Managing Global Transitions

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Barriers Preventing Food Security in Israel, 2050

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The article highlights the benefits of adopting the practice of long-term planning with the aim of helping decision makers and politicians to include scenario thinking in the process of determining food security in Israel, 2050. This study addresses the question of food security, a step that is in contrast with agricultural planning considerations of the past that have mainly focused on maximizing profits or relied on a closed mathematical model. Two teams of experts identified production limitations affecting long-term planning and the ability to ensure food security under these conditions. It was found that there are five key factors important for the decision process: population, land, water, technology and international trade. The data show that today Israel imports a very large scale of virtual land and virtual water in terms of agricultural products. This means that the attention of the decision makers must be diverted from considerations of short-term profit to long-term food security.

Key Words: long-term planning; agriculture policy; food security
JEL Classification: Q18; Q24; Q25; Q28

Introduction

The article deals with the attempt to understand the implications of future calorie supply subject to the terms of the restrictions on the factors of production in agriculture. The largely prevailing view among policy makers in various countries was that lack of food could be supplemented with imports. However, in fact in many countries today it is expected that the issue of food security may be a global problem and imports should not be taken for granted. Agriculture in Israel is expected to face heavy pressure from increasingly restricted water (Hadas and Gal 2014) and land resources (Gal and Hadas 2013) and from a considerable increase in the population (Central Bureau of Statistics 2012). As a result, the Israeli economy is expected to face food supply difficulties in the long run.

Because the State of Israel is a sort of 'Island,' it allows us to examine the question of lack of resources, population growth and the need to understand the importance of long-term planning in some degree of laboratory conditions. The article examines the question of food security and the issue is being discussed as a framework for policy planning in agriculture.

THE FUTURE IS NOT GOING TO BE WHAT IT USED TO BE

The first decade of the 21st century has seen several indications of a troubled future for global food security. The food price spike of 2008, with its consequent food riots and resulting political changes in several countries, the excessive heat and drought in Russia that led to the 2010 wildfires and grain export embargo, as well as the unprecedented floods in Pakistan, signal more trouble ahead. The warning signs could already be seen in the 1990s, as the long-term decline in the number of the world's poor and hungry stalled, and those numbers began to rise. Population numbers continue their march towards a likely 9 billion by 2050, while higher incomes in until now poor countries will lead to increased demand, which in turn puts additional pressures on sustainable food production. To those already daunting challenges, farmers everywhere will need to adapt to climate change. The agricultural system as a whole will have difficulty supplying adequate quantities of food to maintain constant real prices. The challenges extend further: to national governments, to provide the supporting policy and infrastructure environment and to the global trading regime to balance world supply and demand (Nelson et al. 2010).

Evans (2009) argues that the following trends represent a major challenge for global food security: climate change, energy security, water scarcity, competition for land and demand for food. In another study, Sage (2012) suggests that the global food system will be dominated by: (a) rising energy costs given the anticipated decline in conventional oil supplies which will affect land-use and food security, (b) climate change scenarios that anticipate rates of warming and drying in large areas of the tropics that will also have huge implications for food security in those areas, and (c) a global food system that delivers poor quality nutrition with significant dietary health consequences.

Indeed, there are varying degrees of recognition of the challenges that intersect with food production such as freshwater depletion, biodiversity losses, etc., let alone matters of livelihood security and improved access to food. For most, the central solution is to develop and apply new agricultural technologies in order to increase food production. Only one recent

report of international significance comes to a different conclusion (International Assessment of Agricultural Knowledge, Science and Technology for Development 2009), and was clear in its advocacy for a new direction in public policy for food and livelihood security under increasingly constrained environmental conditions. As this report states: 'the current agricultural knowledge, science and technology model requires revision. Business as usual is no longer an option.'

The twentieth century has witnessed extraordinary population growth and the world's population had increased to over 7 billion by 2012. Overall, food production per capita has remained stable during the twentieth century, largely due to technological advances. As the dominant source of human food supply, the per capita availability of world cropland decreased during the twentieth century and will continue to decrease in the foreseeable future. Moreover, the productive capacity of cropland is currently being degraded at an unprecedented rate. Worldwide, nearly one-third of cropland has been lost due to erosion during the past 40 years, it continues to be lost at a rate of more than 10 million hectares per annum and the impact of soil degradation on productivity is indisputable. On the other hand, the demand for cereals will probably continue to grow over the next 20 years, and even larger harvests will be needed if more grain is diverted to produce bio fuels. A higher rate of food production will have to be achieved through agricultural intensification in order to feed additional billions people over the next 50 years (Ye and Van-Ranst 2009).

Historically, Israel's agriculture management policies did not give sufficient consideration for the rapidly growing urban population with its growing demands for the urban, commercial, tourist and industrial sectors (Gal, Gal, and Hadas 2010). Similarly, the planners were overly optimistic concerning the rapidly approaching total exploitation of Israel's limited natural resources. Part of this optimistic point of view stems from the fact that over the last 50 years, even though the role of agriculture in the Israeli economy has been declining, agricultural production grew continuously without additional allocations of water and/or land (Gal and Hadas 2013; Ministry of Agriculture and Rural Development of Israel 2008; 2007; Boroshak 2008; Bank of Israel 2008; Kislev 2002). Even though the importance of agriculture has decreased and an economic cost/benefit analysis might ignore the holistic importance of the sector, there are externalities that decision makers should add to the overall long-term considerations.

Despite its declining importance, the effects of agriculture on the envi-

ronment are significant and complex. Closer examination of the dynamics underlying the global food system reveals a range of possible factors. Even though declining population in some major countries with high consumption per capita levels may contribute to slowdown the growth of aggregate demand, total consumption of agricultural goods will depend, however on the extent to which non-food uses, such as bio fuels, take up the slack (Alexandratos and Bruinsma 2012).

During this period, Israel's rural areas are expected to witness massive and rapid changes in land use due to changes in demography, trade, technology and urban development. Changes in demand for agricultural products and agrarian production structure are likely to have a large impact on landscape quality and the value of natural areas. Key factors that have driven this change include: structural shifts in the economy between manufacturing and services, rising demand for rural leisure and an increasing preference for rural living. The extent of these changes and their likely impact on environment, landscapes and rural livelihoods are largely unknown. Therefore, policy makers need to act in an anticipative or proactive manner, they need to be informed in a timely way what will or could happen and what can be done to lessen risks and stimulate promising developments. With the structural changes of the agricultural sector and the increase in the importance of the domestic-urban sector because of population growth, how will Israel be able to manage to provide food for its population? The notion that Israel's food supply in the long run depends on local agriculture is a mistaken one (Gal and Hadas 2013; Hadas and Gal 2014). For many years now, the vast majority of the caloric value of Israel's food supply has been based on imports, and almost all of the products are imported calories not grown by Israeli agriculture. Since Israel's food security can be based on local agriculture to only a very limited extent, plans must be developed to improve long-term food storage technology and facilities for imported food staples.

COMBINED USE OF PROFESSIONAL EXPERT KNOWLEDGE AND PUBLIC PARTICIPATION

Scenarios of future thinking contain stories, from the expected to the wildcard, in forms that are analytically coherent. Within the framework of this article, scenario is concerned with creating actual story about the future. In fact, very little is said about the actual creation of stories in most methods. More attention is paid to generating the scenario essence or logic, which can be done by any number of methods (Bishop, Hines and

Collins 2007). Above all, the Long-Term Planner's goal is to map uncertainty. Saffo (2007) suggested that for effective future thinking the planner should define a cone of uncertainty that delineates the possibilities that extend out from a particular moment or event. The most important factor in mapping a cone is defining its breadth, which is a measure of overall uncertainty. In other words, the Long-Term Planner determines what range of events or products the cone should encompass.

Scenarios can identify long-term risk and potential opportunity. They encourage strategic thinking about long-term futures and potential discontinuities in a world that obsesses about the short-term. Many statistical and economic models actually work quite well. However, they are best used in situations where there is a consistency of business phenomena, data are extensive and accurate, relationships among variables remain largely constant and the time frame is relatively short. These are situations where there is not much uncertainty and risk. Scenarios are appropriate in any situation where the data are incomplete or unreliable, the relationships among variables are continually changing and the timeframe is sufficiently long to allow disruptive events to occur. Although there may be numerous advantages to long-term thinking, especially in situations where there may be long-term risk, it has not comely naturally to most enterprises, organizations or business people (Millett 2013).

This article uses scenarios to deal with the above questions because they are popular in assessing environmental impact at the large-scale level (Verburg, Eickhout, and Van-Meijl 2008; Jacobs and Statler 2006) and hence are useful tools for long-term planning. Scenarios are a means to portray what could happen, assuming changes in preconditions that differ in nature, course, rate, duration or place (Rotmans et al. 2000; Peterson et al. 2003; Xiang and Clarke 2003; Wester-Herber 2004).

The underlying philosophy of future thinking, that the future is uncertain and cannot be predicted, is often difficult for decision makers and politicians to accept and have not generally become a widely used technique (Verity 2003). While it is a common experience that plans go unrealized or need to be altered because of changing external events, confidence in forecasting is believed to improve over time with better models and tools. Because it is difficult to accept that uncertainty and risk cannot be planned for the future, long-term planning methods have usually been based on mathematical models. However, environments and futures are increasingly turbulent, uncertain and complex. More than any other

strategy tool, scenarios engage with these characteristics rather than ig-
nore them.

There is also antagonism to the idea of relying on experts and Tetlock
for example claims that he found little support for the usual hypothe-
ses about factors often believed to influence the accuracy of experts' pre-
dictions (Tetlock 1999; 2005; 2007). Predictions of experts made on the
political and economic futures found no difference in the accuracy of
forecasts from: (1) experts versus dilettantes; (2) those with more expe-
rience and those with less; (3) experts from different disciplines (e. g.,
economists, political scientists); (4) those with access to classified infor-
mation and those without; (5) those with prestigious institutional affil-
iations and those without; (6) those who had lived for lengthy periods
in the relevant country and those who had not; (7) those with and with-
out relevant language skills; (8) those who identified their ideology as
liberal versus those who considered themselves to be conservative; (9)
those who classified themselves as realists (who believe that in world pol-
itics, the strong do what they will and the weak accept what they must)
versus those who classified themselves as institutionalists (who believe
that international institutions have some normative force not reducible to
power politics); and (10) those whose temperamental self-identification
was boomster-optimist versus doomster-Malthusian. Tetlock's conclu-
sion was that in a complex, probabilistic world, we reach the point of di-
minishing marginal predictive returns for knowledge considerably more
quickly than most experts and most users of expertise appreciate. How-
ever, it should be emphasized that when the debate rests on technical
limitations, the limitations of production factors, or scientific feasibility,
relying on experts allows for identifying the boundaries of possibilities.
Although experts are not immune to error, knowledge and professional
experience in the field has meaning that cannot be ignored. Under cer-
tain conditions diversity and the 'wisdom of crowds' may be better than
experts' wisdom, but this principle does not eliminate the role of the ex-
perts.

Public decision-making is inherently exposed to a high conflict poten-
tial. The necessity to capture the complex context has led to an increasing
request for decision analytic techniques as support for the decision pro-
cess (Gamper and Turcanu 2007). Scenarios such as multi criteria analysis
are deemed to overcome the shortcomings of traditional decision sup-
port tools used in economics, such as cost-benefit or cost-effectiveness
analysis. This is due, among other things, t o its ability of dealing with

qualitative criteria, as well as with uncertainties about current or future impacts. One of the reasons for the use of future scenarios within the framework of this article is based on the claim that Israel can survive only as a high-tech urban/industrial society and will have to reallocate most of its high quality drinking water from agriculture to the domestic/urban/tourist/industrial sectors. Agriculture can no longer be viewed as a high priority food production branch when it comes to the allocation of fresh water (Shuval 2011). However, this argument is based on the reasoning in static and linear systems. The underlying premise of the argument is that in the future, decisions will have to be made where to import the necessary nutrients from. However, what if that is not possible? If we accept the argument of linearity, it is necessary to reduce the importance of the agricultural sector. What if one examines a different story for the future? This completely changes the rules of the game.

The historic question that is raised by Israel's need to reduce its fresh water allocations to agriculture is how will it be able to manage to provide food for its population? For many years now, the vast majority of the caloric value of Israel's food supply has been based on imports and some 80% of Israel's caloric intake is imported (Buchwald and Shuval 2003). The amount of water required by a country to produce the full 'food basket' from local agriculture varies from about 1,000–2,000 m³/person/year (Gleick 2000). It is obvious that countries like Israel with a total water resource potential of significantly less than 1,000 m³/person/year can never approach total food self-sufficiency based solely on locally grown food. Israel can at best grow only 10–20% of its food needs locally and like many other countries with serious water shortages, solves its food security problem by the import of staple food products from the world market. Therefore, the decision makers must face several key questions: what if the world market is not stable? Not sure? What if trade barriers prevent the free movement of goods? Will the decision makers of tomorrow be able to blame the mathematical model? What exactly will feed the population? Will it be new mathematical recipes? Because of the difficulties that are raised by these questions and others like them, the need to examine several future scenarios becomes of vital significance for the decision making of today.

Method

This article focuses on the ability of a small country like Israel to produce all its food needs under conditions of severe land shortage and wa-

ter availability for agriculture, population growth and worsening climate conditions.

Long-term agricultural planning in Israel today (2014) relies on two components: planning at the regional level and the overall policy of the Ministry of Agriculture on the national level. The strategy used for planning agricultural development (Ministry of Agriculture and Rural Development of Israel 2010) is based on public participation through various regional systems. Public participation in planning processes is a prerequisite for the support of the Ministry of Agriculture and the approval of the regional programs. Within the framework of this study, teams of experts were established to assist placement of boundaries for question answering capability of food security in the long run. The experts included researchers from the Department of Economics of the Faculty of Agriculture of the Hebrew University, experts of the Planning Authority within the Ministry of Agriculture and Rural Development, experts of the Extension Service, and experts in the International Trade Department of the Ministry of Agriculture and Rural Development. A total of 28 experts participated in the study.

In this article, forecasting long-term trends will be based on the following:

1. *Identifying and extrapolating megatrends in the past.* Although long-term economic trends can change, these trends can be extrapolated with a reasonable degree of certainty. Unless of course, we have reason to believe that the present economic system will change in some fundamental manner in the future.

2. *Constructing scenarios by experts to consider future possibilities.* It is difficult to define what an expert is because we actually talk about degrees or levels of expertise. Thus, maybe the real question is how much expertise a person should possess before qualifying as an expert? As the future is not predetermined, scenarios by experts are attempts to visualize a number of possible future schemes and consider their implications. Scenarios are based in part on extrapolating megatrends, and in part on subjective interpretation and specific assumptions about critical aspects of the future. A major purpose of scenarios is to avoid extrapolating into the future in a linear fashion.

