

# Quantification of the influence of the Training Forest Enterprise Masaryk Forest Křtiny on the local economy of the region

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**ABSTRACT:** The aim of this paper is to present the results of research aimed at identifying the benefits of the forest enterprise for the local economy through calculation of the local multiplier score. The paper addresses the quantification of local expenditures required for the calculation of the local multiplier score. The analysed economic indicators were the local expenditures of Training Forest Enterprise Masaryk Forest Křtiny (TFE MF Křtiny) for suppliers and employees in the individual forest districts for 2014. A part of the results is the calculation of a score for local multipliers 2 and 3 for the forest districts of TFE MF Křtiny for 2014. The local multiplier is a specific microeconomic indicator allowing the quantification and evaluation of socioeconomic benefits of the chosen entity especially for local residents and entrepreneurs. The results will allow assessing the effect of special-purpose forest enterprises and forestry on the economic and social development, and determining potential cash flows associated with the fulfilment of the socioeconomic functions of forest ecosystems in the area of interest of TFE MF Křtiny.

**Keywords:** economics; local multiplier; local expenditure; management

The article presents the results of the project of the Internal Grant Agency of Mendel University in Brno called “The importance of the Training Forest Enterprise Masaryk Forest Křtiny for the local economy,” which was solved by the Department of Forest and Wood Product Economics and the Department of Landscape Management. The research topic emerged as a response to unresolved problems of the local economy in the forestry sector arising from the goals set out in strategy documents for sustainable development both at the national and international level (e.g. United Nations 1993).

From an economic aspect, it is an important issue which benefits flows to the local economy because of the localization of individual businesses linked to forestry activity. The most famous theory which deals with benefits of enterprises for the local economy is the theory of localization (DOUTHWAITE 1996; SHUMAN 2000).

According to SHUMAN (2000), the definition of economic localization is: “The process of economic localization means that locally owned enterprises use local resources in a sustainable manner, employ local employees for fair wage and serve mainly local customers. As a result of this, the decision-making process returns back into the hands of the community, thus decreasing the dependence on imports.”

Economic localization is reflected in the relationship between the regional economy and policy, as examined by ARMSTRONG and TAYLOR (2000).

Forest enterprises are a specific component of the national economy as their economic activity is bound to rural regions. Importance of small and medium-sized forest enterprises in the European Union for employment, economy and regional development was covered e.g. by TUNKELE et al. (2011). The local economy, which has preserved at least part of their local economic linkages

(businesses owned by local people, local production with the use of local resources, local sales and investment of local money back in place), is both less vulnerable to a global economic perspective and also is effective in terms of the minor waste of energy and natural resources and also contributes to the cohesion of social structures and the social development.

It follows from the above that it should fulfil the definition of sustainable development. The definition of sustainable development was established in 1987 in the so-called Brundtland Report (United Nations World Commission on Environment and Development 1987). The highly applicable indicator of sustainable development seems to be a local multiplier.

The local multiplier is a tool created in 2002 thanks to the British independent think tank of New Economics Foundation under the leadership of the economist Justin Sacks.

The local multiplier is a figure whose value can be determined for any institution (company, shop, local authority, non-profit organisation, social enterprise, or even a household), which has certain expenditure and wants to know the extent to which the money spent stays in the region (SACKS 2002). The local multiplier is a microeconomic indicator allowing the quantification and assessment of socio-economic benefits of the chosen entity for local residents and businesses.

We have several types of local multipliers, but local multipliers 2 and 3 (LM2, LM3) are used the most frequently.

Local multiplier 2 focuses on the first two rounds of circulation of funds – total revenues and local expenditures of the examined entity.

Local multiplier 3 contains the first two rounds according to the same pattern as LM2, but also an extra third round is added, in which the local spending of all those who received funds from the examined entity in round 2 (i.e. who were beneficiaries of local expenditures) is quantified. For organizations, these are mainly suppliers and employees.

Both foreign authors deal with the topic of local multipliers (for example SACKS 2002; CIMADONO, BÉNASSY-QUÉRÉ 2012).

In the Czech Republic, the calculation of the local multiplier has not yet reached the public awareness. The issue of local multipliers was tackled by JOHANISOVÁ (2007). The first results obtained by the application of LM2 and LM3 can be found in the area of nature conservation (BŘEZINA 2014). A portion of the results was published by BŘEZINA et al. (2015).

