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# REVERSE LOGISTICS POLICY – DIFFERENCES BETWEEN CONSERVATIVE AND INNOVATIVE REVERSE LOGISTICS MANAGEMENT

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## Abstract

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One of the of the key barriers that hampers effective and efficient management of reverse flows detected within a number of empirical surveys and case studies focused on reverse logistics and/or return management is business (organisational) policy, specifically lack of policy, deficiency in existing policy or inferior policy. Despite this fact, there is a gap in literature which would show some evidence from practice that innovative reverse logistics policy both can pay off and is associated with certain aspects of reverse logistics management. Such proof can have several implications. It can support the call for better understanding and more research of the linkages of reverse logistics with other corporate functions, promote the acceptation of strategic character of reverse logistics and stress the role of RL policy within the rest of overall corporate management.
The aim of this paper is to contribute and to enrich the existing body of knowledge concerning the above-mentioned gap through presentation of survey results that was realized in 2012 among managers of 244 Czech firms. The results demonstrate the statistically significant association between the innovativeness of RL policy and profitability of firms, quality of RL planning, perception of RL importance, level of RL knowledge and perception of product innovation importance for firms' competitiveness and frequency of product innovation. They also reveal statistically significant differences between firms with conservative and innovative RL policy and the perceived existence of some barriers to manage RL.

reverse logistics, reverse flows, policy, performance outcomes, performance measurement, planning, product innovation, knowledge of reverse logistics, barriers

## INTRODUCTION AND THEORETICAL REVIEW

Every firm pursues its policy or specific types of policies (written and formal or unwritten and informal) to reach the objectives. According to Pearce and Robinson (1995; p. 323) policy can be defined as *specific guides to managerial action and decisions in the implementation of strategy*. Policies are derived from the goals of managers and define the desired behaviour of a firm as a whole and of its employees (Wies, 1994). Steiner (1979) proposed a pyramid of policies with the broad policy at the top concerned with the ways of doing business and related to missions, visions, overall goals and objectives of a firm. Downward to the bottom of firm's hierarchy there are specific policies that might have strategic character nevertheless they typically refer to some particular function, area, task etc. (Pearce and Robinson, 1995). Similarly there are policies that span across several functional areas – most of them have the above mentioned strategic nature (Wies, 1994). Martin (2010) distinguishes between strategic and operational policies. Strategic policies define the business and its boundaries and direction for visions and competitive strategies, while operational policies are more instrumental and refer to specific principles, rules, procedures, processes, structure and they help to allocate resources (Sekhar, 2010). Policy and policies

express values of owners, managers but also shared values of other stakeholders in dependence on the individual stakeholder group power or position and according the internal and external orientation of firm (Grimley, 1986; Brown *et al*., 2001). The same characteristic concerns reverse logistics as well (Carter and Ellram, 1998; Jayraman and Luo, 2007).

Reverse logistics (RL) is a functional area of firms' value created processes dealing with reverse flows with still growing strategic importance for competitiveness (Rogers and Tibben-Lembke, 1998; Stock *et al*., 2002; Jack *et al*., 2010) and supporting or even improving performance in both of efficiency and effectiveness measures (Daugherty *et al*., 2002). The strategic character of RL management is evident in the definition given by Stock (1992; p. 21) who describes RL as *a systematic business model that applies best logistics engineering and management methodologies across the enterprise in order to profitably close the loop on the supply chain.* RL is more complex than forward logistics with some specificity that requires proper attention and proper resources and more demanding planning. (Gooley, 2003; Amini *et al*., 1999). RL should be part of the overall business strategy (Gooley, 2003; Marien, 1998). Excellent leaders of firms, who understand the role of RL, formulate RL policies within overall business strategy and try to set effective and efficient RL programs to support RL (Daugherty e*t al*., 2002; Richey *et al*., 2005; Stock and Mulki, 2009; Lambert *et al*., 2011).

