ANALYSIS OF THE NEED FOR WORKING TIMBER STARTING FROM ISTAT ANNUAL INDUSTRIAL PRODUCTION DATA

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ABSTRACT: The consumption of timber represents a significant impact on the withdrawal of biomass and, more generally, raw materials in Italian regions. Timber is the essential raw material for the production of wood products, paper, and cardboard, as well as being a renewable fuel used in all Italian regions. This study reconstructs the timber supply chain used in industrial production for the creation of wooden semi-finished products, which will be used in subsequent productions, using annual data from Istat's ProdCom[1] survey. The aim is to estimate the timber consumption of the Italian industry and indirectly the withdrawals in the forest.

1   Proposed methodology

The work aims to evaluate the amount of timber used in the Italian timber supply chain, starting from the production data of the "Annual Survey of Industrial Production (ProdCom)" by Istat. The survey is carried out on all productive local units (about 62 thousand establishments) of companies with at least 20 employees and on a representative sample of companies with 3 to 19 employees classified in the Nace Rev.2 divisions from 07 to 33 - excluding division 09 and group 19.2 - and division 38. The analysis focuses on the production of wood semi-finished products, which use both wood logs taken in Italian forests and those imported from abroad as the raw material input of the process, referring to the year 2020 ProdCom code. These activities are linked to Nace division 16 "Wood and wood products; except furniture; manufacture of articles of straw and plaiting materials" represented in detail in Table 1. The timber supply chain involves a first phase of activity in the forest, Nace division

[1] Annual Survey of Industrial Production

02 "Forestry and logging", which concerns tree felling operations, debarking, primary processing, and transportation to the timber sawmills. The quantities taken in this phase of the chain are not currently detected by a direct statistical survey. The indications received from a selected panel of companies operating in Nace division "02 - Forestry and logging" suggest that the quantity of logs selected for primary processing in sawmills represents a percentage ranging from 40% to 50% compared to the volume of felled trees. The remaining part generally undergoes a chipping process directly in the forest and is largely delivered to bioenergy generators.

Table 1: Economic activities due to the first phase of the wood supply chain.

Nace 02	Forestry and use of forest areas
02.10	Forestry and other forestry activities
02.20	Use of forest areas
Nace 16	**Wood industry**
16.10	Sawing and planing of wood
16.21	Manufacture of veneer sheets and wood-based panels
16.23	Manufacture of other wooden structural and joinery products for construction
16.24	Manufacture of wooden packaging
16.29	Manufacture of other wood products; manufacture of cork, straw, and weaving materials articles

For each of these activity classes, the different wood processing stages were revised and analysed, and the semi-finished wood products and primary products obtained directly from log processing were identified based on the 8-digit ProdCom classification codes, 6-digit CPA classification codes, and 4-digit Nace classification codes (Table 2). The ProdCom survey annually publishes, in reference to the list of ProdCom codes in force during the examined period, the data on industrial production achieved during the year in terms of value and quantity/volume.

Table 2. *Primary and semi-finished products, obtained directly from the processing of logs; ProdCom, Cpa, Nace coding.*

NACE	CPA	PRODCOM	Description	U. mis
16.10	16.10.11	16.10.11.34	Spruce wood, fir wood sawn or chipped lengthwise, sliced or peeled, of a thickness > 6 mm (en)	m3
16.10	16.10.11	16.10.11.36	Pine wood sawn or chipped lengthwise, sliced or peeled, of a thickness > 6 mm	m3
16.10	16.10.11	16.10.11.38	Coniferous wood sawn or chipped lengthwise, sliced or peeled, of a thickness of > 6 mm	m3
16.10	16.10.12	16.10.12.50	Wood, sawn or chipped lengthwise, sliced or peeled, of a thickness > 6 mm	m3
16.10	16.10.12	16.10.12.71	Tropical wood, sawn or chipped lengthwise, sliced or peeled, end-jointed or planed/sanded, of a thickness > 6 mm	m3
16.10	16.10.21	16.10.21.10	Coniferous wood continuously shaped	Kg
16.10	16.10.23	16.10.23.00	Wood, incl. strips and friezes for parquet flooring, not assembled, continuously shaped "tongued, grooved, rebated, chamfered,	Kg