Although innumerable forecasts are made every day, little effort is spent in evaluating them, because often, we do not want to be held responsible if our forecasts go wrong. However, judgmental forecasts are

much more common than statistical ones in our decision-making processes. We must accept that errors cannot be entirely avoided and that accuracy of judgmental forecasts is, on average, inferior to statistical ones. This is because our judgment is often characterized by having considerable biases and limitations. The entire subject of judgmental biases could take many volumes to treat thoroughly and cannot, therefore, be covered in this article. However, inconsistency can be avoided by formalizing the decision-making process. This would require deciding, first, which factors are important to consider? Second, how such factors should be weighted? Third, what objective should be optimized? The usefulness of decision rules is derived from the fact that several people can be involved in determining them and make it possible to select the best factors, an optimal weighting scheme, and the most viable objectives.

The main steps in drawing up scenarios of possible land allocation in Israel in the decades to come are as follows:

1. Identification of the key forces that are to be included. These agricultural needs are required in order to supply fresh produce to the population and on the other hand the growing demand of land for urban use.

2. Israel's 'food-basket' consumption per capita will remain at more or less the same level in terms of kg per capita. It is assumed that the main factor affecting the demand for food is the size of the population. In addition, it is assumed that an increase in income level will not significantly affect per capita consumption of food.

3. Israel has a developed an agricultural research infrastructure, so the assumption in this study is that the overall rate of technological improvement in production of the agricultural sector in Israel will be at the rate of one percent per annum (Hadas and Gal 2014).

4. Identification of the key factors. These factors are restricted and the number of key factors was kept to a minimum since the complexity in drawing up a scenario rises dramatically in proportion to the number of factors included.

5. Constructing scenarios from the particular factors identified.

Identification of critical factors that might influence long-term planning of the agricultural sector in Israel was carried out by a team of eight experts, Team #1. The team included: an Agricultural Economics expert, an Environmental Science expert, Soil and Water Science experts, an Agricultural Engineering expert and Agricultural Planning experts.

Team #1 established the starting point of the study based on the Israeli agriculture system at present. There are some influencing factors that together shape the strategic options: What are the main emphases of agricultural production management for maximum food safety? Are there other influential factors essential to long-term planning of agriculture in addition to land, water and population size? This set of influences should be analyzed and understood as part of a detailed strategic analysis.

Team #2 consisted of twenty experts. Some were professional advisors of the Extension Service at the Ministry of Agriculture and Rural Development, while others were active farmers who also function as coordinators of various agricultural associations. Within the framework of this article, schematic constraints were chosen for the experts' scenarios. This was based on the assumption that a judgmental opinion is an assessment given by an expert, and it can have significant value in forecasting key policy variables.

The following are the schematic constraints:

- Level of pressure on agricultural water reserves.
- Level of pressure on agricultural land reserves.
- Level of pressure on agricultural technology.
- Level of pressure on agricultural international trade.

THE EXPERTS' EVALUATION PROCEDURE

Based on some elements of the expectancy value theory (Fishbein and Ajzen 1975) the evaluation procedure took place in three stages:

1. In addition to the list of factors created by experts of Team #1, Team#2 analyzed what they thought might be of importance in establishing a long-term policy for agricultural production in Israel. Each one of the experts designated their highest priority and could add new factors that did not already appear on the list.

2. Team #1 discussed agricultural production factors, while Team #2 discussed agricultural outputs.

3. All the factors were scored according to their importance and ability to provide local food demand. The experts assigned a value to each factor in a subjective way and the final list of factors was ranked accordingly.

There is a temptation to look for a neat and tidy way of formulating strategy. Such a method may appear to be achievable by analyzing the environment and the extent to which resources are matched with the environment. However, this approach may fail to recognize the complex role

that people play in the formulation of strategy. Strategy formulation is about objectives, what decision makers want and how political and cultural context play a role (Johnson and Scholes 1999). The fundamental questions that need to be asked are: who should be the authority to determine policy, and how should the direction and objectives of that policy be determined? This question relates not only to the ability to influence objectives but also to the process of supervising executive decisions and actions. This subject, though very intriguing, is beyond the scope of this paper.

Discussion

SCENARIOS OF TEAM #1

Team #1 selected five key factors for the long-term planning process in the agricultural sector of Israel: Population growth, land shortage, water shortage, technological developments, and international trade. The land factor is affected by limited supply due to urban pressure and limited soil fertility. The water factor is affected by the capital structure of desalination, as well as availability of land for facilities and environmental impact. The technology factor is affected by the need for streamlining production, reducing the use of production inputs, the development of storage conditions for fresh produce and finding alternatives to the food basket that rely on large-scale use of land and water. The international trade factor is affected by the possible future existence of limitations and restrictions on free trade due to global shortages.

   Of these five factors, three are basic and significant factors: population, land, and water. Based on the assumption that per capita consumption in 2050 will remain similar to that of 2010, the demand for land and water will depend on the size of the population (table 1). The population forecast for 2050 is 15 million people (Central Bureau of Statistics 2012). Therefore, future land requirements are expected to be 594,000 Ha and future water requirements will be 1,890 million cubic meters per year. Both requirements are unachievable in Israel. Further details of the cal-

TABLE 1   2050 Planning Data According to the Data of 2010
(Without Import or Export)

Year	Population	Land*	Water**
2010	7.600,000	301,000	957
2050	15.000,000	594,000	1,890

NOTES   * Hectares. ** Million m³/year.

TABLE 2   2010 Data to Calculate Per Capita Water Consumption
(Without Import or Export)

Branch	(1)	(2)	(3)	(4)	(5)
Vegetables	143.8	0.048	0.0069	274.7	39.5
Orchard	155.5	0.052	0.0081	312.5	48.6
Fodder crops	81.4	0.151	0.0123	119.8	9.7
Animal	—	—	0.0002	—	14.5
Fish	2.80	0.105	0.0003	1,047.6	2.9
Field crops, not irrigated	15.40	0.574	0.0088	—	
Field crops, irrigated	41.8	0.054	0.0023	108.1	4.5
Other	0.33	—	0.0006	—	6.2
Total			0.0396		126.0

NOTES   Commmn headings are as follows: (1) kg/capita, (2) ha/mt, (3) ha/capita, (4)
millions m³/MT, (5) m³/capita.

culation method for the 2050 forecasts are detailed below. This forecast
assumes that technology is based on existing knowledge and that popu-
lation is an independent factor.

Table 2 shows the 2010 data that were used for the calculation of the per
capita water consumption (Central Bureau of Statistics 2011). It is impor-
tant to note that the data of the animal branch mainly include production
of milk and eggs and very little meat, which mostly comes from imports.

The experts of Team #1 selected two other factors in addition to the
three basic factors. These factors are technological improvements and
foreign trade. Assuming that the needed GDP growth in agriculture in
2050 is due to the increase in population, the required rate of technolog-
ical improvements is therefore 1.72%. This rate reflects the growth of the
population from 7.6 million to 15 million people, assuming that the other
production factors remain constant. That is, the land for agricultural pro-
duction and the amount of water required will not grow despite the 2050
forecast data presented in table 1. This of course is a calculated number
and still we have to find a professional justification how to achieve this
while historical rate is only 1% per annum.

SCENARIOS OF TEAM #2

The experts of Team #2 think that due to severe resource limitations, there
will be a need in the future for a fundamental change in the food bas-
ket composition. An example of the type of change that will be necessary

TABLE 3   The Scores of the Experts Team#2 for the Ability to Deliver the Food Security for the Domestic Market

Branch	Relative weight	Limitations of							
		Water		Land		Techn.		Exp./Imp.	
		(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Vegetables	23.5%	90	21.15	93	21.74	88	20.56	79	18.45
Orchard	25.5%	83	21.17	89	22.70	86	21.80	78	19.76
Fodder crops	1.4%	59	0.83	68	0.95	73	1.02	68	0.95
Animal	33.1%	66	21.79	67	22.07	89	29.35	65	21.52
Fish	1.3%	57	0.74	67	0.87	67	0.87	77	1.00
Field crops, not irr.	0.4%	59	0.24	68	0.27	73	0.29	68	0.27
Field crops, irrigated	4.9%	59	2.89	68	3.33	73	3.58	68	3.33
Total			69.00		72.00		77.00		65.00

NOTES   Column headings are as follows: (1) score, (2) weighted score.

would be a shift from beef consumption to fish, because of water and land limitations required for animal feed. Despite these changes that will be required due to resource limitations, the experts still believe that there will be a problem related to food security. National planning will be required to guide policy makers how to manage the state's inability to satisfy full domestic demand. Food security parameters were ranked by the experts as seen in table 3. Each expert gave a score for the ability to meet any of the four limits set by Team #1 and for each one independently: Water, Land, Technology and Export/Import. The limit scored with the relative weight of the branch allowed for producing a weighted average score of the team to the specific branch. The experts' opinion suggests that Israeli agriculture will not be able to supply local demand when considering each of the four main limitations prescribed by Team #1.

Although it will be impossible to fully meet the demand, there is a consensus that it is important to maintain mixed farming, even if there are no comparative advantages in production.

According to the experts, technology is the simplest limitation to handle, receiving the highest score of 77 out of 100. It is believed that through technology it will be possible to find partial solutions also for the other limitations. The most important technologies relate to efficient methods for water desalination at different quality levels. Other important technologies are growing methods that maintain soil fertility, prevention of food loss through the development of storage methods and post harvest

TABLE 4   The Balance of Israel's Food Production 2010

Branch	Balance of virtual trade			
	Water (millions m³/year)		Land (1000 ha)	
	Export	Import	Export	Import
Vegetables	95	0	16,725	0
Orchard	83	0	13,796	0
Fodder crops	0	224	0	283,288
Animal	0	7	0	73
Fish	0	170	0	5,690
Field crops, not irrigated	0	0	0	62
Field crops, irrigated	0	102	0	51,029
Total	178	503	30,521	340,142

techniques, increasing harvesting duration, the development of efficient methods for growing fish intensively in cages and automation that reduces labour costs. In addition, the experts believe that there is great importance in developing a central information infrastructure that includes: research, information systems and a central training centre. All of these technologies are interrelated and should play a role in achieving the ultimate goal of providing food security.

The balance of Israel's food production shows a net export for fruits and vegetables and import for grains (table 4). Translating this trade balance into terms of land and water use shows a virtual importing of land and water through grains, and exporting virtual land and water through fruits and vegetables. The virtual importing and exporting balance sheet for land and water must take into account where the crops are produced. For instance, import data are based on the production function of agricultural technology in Israel. This means that if it was required to fully produce the imported products locally, the calculations would be based on the requirements to do that in Israel.

From the data above it turns out that Israel exports virtual water of 178 millions ³/year and virtual land totalling 30.5 thousand hectares per annum. The importing of virtual water is 503 millions m³/year and virtual land totalling 340 thousand hectares per annum. The importing of virtual land is greater than the total cultivated agricultural land of Israel, while the importing of virtual water is equal to the volume of all fresh water allocated for Israeli agriculture. These are the data for the year 2010, hence

under conditions that are planned for 2050 with a population twice the size, the situation will only get worse. It should be noted that not only because of the different composition of export crops compared to imports, that even if all the exports were completely stopped, importing virtual land and water would still be required. The agricultural trade structure today is based on the principle of free competition in international markets. However, global warming, global water shortages and reduced arable land per capita might place barriers to free trade. This means that Israel's national planners must confront a strategic problem of food shortages that cannot be taken care of based on a locally produced food basket. This problem will only get worse as the years pass and the population continues to grow.

Findings and Conclusions

This article is a chapter in a series that deals with the barriers preventing food security in Israel over the next 40 years and with fundamental issues of long-term planning in agriculture in Israel. The article discusses the basic assumptions of food security from the perspective of the quantity required for the anticipated population. The purpose of the article was to outline the difficulties facing the Israel national planner. This is not a forecast, but rather a discussion that deals with the question of the possible limits on long-term food security. Even though the direct importance of agriculture has decreased in the GDP and an economic cost/benefit analysis might ignore the holistic importance of the sector, there are externalities that decision makers should add to overall long-term considerations. This is indeed a very central issue in any discussion of substantive policy of food security.

In Israel, there is a distinction between grain and meat production and the production of fresh fruits, vegetables, milk and eggs. Grains and meat are mostly imported while the latter are often produced by the domestic market. The role of domestic agricultural production is presented in tables 2 and 3 in a focused manner. Breakdown by sub-items of the industry is largely methodological and is not possible within the limits of this article.

Israel's population is expected to grow from 8 million (in 2013) to an estimated 15 million people in forty years, a fact which inevitably will lead to a significant increase in the quantity of food consumed by any method of calculation. This assessment does not even consider the Palestinian Authority's population that relies heavily on Israeli agriculture and is ex-

pected to grow as well. Unlike the rest of the world, Israel's population component is a dominant factor with critical significance. The other factors are limitations and barriers that limit the ability to find a solution. Therefore, the different use of these restrictions was the basis for the different scenarios. It is important to remember that Israel is a very small country and most of the area is desert. The intention of the article was to deal with stresses and to outline limitations. It was not meant to be a single parametric forecast.

Israel is characterized by limited land area, built-in water scarcity, a semi-arid climate and a growing population. Global warming will not change materially the desert character of the country. In addition, the natural water sources without desalination are not expected to change significantly. The population issue is a factor that will require increasing the share of urban water and land resources at the expense of agriculture, while requiring a significant increase in food production. This topic is covered in detail in previous articles. Agriculture in Israel is expected to face heavy pressure from increasingly restricted water (Hadas and Gal 2014) and land resources (Gal and Hadas 2013) and from a considerable increase in the population (Central Bureau of Statistics 2012). As a result, the Israeli economy is expected to face food supply difficulties in the long run.

Long-term planning of agriculture in Israel today (2014) relies on two components: planning at the regional level and the overall policy of the Ministry of Agriculture. For this study, teams of experts were established to assist in setting boundaries for answering the question of how to maintain food security in the long run. Agriculture in Israel is characterized by its high level of technology and very advanced research. All of the advanced growth techniques such as hydroponics, etc., are already used in agricultural production in Israel. However, these methods are suitable for limited production systems and do not provide a response to the overwhelming majority of production which is based on land use, such as grains. Reliance on the opinion of experts was designed precisely to address these possibilities. Israel today is a member of the OECD. This means that the average food basket is balanced and in accordance with the standards of developed countries. This is at a time when most assessments of changes in world's food intake are attributed to developing countries. Therefore, the premise of the article was a stable food basket. The only possible fundamental change in that basket would be a transition to artificial food but this topic is beyond the limits of this article.

