Abstract
The empirical research provides evidence that companies plan the activities related to reverse flows diversely; some companies formulate strategic plans for this field, others specify tactical or operational plans only, and significant part of companies plan no reverse flows at all. Similarly, the strategic focus on reverse flows varies among companies in terms of its intensity and content. The article provides a piece of outcomes of an empirical research conducted among companies operating on Czech market. On the sample of 148 firms, a regression analysis was calculated to answer the question if the strategic aims and the formal planning of reverse flows are related to profitability of reverse logistics activities. The finding supports literature resources that provide either theoretical or empirical support of the existence of such relationships.

Keywords: Reverse flows, reverse logistics, planning system, strategy, empirical research

1. INTRODUCTION
The concept of reverse flows as a scientific term emerged in literature in the 1970s [1], however in context of logistical problems they got more attention in mid-90's only, covered by terminological umbrella of reverse logistics. [2, p. 2] characterized reverse flows as “... those flows on the opposite way from the direct chain, where the disposable products after consumption face the adding of different types of values through the reintegration of their components or materials to the productive and business cycles.” The material substance of reverse flows is diverse and it includes flow of returned products by end-consumers, end-of-use products, by-products, manufacturing as well as retail returns, returnable packaging etc.

To some extent reprocessing of reverse flows concerns every enterprise or organization. For certain industries reverse flows can be even critical for successful performance and survival [3]. Reverse flows differ immanently from “forward” ones in several aspects [4], of which the more complicated predictability is the reason that makes management of reverse flows (i.e. reverse logistic) different and difficult at the same time.

Despite higher uncertainty in quantity, quality and in timing of reverse flows more and more companies try to standardize and formalize reverse logistics processes to increase their efficiency and effectiveness. These economical categories aren’t the only drivers that attract the attention of companies to reverse flows. In their strategic planning the companies follow broader variety of motives to cope with their companies’ strengths, weaknesses, opportunities and threats.

The article is organized as follows. In the beginning the strategy for reverse flows management (here understood as broader term for reverse logistics) and its typology is discussed and based on that, an own (unidirectional) measure for strategic focus is suggested. Next, the planning of reverse flows is explained as one element of formalization. Again the own measure of formal planning of reverse flows is constructed. In the subsequent part, the hypothesis of positive relationships between profitability and (H1) strategic orientation and (H2) the extent of formal planning of reverse flows is tested by means of regression analysis.
2. STRATEGIES FOR REVERSE FLOW MANAGEMENT

There is a number of “academic” papers featuring the term “reverse logistic strategy” or something similar in their titles or abstracts. In spite of this, it is difficult to find a comprehensive study which proposes or describes general strategy types applicable to the management of reverse flows. Most published studies limit these strategies to describing the manner in which the reverse flow is processed. They are therefore primarily technology-based. [5], [6] and [7], who speak directly of a disposition strategy, are examples. Creating a reverse flow processing system, however, requires much broader questions than those simply concerning processing be addressed, in spite of the fact that the technology employed certainly determines system structure in a fundamental way.

If we wish to investigate the relationship between the strategies applied and the practical management of reverse flows, strategy types must be initially determined, or at a minimum, a parameter must be defined to serve as a basis for the description of reverse flow strategies.

The existing typology for corporate or business strategies is not adequate to the classification of reverse flow strategies, since they are typed according to primary company processes which exclude reverse flow management, with the exception of companies specializing in reverse flows. They are also often defined in relation to the market (see Porter, Ansoff and others), with the question becoming, what actually is the reverse flow market for the company? Are customers the ones who stand to profit from the added value offered by an effective reverse flow system (e.g., the rapid repair of a product, a flexible complaint process, etc.) or is it rather the entities purchasing the reverse flows for further processing?

Inspiration for classifying reverse flow strategies may be found in functional strategy models, particularly those aimed at operations management. [8] reviewed 18 such models and arrived at a clear conclusion. Although the models originated in various ways and made use of varied terminology, the generalization may be made that most arrive at three types of strategies:

- Cost minimization strategies
- High production quality strategies
- Flexible customer response strategies

But this very general result may serve only as the inspiration for creating a reverse flows strategy. We have therefore set up our own criterion for further research to help us to characterize company strategies for reverse flow management. As explained below, the discussion focuses on the internal versus external orientation of the strategy, partially inspired by [9] model which focuses on internal and external factors as key out of six strategy planning dimensions for companies. They make reference to prior authors in viewing internal attention as the focus a company places upon monitoring internal factors, past performance and its weak and strong points. By contrast, external attention is tied to monitoring trends in the external company environment.

2.1 Classification of Czech Companies in Terms of Strategy

The interest shown by companies in reverse flows and managing the same is motivated by various factors. Because of this, reverse flows may feature in a number of differing roles in strategic management. An orientation may be deduced for a particular company by examining data on the roles played by reverse flows in strategic management and the reasons behind the company's interest in them. These roles and reasons may be divided into two overall groups: those related to the company's internal environment and those which fulfill their function in relation to external entities, primarily customers.