## MATERIAL AND METHODS

The Training Forest Enterprise Masaryk Forest Křtiny (TFE MF Křtiny) was chosen as an area of interest. The Training Forest Enterprise Masaryk Forest Křtiny is an organisational unit of Mendel University in Brno and a special-purpose facility of its Faculty of Forestry and Wood Technology. The enterprise was founded in 1923. The total area is 10,495 ha. The forest cover is approximately 98%. The enterprise is divided into three forest districts – Vranov (3,345 ha of forest land), Habrůvka (4,006 ha of forest land) and Bílovice nad Svitavou (2,920 ha of forest land, 3,640 ha total land) (TFE Masaryk Forest Křtiny 2014 – <http://www.slpkrtiny.cz/en/slp-krtiny/about-us/>).

The local multiplier was used as a methodological tool for determining the share of the organisation in question (field districts of TFE MF Křtiny) in the economy. The calculation of the local multiplier is done in three rounds. In the first round, the total revenue in each of the individual forest districts of TFE MF Křtiny is determined. In the second round, the expenditure of TFE MF Křtiny for employees and suppliers is determined, divided into local and nonlocal. The third round examines how the local employees and suppliers further redistribute their payments.

The calculation of the local multiplier included the revenue and expenditure only within the individual forest districts. Other organisational components of TFE MF Křtiny were not considered.

For the purposes of research, the territory of the Brno-venkov and Blansko districts was chosen.

For the purposes of calculating the first round of LM2 and LM3, the data was transformed from the accounting of TFE MF Křtiny. The specific revenue and expenditure items for the TFE MF Křtiny forest districts are listed below in the methodology.

In order to obtain the data for the calculation of the third round of LM3, a questionnaire survey was performed.

The survey for employees, which was designed to determine how the employees spend money in the Brno-venkov and Blansko districts and outside these districts, was inspired by the statistical evaluation of family accounts used by the Czech Statistical Office (2015). The questionnaire survey for the employees in individual forest districts of TFE MF Křtiny was offered only to employees who are permanent residents of the Brno-venkov and Blansko districts.

**Example questionnaire for employees.** Items of expenditure: (i) food, beverages, tobacco, (ii) clothing, footwear, (iii) housing, (iv) water, energy, (v) transportation, fuels, (vi) postal services, telecommunications,

(vii) real estate tax, (viii) other taxes, (ix) repayments (credits, loans, insurance, savings), (x) recreation, sport, culture, (xi) other goods and services.

The value of the total annual revenue of the employees in thousand CZK was divided into 7 categories. The first category started at 100–150 thousand CZK. The subsequent division was per 50 thousand, with the last category in the range of 400–450 thousand CZK (the calculation included the median value of the income category entered in the survey). The individual items of expenditure for which the respondents (employees) spent money were listed in percentages. A recalculation to CZK from the total income had to be performed.

The questionnaire survey for suppliers in the forest districts of TFE MF Křtiny was provided to local suppliers for 2014, who reside in the Brno-venkov and Blansko districts.

**Example questionnaire for suppliers.** Items of expenditure: (i) expenditure for staff, (ii) repayment of credit and loans, (iii) real estate tax, (iv) other taxes, (v) water, energy, (vi) rent, operation of buildings, (vii) fuels, (viii) postal services, telecommunications, (ix) promotion, advertising, (x) other goods and services.

The total annual expenditures of the suppliers in thousand CZK were divided into 10 categories. The financial range of each expenditure category for the suppliers was adapted based on the legal form of entrepreneurship. The first four categories corresponded with the range of expenditure of a natural person (NP) operating under a trade licence or another type of licence, the fifth and sixth category was defined for NPs operating under a trade licence or another type of licence (with a certain number of employees) and the final four categories were set for legal persons (LPs). For LPs, the completion of a questionnaire also utilised publicly available information from the public registry, accessible from the website [www.justice.cz](http://www.justice.cz), where these entities publish their final accounts (statements of profit and loss). The calculation included the median value of the category of expenditure filled in the questionnaire. The individual items of expenditure for which the firms spent money were listed in percentages. A recalculation to CZK from the total expenditure had to be performed.

