable makes the statistical correlation worse. The inclusion of the effects of timber felled by storms by using dummy variables only insignificantly improved the statistical correlation. The regression coefficient has the expected sign (greater storm-related disasters, *ceteris paribus*, pushes down sawlog prices by 2.715 percent), but has not been statistically secured. Based on annual average prices, Schwarzbauer [2007] was also only able to prove a slight influence of the fluctuations in the quantities of damaged timber on the prices of coniferous sawlogs. These findings confirm the preceding description of the characteristics of the sawlog market: A large number of buyers and sellers create a highly competitive market in which roundwood prices adjust quickly (in any case within one month) to the business cycle for sawnwood.

**Table 1. Estimation Results for Domestic Soft Sawlogs Prices***Tabela 1. Wyniki oszacowania krajowych cen drewna tartaczego iglastego*

Variable <i>Zmienna</i>	Coefficient <i>Współczynnik</i>	Standard Error <i>Błąd standardowy</i>	R <sup>2</sup>	Observations <i>Obserwacje</i>
SAX <sub>t</sub>	0,758***	0,045	0,48	300
SAX <sub>t-1</sub>	0,710***	0,048	0,42	299
SAX <sub>t</sub>	0,768***	0,045	0,49	300
DUM	-2,715*	1,257		

SAX ... Unit Value Export Soft Sawwood (SITC 24820); DUM ... Dummy variable for massive windbreaks.

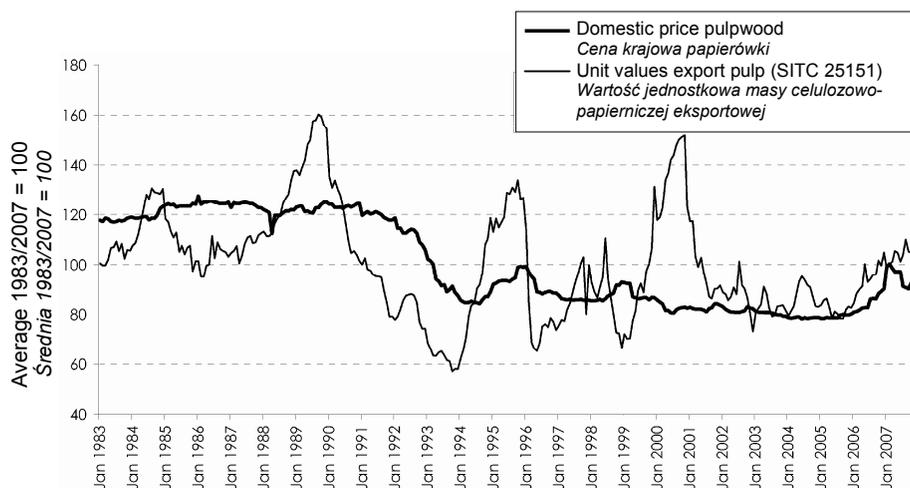
\*\*\*Indicates 1-percent level of significance, \*\*5-percent level, \*10-percent level.  
Note: Results calculated with the percentage changes against the previous year, monthly data, January 1982 to December 2007.

Source: WIFO-Calculations.

SAX ... Wartość jednostkowa tarcicy iglastej eksportowej (SITC 24820); DUM ... Sztuczna zmienna opisująca masowe wiatrolomy.

\*\*\*Wskazuje 1-procentowy poziom istotności, \*\*5-procentowy poziom, \*10-procentowy poziom.  
Uwaga: Wyniki obliczone ze zmianami procentowymi w stosunku do roku poprzedniego, dane miesięczne, styczeń 1982 do grudnia 2007.

Źródło: WIFO-Calculations.



**Fig. 5. Monthly prices of domestic soft pulpwood and unit values of export pulp (SITC 25151), 1983–2007**

*Rys. 5. Miesięczne ceny krajowej papierówki iglastej oraz wartości jednostkowe masy celulozowo-papierniczej eksportowej (SITC 25151), 1983–2007*

Source: Statistik Austria, WIFO-Calculations.

Źródło: Statistik Austria, WIFO-Calculations.