Data on the focus of company strategy (roles and reasons for interest in reverse flows) were determined using a set of partially-open questions. The responses were chosen on the basis of a literature review (see) [10]. A final “other” option was offered which only a minimum of respondents chose, prompting us to exclude this option from further analysis. The list of individual factors and their classification into indicators of internal versus external orientation are shown in Tab. 1.
Tab. 1 List of strategic factors

<table>
<thead>
<tr>
<th>Internal factors</th>
<th>External factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost reduction</td>
<td>Customer satisfaction</td>
</tr>
<tr>
<td>Value capturing/recapturing</td>
<td>Services to customer</td>
</tr>
<tr>
<td>Productivity increase</td>
<td>Customer interest/press</td>
</tr>
<tr>
<td>Assets recovery</td>
<td>Environmental concern</td>
</tr>
<tr>
<td>Margin protection</td>
<td>Compliance with government requirements</td>
</tr>
</tbody>
</table>

The frequencies of internal and external roles and reasons were then summed for each company based upon the classification given in the Tab. 1. A simple subtraction index was calculated to uncover the company's predominant strategic orientation. This index had a maximum value of 10 for companies answering "yes" in every case for internal roles and reasons, while not indicating the use of any external roles or reasons. A value of -10 indicates the opposite situation.

Because no other data were available, the analysis which follows is based upon the frequency difference between internal and external factors.

3. PLANNING AS FORMALIZATION

Formalization connected to the articulation (most frequently in writing) of rules, procedures, instructions and means of communication is demonstrated in various (company) policies, job descriptions, strategic and operational plans, systems for designating targets, the standardization of processes and formal communications systems, as summarized by [11]. Older companies have a more sophisticated activity structure (i.e., are more formalized) than younger companies [12].

Formalization of management mechanisms is connected to higher company efficiency in activities, both within the company and between companies [13; 14; cited according to 15]. The formalization of logistics is also considered to be a key attribute of progressive companies [15]. According to [12], formalization can reduce costs, streamline operations and improve the overall efficiency and effectiveness of logistics. Although it also entails negative consequences, the overall impact on logistics is positive [15] studied formalization directly in a reverse logistics environment using empirical data. He demonstrated that formalization reinforces the relationship between a company's reverse flow capabilities and the efficiency of the reverse flow system.

A simple procedure was used for our analysis to express the level of reverse flow planning formalization in terms of a single data point: the presence or absence of reverse flows in individual levels of planning, as concerns the company-wide strategic plan, the strategic plan for some functional/company units and the tactical and operational plan. Companies were awarded one point if reverse flow planning was present at any of these levels. This gave rise to an index with values ranging from 0 to 4 which reflects the degree to which reverse flows are "included" in the planning mechanism for the company in question. This may be also taken as an indicator of formalization in this area – hereinafter referred to as the formalization index.

4. EMPIRICAL PART

In 2009 and 2010, structured personal interviews were conducted to gain data from managers of 148 companies located in the Czech Republic, representing machinery (29%), chemical industry (9%), trade (28%), food processing (6%) and other industries (27%). In terms of size, the respondents were almost equally distributed: 35% belongs to small, 38% to middle-sized and 27% of large companies. Except for trade, companies of all sizes are covered in the remaining industries of the sample. The interviews have yielded answers to 23 main questions, of which only a few are utilized in the article. More detailed description of questions' formulation and construction of research sample can be found in [10].
For the purpose of the regression analysis, three variables were employed:

- profitability – which can be understood as a measure of effectiveness
- index of planning – as a rough measure of formalization
- index of strategy orientation – as a description of external/ internal orientation of strategy

The tested hypotheses are depicted in Fig. 1.

![Tested model diagram]

**Fig. 1. Tested model**

### 4.1 The employed variables

**Reverse Flow Profitability**

Approximately one-third of Czech companies do not follow the economic impact of reverse flows and others use very imprecise procedures (see [10]). To determine reverse flow profitability, only the estimates of respondents made therefore be employed. As it turns out, a two-thirds majority is convinced of the negative impact of reverse flows; only one-third of companies think reverse flows increase profit. We used these estimates to divide companies into those suffering a loss brought about by reverse flows and those generating profit from them. This allowed the creation of an ordinal veritable.

**Strategic orientation**

The graph shows that an external reverse flow strategy prevails for the companies studied. 48.7% indicated external “reasons for interest” or “roles” more frequently. By contrast, 31.9% chose internal factors. One-fifth (19.6%) of companies chose an identical number of internal and external factors, with an index therefore equal to zero. The average value of the index for the entire sample was -0.7, range [-8, +6] and standard deviation 2.58.