Since policy is the fundamental instrument for future direction of firm's development and assisting to sustain and improve competitiveness, it should be adequately flexible and reacts to the changes in the environment or be even proactive. Thus policy can be characterized on the continuum from very innovative to very conservative and can be very different when dealing with various areas of interest and knowledge of managers. Innovative policy – not only in the frame of reverse logistics – means to introduce innovations into processes and activities, organization, responsibilities, tangible resource, inputs etc. and depends on the strategic stance of the decision makers in companies (Álvarez-Gil *et al*., 2007). The extent and level of innovation policy innovativeness is determined by resources and capabilities of company and by the competences of managers and their ability to recognize opportunities and threats coming from the environment and strengths and weaknesses of company. According to Richey *et al*. (2005) RL innovation capabilities function as the mediator between firm's resources and performance.

Although innovation can have diverse character from product, service, process, management to organizational innovation (Bigliardi and Dormio, 2009), our survey deals, beside RL policy innovativeness, with product innovation in view of the fact that majority of content of RL is represented by products (in various form). The most often followed and important objectives of RL are return flows avoidance (Hjort, 2010), return minimisation and proper or effective and efficient disposal with products within reverse flows (Stock and Mulki, 2009). Such objectives can stimulate innovation in RL policy and lead to innovative approaches, programmes and procedures to enhance firm's performance with the help of RL improvement (Cowan and Van de Paul, 2000; Daugherty *et al*., 2002;, Richey *et al*., 2005).

Empirical research offers several demonstrations of managers' evaluation of policy to be regarded as one of the barrier for better RL management (Rogers and Tibben-Lembke, 1998; Ravi and Shankar, 2005; Janse, 2008). This finding is most frequently an outcome summary of positive answers to the questions directly searching for the obstacles in the present status or potential level of management of all or some of specific processes within the reverse logistics. Less often is this barrier revealed as a consequence of some managerial decisions or as a reason resulting to the investigation of miscellaneous factors, conditions and situations, what implies to be a knowledge gap.

Policy is not the starting element for successful RL management. On the contrary, policy can be developed when some other barriers do not exist. Ravi and Shankar (2005) proposed casual model of interdependencies between eleven barriers they considered as the most effected for reverse logistics and pointed out knowledge, specifically lack of awareness about RL, as the initial cause or the top barrier. Lack of awareness may be joined to another common issues as the relative unimportance of RL in comparison to other areas (Rogers and Tibben-Lembke, 1998) and lack of recognition of RL as a factor to establish competitive advantage and competiveness (Kocabasoglu *et al*., 2007) or management inattention (Rogers and Tibben-Lembke, 1998). If these barriers are employed, other barriers occur as the consequences. If there is no interest, knowledge and recognition, little or no commitment, particularly management and proceeding resource commitment (e.g. financial, space, human resource…), Daugherty *et al*., 2001; Richey *et al*., 2005) is dedicated to RL and RL processes are not included (or not sufficiently) into forecasting and planning (Rogers and Tibben-Lembke, 1998; Ravi and Shankkar, 2005; Janse, 2008) and no corporate policy which would cover RL or no special functional policies regarded to all or particular RL processes and activities exist. RL processes and activities must be performed and solved (less or more in every firm), but on in the situation described above as ad hoc or on operative basis prevalently. Such incidental character of management means that there is no specific information system and performance management and measurement recording what happens in everyday firms' life within reverse logistics processes (Škapa and Klapalová, 2012). For instance Janse (2008) stated that one of major barrier is if the costs connected to RL are not known. Where no data and

information are for management, it is impossible to know if and if yes, what value can be captured from reverse logistics.