The development strategy for agriculture in Israel (Ministry of Agriculture and Rural Development of Israel 2010) is based on the concept of maximum independence for the supply of fresh produce while most grains are imported. As a result of the Paris 2011 (FAO/OECD Expert Meeting on Greening the Economy with Agriculture, 5–7 September) conference on food security, food security policy in Israel today (2014) is based on the assumption that the effort should be focused on domestic production as much as possible. The national planner must take into account in particular the question of the future food security of the country. These externalities should take into account such items as environmental aspects related to the rural landscape, maintenance of drainage systems, prevention of soil erosion, refilling of aquifers etc. However, the question that must be raised is what variables should be examined and subject to what considerations? There are so many constraints with different levels of influence, which one should know in order to make the right decisions, which of course is very difficult to achieve.

So far, agricultural planning considerations have mainly focused on maximizing profits. Israel domestic production today supplies mainly the domestic market and export accounts for only about 20% of total production. Still, Israel imports on a very large scale in terms of virtual land and virtual water. This means that the attention of the decision makers must be diverted from consideration of short-term profit to considerations of long-term food security. Relying on the opinion of the experts, there are five key factors for the long-term planning process in the agricultural sector of Israel: population growth, land shortage, water shortage, technology development, and international trade. However, the issues discussed should not be limited only to the restriction of production factors. Other questions are: What other factors that are required today that takes a long time to develop? What should be done in the case that change is not possible? Is there a need for additional budgets to develop advanced technologies for saving manpower, improving storage, raising crops etc.? Other questions might be: What is the most suitable R&D structure? What information systems are needed? What should be the role of the extension services? All of these technologies are interrelated and should play a role in achieving the ultimate goal of providing food security.

In conclusion, the small relative weight of agriculture in the national economy should not be the decisive factor in allocating land and water resources, but rather the strategic issue of the ability to produce food for the domestic market.

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Preferences for Physical and Virtual Retail Formats Choice: The Case of Polish Consumers

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Paper discusses Polish consumers' behaviour and preferences for retail channel and format choice on the background of relevant literature. Results include perception maps created using multidimensional scaling (MDS) on data from two studies: in 2008 and 2012, giving possibility to assess changes at the economic slowdown. Two-dimensional solutions are fitting the data very well and allow to describe compared formats in terms of perceived level of personal interactions with the sales personnel, and perceived total cost for consumer. During analysed period perception of discount stores substantially changed – previously perceived as similar to marketplace, now they are closer convenience stores. Virtual channel formats are still perceived as separate cluster in comparison to physical ones. Declared shopping frequency for 15 formats from both channels is compared with emotional attitudes toward them. In addition, UNIANOVA procedure has been used to find connections with shopping frequency and demographic variables as well as decision-making styles.

Key Words: retail format choice; consumer preferences; economic
    slowdown; demographics; decision-making styles
JEL Classification: M30, O33

Introduction

Preferences for retail channel and format choice within particular channel depend on factors external to the consumer and internal ones. Those preferences are subject to adaptive change when important factors as changes in economy and retail industry become visible for consumers.

External factors on macro level are influencing general consumer preferences, sometimes with prolonged lag. For instance, cycles in economy,

including crises or slowdowns are resulting in changes in consumers' income, to which consumers should adapt their structure of consumption. Other important factors are trends in retail industry, e. g. development of new sales channels and/or store formats. In last 20 years, influence of technological change, mostly through information and communication technologies (ICTs), substantially increased. ICT is treated nowadays as general-purpose technology (GPT) and its impact on economy for both supply and demand sides is overwhelming (Basu and Fernald 2007). For consumers this means the need to adopt ICT related devices/tools and to get skills to operate them, for instance to buy over the Internet or cope with self-service cash registers. Brick-and-mortar retailers need to follow technology change to be in touch with consumer needs and competitors actions – this can lead to broader usage of virtual sales channel and become multi-channel retailer.

External factors on micro-level include among others: perceived price level (for the format, and particular retail outlet), physical effort to buy (including commuting), amount of time needed to fulfil shopping task (Peter and Olson 2002). Most of micro-level external factors create perceived total cost of buying for the consumer. This 'cost' is considered currently by growing numbers of consumers during their decision processes, decreasing importance of price level.

Among internal factors, influencing consumer decisions are i. e.: consumer demographics, and consumer personality manifesting in decision-making styles and perceived level of cognitive and/or emotional effort connected with shopping. Consumer personality issues are considered in this paper indirectly through a scope of decision-making styles (Sproles and Kendall 1986) extended by authors. Mentioned styles are leading to beliefs and attitudes toward shopping. All those factors create emotional and rational perception of retail channels and formats creating attitudes toward them, including perceived risk and trust for retail channel, format or particular outlet.

PREFERENCES FOR RETAIL CHANNEL AND FORMAT CHOICE

Studying store choice issues has in literature long tradition, starting mainly in the 70's of the 20th century. In earlier studies (Monroe and Guiltinan 1975; Arnold, Ma and Tigert 1978; Arnold, Oum and Tigert 1983; Mason, Durand and Taylor 1983; Keng and Ehrenberg 1984; Louviere and Gaeth 1987; Spiggle and Sewall 1987; Dawson, Bloch and Ridgway 1990; Burke et al. 1992; Arnold, Handelman and Tigert 1996) store

choice task has been rationalized using various approaches regarding external and internal factors to the consumer. For instance the store attributes and situational factors were studied, shoppers' and their household demographics, shopping patterns as well as attitudes toward different stores. In addition, implied importance weights of factors like price level, store attractiveness or commuting distance etc. has been researched in mentioned studies.

More recently, the impact of task definition on store choice (Kenhove, Wulf and Waterschoot 1999) has been studied, but most studies have been restricted to the same format, i. e., supermarkets or discount stores. There also exist some researches examining the influence of retail pricing formats on shopping behaviour (Bell, Ho and Tang 1998), often assuming that one store format has generally higher prices than the other one. Similarly the fixed and variable costs of shopping were explored (Bhatnagar and Ratchford 2004), where conditions of optimal store format choice has been found, under assumptions that consumer prefers to shop at minimum total cost, and differences between store format price level exist.

Although non-store retail has long tradition in some countries, this sales channel has been used by consumers as complementary to the sales through typical retail outlets, usually not replacing directly store visits. However, situation changed since e-commerce began play important role in retail industry. Now consumers are choosing not only store format but also channel of buying. Recent studies about channel choice and change (Gensler, Verhoef and Böhm 2012; Joo and Park 2008; Mokhtarian and Tang 2011; Schoenbachler and Gordon 2002) are focused on the influence of consumer perception of channel characteristics on channel choice at different stages of consumer decision-making process, mainly at information search and transaction (Mącik, Mazurek and Mącik 2012).

This paper focuses on perception of retail formats from both physical and virtual channel, on the base of declarations about shopping frequency and emotional attitudes toward them, including influence of simple demographic variables and consumer decision-making styles. This approach, with direct comparison of retail formats, seems to be interesting and valid under circumstances of multichannel shopping behaviour being very common practice. Therefore, we do not assume that channel is chosen first, and choice of store format is the next step in buying process. Both choices are dynamic for us. Qualitative investigation by authors proved that channel choice is often situation driven, especially when there are no strong preferences to use particular channel. In addi-

tion, when seeking information is treated separately from actual buying, channel changes in both ways are occurring very often (Mokhtarian and Tang 2009; Mokhtarian and Tang 2011).

Looking for factors influencing choices of retail channel (physical or virtual one) and store format within it, we assumed that consumer mental characteristics should explain attitudes to particular store formats and chains/outlets.

CONSUMER DECISION-MAKING STYLES

A consumer decision-making style concept is defined as 'a mental orientation characterizing a consumer's approach to making choices' (Sproles and Kendall 1986, 268). Consumer decision-making styles can be perceived as 'basic buying-decision making attitudes that consumers adhere to, even when they are applied to different goods, services or purchasing decisions' (Walsh et al. 2001, 121). They are relatively stable constructs, connected to consumer personality (Sproles and Kendall 1986; Lysonsky, Durvasula and Zotos 1995), and particular shopping activities and attitudes toward shopping are direct outcomes of consumer's decision-making style (Tai 2005). Mentioned concept used in several more contemporary studies (Walsh et al. 2002; Tai 2005) proved to be useful to explain outcomes of particular shopping activities and attitudes toward shopping, including usage of online channel (Mącik and Mącik 2009).

Consumer decision-making styles were measured using instrument developed by authors from PCS (Profile of Consumer Style) questionnaire (Sproles and Kendall 1986) by translation into Polish and later paraphrase of scale items with adding two new styles on the base of previous authors' research. In result, 10 styles (instead of original 8) were measured by 30 items scaled in the Likert-type way with five variants of answers. Those styles are described as follows (with shortcuts of their names used in table 2):

- PERF – Perfectionist Consumer – sensitive to high quality products prone to spend money and/or time to get the expected quality, customer care, comparing the available options;
- BC – Brand-Conscious Consumer – believing that price of branded products is appropriate to their quality, buying well-known and heavily advertised brands, often in shopping malls and specialty stores;
- NFC – Novelty Fashion Conscious Consumer – willing to put extra

effort to obtain a trendy, new products sooner than others; follower of fashion, always in line with current trends, often looking for variety in the products they purchase;

- RSC – Recreational Shopping Conscious Consumer – hedonistic, perceiving shopping environment as pleasant and desirable;
- PVC – Price-Value Conscious Consumer – prone for getting highest possible 'value for money' – sensitive to price reductions, looking for low prices, often carefully comparing products before purchase;
- IMP – Impulsive Consumer – not paying much attention to how much is spending, does not plan purchases, usually not looking for opportunities to buy cheaper;
- CO – Confused by Over choice Consumer – feels the fatigue of to many products, brands and shopping options, often has trouble in deciding;
- HBL – Habitual Brand-Loyal Consumer – has strong habits for buying specific brands and/or at the same places;
- COMP – Compulsive Consumer – having tendency to uncontrolled spending, and addiction for shopping (style added by authors);
- ECO – Ecologically Aware Consumer – prone to choose products that are ecologically safe for him/her and for environment (style added by authors).

Listed styles are not independent – particular person possesses an individual combination of them, creating personal profile of all styles, manifesting itself on different levels, with some styles more intense or prominent (Sproles and Kendall 1986).

BRIEF DESCRIPTION OF RETAIL SECTOR IN POLAND

Economic transition in Poland starting at 1989 involved substantial changes in Polish retail sector. It is worth to note, that even before 1989 in Poland private-owned shops existed in noticeable numbers, but economic system changes led to very quick growth of the number of retail outlets, mostly independent and family owned. Foreign capital store chains entered the market right after, introducing hypermarket and supermarket formats into larger Polish cities first. About year, 2000 there was also discount store format introduced. Since 2005 there is visible concentration of sales volumes in mentioned store formats, and after 2009 systematic decrease of number of independent, small stores (by about 25% in last 8 years, to the level of about 300 000 outlets in the country).

During the time hypermarket format lost their leadership in driving changes of retail sector in Poland – its share in total sales according to Nielsen data decreased from 15% to about 13% (between 2006 and 2011), when number of hypermarkets increased by ca. 38%. Limited number of larger cities in Poland and aversion to drive longer for shopping, leaded to growth of supermarket format first and discount format later, as possible to locate closer to consumer places of residence. Such stores were localized in smaller towns, and were successfully competing on local markets with more traditional FMCG stores, despite their entering to store-chains and remodelling into convenience format. Between 2006 and 2011 share in total retail sales through supermarkets increased by about 2 p. p. up to 17%. For discounts growth was more dynamic – 7 p. p. (to 20% share in 2011). Main discount chains in Poland (Biedronka, Lidl and Netto brands) are using soft discounter strategies after 2010, and are growing very quickly in terms of store numbers. Biedronka brand ('ladybug' in Polish) is market leader for this format with about 2000 stores. The still growing format is so called category killer – consumer electronics markets like MediaMarkt or Saturn, as well as home-improvement/gardening/do-it-yourself oriented retailers like IKEA, Leroy Merlin or Praktiker, is opened in larger numbers than not specialized hypermarkets.

Virtual channel in Poland is dominated since many years by one auction platform – Allegro.pl. Despite this, number of active internet shops increases rather quickly with growth of e-commerce sector (between 2006 and 2011 number of internet stores increased from 2800 to about 12100, and its share in total retail grown from about 1% to circa 3–4% according to various sources (Chodak et al. 2012). Most of internet shops are small firms, typically employing no more than two persons. Allegro.pl still generates about half of total Polish B2C e-commerce turnover. Also about of 20% of internet stores sales in Poland is generated through this platform because of easy access to potential clients. It should be noted that about half of internet stores are multi-channel sellers, having at least one physical store, often opened later than virtual one (Chodak et al. 2012). Newer formats of internet sales including group purchases (launched in Poland during Spring 2010 – like Groupon and Gruper.pl), and online private shopping clubs (like Zlotewyprzedaze.pl or Stilago.pl) are increasing their reach nowadays.

Samples and Measures

Data presented in this paper are coming from two large nationwide samples, collected by computer assisted web-based interview (CAWI) at the

end of 2008 for first sample and at the end of 2012 respectively. First sample size is 1100 subjects, the second – 1701. Because of collection method, data are representative for population of Internet users in Poland regarding gender and age (between 18–65yo). Some background data from statistics of retail sector in Poland and explanation from 4 focus groups performed in January 2013 were utilized.

Used measures include declared frequency of shopping at particular formats within both channels (15 formats for 2012 and 12 for 2009, as some virtual retail formats were not used in Poland at this time) as well as emotional attitudes toward them. For 2012 sample consumer decision-making styles in the form extended by authors were additional measurements.

Data analysis in the paper relies on descriptive statistics and graphs. Multidimensional scaling procedures (MDS) to produce perception maps were used. UNIANOVA procedure gave additional results in terms of factors influencing particular format usage. Presented analysis has an exploratory character. No exact hypotheses have been settled and tested in this case.

Results

PERCEPTION OF STORE FORMATS BY POLISH CONSUMERS

For visual interpretation of perceived attributes of analyzed retail formats, ALSCAL procedure – one from typical algorithms for multidimensional scaling – has been performed. Figure 1 contains graphical representation of 2 main dimensions revealed from 2008 sample. Figure 2 presents results from 2012 sample.