**Calculation of LM2** (SACKS 2002; Eq. 1):

$$(1^{\text{st}} \text{ round} + 2^{\text{nd}} \text{ round}) / 1^{\text{st}} \text{ round} \quad (1)$$

where:

1<sup>st</sup> round – total revenue of the studied entity,

2<sup>nd</sup> round – local expenditure of the studied entity.

The first round of the calculation includes total revenue of the TFE MF Křtiny forest districts in 2014. Items of income: (i) revenue from the sale of services, (ii) revenue from the sale of products, (iii) rental revenue, (iv) revenue from the sale of long-term tangible property (excluding land), (v) revenue from the sale of material, (vi) revenue from transfer, (vii) other revenue associated with the core business.

The second round of the calculation: total expenditure of the TFE MF Křtiny forest districts for 2014 was divided into local expenditures (in the Brno-venkov and Blansko districts) and nonlocal expenditures (outside the Brno-venkov and Blansko districts). Nonlocal expenditures are not included in the calculation.

For local expenditure, we determine: (i) the expenditure on staff (only labour costs) with permanent residence in the Brno-venkov or Blansko districts, (ii) the expenditure on suppliers based in the Brno-venkov and Blansko districts.

The calculation of LM2 included only the prominent local suppliers.

**Calculation of LM3** (SACKS 2002; Eq. 2):

$$(1^{\text{st}} \text{ round} + 2^{\text{nd}} \text{ round} + 3^{\text{rd}} \text{ round}) / 1^{\text{st}} \text{ round} \quad (2)$$

where:

1<sup>st</sup> round – total revenue of the studied entity,

2<sup>nd</sup> round – local expenditure of the studied entity,

3<sup>rd</sup> round – local expenditures of the beneficiaries from the 2<sup>nd</sup> round (beneficiaries from the forest districts of TFE MF Křtiny – local suppliers, employees).

The first and the second rounds of the calculation include the same items as in LM2.

In the third round it is necessary to determine how much the local employees and suppliers spend locally in the region (Brno-venkov and Blansko districts). The most common expenditures of consumers are items such as food, clothing, entertainment and free time, rent or mortgage. Suppliers (organisations) spend similarly to the organisation studied (personal expenditures, suppliers of goods and services, rent or mortgage) (BŘEZINA et al. 2013).

In the third round of the calculation of LM3, a questionnaire survey is necessary which allows the determination of:

(i) the net annual income of each employee of the forest districts of TFE MF Křtiny with permanent residence in the Brno-venkov or Blansko districts, and the structure of their expenditure (for 2014);

(ii) the annual expenditure of suppliers in the forest districts of TFE MF Křtiny located in the Brno-

venkov or Blansko districts and the structure of their expenditure (for 2014).

Again, the calculation included only local expenditure.

**Methods of calculation.** From the questionnaire, control samples were created – the questionnaires sent ( $N$ ) and filled-in questionnaires received ( $n$ ) for the estimation of the relative frequency of local expenditure of local employees ( $p_1$ ) and the relative frequency of local expenditure of local suppliers based on a point estimate ( $p_2$ ). To increase the explanatory power of the result, an interval estimate of the quantity ( $p$ ) was performed with the use of correction coefficient ( $k$ ) for the random error of relative frequency ( $\sigma_p$ ).

Dispersion of the control sample ( $s^2$ ) (SWOBODA 1977; Eq. 3):

$$s^2 = p_1 \times (1 - p_1) \text{ or } p_2 \times (1 - p_2) \quad (3)$$

Standard deviation of the control sample ( $s$ ) (SWOBODA 1977; Eq. 4):

$$s = \sqrt{p_1 \times (1 - p_1) \text{ or } p_2 \times (1 - p_2)} \quad (4)$$

Random error of relative frequency ( $\sigma_p$ ) (SWOBODA 1977; Eq. 5):

$$\sigma_p = \sqrt{s/N} \quad (5)$$

where:

$p$  – interval estimate of the quantity,

$s$  – standard deviation of the control sample,

$N$  – number of sent questionnaires.

Correction coefficient for the random error of relative frequency ( $k$ ) (SWOBODA 1977; Eq. 6):

$$k = \sqrt{(N - n)/(N - 1)} \quad (6)$$

where:

$N$  – number of sent questionnaires,

$n$  – number of received filled-in questionnaires.

## RESULTS

For the sake of a comparison of financial flows of a forest enterprise on an international scale the exchange rate EUR/CZK in December 2015, i.e. 1 EUR = 27.0260 CZK is reported (Czech National Bank 2015).