Nevertheless, it would be myopic to adhere to the above introduced causality. In entrepreneurship there are also other factors that can feature as obstacles but as driving forces as well. The line between is too thin. Driving forces, that similarly can play role of barriers for better RL management and for policy formulation, can be for instance different pressuring groups and their power and requirements (Álvarez-Gil *et al*., 2007). Among them the governments, their policies and legislation, the customers, suppliers or other partners in supply chain from the external environment and shareholders, disposable resources and staff capabilities from the internal environment belong to the examples (Carter and Ellram, 1998; Stock, 1998; De Brito, 2003; Presley *et al*., 2007; Ha, 2012).

The aim of this paper is to contribute and to enrich the existing body of knowledge concerning the above-mentioned gap through presentation of survey results that was realized in 2012 among managers of 244 Czech firms. Survey is a part of longitudinal research focused on various features of reverse logistics management in the country. The research question for the outcomes which are analysed and evaluated in this paper was formulated as: *Are there differences in some reverse logistics (RL) management areas between firms that have innovative RL policy and firms that have conservative RL policy?* Basic statistical methods for quantitative data analysis – particularly correlation and t-test, calculated in SPSS v. 21 – were applied.

## MATERIALS AND METHODS

From the literature review and problem statement several hypotheses were formulated for the survey to get answer to the research question and they are divided into following areas:

1. performance outcome and performance measurement:

H1a: RL policy innovativeness is positively associated with the profitability of firms;

H1b: RL policy innovativeness is positively associated with the perception of RF profitability;

H1c: RL policy is more innovative in the case of firms for which RL helps to increase the profit in contrary to firms where this situation does not occur and in the case of firms where RL does not reduces the profit in comparison to firms where RL is the cause for profit reduction;

H1d: RL policy is more innovative in the case of firms that measure RL financial performance in comparison to firms which do not measure financial performance.

2. quality of RL planning:

H2: RL policy innovativeness is positively associated with the quality of planning;

3. perception of RF position:

H3: RL policy innovativeness is positively associated with the management perception of RF position;

4. importance of product innovation:

H4: RL policy innovativeness is positively associated with the perception of product innovation importance;

5. frequency of product innovation:

H5: RL policy innovativeness is positively associated with the frequency of product innovation;

6. RF knowledge:

H6: RL policy innovativeness is positively associated with the frequency of product innovation;

For the relation between the level of RL policy innovativeness and variables in H2–H6 also differences between firms were analyzed (see Materials and Methods) with the overall presumption that firms with innovative RL policy show different aspects of management in those variables.

7. barriers of RL management:

H7: There are statistically significant differences between firms with innovative and firms with conservative RL policy and barriers to manage reverse logistics.

Data for the analysis to answer the research question were gathered through empirical survey done during the year 2012. With the use of structured questionnaire 244 personal interviews with managers at top, middle and lower level of hierarchy from the same number of Czech firms were realized. Respondents (if not from tope-level) represented various function, in the case of large and middle enterprises they were the logistics, supply chain or purchase/sales/marketing managers, production managers or quality managers. In the case of micro and small enterprises (counted together into one group) also owners that manage firms took part in the survey. The questionnaire ranged over various issues of reverse logistics management and included 28 closed, opened and semi-opened questions. For the purpose of this paper answers to only 12 questions are analysed and evaluated. The structure of industries and sectors was diverse, with relative big share of firms engaged in services. Character of the survey is mixed descriptive and exploratory.

Eight questions have character of scale and four questions were of dichotomy nature. Seventeen types of barriers to manage RL were investigated in the form of binary variable (if the barrier exists or not). The same character had also the questions asking if the firms measure costs associated to RL or not, if RL reduces the profit of company or not and if RL raises the profit of company or not.

