

MODELLING SUBSTITUTION IN CONIFEROUS SAWNWOOD CONSUMPTION IN SLOVAKIA

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Why study substitution in Slovak sawnwood?

1.1 – 1.4 mil. m³

Production

Annual domestic production
during 2013–2023.

205 – 480 ths. m³

Imports

Foreign supply available to the
Slovak market.

0.5 – 1.1 mil. m³

Exports

A substantial part of domestic
output is exported.

- Domestic demand is satisfied through a combination of domestic production and imports.
- Coniferous sawnwood is relatively homogeneous, making price an important sourcing signal.
- The relevant question is how strongly sourcing in terms of its origin reacts when domestic and import prices change relative to each other.

Objective and theoretical framework

Objective

Analyse the substitution relationship between domestic production and imports and quantify the effect of relative prices on the consumption structure.

Armington approach

Domestic and imported sawnwood satisfy the same demand, but products are differentiated by origin and are therefore imperfect substitutes.

Relative price
 P_d / P_m

Sourcing
decision

Import / production
 M / P

Expected relationship:
higher relative domestic price → greater reliance on imports

From the CES framework to the econometric model

1 CES framework

Captures the degree of substitutability between domestic and imported sawnwood.

2 Cost minimisation

The optimal mix of sources depends on their relative prices.

3 Log transformation

Allows direct interpretation of σ as the elasticity of substitution.

$$\ln(M / P) = \alpha + \sigma \cdot \ln(P_d / P_m) + \mu$$

M/P = imports relative to domestic production • Pd/Pm = domestic price relative to import price • σ = substitution elasticity

Data and estimation

Annual observations, 2013–2023

Market quantities

Production, imports and exports
FAOSTAT

Domestic prices

Coniferous sawnwood prices
Forestportal

Price comparability

EUR/USD: ECB • HICP: Eurostat
Real prices in constant 2015 terms

- Dependent variable: import-to-production ratio (M/P)
- Explanatory variable: relative domestic/import price (P_d/P_m)
- Estimation: Ordinary Least Squares (OLS)
- Verification: t-test, F-test, R^2 and Durbin–Watson statistic
- Software: IBM SPSS Statistics

Main econometric results

$$\sigma = 0.612$$

Elasticity of substitution

A 1% increase in the relative price of domestic sawnwood is associated with an approximately 0.612% increase in the import-to-production ratio.

$$p < 0.01$$

$$R^2 = 0.556$$

Explained variation

Relative prices account for 55.6% of the variation in M/P.

$$R = 0.745$$

Correlation

Positive relationship between the model variables.

$$D = 2.065$$

Residual check

No indication of autocorrelation in the residuals.

$$Su(r) = 0.130$$

Standard error

Standard error of the estimate.

$$\ln(M/P) = -1.268 + 0.612 \ln(P_d/P_m)$$

Economic interpretation

Price response

Companies respond to relative-price changes by shifting sourcing toward the relatively cheaper source.

Imperfect substitution

Because $\sigma < 1$, the response is partial: domestic and imported sawnwood are not perfect substitutes.

Beyond prices

Quality, transport costs, long-term trade relationships and processor requirements may also affect sourcing.

Price matters, but it does not fully determine the origin of coniferous sawnwood consumed in Slovakia.

The result supports the Armington assumption of imperfect substitution and is consistent with previous evidence from international wood markets.

Conclusions

1 Relative prices matter

Relative prices significantly affect the consumption structure of coniferous sawnwood in Slovakia.

2 Substitution is incomplete

Domestic and imported sawnwood are substitutes, but the estimated response is less than proportional.

3 Trade supports adjustment

Imports provide an alternative source of supply when relative prices change.

4 Limitation

Relatively short annual time series and a model focused on the price determinant.

5 Future research

Include non-price determinants and, where possible, higher-frequency data.

Thank you for your attention

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IPA 4/2026: Determinanty zahraničného obchodu s drevom a výrobkami z dreva v SR v kontexte teoretických modelov
medzinárodného obchodu

VEGA 1/0513/25 Biznis model inovácií založených na princípe udržateľnosti

APVV APVV-23-0022 Integrácia ekologických inovácií do inovačného procesu

VEGA 1/0161/26 Spotrebiteľ ako aktér zmeny: Výskum uvedomelej spotreby v slovenskom kontexte