Total income (133.5 mil CZK) of TFE MF Křtiny for 2014 by forest district:

(i) Vranov forest district – 39.0 mil CZK;

(ii) Habrůvka forest district – 68.8 mil CZK;

(iii) Bílovice nad Svitavou forest district – 25.7 mil CZK.

The total number of suppliers of the forest districts of TFE MF Křtiny in 2014 was 54, with 30 being locals and 24 nonlocals. Total expenditure amounted to 23.5 mil CZK, of which 13.3 mil CZK was spent for local suppliers and 10.2 mil CZK for nonlocal suppliers.

The highest share in local expenditure for suppliers within the area of interest was reported by the Vranov forest district (5.4 mil CZK), followed by Bílovice nad Svitavou (5.1 mil CZK) and, finally, the Habrůvka forest district (2.8 mil CZK), which had the lowest share of funds spent on local suppliers.

The structured interview yielded 23 filled-in questionnaires from 30 local suppliers (76.67%).

Number of employees and labour costs by forest district:

(i) Vranov forest district – 13 (3.9 mil CZK);

(ii) Habrůvka forest district – 46 (8.6 mil CZK);

(iii) Bílovice nad Svitavou forest district – 23 (4.5 mil CZK).

The total number of employees at each of the forest districts was established as 82 employees (total of 17 mil CZK in labour costs). These were local employees. The structured interview yielded 57 filled-in questionnaires from employees (69.51%).

The characteristics of the suppliers and the expenditure on suppliers in the individual forest districts of TFE MF Křtiny in mil CZK and in percentages for 2014 are listed in Table 1. The distribution of local suppliers in the individual items is shown in Figs 1a–c.

From the total of 7 local suppliers, 3 were NPs and 4 LPs. All the suppliers asked filled in the questionnaire. The total average expenditure of local suppliers amounted to 186.4 mil CZK (of which 25.7 mil CZK was local, 13.78%; 160.7 mil CZK nonlocal, 86.21%). The distribution of expenditures of local suppliers for 2014 is shown in Fig. 1a.

The largest item in the suppliers' expenditures was expenditure on suppliers. This was followed by expenditure on staff, other taxes, repayments, fuels, other goods and services. The biggest item of local expenditure was expenditure on suppliers (17.1 mil CZK) and employees (4.0 mil CZK). In each category of expenditure, nonlocal expenditure was higher, with the exception of expenditure on real estate tax and promotion, advertising. The results include the expenditure of both NPs and LPs.

Out of the total of 9 local suppliers, 7 were NPs and 2 LPs. The questionnaire was filled in by 2 NPs. The total average expenditure of local suppliers amounted to 1.0 mil CZK (of which 0.9 mil CZK



Table 1. Characteristics of suppliers of the forest districts in 2014

	Total	Local	Nonlocal	Local (%)	Nonlocal (%)
<b>Vranov</b>					
Number of suppliers	13	7	6	53.85	46.15
Total expenditures of the forest district (mil CZK)	7.9	5.4	2.5	68.35	31.65
<b>Habrůvka</b>					
Number of suppliers	20	9	11	45.00	55.00
Total expenditures of the forest district (mil CZK)	9.7	2.8	6.9	28.87	71.13
<b>Bílovice nad Svitavou</b>					
Number of suppliers	21	14	7	66.67	33.33
Total expenditures of the forest district (mil CZK)	5.9	5.1	0.8	86.44	13.56

was local, 90.00%; 0.1 mil CZK nonlocal, 10.00%). The distribution of expenditures of local suppliers for 2014 is shown in Fig. 1b.

The largest item in the suppliers' expenditures was expenditure for suppliers. This was followed by expenditure on fuel, other goods and services, rent and operation of the buildings, other taxes and postal services and telecommunications. The biggest item of local expenditure was expenditure on suppliers (420,000 CZK) and fuels (374,100 CZK). In each category of expenditure, local expenditure was predominant, with the exception of expenditure on other taxes, energy and postal services/telecommunications. The results include expenditure of NPs only.

Out of the total of 14 local suppliers, 11 were NPs and 3 LPs. All the suppliers asked filled in the questionnaire. The total average expenditure of local suppliers amounted to 13.3 mil CZK (of which 8.4 mil CZK was local, 63.16%; 4.9 mil CZK was nonlocal, 36.84%). The distribution of expenditures of local suppliers for 2014 is shown in Fig. 1c.