Frequencies and relative frequencies, Means, standard errors and independent t-tests were calculated to find out if any differences exist between the firms that introduced the existence

of barriers, answered to the RL performance outcomes and RL cost measurement in the level of RL policy innovativeness. Correlations (determined with a Spearman's Rho) were calculated for the scale questions to ascertain the association and the strength of association between the level of RL policy innovativeness (7-point scale from 1 = very conservative RL policy and 7 = very innovative RL policy) and:

a) profitability of company (7-point scale from 1 = highly in loss and 7 = high profitable);
b) quality of RL planning (5-point scale where 1 = the highest quality means planning RL on the strategic corporate level; 2 = planning on strategic functional level; 3 = planning on tactical level; 4 = planning on operational level and 5 = the lowest quality if RL is not planned at all and managed just ad hoc);
c) knowledge level of RL (7-point scale with 1 = distinctively higher than knowledge of forward logistics and 7 = distinctively lower);
d) perception of RL necessity to manage (7-point scale where 1 = useless and bothering and 7 = necessary and important to deal with);
e) perception of RL profitability (7-point scale with 1 = very loss-making and 7 = very profitable);
f) frequency of product innovation (5-point scale where 1=several times in a month and 5 = less than once in five years);
g) the importance of product innovation(5-point scale with 1 =existentially necessary and 5 = very marginal, it is not necessary to innovate the product).

## RESULTS AND DISSCUSSION

From the total sample of 244 companies, 66.0% (N = 161) belongs to the group of micro and small enterprises (1–49 employees), 19.3% (N = 47) to the group of middle-sized enterprises (50–249 employees) and 14.8% (N = 36) to the group of large enterprises (250 and more employees. As it will be showed in the results, size of companies measured by the number of employees is relatively strongly reflected in the differences of outcomes.

First, results of descriptive statistical analysis related to the investigated issues for the three size-groups of companies are introduced (see Tab. I). Large companies are the most profitable whereas micro and small companies are the least profitable. The same ranking is with the degree of perceived necessity to manage RL and level of RL policy innovativeness. The same we can conclude with level of perceived importance of product innovation and frequency of innovation, just the findings with the measure of quality of RL planning shows that middle-sized companies quality is slightly less strategic in average in comparison with micro and small companies (Means are for the inverse scales, see Materials and Methods).

### 1. performance outcomes and performance measurement

All four hypotheses (H1a–H1d) were confirmed. Spearman Rank Order Correlation tests proved at the significance level 0.01 that there are statistically significant associations between RL policy innovativeness and both variables related to profitability (see Tab. II). Specifically for the association between RL policy innovativeness and overall profitability of firms r = 0.213, p = 0.001. Nevertheless the strength of effect is rather small. Value of $R^2$ = 0.045369, what means that RL policy innovativeness shares only 4.5% of the variability in overall profitability. For the association between RL policy innovativeness and perception of the impact of RL on profitability r = 0.587, p = 0.000 and $R^2$ = 0.3445. We can see that in this case the strength of effect is much higher – RL policy innovativeness shares more than 34% of the variability in RL impact on profitability what allow to conclude that the more innovative RL policy is the more profit can be gained from RL processes. Nevertheless, this is the outcome of variable that measures only experts' perception.

If we add to the analysis also the consideration of size of companies, some shifts in the outcomes can be detected (see Tab. III). In the case of profitability the association is slightly stronger with the micro and small companies but there is no association with middle and large companies. Although these results can be affected by the structure of sample

I: *Descriptive statistics (Means) of size-groups related results*

| size of companies | company profitability | RL planning quality | RL policy innovativeness | RL knowledge |
|---|---|---|---|---|
| micro and small companies | 4,05 | 2,83 | 3,63 | 4,44 |
| middle-sized companies | 4,48 | 2,92 | 3,96 | 4,92 |
| large companies | 5,00 | 2,06 | 4,29 | 4,24 |
| | **RL necessity** | **RL impact on profitability** | **product innovation importance** | **frequency of innovation** |
| micro and small companies | 4,65 | 4,53 | 2,74 | 2,97 |
| middle-sized companies | 4,68 | 4,44 | 2,52 | 2,96 |
| large companies | 5,18 | 5,00 | 2,12 | 2,53 |