Dimension 1 – horizontal one on figures 1 and 2 – can be interpreted as perceived level of personal interactions with the salespersons in particular retail format – (with alternative explanation of representing consumer familiarity with particular format). While dimension 2 – vertical one on figures 1 and 2 – represents perceived total cost for consumer (Peter and Olson 2002, 459–61). Provided interpretation is clearer for 2008 data, and for new data set should be used more carefully, although there are no direct suggestions indicating that such approach is not appropriate. Two-dimensional solution for both cases fits the data very well. Also Stress value is better or close than acceptable minimum of 0,1, and R^2 statistic is very high, exceeding minimum of 0,6 (Borg and Groenen 2005, 48).

In both cases virtual channel formats are forming group on the left side of dimension 1 – signalizing discernible depersonalization of contacts with customer, relying mostly on automated solutions. Standard forms of

internet shopping (online stores and online auctions) are similarly perceived as whole mentioned group – still having high perceived total cost to the customer, despite lower than in physical retail perceived price level – this suggest that time of delivery, possible need to return (i. e. clothing) or sent to repair (i. e. consumer electronics), are seen as important drawbacks of such purchasing. For other formats of internet sales included in 2012 study, perception of substantially lower price creates climate of 'good deal' (in accompanied qualitative study utilizing focus groups, this has been explained by younger participants in the context of group purchasing via Groupon or similar places as 'real' price to the value, or 'affordable' price – in most cases persons using such offers declared not buying things or services different way, very good example of such approach is expensive SPA package bought via Groupon by young student – catalogue price was in this case far beyond her payment possibilities). Group purchasing and private online shopping clubs by creating limited time offers are successfully exploiting hedonic motives of consumption and tendency for impulsive buying – this was not seen by consumers.

Comparing map from 2008 research with new one, very visible is substantial change in discount stores perception among consumers – during the time between both measurements they become accessible by most consumers even in small towns, and because of location policy, within or close to residential areas, they are substituting larger independent convenience stores. It is worth to note, that stores described as discounts became between two measurements rather soft discounters – two main chains (Biedronka and Lidl) are not focused only on low prices (but still communicating them in ads despite introducing many premium products to assortment). Both chains are relying mostly on private labels, although consumers perceive them as not worse quality comparing national brands.

The second important change is differentiation between classical specialist stores and so called 'category killers' – mass merchandisers with deep product assortment within specialized product categories (like consumer electronics, home and garden ect.). Accompanied focus groups gave light on this difference in perception: classical specialist stores are perceived as trustworthy, so consumers often are using them to get more specific information about products, than to buy – they want to buy in such stores (have positive attitudes toward them – figure 3), but at the same time higher prices are driving them out of this format. In 'category killer' stores consumers are instead more prone to perform 'show

FIGURE 1 Perception Map of Retail Formats on the Base of Declared Shopping Frequency, 2008 (stress = 0.082, R^2 = 0.981)
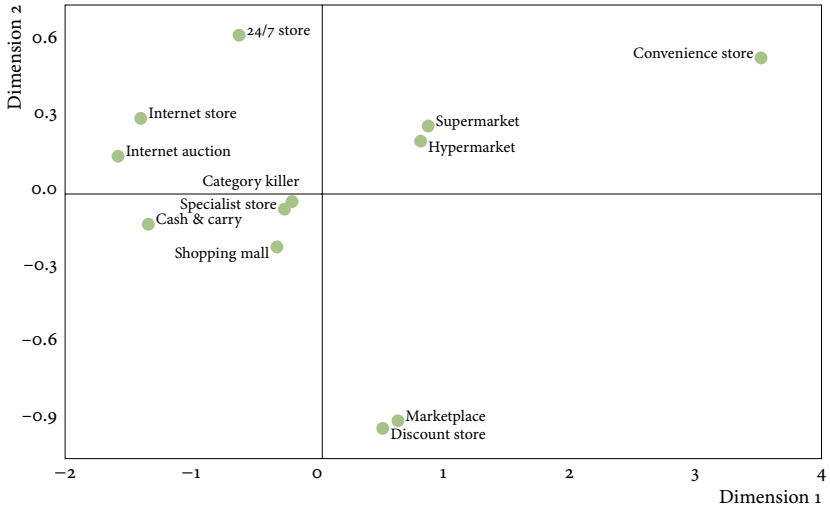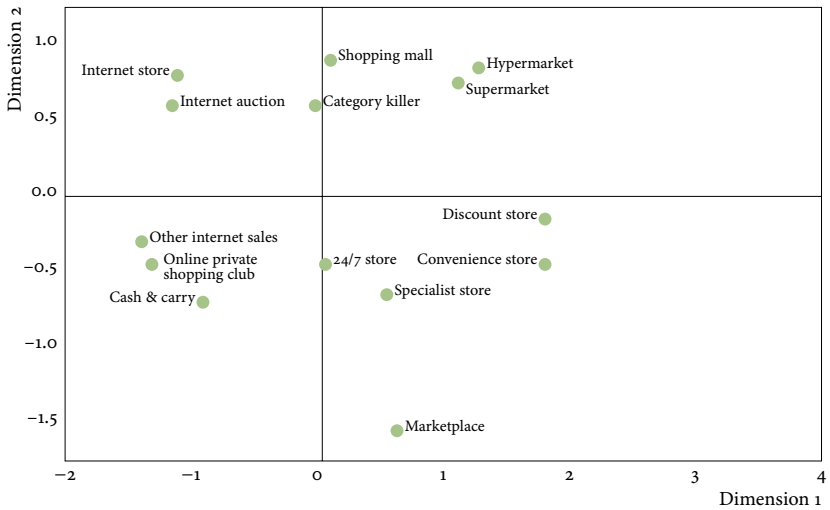

FIGURE 2 Perception Map of Retail Formats on the Base of Declared Shopping Frequency, 2012 (stress = 0.098, R^2 = 0.946)

rooming' – looking at/experiencing product with clear intention to buy it cheaper online.

Perception of stores open 24/7 also changed significantly – previously they were referred mostly as small shops existing in little numbers selling

mainly alcoholic beverages (having prices including surcharge for 'availability'). Now they are perceived as similar to smaller convenience stores with very limited assortment of FMCG merchandise – mostly snacks and beverages – as well as simple bistro-type gastronomy. This format nowadays is connected with petrol stations facilities, and total cost to the customer is perceived as lower than earlier, as they are more easily available, and shopping is typically rewarded by mass loyalty program points.

Most isolated format in 2008 study was convenience store – differing significantly from other formats in both dimensions, in 2012 research isolated is marketplace – perceived as a sales format with lowest cost to the consumer. Similarities in perception between hypermarkets and supermarkets still persist, and today more often than previously, the same store brands are operating simultaneously in both formats – like Tesco chain, having hypermarkets in large cities, and supermarkets in smaller towns. In addition, shopping malls and 'category killers' are still similarly perceived.

SHOPPING FREQUENCY AND EMOTIONAL ATTITUDE TOWARD RETAIL FORMAT

Declared shopping frequency is plotted versus emotional attitude toward particular format on figure 3. Those dimensions are highly correlated – Pearson correlation coefficient $r = +0,845$ ($p = 0,000$), suggesting very strong positive relationship. This is reasonable because consumers are buying more frequently at places they like – on the level of format as a whole and particular store location. Buying at places not preferred emotionally involves perception of taking greater risk – which should be rewarded by substantially lower price or other bonus valuable for the consumer.

Regression line plotted on figure 3 allows easily find formats for which declared shopping frequency differs much from emotional attitude. Highest positive difference is for internet stores and specialist stores (both perceived better emotionally than used frequently), and greatest negative distance (suggesting disliking) is for 24/7 stores.

Most positive attitudes are connected with discount stores – people feel 'smart' buying at discounts – it saves money and time, gives access to interesting products perceived as having good value. Most negative attitudes (disliking) are for two relatively new internet sales formats: online private shopping clubs and informal internet sales (mostly C2C using social media tools). This comes from little knowledge about those forms –
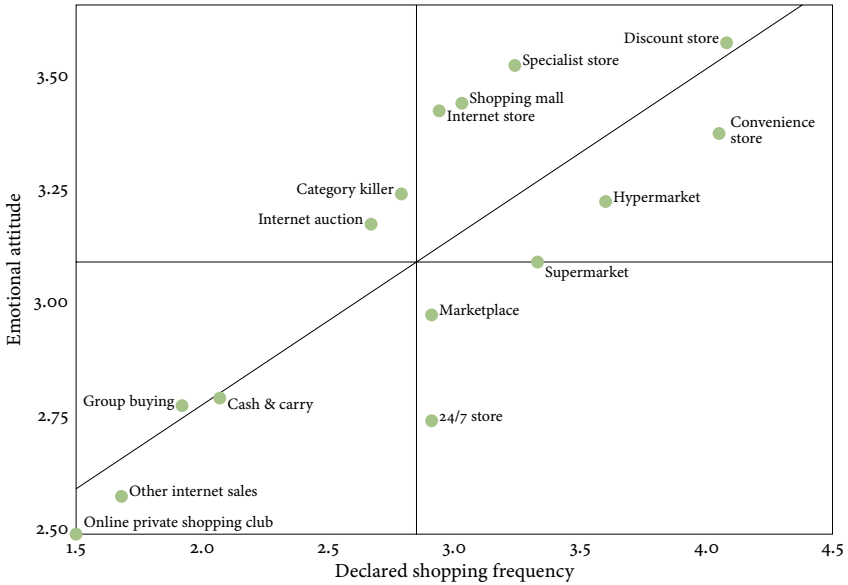
FIGURE 3   Declared Shopping Frequency vs. Emotional Attitude toward Retail Format
(2012; regression line: $R^2 = 0.714$)

from cognitive perspective it is hard to like the unknown. More often used group buying is connected with more positive attitudes.

Positive attitude toward internet stores leads to conclusion that consumers want to buy more often in them, than do this in reality. Positive attitude comes in this case from availability of products not easily accessible in physical retail, and from ease to perform comparison shopping – as expressed by focus group participants, while main force prohibiting them to buy at internet stores is still a risk, perceived mainly as possible delay with shipping and logistics, hidden costs or future problems after purchase. Consumers also like specialist stores – they trust the salespersons, appreciate their professional knowledge and advice, but think that price level is too high for them to made transaction. As common market practice in Polish specialist stores is having many products available on order, which consumers dislike (immediate availability is perceived as one from main advantages of physical retail), in effect many purchases are done outside this format, mainly over the Internet or through large store chains.

Not liking, but quite often buying in 24/7 stores, is obviously connected by respondents with shopping by the way of fuel purchasing – this

is sometimes perceived as overspending or with necessity to buy some FMCG products (including alcoholic beverages) beyond typical hours. It is worth to note that in Poland there are very little restrictions of open days/hours for retail (most of shops must be closed only on 12 holidays in a year), but limited demand causes that only in large cities exist larger stores open 24/7 (for instance in city of Lublin having circa 350000 inhabitants only Tesco hypermarket is open this way).

SHOPPING FREQUENCY AT PARTICULAR FORMATS AND SELECTED DEMOGRAPHIC VARIABLES

To assess influence of demographic background of the consumer – in terms of such variables as gender, age group (6 groups) and income (in 4 quartile groups) – the univariate analysis of variance (UNIANOVA procedure) has been performed (table 1). This procedure provides regression analysis and analysis of variance for one dependent variable by one or more factors and allows finding possible interactions of factors.

UNIANOVA model was significant for 14 of the 15 investigated retail formats – excluding the supermarkets. In all models the intercept is significant, suggesting that the frequency of shopping is certainly influenced by factors other than specified in the model – probably psychographic and/or situational in nature.

The effect of gender is significant in all physical channel formats, and for virtual channel only for buying at online auctions (for online stores achieved significance level of statistical tendency, $p < 0,1$). The direction of the impact of gender is consistent with the culturally established stereotypes of roles – women are more likely to buy in formats allowing purchases of non-durable goods, and men – durable ones or linked to the technology, as well as in the shops open 24/7, where frequent purchases by men are consistent with the stereotype.

The effect of age is significant for the vast majority of formats, regardless the channel – age does not explain the frequency of buying for the most commonly used formats such as convenience stores and discounters. However, a significant association of age with the declared frequency of purchase in the virtual channel formats seems in this case to mask individual level of acceptance of information technology.

Income per capita in a household does not differentiate the frequency of purchase in convenience stores and newer virtual channel formats like group buying, online private shopping clubs and other internet sales. It reaches the level of significance of statistical tendency for shopping in

TABLE 1 Influence of Simple Demographic Factors on Declared Frequency of Shopping: UNIANOVA Results

Formats	Main effects					Interactions				Model fit	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Hypermarket	0.000	0.000	0.000	0.000	0.015	0.002	0.862	0.303	0.303	0.081	0.051
Supermarket	0.199	0.000	0.037	0.178	0.144	0.024	0.530	0.892	0.817	0.038	0.006
Category killer	0.000	0.000	0.045	0.000	0.042	0.213	0.567	0.171	0.493	0.107	0.077
Shopping mall	0.000	0.000	0.042	0.000	0.026	0.774	0.758	0.128	0.069	0.174	0.146
Convenience store	0.007	0.000	0.000	0.840	0.601	0.124	0.601	0.452	0.057	0.050	0.019
Discount store	0.001	0.000	0.000	0.666	0.022	0.040	0.771	0.612	0.307	0.056	0.021
Specialist store	0.000	0.000	0.000	0.011	0.061	0.015	0.615	0.985	0.550	0.082	0.051
Store open 24h	0.000	0.000	0.001	0.000	0.367	0.465	0.470	0.567	0.813	0.147	0.118
Marketplace	0.000	0.000	0.000	0.000	0.001	0.192	0.211	0.001	0.010	0.101	0.071
Cash and carry	0.000	0.000	0.001	0.000	0.124	0.753	0.220	0.337	0.544	0.075	0.045
Internet store	0.000	0.000	0.052	0.000	0.001	0.009	0.267	0.767	0.586	0.215	0.189
Internet auction	0.000	0.000	0.020	0.000	0.004	0.213	0.747	0.350	0.876	0.203	0.176
Group buying	0.000	0.000	0.238	0.000	0.151	0.172	0.514	0.138	0.802	0.120	0.091
Online private shopping club	0.005	0.000	0.224	0.000	0.504	0.880	0.977	0.677	0.844	0.052	0.020
Other internet sales	0.000	0.000	0.085	0.000	0.481	0.295	0.603	0.693	0.778	0.066	0.035

NOTES Dependent variable: declared frequency of shopping at particular format. Column headings are as follows: (1) corrected model, (2) intercept, (3) gender, (4) age, (5) income per capita, (6) 3 × 4, (7) 3 × 5, (8) 4 × 5, (9) 3 × 4 × 5, (10) R^2, (11) corrected R^2.

specialty stores. Declared frequency of buying becomes higher with the increase in income for shopping in supermarkets, specialty stores, shopping malls and stores and auction sites, but decreases for shopping at discount stores and marketplaces.