### Pulpwood Prices

This section analyses the dependence between pulpwood prices (pulpwood, spruce, pine, "1A/B"), forest roadside, and the export unit values of bleached pulp made of softwood (SITC 25151) (fig. 5) and the prices of coniferous sawlogs and fuel wood (fuel wood, soft) as well as looks into the influence of quantities of damaged timber on pulpwood prices (table 2). The estimated coefficients are statistically much less significant than those in the sawlogs analysis.

**Table 2. Estimation Results for Domestic Soft Pulpwood Prices**

*Tabela 2. Wyniki oszacowania krajowych cen papierówki iglastej*

Variable <i>Zmienna</i>	Coefficient <i>Współczynnik</i>	Standard Error <i>Błąd standardowy</i>	R <sup>2</sup>	Observations <i>Obserwacje</i>
PUX <sub>t</sub>	0,038**	0,014	0,02	300
PUX <sub>t-1</sub>	0,054**	0,014	0,05	299
PUX <sub>t-6</sub>	0,101***	0,013	0,17	294
SRW <sub>t</sub>	0,305***	0,039	0,24	300
SRW <sub>t-1</sub>	0,355***	0,037	0,24	299
SRW <sub>t-6</sub>	0,454***	0,032	0,42	294
FUW <sub>t</sub>	0,699***	0,069	0,27	300
FUW <sub>t-1</sub>	0,692***	0,069	0,26	299
PUX <sub>t-6</sub>	0,025***	0,013	0,42	294
SRW <sub>t-6</sub>	0,417***	0,038		
PUX <sub>t-6</sub>	0,042***	0,011	0,62	294
SRW <sub>t-6</sub>	0,346***	0,031		
FUW <sub>t</sub>	0,617***	0,050		

PUX ... Unit Value Export Pulp (SITC 25151); SRW ... Domestic Price Soft Sawlogs; FUW ... Domestic Price Soft Fuelwood.

\*\*\*Indicates 1-percent level of significance, \*\*5-percent level, \*10-percent level.  
Note: Results calculated with the percentage changes against the previous year, monthly data, January 1982 to December 2007.

Source: WIFO-Calculations.

*PUX ... Wartość jednostkowa masy celulozowo-papierniczej eksportowej (SITC 25151); SRW ... Cena krajowa drewna tartaczno iglastego; FUW ... Cena krajowa drewna opałowego iglastego.*

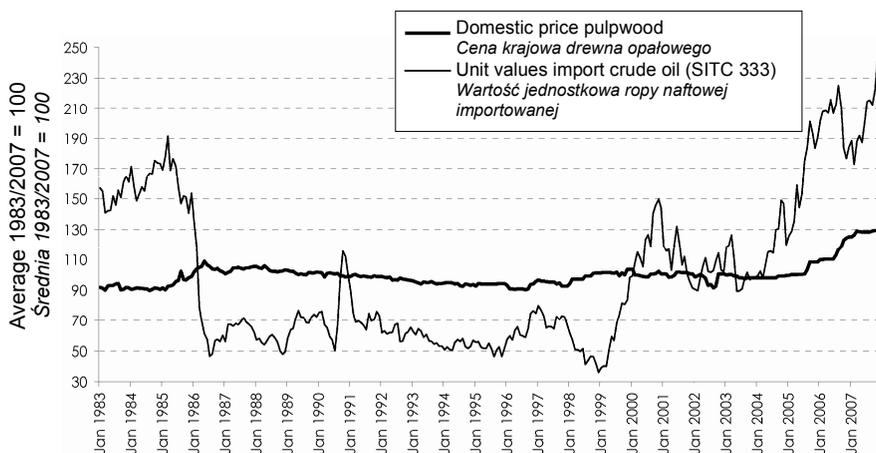
*\*\*\*Wskazuje 1-procentowy poziom istotności, \*\*5-procentowy poziom, \*10-procentowy poziom. Uwaga: Wyniki obliczone ze zmianami procentowymi w stosunku do roku poprzedniego, dane miesięczne, styczeń 1982 do grudnia 2007.*

*Źródło: WIFO-Calculations.*

Changes in export prices of pulp have an effect with a lag, with the strongest effect occurring only after six months due to changes in pulpwood prices. The influence of sawlogs prices is much greater, but also with a lag of six months. In the case of strong demand for softwood from the sawmill industry, the pulp industry is also forced to pay higher prices. A similar situation occurs for fuel wood, but the reaction of pulpwood prices to changes in the prices of fuel wood is more direct in this case. Storm damages do not have any influence on the prices of pulpwood.