16.10	16.10.24	16.10.24.00	Wood wool; wood flour	Kg
16.10	16.10.25	16.10.25.03	Coniferous wood in chips or particles	Kg
16.10	16.10.25	16.10.25.05	Non-coniferous wood in chips or particles	Kg
16.10	16.10.39	16.10.39.00	Other wood in the rough, including split poles and pickets	m3
16.21	16.21.11	16.21.11.00	Plywood, veneered panels and similar laminated wood, of bamboo	m3
16.21	16.21.16	16.21.16.00	Other plywood, veneered panels and similar laminated wood, of coniferous wood	m3
16.21	16.21.17	16.21.17.11	Plywood consisting solely of sheets of wood, each ply not exceeding 6 mm thickness, with at least one outer ply of tropical wood	m3
16.21	16.21.18	16.21.18.00	Other plywood, veneered panels and similar laminated wood, of other wood	m3
16.21	16.21.22	16.21.22.10	Veneer sheets and sheets for plywood and other wood	m3
16.21	16.21.23	16.21.23.00	Veneer sheets and sheets for plywood and other wood	m3
16.21	16.21.24	16.21.24.00	Veneer sheets and sheets for plywood and other wood	m3
16.23	16.23.12	16.23.12.00	Shuttering for concrete constructional work, shingles and shakes, of wood	Kg
16.23	16.23.19	16.23.19.00	Builders' joinery and carpentry of wood	Kg
16.24	16.24.12	16.24.12.00	asks, barrels, vats, tubs, and coopers products and parts thereof of wood	Kg
16.24	16.24.13	16.24.13.20	Cases, boxes, crates, drums and similar packings of wood	Kg
16.29	16.29.14	16.29.14.95	Pellets	t

The published quantities are directly due to the timber used, through a simple mathematical model that takes into account some factors such as the moisture content of the raw material compared to the semi-finished products, the coefficients of use of the logs, and other aspects related to wood processing phases. The quantity of timber available for industrial production is estimated based on the relationship (1).

The timber used as raw material, estimated through the reconstruction of the supply chain, is partly imported from abroad, with reference to the commodity category of roughly squared logs or blocks. Consequently, the timber for industrial use taken in Italy can be estimated (2).

$$Tav = \sum_{i}^{n} p_i * \alpha_i * \frac{100}{\eta_i} \tag{1}$$

$$T_{Italy} = Tav - T_{imp} + T_{exp} \tag{2}$$

T_{av}:   Quantity of timber available for industrial production used for semi-finished and primary products, expressed in tons at standard moisture content of 12-15%.

p_i: Quantity annually published by ProdCom for each product identified in Table 2 of primary codes, based on the unit of measurement reported in the table.

α_i: Conversion coefficient of the unit of measurement of the ith ProdCom code into tons

η_i: Yield of logs in sawmills. The expert panel declares a performance of around 90%.

$T_{imp/exp}$:   Raw imported/exported timber

T_{Italy}:   Raw timber taken in Italy, and considered with a standard moisture content of 12-15%;

Starting from the timber for industrial use of Italian origin (Tav), the volumes of trees cut in Italy are estimated (3). Moreover, it should be considered that both the estimation of the quantity of timber available for industry (Tav) and the estimation of imported and exported timber (Timp/exp) have been made considering a standard moisture content of wood equal to 12% - 15% of moisture[2].

$$Tf_{Italy} = \left(\frac{100+u_f}{100+u_s} * T_{Italy}\right) * \frac{100}{\eta_f} \qquad (3)$$

Tf_{Italy} : Quantity in tons of trees cut, considering an average moisture content of wood in a range of 60% - 150%.

u_f : Moisture content of the timber at the time of extraction, in a range of 60% - 150%

u_s : Standard moisture content of the timber 12% - 15%, considering standard conditions of 20°C temperature and 65% relative humidity.

T_{Italy}: Raw timber taken in Italy, and considered with a standard moisture content of 12-15%;

η_f : Percentage ranging from 40% to 50% that represents the logs selected for primary processing in sawmills compared to the volume of felled trees, as indicated by the experts' panel.

In conclusion, the developed metodology provides annually an estimate of the quantity of timber used in the Italian timber supply chain, starting from the production data of the "Annual Survey of Industrial Production (ProdCom)" by Istat. The estimation is made by analysing the different phases of wood processing and identifying the wood semi-finished products and primary products obtained directly from the processing of logs. The estimation takes into account the quantity of timber available for industrial production, the conversion coefficient of the unit of measurement of the ProdCom codes into tons, and the yield of logs in sawmills. Moreover, the estimation considers the raw imported and exported timber and the moisture content of the timber at the time of extraction and under standard conditions. The result of the analysis is an estimate of trees cut in Italy, considering an average moisture content of wood in a range of 60% - 150%.

References

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[2] $u = (m\_f - m\_o)/m\_o * 100$

u: percentage of wood moisture content; m_f weight of wood referred to the moisture percentage u; m_o weight of the wood when dried.