The interaction effect of gender and age is significant for shopping in hypermarkets, discount stores, specialty stores and online shops. Buying more frequently is domain of younger persons and women in the first two formats, and of older women in discount stores. For online stores this interaction is strong – they are often used by young women and older men.

SHOPPING FREQUENCY AT PARTICULAR FORMATS AND CONSUMER DECISION-MAKING STYLES

Table 2 presents in concise way UNIANOVA results when consumer decision-making styles were factors (in 4 quartile groups). All models are significant, although explained part of variance is in most cases low, and intercept is significant, suggesting that the frequency of shopping is influenced by factors other than specified in the models.

In general frequency of shopping in virtual channel is easier to explain by consumer decision-making styles than in physical one, particularly for most typical formats like supermarkets, hypermarkets and convenience stores.

Compulsive style (COMP) significantly increases frequency of shopping in 12 from 15 investigated formats (all in virtual channel and beside supermarket, convenience store and marketplace for physical channel). Perfectionist consumers (PERF style) are shopping more often in hypermarkets, category killer stores, shopping malls, 24/7 stores, cash and carry places, and all virtual channel formats beside online private shopping clubs. They avoid buying at marketplace.

Consumers confused by over choice (CO) are buying less often in virtual channel and cash and carry chains, but more often at discount stores – their limited product lines are perceived as easy to choose by them, and also at marketplaces. Price-value conscious consumers (PVC) prefer to choose marketplaces, discount stores and hypermarkets for low prices, and convenience stores as well as specialist ones for giving value without unnecessary effort and costs. They avoid buying in virtual channel (particularly at internet stores and group buying sites) in fear of additional costs increasing advertised price, including delivery and returns/exchanges. They also rather not buy at cash and carry format be-

TABLE 2 Influence of Consumer Decision-Making Styles on Declared Frequency of Shopping: UNIANOVA Results

| Formats | Significance of between-subjects effects (probability from *F*-tests) | | | | | | | | | | | | Model fit | |
| | | | | | | Main effects | | | | | | | | |
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Hypermarket	0.000	0.000	0.035	0.612	0.231	0.209	0.026	0.288	0.484	0.015	0.023	0.951	0.043	0.026
Supermarket	0.022	0.000	0.452	0.355	0.546	0.376	0.169	0.119	0.544	0.027	0.124	0.863	0.029	0.011
Category killer	0.000	0.000	0.000	0.720	0.019	0.055	0.096	0.280	0.007	0.169	0.020	0.317	0.073	0.056
Shopping mall	0.000	0.000	0.000	0.372	0.000	0.528	0.428	0.184	0.391	0.001	0.216	0.005	0.127	0.111
Convenience store	0.000	0.000	0.685	0.236	0.064	0.361	0.000	0.043	0.125	0.267	0.001	0.430	0.052	0.034
Discount store	0.000	0.000	0.847	0.761	0.048	0.899	0.000	0.023	0.008	0.028	0.008	0.361	0.089	0.072
Specialist store	0.000	0.000	0.415	0.247	0.000	0.153	0.004	0.080	0.740	0.676	0.001	0.679	0.110	0.094
Store open 24h	0.000	0.000	0.001	0.040	0.001	0.001	0.170	0.045	0.143	0.056	0.003	0.001	0.093	0.076
Marketplace	0.000	0.000	0.001	0.753	0.266	0.810	0.001	0.162	0.011	0.427	0.192	0.000	0.062	0.045
Cash and carry	0.000	0.000	0.005	0.665	0.510	0.732	0.010	0.455	0.000	0.059	0.000	0.367	0.085	0.068
Internet store	0.000	0.000	0.000	0.298	0.001	0.114	0.000	0.166	0.066	0.013	0.000	0.004	0.147	0.131
Internet auction	0.000	0.000	0.000	0.326	0.008	0.224	0.132	0.189	0.004	0.010	0.000	0.058	0.122	0.105
Group buying	0.000	0.000	0.004	0.898	0.001	0.100	0.011	0.234	0.001	0.979	0.000	0.873	0.097	0.080
Online private shopping club	0.000	0.000	0.076	0.306	0.000	0.467	0.054	0.482	0.004	0.075	0.000	0.511	0.132	0.116
Other internet sales	0.000	0.000	0.000	0.784	0.039	0.727	0.180	0.433	0.004	0.138	0.000	0.021	0.125	0.108

NOTES Dependent variable: declared frequency of shopping at particular format. Column headings are as follows: (1) corrected model, (2) intercept, (3) PERF, (4) BC, (5) NFC, (6) RSC, (7) PVC, (8) IMP, (9) CO, (10) HBL, (11) COMP, (12) ECO, (13) R^2, (14) corrected R^2.

cause of need to pay larger amounts at once. Pronounced habitual brand-loyal style (HBL) is connected with more often purchases at shopping malls, discount stores as well as hyper- and supermarkets, also they like buying in internet stores and auctions.

Novelty-fashion conscious style (NFC) is positively connected with purchases using virtual channel, and such formats like shopping malls, category killers, specialist stores and 24/7 outlets from physical channel. Tendency for impulsive buying (IMP style) leads to more often purchases at discount and convenience stores as well as 24/7 places, suggesting that small FMCG products are often bought on impulse, but there is not such situation visible in the data for durable goods.

Ecologically aware consumers (pronounced ECO style) are buying more often at marketplace in internet stores and are using other internet sales (also informal), but they avoiding purchasing at shopping malls and 24/7 stores. This comes from their values: appreciating slow life and local products. Their demand also often is so specific (for example vegan food) that buying over the internet is often the only way to get demanded goods.

For 2 last styles: brand conscious (BC) and recreational shopping conscious (RSC) there are no significant connections with frequency of purchasing at particular channel (beside rather unexpected influence on buying at 24/7 stores, being rather an effect of purchases of young people enjoying night city life). Such persons have more pronounced BC and RSC styles as this research confirms.

Conclusions and Limitations

Both performed studies shown relative similarities and differences in perception of investigated retail formats from both channels used by consumers: traditional – physical and more advanced – virtual one. Perceived differences between formats inside virtual channel are typically less pronounced, than between formats of physical retail. In addition, changes over time are greater in perception of physical retail formats than for virtual ones. This leads to conclusion, that physical channel changes itself more than virtual one, possibly because of feeling competition of virtual one.

Biggest change in perception of discount stores shows that format as winning one today in Poland. This suggests that in close future growth of market power of discount chains will force other FMCG retailers to copy some of strategies used currently by discounters, for instance advertising

prices heavily, promote private labels, and introduce one-time offers of not food products. For consumers firstly this probably will lead to some savings, but also to narrowing of choice alternatives, as number of assortment positions will fall. Possible is also higher differentiation of price level according of local competition. Because most Polish consumers are still not interested in grocery shopping over the internet, sales volume of fmcg goods sold in virtual channel will rise rather slowly.

At the same time internet retail increased its share in total sales but not changed its perception, still facing some problems like perceived risk of fraud and logistics failures. Increasing total share of retail sales via virtual channel, mostly for durable goods, signalizes that importance of such failures for consumers' falls, and at the same time this tendency increases competition between physical channel retailers and virtual ones. From one side this leads to opening internet stores by some of category killer retailers (like MediaMarkt and Saturn recently in Poland), and from other side leads to equalization of price levels between both mentioned channels, not only for multichannel sellers. This equalization sometimes is connected with increasing prices in internet sales.

Declared shopping frequency is highly positively correlated with emotions toward particular format. Channel to which particular format belongs does not play in this relationship important role. Generally positive emotions toward Internet stores are leading to conclusion that this format – when well managed – has great potential to growth, particularly when today's consumer objections toward it will be overcome.

Both demographic variables and consumer decision-making styles are more influencing frequency of purchasing through virtual channel than physical one (this purchases are perceived as normal, typical and boring – they are also more situation driven – especially when urgent need reveals. Age and gender as well as such consumer decision-making styles as comp, perf and nfc are connected with particular format choice most often.

Presented analysis has several limitations. First - all data used were analyzed using exploratory techniques, so no exact hypotheses have been tested. This limitation is partly overcome by usage of large nationwide representative samples. Second – used measures are mostly consumer declarations, so it will be interesting to compare real behaviour traces in example by analyzing bank account or payment/discount cards data over time in longitudinal study. And last – third limitation is to present results gathered through cawi questionnaire – not accessible for persons not

using the Internet in any form, so their opinions and behaviours are not included in this paper.

Results from different approaches are convergent each other and graphical way of their presentation is easy and useful. Repeating measurements over time allow also to examine changes in perception (when treated as longitudinal data from consumer panel). Lack of strong cultural cues in used questions and allows for easy international comparisons in future research.

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The Role of Information Asymmetry in Financing Methods

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There is no doubt that new investments are the cornerstone of progress and competition in today's world. Different financing instruments are employed to secure the funds for these investments. The most common financing methods in Iran are debt and equity financing. Some investors, including corporate insiders, have access to private information. The more private the information, the more will be the bid/ask spread between investors, thus reducing the returns of those with no access to such information. Therefore, information asymmetry is expected to affect the funding of investments. The purpose of this study was to examine the relationship between information asymmetry and financing methods (debt and equity financing). The population consists of all the firms listed on the Tehran Stock Exchange that have been operating during the period 2006–2010. Totally, 61 firms were selected as sample using targeted sampling. The results showed that there is no significant relationship between information asymmetry and debt financing; however, there was a significant positive relationship between information asymmetry and equity financing.

Key Words: information asymmetry; debt financing; equity financing
JEL Classification: D53; E44; C58

Introduction

Economic entities need large investments to sustain their viability and develop their activities. These entities also highly depend on financial markets for financing their activities. Therefore, choosing the right financing methods is an important issue for financial managers. This study introduces different methods of financing and examines the role of information asymmetry on the financing of firms.

Industrial development in any country entails short-term, mid-term, and long-term planning and investment. The resources required for investment can be secured from retained earnings, bank loans, selling stocks, and/or a combination of these sources.

One of the goals of financial management is to maximize shareholder wealth. Thus, financial managers must find ways of securing the funds necessary for achieving these goals (Abzari, Dastgir and Gholipur 2008). This study investigates the financing approaches of firms to reveal the effect of information asymmetry on the choice of financing methods.

In financial reporting, the main purpose of financial statements is to provide information about the financial state, performance, and flexibility of a business unit, thus helping the users of these statements in decision-making. A part of the ownership of firms is in the hands of shareholders. This group mainly relies on publicly available information such as financial statements for monitoring the performance of managers. However, a portion of the shareholders has access to valuable information about the business strategies and long-term investments of the firms.

Well-informed shareholders are those with access to private information, such as managers, analysts, and institutions and individuals who provide such information. Less informed investors, also called retail investors, are common people whose only way of access to information is through the reports provided by the firms. Differences among investors arise from the signals that they receive about the value of future fundamentals. All investors receive a common public signal about the value of future fundamentals, but a proportion of these investors also receive a private signal about this value.

However, just a small portion of well-informed investors is enough to drive the market price of a share toward the real value. Obviously current profits do not reflect the result of all the economic activities of a firm. There are activities such as long-term sale contracts, investments, and R&D, which are of long-run value. Information about these activities is only provided to institutional investors, thus leading to information asymmetry between institutional investors and retail investors (Khoshtinat and Yusefi 2008).

Information asymmetry often arises from investment opportunities. It provides the opportunity for income smoothing and wealth transfer to managers through internal deals and bonuses. Higher growth opportunities increase expected future cash flows, thus increasing the information asymmetry between managers and shareholders. Thus, identification of

the right financing method is of utmost important in maximizing shareholder wealth.

One of the most important parts of any economic activity is its financing. Required funds can be secured from equity of debts. The debt equity mix (the left-hand side of a firm's balance sheet) indicates the capital structure of the firm. If debt is the source of financing, its use in the capital structure of firms increases return on equity. Increasing return using financial leverage increases the firms' ability to compete. Under these conditions, the decision to use debt in the capital structure is a critical one, for increased debt may increase the firm's risk if return on investment is lower than the amount borrowed. Decisions about the financial structure of a firm affect its value. As shareholders, managers must adjust the structure a firm to minimize the cost of capital and maximize shareholder wealth and firm value.

On the other hand, a major factor in decision-making is the information relevant to the matter at hand. If the necessary information is asymmetrically disclosed among the users, it can lead to different views on the same matter. Therefore, more important than information it is how the information is distributed (Ghaemi and Vatanparast 2005).

When information asymmetry on the stocks of a firm increases, the inherent value of the stocks will differ from the value given to the stocks by investors in the capital market. Therefore, the real value of stocks will be different from the value expected by shareholders. It must be noted that the majority of investors are common people who can only access important information through the reports provided by the firms. Those with better access to information, like information about the returns and investments of the firm, will be able to affect the process of supply and demand, leading to the so-called 'spread' in prices.

Review of the Literature

Akerlof (1970) brought informational issues at the forefront of economic theory. He showed that information asymmetry could increase adverse selection in the market. Glosten and Harris (1988) found that adverse selection is positively associated with the degree of information asymmetry in the market. Subsequently, Stoll (1989) provided evidence that 43 percent of bid/ask spread is due to adverse information in the market. Gietzman and Ireland (2005) examined the relationship between disclosure and the cost of capital in the UK. They found a negative relationship between disclosure and the cost of capital, but this relationship exists only

for firms adopting aggressive accounting policies. Zhang and Ding (2006) also found a negative relationship between disclosure and the cost of capital.

Myers and Majluf (1984) argue that managers know more about the firm's value of assets and opportunities than potential investors do. They also assume that managers act in the interests of existing shareholders. Since managers act in the interests of existing shareholders, there is an incentive to sell new equity when it is overvalued. Thus, selling equity on average conveys negative information about the firm, and the stock price drops at the equity issue announcement.

Ambarish, John and Williams (1987) showed that announcement effect of new stock depends on the role of assets in place and investment opportunities. For instance, the announcement effect is negative for firms with private information primarily about assets in place and positive for firms with inside information mainly about opportunities to invest.

Some researchers have studied the leverage effect of financing activities. Modigliani and Miller (1963) argue that issuing new stocks reduces stock prices if debt levels are reduced. According to this theory, issuing new stocks reduces financial leverage. Due to losing tax advantage because of equity financing, leverage decreases with stock prices, and the decrease in stock prices is positively associated with the relative size of the issue.

Eberhart and Siddique (2002) studied long-run bond returns following securities offerings. Distinguishing between pure and partial wealth transfer, they showed that abnormal firm returns are negative following equity offerings, and much of the shareholder wealth loss represents a wealth transfer to bondholders, supporting the partial wealth transfer hypothesis.