### Fuel Wood Prices

Changes in the import unit value of crude oil (SITC 333) do not have any direct effect on fuel wood prices (fig. 6). The analysis of un-lagged values resulted in a regression coefficient with a minus sign (table 3). Only after a lag of six months, a positive but statistically not significant correlation was revealed. This can be explained by the also lagged effect of the oil price on the prices of other energy sources such as gas, electricity, and coal. Moreover, the switch to wood-fired heating takes some time and only afterwards does demand for fuel wood rise. Fuel wood reacts much more strongly to the price of pulpwood. In this context, there is a direct competition. Storm disasters have practically no effect on fuel wood prices.



**Fig. 6. Monthly prices of domestic soft fuelwood and unit values of import crude oil (SITC 333), 1983–2007**

*Rys. 6. Miesięczne ceny krajowego drewna opałowego iglastego oraz wartości jednostkowe ropy naftowej importowanej (SITC 333), 1983–2007*

Source: Statistik Austria, WIFO-Calculations.

Źródło: Statistik Austria, WIFO-Calculations.

**Table 3. Estimation Results for Domestic Soft Fuelwood Prices**  
**Tabela 3. Wyniki oszacowania krajowych cen drewna opałowego iglastego**

Variable <i>Zmienna</i>	Coefficient <i>Współczynnik</i>	Standard Error <i>Błąd standardowy</i>	R <sup>2</sup>	Observations <i>Obserwacje</i>
OII <sub>t</sub>	-0,017*	0,008	0,02	300
OII <sub>t-1</sub>	-0,013*	0,008	0,01	299
OII <sub>t-6</sub>	0,018**	0,008	0,02	294
PRW <sub>t</sub>	0,392***	0,036	0,27	300
OII <sub>t-6</sub>	0,020*	0,007	0,29	294
PRW <sub>t</sub>	0,394***	0,036		
OII <sub>t-6</sub>	0,020*	0,007	0,29	294
PRW <sub>t</sub>	0,394***	0,036		
DUM	-0,038	0,750		

OII ... Unit Value Import Crude Oil (SITC 333; KNO 27090090); PRW ... Domestic Price Soft Pulpwood; DUM ... Dummy variable for massive windbreaks.

\*\*\*Indicates 1-percent level of significance, \*\*5-percent level, \*10-percent level.

Note: Results calculated with the percentage changes against the previous year, monthly data, January 1982 to December 2007.

Source: WIFO-Calculations.

*OII ... wartość jednostkowa ropy naftowej importowanej (SITC 333; KNO 27090090); PRW ... Cena krajowa papierówki iglastej; DUM ... Sztuczna zmienna opisująca masowe wiatrolomy.*

*\*\*\*Wskazuje 1-procentowy poziom istotności, \*\*5-procentowy poziom, \*10-procentowy poziom. Uwaga: Wyniki obliczone ze zmianami procentowymi w stosunku do roku poprzedniego, dane miesięczne, styczeń 1982 do grudnia 2007.*

*Źródło: WIFO-Calculations.*

## Long-term Development of the Prices of Roundwood and Wood Products

Improved productivity in manufacturing and marketing has a critical influence on the long-term development of commodity prices. A general observation made is that the productivity gains in the primary sector are greater than in the secondary and tertiary sectors [Fourastié 1969]. In the area of non-renewable resources, shortages can lead to structural price increases.