Source: survey results

II: *Correlation test for RL policy innovativeness and profitability*

| | profitability | RL – loss-making – profitable |
|---|---|---|
| RL policy innovativeness | 0.213** | 0.587** |
| Sig. (2-tailed) | 0.001 | 0.000 |

** Correlation is significant at the 0.01 level
Source: survey results

III: *Correlation test for RL policy innovativeness and profitability implying size of companies*

| size of companies | | profitability | RL – loss-making – profitable |
|---|---|---|---|
| micro and small companies | RL policy innovativeness | 0.266** | 0.600** |
| | Sig. (2-tailed) | 0.000 | 0.000 |
| middle-sized companies | RL policy innovativeness | 0.010 | 0.563** |
| | Sig. (2-tailed) | 0.474 | 0.000 |
| large companies | RL policy innovativeness | –0.047 | 0.618** |
| | Sig. (2-tailed) | 0.395 | 0.000 |

** Correlation is significant at the 0.01 level
Source: survey results

with the prevalence of micro and small companies it can be also explained by the fact that profitability of this size-group of companies is more dependent on dealing with reverse flows and the existence of reverse flows. The analysis of perception variable investigating the effect of RL on profit show no specific differences when taking into account also size of companies.

Results in Tab. IV confirm once more time the above formulated presumption which expressed the expectation that innovative RL policy can pay off. In this instance, not only as the corporate profitability, but directly approving the impact of RL on profit gaining. Firms where RL helps to raise the profit have more innovative RL policy (Mean 4.07) in comparison to firms where RL does not lead to the profit growth (Mean 3.49) with the statistically significant difference ($p = 0.013$) and $t = -2.512$. Negative t-value means that (not causally) that RL as raising the profit leads to higher RL policy innovativeness than if RL does not raise the profit. Statistically significant difference was detected also in the case of micro and small companies ($p = 0.006$) and $t = -2.823$ but not in the case of middle and large companies, although the Means confirm the expectation as well (for middle-sized companies the Means for companies where RL help to raise the profit is 4,48 and the Means for those companies where it does not help to raise the profit is 3,79 while for large companies the first Means is 5,13 compared to 4,36). The difference which favours innovative firms (Mean 4.03 in comparison to 3.65) as well was found also with other variable investigating RL financial outcome – the point of RL impact on profit reduction, nevertheless in this circumstance not statistically significant ($t = 1.684$, $p = 0.094$). Nevertheless after the sample has been split according the size of companies, statistically significant difference was found with micro and small companies ($p = 0.017$) and $t = 2.419$, but only differences with the other size-groups of companies. The last important finding refers to the linkage between RL innovativeness and RL costs measurement. Firms which measure RL costs have RL policy more innovative (Mean 4.20) in comparison to firms which do not measure RL costs (Mean 3.59). The value of $t = -3.080$, $p = 0.002$. Large companies demonstrate the major effect to this result, statistically significant difference was identified only with this group and not with the other two groups although the difference of Means with middle–sized companies is also relative big (3,74 if not measured and 4,42 if measured) with $p = 0.123$) and $t = 1.573$.

IV: *Differences in RL outcomes and financial performance measurement between firms with conservative and firms with innovative RL policy*

| RL outcomes and financial performance measurement | Mean for RL policy innovativeness | N | t | p value |
|---|---|---|---|---|
| RL does not reduce the profit | 4.03 | 99 | 1.684 | 0.094 |
| RL reduces the profit | 3.65 | 68 | | |
| RL does not raise the profit | 3.49 | 59 | –2.512 | 0.013* |
| RL raises the profit | 4.07 | 107 | | |
| we do not measure the RL costs | 3.59 | 164 | –3.080 | 0.002* |
| we measure the RL costs | 4.20 | 75 | | |

*Statistically significant at the 0.05 level
Source: survey results

### 2. quality of RL planning, perception of RF position, importance and frequency of product innovation and level of RL knowledge