The largest item in the suppliers' expenditures was expenditure for employees. This was followed by expenditure for suppliers, fuels, other goods and services, repayments, postal services and telecommunications, other taxes, water, energy, followed by real estate tax, rent and operation of buildings.

The biggest item of local expenditure was expenditure on employees (4.9 mil CZK) and suppliers (2.3 mil CZK). The results include the expenditure of both NPs and LPs.

Total average expenditure of local suppliers of the TFE MF Křtiny forest districts for 2014 amounted to 200.7 mil CZK, of which 35.1 mil CZK was local expenditure (17.48%) and 165.6 mil CZK was nonlocal expenditure (82.25%).

From the total local expenditure of suppliers, an interval estimation of quantity ( $p_2 = 17.47\%$ ) was performed. The standard deviation obtained from the control sample (range  $N = 30$ ,  $n = 23$ ,  $p_2 = 0.175$ ) was  $s = 0.380$ , the random error of relative frequency

was  $\sigma_p = 0.069$  (i.e.  $\pm 6.9\%$ ). With the use of correction coefficient  $k = 0.491$ , the result is  $\sigma_p = 0.069 \times 0.491 = 0.034$  (i.e.  $\pm 3.4\%$ ). From the above, we can state that with 95% certainty, the local expenditure of local suppliers was between 14.07 and 20.87%.

The distribution of expenditures of local employees of the TFE MF Křtiny forest districts in the individual items for 2014 is shown in Fig. 2.

The total of 57 employees who filled in the questionnaire spent 10.8 mil CZK in 2014 (4.3 mil CZK locally and 6.5 mil CZK nonlocally). 39.81% was spent locally and 60.19% nonlocally. Food, beverages, tobacco constituted 31.47% of the total expenditure of employees. Housing, water, energy constituted 22.35%, transport, fuels 11.52%. All these items together accounted for ca. 65% of the total expenditure of employees in 2014.

From the total local expenditure of employees, an interval estimation of quantity ( $p_1 = 39.56\%$ ) was performed. The standard deviation obtained from the control sample (with a range of  $N = 82$ ,  $n = 57$ ,  $p_1 = 0.396$ ) was  $s = 0.489$ , the random error of relative frequency was  $\sigma_p = 0.054$  (i.e.  $\pm 5.4\%$ ). With the use of the calculated correction coefficient  $k = 0.556$ , the result is  $\sigma_p = 0.054 \times 0.556 = 0.030$  (i.e.  $\pm 3.0\%$ ). Now, the statements can be refined. With 95% certainty, the local expenditure of local employees was between 36.56 and 42.56%.

The calculation of LM2 score determined that in the Brno-venkov and Blansko districts, a total of an additional 40.0 mil CZK was generated for the residents of these districts by TFE MF Křtiny in 2014. The value of the calculated LM2 score was 1.23 (low score). The value of LM2 usually ranges between 1 and 2.

The calculation of LM3 score determined that in the Brno-venkov and Blansko districts, a total of an additional 90.5 mil CZK was generated for the residents of these districts by TFE MF Křtiny in 2014. The value of LM3 ranges between 1 and 3. The calculated LM3 score (1.52) expresses the average value of the local multiplier. That means that out of each 10 CZK the Administration gains on revenue,

it generates 15.20 CZK for the local economy in the Znojmo district. Each crown of the Administration's expenditure generates 1.52 CZK for the local economy. Or, each crown of expenditure generates an additional 0.52 CZK of revenue for the local economy ( $1.52 - 1 = 0.52$ ).