The special role of banks as the financial intermediaries has received much attention in the literature. For instance, Diamond (1984) argued that the key advantage of banks for investors is their access to private information, reducing information asymmetry among different groups operating in the market.

Mikkelson and Partch (1986), James (1987), and Lummer and Mc-Connell (1989) showed that bank loan announcement creates positive abnormal stock returns for the borrowing firms. James (1987) investigated the reaction of stock prices to bank loan announcements. He found that positive stock price response to the announcement of new bank credit agreements that is larger than the stock price response associated with

announcements of private placements or public straight debt offerings. He also found significantly negative returns for announcements of private placements and straight debt issues used to repay bank loans. Others followed up this study. Lummer and McConnell (1989), for instance, distinguished between new bank loans and loan renewals. They found that the positive response of stock prices only holds true for the latter, i. e. loan renewals.

Bharath, Pasquariello and Wu (2009) found a significant positive relationship between information asymmetry and the use of debt in the capital structure of firms. Yumei, Chunfeng and Zhenming (2007) studied the effect of information asymmetry on the financing of Chinese firms and found a significant positive relationship between information asymmetry and debt ratio (short-term, long-term, and total).

Van Buskirk (2012) studied the effect of frequency of disclosure on the level of information asymmetry among investors. Studying a sample of firms in the us retail sector, he found that more detailed (greater quantity) disclosure is associated with reduced information asymmetry.

Francis, Nanda and Olsson (2008) showed that the cost of equity is negatively related to the disclosure measure based on annual reports and 10-k filings, positively related to disclosure measures based on management forecasts and conference calls, and unrelated to press-release based disclosure measures.

Fama and French (2002) and George and Hwang (2010) found that leverage based on book value is associated with lower returns, while leverage based on market value is associated with higher returns.

A recent study by Fulghieri, Garcia and Hackbarth (2013) shows that equity can dominate debt if both the asset in place and the growth option are subject to the type of asymmetric information that is similar to what we examine here.

Fulghieri, Garcia and Hackbarth (2013) investigate the optimal security design problem under more general distributions of firm values, although information asymmetry in their model is not time varying. In contrast, we focus on the choice between debt and equity, study time-varying asymmetric information, and associated delays in investment.

Rouhi et al. (2010) found that information asymmetry is not significantly changed post seasonal profit announcement compared to pre seasonal profit announcement. This is observed in relation to announcement containing good news as well as bad news. Kashani Poor, Mehrani and Oashanejad (2010) showed that companies with more independent board

structure and more effective board approach have more market liquidity compared to other companies. In fact, companies with higher score in terms of corporate governance quality experience lower ask-bid spread and higher different share supplied and demanded.

Methodology

The present research is an applied study that examines the relationship between information asymmetry and financing methods in Iranian firms. It is a non-experimental or correlational research with ex post facto design.

HYPOTHESES

The present research investigates the relationship between bid/ask spread and the choice of debt or equity financing to find whether information asymmetry has any effect on the choice of financing method. To answer this question, the following hypotheses can be developed:

H₁ *There is a significant relationship between information asymmetry and debt financing.*

H₂ *There is a significant relationship between information asymmetry and equity financing.*

POPULATION AND SAMPLE

The population of the present research consists of all the firms listed on Tehran Stock Exchange (TSE) during the period 2006–2010 that satisfy the following conditions:

- Firms' financial year must end on the final day of Iranian calendar;
- Firms must have been listed in TSE before 2006
- Firms with at least three months of trade interruption are excluded;
- Firms must have available data on bid/ask prices.

DATA COLLECTION

The required data was extracted from the financial statements of the sample firms and was analyzed in Excel and Stata.

VARIABLES

The independent variable is information asymmetry, which is calculated from the model developed by Venkatesh, and Chiang (1986) for measuring bid/ask spread:

$$\mathrm{SPREAD}_{it} = \frac{\mathrm{AP} - \mathrm{BP}}{(\mathrm{AP} + \mathrm{BP}) \div 2} \times 100, \tag{1}$$

where SPREAD denoted bid-ask spread, AP is the ask price for firm i in the period t, and BP is the bid price for firm i in the period t.

To measure information asymmetry between investors, the model developed by Vankatsh and Chiang (1986) is used to determine bid-ask spread range. This model has been used in different studies. According to the model, the higher range of ask-bid spread the more information asymmetry (Rezazadeh and Azad 2008).

The dependent variables are debt financing and equity financing. Debt financing is obtained from the following equation:

$$D\mathrm{t}= d\mathrm{t} - d\mathrm{t\text{-}1}, \tag{2}$$

where D_t denotes debt financing in period t, d_t is debt financing in period t, and d_{t-1} is debt financing in the period $t - 1$.

Equity financing is obtained from the following equation:

$$S = C_1 - C_0 - A, \tag{3}$$

where S denotes equity financing, C_0 is capital before capital gain, C_1 is capital after capital gain, and A is the percentage of capital gain from shareholders' cash earnings.

DATA ANALYSIS

F-test is applied to choose between panel data and pooled data. In F-test, if the calculated F is lower than the table value of F, panel data is used and vice versa. If panel data is used, Hausman test must be applied. This test shows whether the intercept represents fixed or random effects. If the p-value in Hausman test is lower than 5%, the null hypothesis (random effects) is rejected and fixed effects method is used and vice versa.

Based on the results of F-test and Hausman test the proper regression method is selected and the hypotheses are analyzed accordingly. In panel data, the models may exhibit heterogeneity of variance. Fixed effects method automatically solves this problem. However, if random effects method is used, generalized least squares (GLS) regression must be applied for estimating the model. The following model is used for examining the relationship between the variables:

$$Y_{it} = \beta_0 + \beta_1 \mathrm{SPREAD}_{it} + \varepsilon_{it}, \tag{4}$$

TABLE 1   The Results of F-test for the First Hypothesis

Test	Test Statistic	p-value	Result
F-test	0.34	1.00	Pooled data

where Y_{it} is the dependent variable and SPREAD$_{it}$ is the bid-ask spread for firm i in year t (as a measure of information asymmetry).

Results

HYPOTHESIS 1

According to the first hypothesis, there is a significant relationship between information asymmetry and debt financing. The statistical representation of this hypothesis is as:

$$\begin{cases} \text{H}_0: b_s = \hat{\beta}_s \\ \text{H}_1: b_s \neq \hat{\beta}_s \end{cases}. \tag{5}$$

The results of F-test for the first hypothesis are shown in table 1.

As shown in table 1, the p-value for F-test is 1.00 ($p > 0.05$). In other words, the calculated F is less than the table value of F. Therefore, this hypothesis is tested using the pooled method. The results obtained from analyzing the data in Stata software are summarized in table 2.

The results show that there is a positive relationship between information asymmetry and debt financing. However, this relationship is not statistically significant at the 95% confidence level. The value of F indicates the overall validity of the model. The data in table 2 shows that the calculated F is greater than the table value of F ($p < 0.05$). Thus, we can argue that the model has a high validity. The coefficient of determination for this model is 11%, suggesting that 11% of the changes in the dependent variable can be explained by the independent variable.

HYPOTHESIS 2

Based on the second hypothesis, there is a significant relationship between information asymmetry and equity financing. The statistical representation of the second hypothesis is as follows:

$$\begin{cases} \text{H}_0: b_s = \hat{\beta}_s \\ \text{H}_2: b_s \neq \hat{\beta}_s \end{cases}. \tag{6}$$

Table 3 provides the results of F-test for the second hypothesis.

TABLE 2   The Results of Pooled Regression for the First Hypothesis

Variable	Coefficient	Std. Error	t-statistic	p-value
Information Asymmetry	0.175	0.123	1.44	0.118
Constant	0.597	0.031	18.93	0.000

NOTES F-statistic (probability): 5.07 (0.0062); R^2: 0.11.

TABLE 3   The Results of F-test for the First Hypothesis

Test	Test Statistic	p-value	Result
F-test	0.90	0.7054	Pooled data

TABLE 4   The Results of Pooled Regression for the Second Hypothesis

Variable	Coefficient	Std. Error	t-statistic	p-value
Information Asymmetry	0.412	0.132	3.10	0.002
Constant	0.606	0.029	20.97	0.000

NOTES F-statistic (probability): 9.63 (0.0021); R_2: 0.12.

As shown in table 3, the p-value of F-test is 0.7054 ($p > 0.05$). In other words, the calculated F is lower than the table value of F. Therefore, pooled method is again used for testing the second hypothesis. The results of analyzing the data in Stata are shown in table 4.

The data in table 4 shows that there is a positive relationship between information asymmetry and equity financing. This relationship is statistically significant at the 95% confidence level. This shows that a unit of change in equity financing leads to 0.412 increase in information asymmetry. As mentioned earlier, F shows that overall validity of the model. The data in table 4 shows that the calculated F is greater than the table value of F ($p < 0.05$), indicating the high validity of the model. The coefficient of determination is 12%, suggesting that 12% of changes in the dependent variable can be explained by the independent variable.

Conclusion

This study examined the relationship between information asymmetry and debt/equity financing within companies listed on the Tehran Stock Exchange. The results showed that information asymmetry is positively associated with debt financing, but the relationship was not significant. However, there was a significant positive relationship between information asymmetry and equity financing.

Previous studies have shown that less information asymmetry among

investors indicates a fair market where both institutional and retail investors have equal access to information. Sellers and buyers of shares enter such a market with greater information. This market enables fair distribution of profits among people, thus increasing justice in the society.

Future Research Directions

- It is recommended that a similar study is conducted considering industries or firm sizes (small, average, large).
- It is recommended that a study be conducted to evaluate the relationship between ownership structure and information asymmetry.
- It is recommended that future researchers study the relationship between Number of buyers and sellers and information asymmetry.

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Estimating WACC for Regulated Industries on Developing Financial Markets and in Times of Market Uncertainty

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The paper deals with the estimation of weighted average cost of capital (WACC) for regulated industries in developing financial markets from the perspective of the current financial-economic crisis. In current financial market situation some evident changes have occurred: risk-free rates in solid and developed financial markets (e.g. USA, Germany) have fallen, but due to increased market volatility, the risk premiums have increased. The latter is especially evident in transition economies where the amplitude of market volatility is extremely high. In such circumstances, there is a question of how to calculate WACC properly. WACC is an important measure in financial management decisions and in our case, business regulation. We argue in the paper that the most accurate method for calculating WACC is the estimation of the long-term WACC, which takes into consideration a long-term stable yield of capital and not the current market conditions. Following this, we propose some solutions that could be used for calculating WACC for regulated industries on the developing financial markets in times of market uncertainty. As an example, we present an estimation of the capital cost for a selected Slovenian company, which operates in the regulated industry of electric distribution.

Key Words: cost of capital, CAPM, WACC, return, risk
JEL Classification: G31, G32

Introduction

The weighted average cost of capital (WACC) is a rate of return, required by investors who invest in the company either equity capital or debt. It

resembles (amongst other factors) company's risk and market circumstances. Managers in the company usually use WACC in capital budgeting decisions, i. e. WACC is a required rate of return/discount rate for financial analysis of new projects. For Stewart (1999) the task to earn the cost of capital is not a question of company financing, which many managers think. To earn the cost of capital is the market mandate. Many authors have dealt with the important issue of capital cost estimation as Gordon (1959), Lintner (1965), Black (1972), Merton (1980), Bruner et al. (1998), Ferson and Locke (1998), Mishra and O'Brien (2005), and others. Despite a broad attention on this important issue, the literature survey indicates that a proper method for a cost of capital estimation is still not defined. In the oft-cited publication *Stocks, Bonds, Bills, and Inflation,* Ibbotson and Sinquefield wrote: 'Estimating the cost of capital is one of the most important and difficult tasks performed by financial analysts. There is no clear consensus on the best way to approach this problem' (Borgman and Strong 2006).

WACC is also important in business regulation, i. e. in regulated industries. Regulated companies are important for the economy as suppliers of basic services. They use WACC to determine the proper price for the services they supply to their clients. To estimate a proper WACC is of utmost importance.

The cost of capital estimation is especially problematic and difficult to estimate on developing markets and in times of market uncertainty. Most of the models are based on historical data. In developing financial markets (like Slovenian), there is a short time series of data.

One can calculate the WACC using the usual WACC formula, where costs of different capital components are weighted against their relative importance in the company's financing.

Based on extensive literature review (cited in the paper) we believe that the appropriate WACC has to comply with the following features:

- It has to incorporate the opportunity costs of all financial resources (i. e. debt and equity financing), because free cash flows belong to all investors, each expecting the compensation for the risk they take.
- It can be calculated either as after tax or pretax WACC (depending on the purpose of its calculation), but taken into consideration the eventual tax savings and the proper effective tax rate of the company.
- Moreover, it has to be expressed in nominal terms the same as usually are the cash flows.

A company's capital is composed of different components of capital

(equity, debt etc.). When one estimates WACC, it is important to note that WACC presents an average cost of the last obtained unit of capital and not the average cost of all the capital obtained in the past. The proportion of different capital components is usually based on the target capital structure, which is – in an ideal situation – equal to the optimal capital structure of the company. The rate of return required by the investors (new or existing) is always the marginal required rate of return. Each investor will, irrespective the time that the investment was made, require the same rate of return for all invested funds. All investors (lenders or owners) seek for a return that is comparable to returns of investments with similar risk. Further, investors require a return taking into account current market circumstances, irrespectively of the past conditions, when the investment was actually made. Therefore, the cost of capital is based on present and not historical costs of capital components. Following this, the weighted average cost of capital is actually the marginal cost of capital, which depends on the current market returns (market circumstances) and represents the cost of additional unit of capital that could be obtained by the company.

The purpose of the paper is to propose some solutions that could be used for calculating WACC for regulated industries on the developing financial markets in times of market uncertainty. As an example, we present an estimation of the capital cost for a selected Slovenian company, which operates in regulated industry of electric distribution. We use a specific company as an example. The contribution of the paper relates the proposed methods of calculating WACC that can be used for a WACC calculation in regulated industries and emerging financial markets with particular emphasis on times of market uncertainty.

Thus, the goals of the paper are as follows: a) review of relevant literature and studies in the field, b) presentation of the problems and methods of assessing WACC, c) estimate the WACC for a selected company, and d) based on our findings derive conclusions.

A research question is *How to estimate a proper* WACC *for a regulated industry on a developing financial market in times of market uncertainty?*

The methodology of WACC estimation is based on generally used financial definition (see Brealey and Myers 2003, Brigham and Ehrhardt 2005, Estrada 2005), where the capital consists of all financial resources investors must provide for the normal functioning of a firm. The general dilemma in calculating WACC is whether to use short- or long-term oriented WACC. In this sense, the tradeoffs are between short-term accuracy and long-term stability of WACC. Our argument is that a long-term

WACC should be taken into account for valuing investment opportunities, since short-term movements of relevant variables are irrelevant for long-term investors.