**Level of formal planning of reverse flows**

Reverse flows issues are present on strategic, tactical or operative level in the half of companies, whereas the planning on operative level is the most frequent (69% of companies). The frequencies of calculated index are distributed almost equally among companies as it is apparent from Tab. 2.

<table>
<thead>
<tr>
<th>No. of planning levels dealing with reverse flows</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>Total</th>
<th>Missing values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequencies</td>
<td>30</td>
<td>23</td>
<td>26</td>
<td>22</td>
<td>32</td>
<td>133</td>
<td>15</td>
</tr>
<tr>
<td>%</td>
<td>23</td>
<td>17</td>
<td>20</td>
<td>16</td>
<td>24</td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>

### 4.2 Regression analysis

The outputs of the regression analysis calculated in SPSS 20 are presented in Tab. 3. Whereas the index of planning appears to be a reliable predictor of profitability ($p = 0.02$), the orientation of strategy is significant at $p = 0.057$ only; however such (un)reliability can be partially accepted in social sciences.

The quality of the resulting model was tested using three indicators. ANOVA was employed initially. The test criteria $F = 5.283$ exceeds 1 and is statistically significant at the ($p = 0.007$) level. The proposed model therefore has statistical significance because it accounts for some of the variance in the data – ($R^2 = 0.11$).

The Durbin-Watson statistic ($D-W = 2.076$), was used as a second test. It is in a desirable range approaching 2, the ideal value and demonstrates autocorrelation in model residuals is not pronounced.
Tab. 3 Regression coefficients

<table>
<thead>
<tr>
<th>Variable</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
<th>t</th>
<th>Sig.</th>
<th>Collinearity Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Constant)</td>
<td>-0.682</td>
<td>0.195</td>
<td>-3.504</td>
<td>0.001</td>
<td>Tolerance: 0.985, VIF: 1.015</td>
</tr>
<tr>
<td>Orient.strat</td>
<td>0.068</td>
<td>0.035</td>
<td>0.198</td>
<td>1.929</td>
<td>0.057, 0.985, 1.015</td>
</tr>
<tr>
<td>Planning</td>
<td>0.161</td>
<td>0.068</td>
<td>0.242</td>
<td>2.363</td>
<td>0.020, 0.985, 1.015</td>
</tr>
</tbody>
</table>

The third test is for multicolinearity – i.e., it tests the independence of the variables. The correlation among independent variables (coeff. of correlation = -0.121) did not exceed the indicated limit value of 0.75 and VIF (the Variance Inflation Factor) for all variables included in the models was less than the limit value of 10. The models proposed are therefore not problematic from the standpoint of basic reliability and therefore we can accept the hypothesis H1 and H2.

Tab. 4. Anova

<table>
<thead>
<tr>
<th></th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regression</td>
<td>8.267</td>
<td>2</td>
<td>4.134</td>
<td>5.283</td>
<td>0.007*</td>
</tr>
<tr>
<td>Residual</td>
<td>67.284</td>
<td>86</td>
<td>0.782</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>75.551</td>
<td>88</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

5. CONCLUSIONS

The strategy orientation index for companies in terms of internal and external reverse flows may be understood, with a bit of leeway, as providing information on whether companies prefer efficiency or effectiveness in their reverse flow systems. Efficiency represents a focus on the economical use of resources. Effectiveness, on the other hand, takes in objectives and their fulfillment, in other words problem solving. In the context at hand, it may involve providing other values to customers, satisfying their needs, attaining a competitive advantage, etc., by the effective use of reverse flows. Let us here note that we do not presume attaining efficiency is a prerequisite to effectiveness, as some definitions do.

Ramanujam and Venkatraman (1987, p.464) state that an externally oriented planning system (including strategic plans) is a significant predictor of higher effectiveness while, by contrast an internal orientation predisposes to decreased organizational effectiveness. Our results do not confirm this finding at the level of company-wide planning. Looking at the average index values of company reverse flow profitability, it is clear that the value approaches zero. It may thus be assumed that it is not an internal orientation which is beneficial but rather a balanced focus on both internal and external factors.

These data serve to bolster the argument that the general principles underpinning efficiency and effectiveness may bear fruit even in terms of reverse flows. Although it may seem trivial, the ideas of a high percentage of the management team (the people who form the major driving force in a company) differ; as shown in a number of empirical studies, they frequently, even usually, see reverse flows as a necessary evil (for more see, e.g., Škapa and Klopalová, 2011). Speaking in statistic terminology, the level of planning of reverse flows turned out to be more significant predictor of profitability, which means that the companies with more elaborate planning system are characterized by positive economic impact of reverse flows more often. It suggests that formalization of coordination mechanism in the field of reverse flows is probably beneficial for companies.

Despite several methodological limitations related to the presented study that were mentioned above, the whole model supports the idea that the attention devoted to reverse flows can pay in the end and it contradicts the views on reverse flows as the necessary evil that should be avoided and on which only a minimum resources should be allocated.
LITERATURE