Hypotheses related to some aspects of management, particularly RL involvement into planning, perception of RL necessity, level of RL knowledge and the importance and frequency of product innovation were also confirmed. The values of a Spearman Rank Correlation coefficient show positive associations ascertained by the p-values at 0.001 and 0.05 level of statistical significance. Minus signs with 4 variables are consequence of opposite values in the scales. The highest effect of strength is with the perception of RL necessity and RL policy innovation ($r = 0.626$, $p = 0.000$), where $R^2 = 0.3918$ shows that RL policy innovativeness accounts for nearly 40% of the perception degree of RL necessity. Relatively strong effect of association is found with the quality of RL planning ($r = -0.452$, $p = 0.000$). $R^2 = 0.2043$ means that RL policy degree of innovativeness can account of about 20% of RL quality of planning. Statistically significant associations were detected also with the rest three variables (see Tab. V), notwithstanding the strength is rather low. It might be said that RL policy innovativeness is related to the perceived degree of importance of product innovation and existing level of product innovation frequency as well as to the level of RL knowledge but these variables do not necessarily have real cause effect. On the contrary, recognition of the RL importance included also in strategic planning of RL are linked to RL policy innovativeness substantially more. Strength of association is related to the size of companies considerably. The smallest correlation coefficient of the quality of planning was discovered with the micro and small companies (–0.385) and highest with middle-sized companies (–0.519), distinctively highest correlation index of the RL importance (necessity) perception was found with large companies (0.828) while correlation index for micro and small companies is only (0.561). Correlation coefficients for micro and small companies in the case of the last three variables (importance and frequency of innovation and level of RL knowledge) were very small and no statistically significant association were detected with this group of companies. On the contrary the overall result of statistically significant correlation in the case of the importance and frequency of innovation is the consequence of the answers given by the respondents of large companies. In other words it is the large companies where there is the association between RL policy innovativeness and the rate of the perception of the importance of innovation as well as the frequency of innovation, but not in the case of micro and small and middle-sized companies. Nevertheless, for the case of last variable – level of RL knowledge, only the answers of middle-sized companies affected the overall result. P-value is 0,043, while for micro and small companies it is 0,338 and for large companies 0,536. Although we cannot make reasoning for this finding, analysis of position of the respondents show that in the case of large companies the knowledge and skills of the interviewed person can lead to some biases of results.

### 3. barriers of RL management

In our survey RL policy as a barrier does not rank the first position as the most frequently mentioned barrier from all 17 barriers that the respondents could indicate when managing reverse logistics. Two barriers in the list related to policy as a barrier – "RL policy not clear" and "restrictive RL policy" were included in the questionnaire. The first policy-barrier holds the 8th rank with the share of answers 27%, the second one holds 17th rank. Barriers ordered according the frequencies and relative frequencies are introduced in Tab. VI. What we see as very important in our finding is the fact that barriers that represent the capabilities and competencies are those they are perceived as barriers by about third of respondents (first five ranks in the Tab. V).

Testing the hypothesis about the existence of statistically significant differences between firms with innovative and firms with conservative RL policy and barriers to manage reverse logistics (H7), the findings introduced in Tab. VII are of mixed nature. The hypothesis was confirmed in the case of six barriers and in one case (character of market) the difference was found as big but not significant statistically. If we have closer look at the differences found we see that they are related exactly to those barriers that have character of capabilities and competencies: The biggest differences was found with the lack of RL importance recognition ($t = 5.378$, $p = 0.000$), l ), lack of RL performance management and evaluation ($t = 2.633$, $p = 0.009$), lack of knowledge to manage RL ($t = 2.614$, $p = 0.010$) and lack of systematic RL management ($t = 2.413$, $p = 0.017$). If the results for three size-groups of companies should be analysed, there is no difference considering the size in the case of lack of RL importance recognition, but big