## DISCUSSION

Generally, it is possible to notice the economic benefit of calculating the local multiplier to assess increases in regional employment, support of local households and business entities, and increases in the

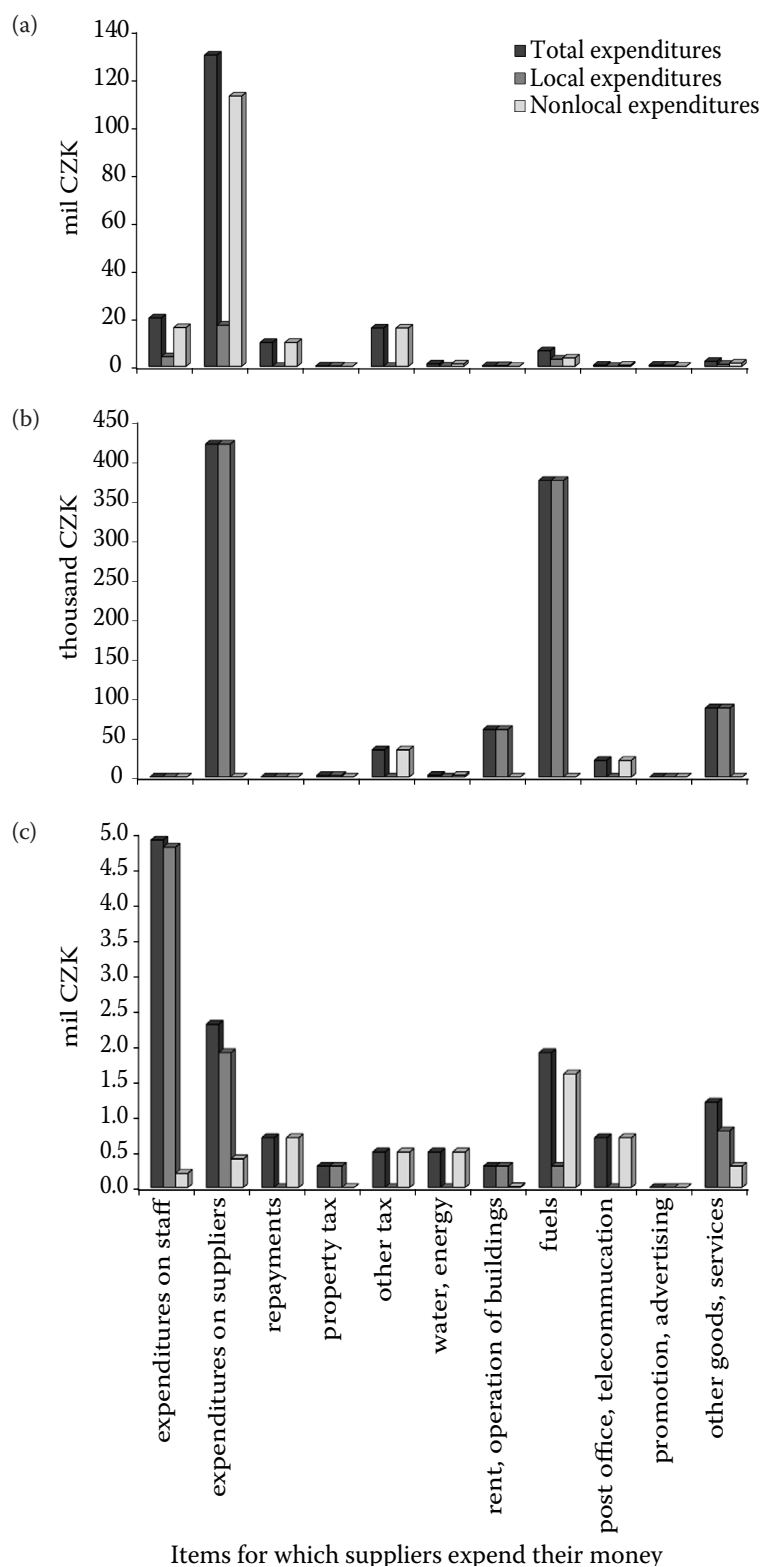


Fig. 1. Distribution of expenditures of suppliers of the Vranov (a), Habrůvka (b) and Bílovice nad Svitavou, (c) forest district for 2014