### Sawlogs Prices

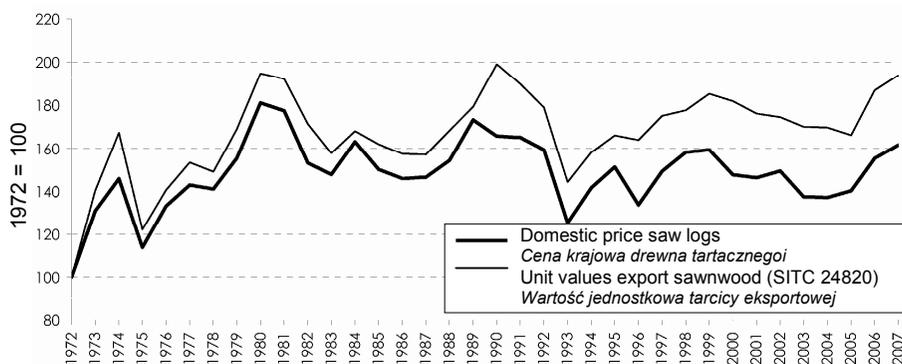
During the period 1972 to 2007, the prices of coniferous sawlogs rose on average by 1.4 percent annually and the prices of exported soft sawnwood rose by 1.9 percent (table 4). The margin for transport, processing and marketing costs concerning sawmills have also widened (fig. 7). This permits one to derive that in previous 35 years the productivity progress achieved in roundwood harvesting and removing has been greater than in the sawmill industry. A structural scarcity of the commodity of roundwood has not occurred to date.

**Table 4. Prices of Roundwood, Wood Products and Crude Oil, 1972–2007**  
**Tabela 4. Ceny drewna okrągłego, produktów drzewnych oraz ropy naftowej, 1972–2007**

	Average annual percentage rates <i>Średnie roczne wskaźniki procentowe</i>
Unit Value Export Soft Sawnwood <i>Wartość jednostkowa iglastej tarcicy eksportowej</i>	+ 1.9
Domestic Price Soft Saw Logs <i>Cena krajowa drewna tartaczno iglastego</i>	+ 1.4
Unit Value Export Pulp <i>Wartość jednostkowa masy celulozowo-papierniczej eksportowej</i>	+ 1.7
Domestic Price Soft Pulpwood <i>Cena krajowa papierówki iglastej</i>	+ 0.4
Unit Value Import Crude Oil <i>Wartość jednostkowa ropy naftowej importowanej</i>	+ 6.9
Domestic Price Soft Fuelwood <i>Cena krajowa drewna opałowego iglastego</i>	+ 3.9
Inflation Austria (Consumer Price Index) <i>Inflacja w Austrii (wskaźnik cen artykułów konsumpcyjnych)</i>	+ 3.6

Source: Statistik Austria, WIFO-Calculations.

Źródło: Statistik Austria, WIFO-Calculations.



**Fig. 7. Annual average prices of soft sawlogs and unit values of export soft sawnwood (SITC 24820), 1972–2007**

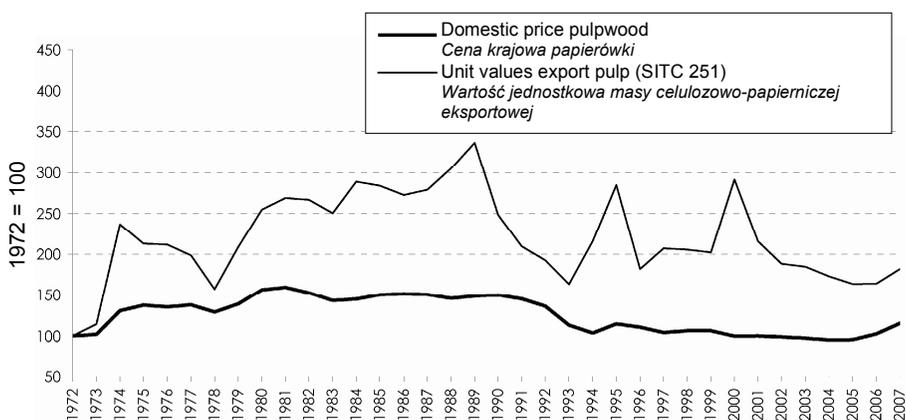
**Rys. 7. Średnie roczne ceny drewna tartaczno iglastego oraz wartości jednostkowe iglastej tarcicy eksportowej (SITC 24820), 1972–2007**

Source: Statistik Austria; WIFO-Calculations.

Źródło: Statistik Austria; WIFO-Calculations.

### Pulp Wood Prices

Since 1972 prices for coniferous pulpwood have increased on average by only 0.4 percent annually (table 4), while pulp prices have risen by 1.7 percent annually. Unlike the market for sawlogs, on the pulpwood market the strong economic fluctuations in pulp prices were hardly passed on to pulpwood prices, but were largely absorbed in the margins for wood processing industries (fig. 8). Due to an increasing demand for fuel wood, the prices for pulpwood decreased only slightly in last economic contraction in 2000/2005 and climbed again in 2006/2007 along with pulp prices.