V: *Correlation test of RL policy innovativeness and some management aspects*

| | quality of planning RL | RL - unnecessary-inevitable | importance of innovation | frequency of innovation | level of RL knowledge |
|---|---|---|---|---|---|
| RL policy innovativeness | –0.452** | 0.626** | –0.257** | –0.214* | –0.186* |
| Sig. (2-tailed) | 0.000 | 0.000 | 0.002 | 0.012 | 0.027 |

** Statistically significant at 0.001 level; * Statistically significant at 0.05 level
Source: survey results

VI: *Ranks of barriers to manage reverse logistics*

| barrier | rank | N | N in % |
|---|---|---|---|
| lack of knowledge to manage RF | 1. | 90 | 37% |
| RL importance for competitiveness not recognized | 2. | 88 | 36% |
| lack of systematic RF management | 3. | 87 | 36% |
| lack of RF performance measurement and evaluation | 4. | 86 | 35% |
| lack of human resources | 5. | 81 | 33% |
| lack of financial resources | 6. | 80 | 33% |
| character of product | 7. | 76 | 31% |
| RL policy not clear | 8. | 66 | 27% |
| bargaining power of customer | 9. | 56 | 23% |
| existing corporate strategy | 10. | 48 | 20% |
| legislation | 11. | 47 | 20% |
| poor support of corporate information system IS | 12. | 40 | 16% |
| lack of needed equipment/machines for RF operations | 13. | 36 | 15% |
| character of supply chain | 14. | 30 | 12% |
| insufficient interest in the environmental issues of entrepreneurship | 15. | 28 | 11% |
| character of market | 16. | 19 | 8% |
| restrictive corporate policy towards RF | 17. | 14 | 6% |

Source: survey results

VII: *RL policy innovativeness and barriers to manage reverse flows – t-test results*

| RL policy innovativeness and barriers to manage reverse flows | Barrier "yes" Mean | N | Barrier "no" Mean | N | t | p value |
|---|---|---|---|---|---|---|
| lack of knowledge to manage RL | 3.46 | 90 | 3.95 | 153 | 2.614 | 0.010* |
| RL importance not recognized | 3.10 | 88 | 4.15 | 155 | 5.738 | 0.000* |
| lack of systematic RL management | 3.47 | 87 | 3.94 | 156 | 2.413 | 0.017* |
| lack of RL performance measurement and evaluation | 3.44 | 86 | 3.95 | 157 | 2.633 | 0.009* |
| lack of human resources | 3.70 | 80 | 3.80 | 163 | 0.522 | 0.602 |
| lack of financial resources | 3.61 | 80 | 3.85 | 163 | 1.181 | 0.239 |
| restrictive corporate policy towards RL | 4.00 | 13 | 3.76 | 230 | –0.587 | 0.558 |
| character of product | 3.71 | 76 | 3.80 | 167 | 0.426 | 0.670 |
| RL policy not clear | 3.45 | 66 | 3.89 | 177 | 2.077 | 0.039* |
| bargaining power of customer | 4.16 | 56 | 3.65 | 187 | –2.317 | 0.021* |
| existing corporate strategy | 3.62 | 47 | 3.81 | 196 | 0.801 | 0.424 |
| legislation | 4.06 | 47 | 3.70 | 196 | –1.550 | 0.122 |
| poor support of corporate information system | 3.53 | 40 | 3.82 | 203 | 1.165 | 0.245 |
| lack of needed equipment/machines for RF operations | 3.89 | 36 | 3.75 | 207 | –0.533 | 0.594 |
| character of supply chain | 3.83 | 30 | 3.76 | 2013 | –0.256 | 0.798 |
| insufficient interest in the environmental issues of entrepreneurship | 3.61 | 28 | 3.79 | 215 | 0.628 | 0.531 |
| character of market | 3.16 | 19 | 3.82 | 224 | 1.921 | 0.056 |
| restrictive corporate policy towards RF | 4.00 | 13 | 3.76 | 230 | –0.587 | 0.558 |