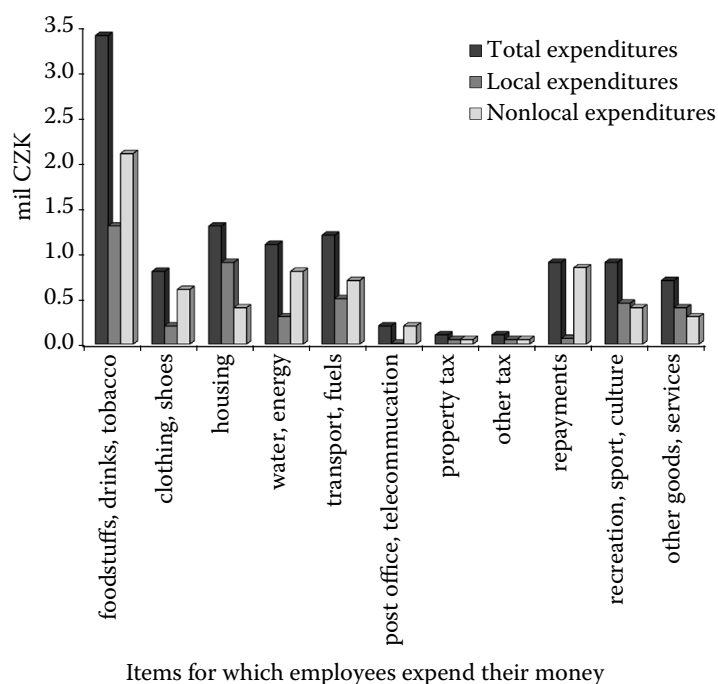


Fig. 2. Distribution of expenditures of local employees of the three TFE MF Křtiny forest districts for 2014

overall local economy of a region. According to SHUMAN (2000) it would then lead to a return of decision-making processes back to the region and decrease its dependence on external inputs. Regional politicians then play an important role here (ARMSTRONG, TAYLOR 2000).

In addition to the economic benefits, changes in enterprise management will influence the environmental and social profile of an organization.

The main objective is to strengthen local economies that should provide basic human needs in a sustainable way. Another goal is to reduce differences between social groups and genders, improving the respect for human rights and increasing fairness and control in decision-making processes (HINES 2000).

The calculation of local multiplier will allow businesses to find out to what extent their economic activity contributes to the development of local economy. This finding may lead to a change in decision-making of the company management with emphasis on sustainable development of forestry.

Effective decisions how spending is carried out can bring profits to local residents, improving the competitiveness of the investigated company and meet the objectives of development policies.

If the strengthening of local economy takes place, fiscal expenditures, such as social benefits, may be reduced.

The results show that the TFE MF Křtiny management should focus on increasing the share of local suppliers or educate its employees.

However, both recommendations seem to be problematic. In the case of suppliers, the enterprise must

obey the law about public procurement, which forbids it from considering a supplier's location. Influencing the consumer behaviour of employees seems to be also problematic because the enterprise is not able to order them to support local shops. The only possible solution seems to be a change of regional or national politics and the introduction of tools for the support of a local economy.

The local multiplier is one of the possible tools how to detect the flow of funds in local economy of the region and can be used to identify: (i) the regional economic contribution of a forest enterprise, (ii) the regional economic contribution of an entity set up for the purpose of nature and landscape conservation, (iii) the regional economic contribution of a wood and furniture enterprise, (iv) the regional economic contribution of a municipality or town, (v) the economic contribution of any organization.

Forest enterprises are open systems that have close relations with the region in which they are located. Primarily small and medium-sized enterprises are important for employment, economy and development of the region. The importance of small and medium-sized forest enterprises in the European Union in relation to the local economy and rural development was covered e.g. by TUNKELE et al. (2011).

## CONCLUSIONS

The forest districts of TFE MF Křtiny in 2014 significantly supported the local economy in the area

of interest, especially due to the employees of the enterprise, who spent their income in the Brno-venkov and Blansko districts. The value of LM2 and LM3 was 1.23 and 1.52, respectively. This is a low to average value of the calculated score. The calculation of LM2 can be used in practice. Only exact data from the accounting of the studied enterprise is required for its determination. The results of the research show that the calculation of LM3 is also feasible in practice, and can thus be applied to other entities in forestry, nature conservation and wood processing. At the same time, it is necessary to mention that the correctness of the calculated LM3 score is dependent on a questionnaire survey (i.e. on the number filled-in questionnaires). To increase the explanatory power of the results obtained from the questionnaire survey, an interval estimate of the quantity ( $p$ ) was performed with the use of correction coefficient ( $k$ ) for the random error of relative frequency ( $\sigma_p$ ). We can assert with 95% certainty that the local expenditure of local employees of TFE MF Křtiny in 2014 was within the interval of 36.56 to 42.56% and the local expenditure of major local suppliers in the interval of 14.07 to 20.87%. The local multiplier is one of the potential tools to determine the economic contribution of entities to the local economy of a region.

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