**Fig. 8. Annual average prices of soft pulpwood and unit values of export pulp (SITC 251), 1972–2007**

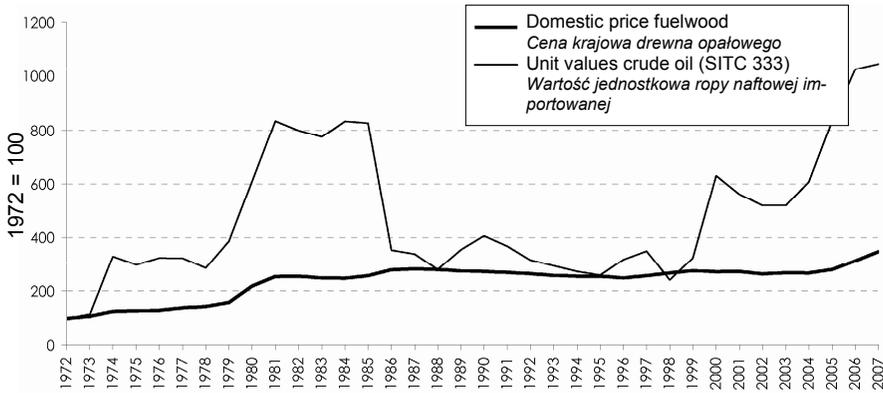
*Rys. 8. Średnie roczne ceny papierówki iglastej oraz wartości jednostkowe masy celulozowo-papierniczej eksportowej (SITC 251), 1972–2007*

Source: Statistik Austria; WIFO-Calculations.

Źródło: Statistik Austria, WIFO-Calculations.

### Fuel Wood Prices

Of all types of wood, fuel wood has become the most expensive since 1972 (on average by 3.9 percent annually). This increase in the price is a consequence of higher demand due to the steepening of oil prices. In comparison import prices for oil increased on average by 6.9 percent annually (table 4). Fuel wood prices increased strongly along with the surge in oil prices in the period from 1974 to 1984 (fig. 9). Investments were made into new improved wood-burning installations. The higher demand for fuel wood remained intact even after oil prices decreased in the period from 1985 to 1988. The most recent surge in oil prices triggered again a movement in fuel wood prices as of 2004. Fuel wood will profit over the long term from shrinking of energy resources.



**Fig. 9. Annual average prices of soft fuelwood and unit values of import crude oil (SITC 333), 1972–2007**

*Rys. 9. Średnie roczne ceny drewna opałowego iglastego oraz wartości jednostkowe ropy naftowej importowanej (SITC 333), 1972–2007*

Source: Statistik Austria; WIFO-Calculations.

Źródło: Statistik Austria, WIFO-Calculations.

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## KSZTAŁTOWANIE CEN NA RYNKU DREWNA OKRĄGŁEGO W AUSTRII

### Streszczenie

Zbadano proces kształtowania się cen drewna okrągłego w Austrii. Ceny te są uwarunkowane głównie przez ceny eksportowe produktów drzewnych, a tym samym przez wpływ rynku światowego. Znajduje to odzwierciedlenie szczególnie w przypadku wysoce konkurencyjnego rynku drewna tartaczego, gdzie wahania cen eksportowych tarcicy wywierają bezpośredni wpływ na krajowe ceny drewna okrągłego. Silna pozycja rynkowa krajowego przemysłu papierniczego powoduje, że światowe ceny masy celulozowo-papierniczej wywierają spowolniony i słabszy wpływ na ceny papierówki w Austrii. Alternatywne

wykorzystywanie kłód małowymiarowych wyjaśnia oddziaływanie cen drewna tartaczego i energii na cenę papierówki. Zniszczenia w lasach spowodowane klęskami prawie nie mają wpływu na kształtowanie się ceny drewna tartaczego. W ciągu ostatnich trzech dekad ceny drewna okrągłego rosły mniej gwałtownie aniżeli ceny tarcicy i masy celulozowo-papierniczej.

**Słowa kluczowe:** kształtowanie cen, podaż, popyt, ceny drewna okrągłego, rynek drewna okrągłego, Austria