Using the proposed methodology, we show an example of estimation – of the capital cost – for a Slovenian company which operates in the field of electric distribution.

The paper is structured as follows. We start with the theoretical basis and the explanation of the methodology and data followed by results and conclusion.

The Calculation of WACC

The methodology of calculating WACC is based on generally used financial definition, where the capital consists of all financial resources, i. e. common and preferred equity, and long-term debt:

$$\text{WACC} = w_d r_d (1 - T) + w_s r_s + w_{ps} r_{ps}, \tag{1}$$

where w_d, w_s, and w_{ps} are percentage of debt, and common and preferred equity financing ($w_d + w_s + w_{ps} = 1$), r_d is cost of debt, r_s is cost of common equity, r_{ps} is cost of preferred equity, and T is corporate tax rate.

The estimation of all components of WACC is explained later in details. The average cost of capital depends on several factors, of which some are not affected by an individual company, some – on the other hand – are company specific and depend on financial and investment policy of companies (Brigham and Ehrhardt 2005, 323). The company, for example, cannot control the volatility and the level of interest rates, which of course significantly affects the cost of debt (increasing interest rates influence on higher cost of debt). Moreover, the company cannot control the market risk premium, which depends on general risk aversion of investors. Further, the company has no control over some factors that affect the cost of debt (e. g. the general level of interest rates, slope of yield curve etc.), resulting in the company's WACC. Moreover, the company cannot control the corporate tax rate. The latter affects the WACC in two ways: first, the tax rate determines the after-tax cost of debt (note that after-tax cost of debt, $r_{d,at}$, is calculated as $r_d(1 - T)$); and second, it can affect the company's capital structure. In fact, the only factor that is under company's control is the risk of the company, expressed relatively to the average market risk (e. g. systematic risk, β, in the CAPM model).

In the calculation of WACC, one can note several dilemmas, which are discussed in the following sections.

Estimating wacc on Developing Equity Markets

There are some dilemmas that analysts face when they calculate wacc, especially if wacc is calculated for developing equity markets (or equity capital in transition and developing economies) and even more in times of high market volatility.

NOMINAL VS. REAL REQUIRED RATE OF RETURN FOR CAPITAL

The first question is whether wacc needs to be calculated in nominal or real terms. From the theoretical point of view, it is the same, whether one uses nominal or real rate of return, but only if revaluation of assets is consistently and adequately applied. However, this necessary condition can be met only if inflation can be estimated more or less accurately (see Independent Pricing and Regulatory Tribunal of New South Wales 2002). In fact, the following three alternatives are possible when one weights between nominal and real wacc:

- if assets are not revalorized, using nominal rate of return requires no adjustments,
- if assets are revalorized, using nominal rate of return requires that the amount of revalorization is included in revenues; or
- if assets are revalorized, using real rate of return requires no adjustments.

We believe that the most appropriate (and in fact simple) way is using nominal wacc. This is reasonable by at least two facts. First, nominal wacc incorporates the real rate of return and the compensation for (expected) inflation. Second, rates of return are usually expressed and quoted in nominal terms (e. g. yields on corporate bonds, risk-free sovereign bonds etc.). Thus, the real rate of return is not given as such and it must be estimated using nominal rates of return and expected inflation. Therefore, one might see no sense in subtracting the (expected) inflation rate from nominal rate of return and at the same time using this inflation rate in revalorization of the assets. This might be justified only in times of high (or hyper) inflation.

TAX RATE

The next dilemma relates to the following: i) should one calculate pre- or post-tax wacc and ii) should one use in calculation the legislated or effective tax rate. Although these two dilemmas can be tackled separately,

it would be more useful to address the two issues together.[1] As mentioned above, WACC presents the rate of return the investors (both creditors and owners) require if they invest in a company. Therefore, the generated cash flows of the company have to cover at least the investors' requirements. Nevertheless, from the perspective of tax legislation both types of investors are not in the same position. Namely, cash flows on interest payments are tax-deductible expenses, while the payments to owners (of equity) can be made only after the corporate taxes.

There are some advantages of post-tax WACC, such as its consistency with business practice, transparency, and a simple and accurate consideration of tax rate (i. e. simple and implicit application of effective tax rate) (Independent Pricing and Regulatory Tribunal of New South Wales 2002). On the other hand, the pre-tax WACC is generally used for regulated branches, especially because of its simplicity, while the risk of using an inadequate effective tax rate (i. e. using too high or too low tax rate) has to be addressed.

Concerning the dilemma on the use of legislated or effective tax rate, we believe that more adequate is the use of effective tax rate. The application of the legislated tax rate (which is at the same time the maximum effective tax rate) can lead to situations, where excessive cost of equity capital might be applied (because of tax reliefs).

CYCLICALLY ADJUSTED VS. LONG-TERM STABLE WACC

In times of current financial crisis and high market volatility, we are faced with a logical question, whether to calculate WACC based on current input data or data that account for long-term trends, i. e. whether to calculate 'current WACC' or a 'long-term stable WACC.' We believe that it is more accurate to take into account a long-term stable return on capital; we argue that the long-term WACC is better for the long-term perspective of investors.

The cyclical movements of relevant financial market factors (especially the risk premium and the premium for inflation expectations) are mostly consistent (i. e. are correlated) with economic/business cycles. These factors are implicitly the integral part of all WACC calculations, as they occur in the case of both capital components: equity capital and debt.

In times of economic uncertainty, the required rate of return (of equity capital and debt) usually increases. Several reasons can be found behind this fact. The increase of the required rate of return is at least a consequence of higher risk of equity financing (because of a higher market pre-

mium), and higher liquidity and credit risk for debt financing. In times of recession, a lower inflation usually follows, but the latter still cannot neutralize the effect of increased general risk (for details see Grabowski 2009).

On the other hand, in times of expansion the risk premium lowers. Even a potential increase of inflation cannot neutralize the effect of decreased rate of return for common equity and debt financing, so the decrease of required rate of return is usually associated with economic upturn.

Is then more appropriate to use a current (i. e. cyclical) or a long-term stable WACC? We believe that more appropriate is the calculation of a stable WACC. Namely, the investments are always oriented on long run, where WACC is long-term rate of return, required by the investors. Thus, investment decisions or their financial evaluation cannot be based on short-term estimates of the relevant parameters. Financial evaluation has to be based on long-term parameters. Namely, some parameters that are used in the calculation of WACC tend to be under the influence of business cycles in short-run, but are found to be relatively stable in a long run (if we consider a period that goes beyond one or more business cycles). Therefore, we argue that an appropriate statistical estimator (for example arithmetic mean) is an acceptable approximation of the long-term 'kernel' for the relevant variable. Thus, an estimation of a long-term WACC is a manageable operation.

Using a long-term WACC means that in some periods of investment cycles the used WACC is higher than current WACC and lower in other periods. However, in the long run the effects are levelled-off. Using long-term WACC, we can most appropriately avoid estimation errors.

THE CALCULATION AND THE CHOICE OF WACC PARAMETERS

As can be noticed from equation (1), several input parameters have to be estimated before calculating WACC. We tackle these inputs in next chapters.

Capital Structure

The capital structure (the composition of debt and equity capital) plays an important role when estimating the cost of company's financial resources. In fact, the capital structure is more or less the only factor that is under direct influence of business decision. Thus, the capital structure decisions
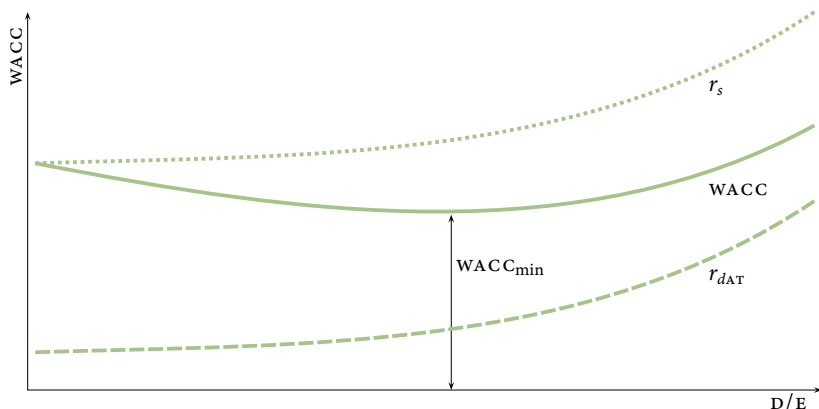
FIGURE 1   Schematic Approach in Determining the Optimal Capital Structure

are of crucial importance. Capital structure decisions include decisions on debt-to-equity ratio, dividend policy (which in turn determines debt-to-equity ratio) and investment decisions of the company.

Debt is cheaper than the equity capital (also because of tax shield) and to that end companies usually exploit the advantages of the so-called financial leverage. However, borrowing leads to a higher risk as it results in higher fixed obligations of a company (i. e. payments of interest rates and the principal of debt), which usually leads to higher required rates of return for invested capital.

From the theoretical point of view the company should try to achieve the optimal capital structure (i. e. an optimal composition of debt and equity financing, D/E^* in figure 1), where the WACC is at its minimum. If debt-to-equity ratio is below its optimum, the company can exploit the advantages of financial leverage, due to cheaper debt financing, while after this point, the risk premium starts to raise the price of all financial resources and consequently the WACC starts to increase.

The company's capital structure policy thus affects the cost of the capital (Brigham and Ehrhardt 2005, 265). There are several reasons behind this fact. Firstly, it has an influence on cost of equity. Namely, the systematic risk factor, β in CAPM model for estimation of required return for equity capital, is among other things, a function of financial leverage of the company. This is evident from Hamada's (1972) equation:

$$\beta = \beta_u \left[1 + (1 - T)\frac{D}{E} \right], \tag{2}$$

where β and β_u are leveraged and unleveraged beta coefficients, respectively, D/E is debt-to-equity ratio, and T tax rate.

It is evident that:

$$\frac{\partial \beta}{\partial D} > 0. \tag{3}$$

Secondly, as shown in figure 1 the cost of debt after-tax is always lower than the cost of equity capital, regardless of the capital structure. Therefore, if the unleveraged company decides to use a higher proportion of debt, this will lead to a lower average cost of capital of a company. However, this effect does not last forever. A higher proportion of debt will increase the risk of debt and equity capital, increasing the required return of both capital components, which will lead to higher WACC and will neutralize the effect of higher proportion of the cheaper debt.

Thirdly, the dividend policy also affects the weighted average cost of capital of the company. The proportion of net income that is paid out as dividends can affect the required rate of equity. If the proportion of payment is high, forcing the company to raise new equity for financing the investments and to maintain the optimal capital structure, the (additional) cost of raising new equity will occur. The latter has an influence on the weighted average cost of the capital structure.

Finally, also the investment policy affects the cost of capital if it has an impact on the capital structure. When the WACC is calculated, it is assumed that the capital structure will not change. However, if a company's capital structure changes significantly, the WACC will change as well, due to the change in financial leverage.

Cost of Debt Financing

The first step is the estimation of the required rate of return for lenders. It may seem easy, but it is often very problematic in the practice (Brigham and Ehrhardt 2005, 308). The company uses different types of debt with different effective interest rates. Even when investment plans are made, the managers do not know exactly what will be the cost of debt and how it will change due to financial market variability until the maturity of debt that needs to be refinanced. When we calculate the cost of debt, we have to consider the marginal required rate of return, i. e. the cost of the last unit of obtained capital (note that also WACC is marginal cost). Therefore, the cost of a new debt has to be considered rather than existing cost of debt; this holds at least for new investments.

How could be the actual cost of debt estimated? If the company in the past issued bonds and if these bonds are listed/quoted on financial market, we can use as a cost of debt the yield to maturity of the outstanding bonds, as it reflects the current cost of companies' debt. In developing financial markets companies rarely issue bonds to fulfil the funding needs, and even if they do, they are not liquid (thus the price does not reflect the current yield-to-maturity). In this case, yield-to-maturity of a bond issued by a similar company can be used (especially if they have a similar operating and financing risk). Given that companies rarely use bonds, there are only few or no outstanding liquid bonds on developing financial markets. Consequently, the alternative solution is to use an alternative cost of debt (either on domestic sovereign securities or on foreign corporate bonds) and an appropriate mark-up (i. e. adequate risk premium) for the company in question (comparing, say, credit rating and maturity).

However, due to tax-shield the effective cost of debt for the company is lower than the rate a company must pay to its lenders. In the calculation of the after-tax cost of debt the corporate income tax rate is applied as presented in the section on methodology.[2]

Cost of Equity Capital

The equity capital can be of two forms: common and preferred equity, which means that a company (i. e. a joint stock company) can issue common or preferred shares. The common equity capital can be raised by issuing new ordinary shares (or stocks) or on the other hand by retaining earnings (net income). When a company issues new ordinary shares, the cost of the common equity capital depends on the required rate of return, which can be derived from stock price, expected growth rate of dividends and by the floatation costs of a new issue. Note that the market price of shares is set by investors who by quoting and accepting market price implicitly determine the required rate of return. However, only few companies issue new equity. Brigham and Ehrhardt (2005, 311) point out some reasons for this fact.

On the other hand, companies can also employ retained earnings and raise equity capital in this manner. Note that the net income can be disbursed to shareholders as dividends or it can be retained in the company. The cost of retained earnings is in fact the opportunity cost of the equity capital: the owner could receive the retained earnings in the form of dividends, which could be invested in alternative investment opportunities. If the investors are to leave a part of net income in the company, then they

require an adequate rate of return, depending on the risk they take. An investor is entitled to expect a similar rate of return, i. e. rate of return that is expected for shares of a company with a similar risk. If a company was not able to assure the investors' expected rate of return for retained earnings, it would be better if the net income were paid out to investors so they can invest in more profitable alternatives (Brigham and Ehrhardt 2005, 311).

There are numerous more or less complicated methods for calculating the cost of common equity capital: Capital Asset Pricing Model (CAPM) (Black 1972; Lintner 1965; Ross 1976; Sharpe 1964), Fama and French three factor model (Koller, Goedhart and Wessels 2005; Estrada 2005, 85), Arbitrage Pricing Theory Model etc. The latter is theoretically very interesting but has a small practical value.