*Statistically significant at the 0.05 level
Source: survey results

difference in the case of lack of RL performance management and evaluation. The overall statistically significant difference between the companies that do and do not do perceive this issue as barrier comes from the difference perceived by micro and small companies (p = 0.030). P-value for middle-

sized companies is 0,077 and for large companies is 0,729. Micro and small companies answers for the lack of systematic RL management affect also the overall significant difference between the companies that introduced and do not introduced this variable as the barrier. One of the external barrier – bargaining power of customers – accounts for another statistically significant difference. Mean of RL policy innovativeness for firms that introduced this barrier is higher (M = 4.16) as Mean for firms that did not agree with the existence of this barrier (M = 3.65) with t = –2.317 and p = 0.021. Such result can indicate that customers really drive RL policy innovativeness, but such effort in the eyes of managers might be reactive and not proactive. The last barrier where statistically significant difference between two groups of firms was detected (t = 2.077, p = 0.039) concerns RL policy clarity and it corroborates the presumptions about the role of policy for management. Firms where RL policy is clear have more innovative RL policy (M = 3.89) in comparison with firms where RL policy is not clear (M = 3.45). Significance of difference in the sample stems form the middle-sized companies where the difference was the only statistically significant one (p = 0.014). Means of RL policy innovativeness for companies with existing clear policy is 4,39 and for those with the missing clear RL policy is 3,31. The smallest difference was found in the case of micro and small companies.

## CONCLUSIONS AND SUMMARY

This paper focused on reverse logistics (RL) policy innovativeness and on discovery of hypothetical relation between the measures of chosen managerial aspects of reverse logistics management and the level of reverse logistics policy innovativeness as well as differences between firms with conservative and firms with innovative reverse logistics policy in that managerial aspects. All hypotheses were confirmed and based on this overall result we can conclude that innovative reverse logistics policy is one of influencing factors that help firms to be more profitable. However, both survey and presented analysis have some limitations, particularly the structure of sample with the prevalence of micro and small companies that have impact of some individual analyses (not sufficient number of cases). Questionnaire was pretested for face-to face contact method, but some interviews were not being able to realize and respondents filled them on their own. This could result in lower level of some questions formulation understanding. Limitation of the inquiry may lie also in the persons of respondents when in some companies RL belongs to many diverse areas of responsibility and the knowledge of these respondents related to RL and their commitment to RL can be deficient and does not reflect the reality fully. Since only simple statistical methods were used for the hypotheses verification – what is both one of another limitation of this paper and challenge for further and deeper investigation – bivariate analyses revealed some important associations and differences. Firms with innovative RL policy, respectively with higher level of RL policy innovativeness on the contrary to firms with conservative RL policy, respectively with lower level of RL policy innovativeness more often involve RL into the strategic planning, measure the costs associated with RL, recognize the importance of RL and RL in the first group of firms more often help to increase the profit. Also the level of RL knowledge is higher with these firms and they evaluate the importance of product innovation and frequency of product innovation as higher than the second group, although the strength of association coming from the correlation analyses and the differences of Means from independent t-tests are not strongly significant. More innovative RL policy is also related with the lower number of firms that introduces some barriers to manage RL. Most of these barriers that perceive firms with conservative RL policy refer to capabilities and competencies of managers and staff of firms. Only one barrier – bargaining power of customers – was stated more often by firms with innovative RL policy what can be explained as the driving forces for RL policy innovativeness, hence maybe reactive.

In summary, RL policy reflects some managerial aspects not only of reverse logistics but also of product innovation and overall financial performance management and measurement. RL policy is not discussed widely and in more detail in literature and there is lack of knowledge about many issues of RL policy creation, implementation and outcomes or consequences as well as of linkages with various functions and the processes, activities and decision within them, beside other areas. This paper can serve as one of inspiration springboard for following research.

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