The commonly used method in the calculation of the cost of equity is CAPM model, in which the required rate of return is the sum of risk free rate and market risk premium, multiplied with the company's Beta (equation 4). Beta coefficient denotes the risk of the company relatively to the average market risk (average company). The CAPM supposes that all investors hold a combination of a risk-free investment and a well-diversified (market) portfolio. In such a case, they achieve the maximum return with a minimum risk. The proportion of the diversified portfolio and risk-free investment an individual holds depends on investor's risk aversion. The CAPM is based on strong assumptions. McNulty et al. (2002) found three central shortcomings of the CAPM: a) the validity of beta, b) the reliance of historical data, and c) the indifference of holding period (Zellweger 2007). Even though there are some disadvantages of CAPM, the model is the most widely used method for the calculation of the cost of common equity capital (Bruner et al. 1998; Graham and Harvey 2001; Brigham and Ehrhardt 2005, 320). It is argued in theoretical and empirical discussions that using a more complex method requires more data, which is rarely available on developing markets and leans on more estimated parameters, which requires more rule of thumb. This might lead to biased estimations.

Gunnlaugsson (2006) made a study on the validity of the CAPM on the small Icelandic stock market. The results indicate that the CAPM has worked well in the small Icelandic stock market and that CAPM (through beta coefficient) does in fact explain returns better even when compared to larger foreign stock markets. A strong relationship between the beta coefficient and stock returns was found. Furthermore, the stock returns with

high betas were higher than one would expect from the CAPM. There are two limitations of this research: i) the model was tested on a small number of shares (27), and ii) a short time series of data was used.

The CAPM model is defined as follows:

$$r_1 = r_f + \beta(r_m - r_f), \tag{4}$$

where r_i is expected rate of return, r_f risk-free rate, β Beta of the security (the risk measure of a stock, the measure of the systematic risk of a stock), r_m the expected market return, and $r_m - r_f$ market risk premium.

Risk-Free Rate

The first step in estimating the cost of equity capital under CAPM is the estimation of the risk-free rate of return. The question is which asset is risk-free. Every asset has its useful life in which it must earn an expected return. With the increasing probability that the return of the asset in its useful life will be different from the expected the risk increases. In finance, the risk is defined as a deviation of the actual from the expected return, so the risk free investments are those for which the actual return is equal to the expected return. The probability of default must be equal to zero and the reinvestment must be always possible.

When we estimate a cost of capital and when we determine the risk-free rate for this purpose, we must pay attention to a maturity of the asset. The equity capital invested in a firm has no maturity. So, it is recommended to use a risk-free investment with closest possible maturity as the asset in question (i. e. equity capital). A good approximation of a risk-free investment can be a long-term government bond, provided that the bond is of sufficient maturity (say 10 or better 30 years) and liquid. In this case, its yield-to-maturity would be a good approximation of a risk-free rate for current market conditions. In some cases, especially if no domestic government bonds are available or traded, one can use as a basis the government bond of a developed equity capital market. In such a case, we must calculate the difference in expected inflation rates between the countries. An even better solution would be to use the inflation-indexed bond and add the expected inflation rate on top of the real return of the bond, which would represent a risk-free rate of return.

Market Risk Premium

The next step is the estimation of the market risk premium. In their study, Ferson and Locke found that the estimation of the market risk premium is

much more important than the estimation of the beta coefficient (Ferson and Locke 1998). The majority of errors in the cost of capital estimations result from an incorrect estimation of the market premium. This means that the analysts must improve the methods of market risk premium estimation that is based on historical data. Bartholdy and Peare found that one must use the same approximation for the market portfolio for market risk premium and beta estimation. Using different approximations most likely yields a biased estimate (Bartholdy and Peare 2000).

The market risk premium is the difference between an expected market return and the risk-free rate of return. The market risk premium can also be denominated as the risk premium for the equity capital as it measures the risk aversion of investors. As the majority of investors are risk averse, they require a higher rate of return (risk premium) for their investments in stocks, compared to investments in debt securities (Brigham and Ehrhardt 2005, 313).

We can estimate the market risk premium in different ways. As every investor has its own expectation about the adequate market risk premium, we can calculate the market risk premium as a weighted average of different investors' expected premiums. This method is rarely used in practice; estimated premiums are very volatile and short-term (Damodaran 2006, 38).

In case the investors' risk aversion has not changed significantly in the past, the historical risk premium is a good proxy for the expected risk premium. We calculate the historical risk premium from a long-term time series of assets' (stocks and bonds) historical returns. The market risk premium is calculated as a difference between the average yearly return on stocks and return on risk-free bonds. For some developed markets (e. g. USA), historical data of returns exist for the period of eighty and more years.

Period for estimation of relevant parameters has to be carefully chosen. Some experts advocate shorter time as risk premium significantly changes over time and thus a more realistic estimation is obtained. On the other hand, a shorter time series has a bigger standard error. The differences in standard errors in relation of the length of time series are so evident that the use of shorter periods is not reasonable (Damodaran 2006, 47). This is proved by the research of Koller, Goedhart and Wessels (2005, 298).

The calculation of historical risk premiums is limited to financial markets with a long history of data, where the data for 50 or more years are

available. A good example of such market is the USA. In this case, the standard error of estimate could be relatively small.

In developed financial markets, the risk premium is estimated to be between 3.5% and 6% (Brigham and Ehrhardt 2005, 315). The results of Fama and French (2002) show that the expected market premium for the US market (the analysis was performed for the period 1951–2000) equals to 2.55%. Damodaran (http://pages.stern.nyu.edu/~adamodar/) argue that the expected market risk premium (implied risk premium) is more reliable because is forward looking.

For developing financial markets, the historical data on rate of returns are usually relatively short. In this case, the market risk premium can be obtained by using estimated market risk premium. Under the assumption that stocks are correctly valued, we can apply the Gordon's growth model (Gordon 1959) for stock valuation for calculating average return on stocks.

What is the adequate risk premium for emerging markets? It is indubitably higher in comparison with a developed market, since risk on developing markets is definitely higher in comparison with developed and more liquid markets. We can estimate the equity risk premium for a developing market adding a country risk premium to the risk premium for a developed equity market.

Beta

The next step is the estimation of beta coefficient. According to CAPM, the relevant risk of an individual stock is its contribution to the risk of a well-diversified portfolio. A well-diversified portfolio can be viewed also as a smaller picture of a market portfolio. It means that it comprises all the investments in the same structure as in the whole market.

The risk contribution of an individual stock to a well-diversified portfolio is measured with the beta coefficient. For market portfolio the $\beta = 1$. The investment with $\beta = 1$ is average risky, with $\beta < 1$ less risky and with $\beta > 1$ more risky than an average risky investment.

Beta coefficient is calculated as:

$$\beta = \frac{cov_{i,m}}{\sigma_m^2}, \tag{5}$$

where $Cov_{i,m}$ is covariance between returns of the investment and a market portfolio and σ_m^2 variance of returns of market portfolio.

We usually calculate beta coefficient with the use of linear regression. Beta is the slope in the linear regression function where the dependent

variable comprises past returns of an individual investment and the independent variable comprises the past returns (a proxy) of a market portfolio. Several financial institutions, e. g. Thomson Financial, Bloomberg and Yahoo calculate betas with slightly different methods and their betas for the same shares could be different. Analysts usually use monthly data for the period of 4 to 5 years, and some others prefer weekly returns for the period of 52 weeks (Brigham and Ehrhardt 2005, 316). Robert Merton (1980) proved that the use of shorter periods of returns improves the results. According to Koller, Goedhart and Wessels (2005, 309) the Merton theory is illusive. The use of daily or weekly returns is problematic when the trading with the share in not frequent. In the period of not trading the illiquid share will have the return equal to zero. However, this does not mean that the price of the share is stable. If there are many days, when the share is not traded, then the value of beta is downward biased. In this case, it is recommended to use monthly returns (Koller, Goedhart and Wessels 2005, 309). If historical betas is used in the CAPM it is implicitly assumed that future relative volatility of the share will not change.

If the company's stocks are not traded on a financial market, we can also estimate the relevant beta coefficient by using data that are available for other markets, say US markets (for example data that are available on Morningstar, Damodaran online etc.). Here we use the unleveraged beta coefficient and adjust it for the financial leverage of the estimated company (Hamada equation can be used, see equation 2).

Other methods for beta evaluation are fundamental betas, accountant betas, industrial betas and the valuation with the combination of these models (for the explanation of these models see Damodaran (2006, 51)). Because of the short time series and a small number of comparable companies, these methods are rarely possible or difficult to use in developing equity markets.

Market Facts

The financial crises complicated the cost of capital estimation for regulated industries. Parameters used for the calculation, such as bond yields, credit risk and interest rates, changed evidently in recent years and become more volatile and unpredictable.

The real yield to maturity of a 30-years inflation indexed Treasury bond, which is usually used as a measure of the real risk free rate has fallen substantially (see figure 2). The reason behind is partly to the fact that American treasury bonds represent a 'safety heaven' for investors in
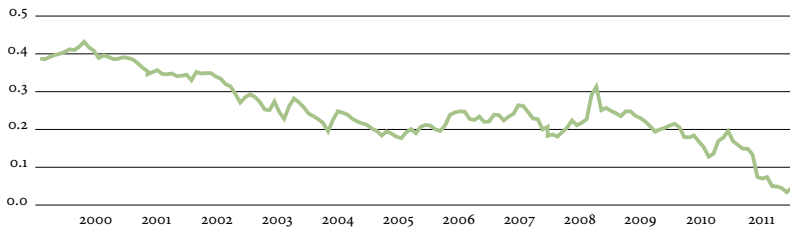
FIGURE 2   Yield to maturity of 30-Year 3-7/8% US Treasury Inflation-Indexed Bond, due 15 April 2029 (based on data from www.stlouisfed.org)
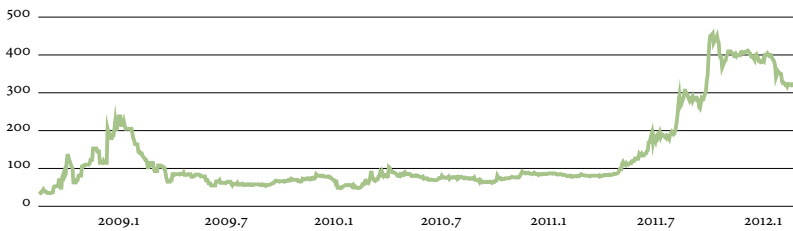

FIGURE 3   Credit Default Swap for Slovenia to US (based on data from www.reuters.com)

times of global financial turmoil's. An increased demand for such financial instrument drives the yields to maturity to historical low levels. Our opinion is that present levels are not long run equilibrium returns.

In Slovenia, interest rates drastically increased, as it is presented in figure 3 that shows the Credit Default Swap for Slovenia for the period from September 2008 to March 2012.

As could be seen from figure 3 the increased credit risk for Slovenia increased the cost of the 'relative insurance' for almost 200 basis points. Our opinion is that such an increase is a consequence of excess reaction of financial markets to a drop of credit rate for Slovenia. We estimate that this extreme increase of CDS in the second half of 2012 is not reflecting only the credit rating change but also the general mistrust, worsening liquidity on the market, the fear for the future of Euro, and other factors. According to Damodaran (http://pages.stern.nyu.edu/~adamodar/), the increased required rate of return due to the change in credit rating in Slovenia should be around 50 basis points.

This latter is in line with figure 4 that shows the yield to maturity of Slovenian government bonds from September 2009 to March 2012, which increased in this period for 70 basis points. We do not expect the rise of the credit rate in short nor do we expect the drop of the credit rate, espe-
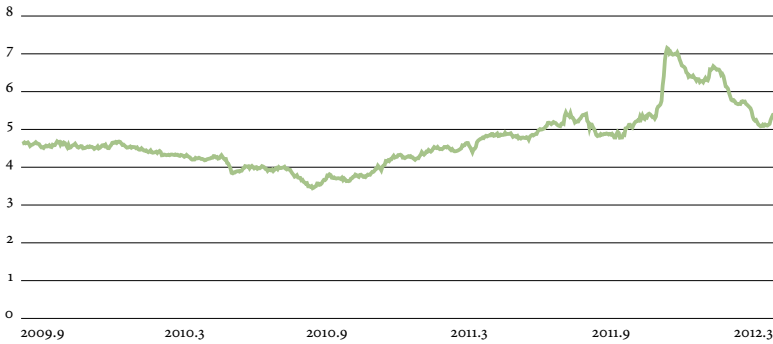
FIGURE 4   Yield to Maturity of Slovenian Government Bond SLOREP 4.625 9
            September 2024 Govt, Due in Year 2024 (based on data from
            www.reuters.com)
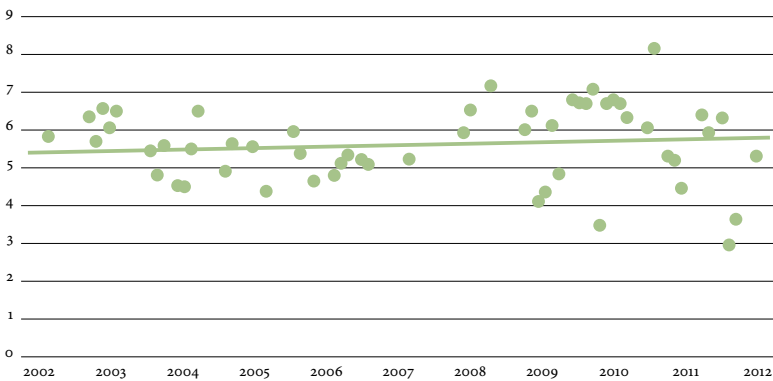

FIGURE 5   Interest Rates for New Credit Contracts with Maturity of 5 Years and Longer
            for Firms in Slovenia (based on data from www.bsi.si)

cially in light with the stabilization measures the Slovenian government
is currently adopting.

Due to financial market pressures, the cost of debt for Slovenia on in-
ternational market has increased, but – as showed by the data of Bank
of Slovenia – this has not affected in the same extent the cost of debt for
firms (figure 5).

The effective cost of new long-term debt financing for firms in Slove-
nia increased in average for 25 basis points (figure 5), but the financing
activity stagnated from the year 2009 onwards. The growth of credits
to nonfinancial sector (figure 6) decreased from 3% growth before the
financial crisis to about 0% or almost a negative growth in 2011. The
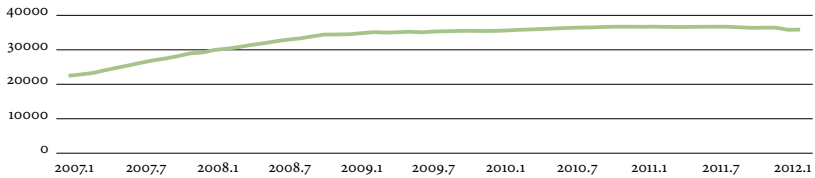reasons are the lower demand for credit from firms and individuals,

FIGURE 6   Credit to Non-Financial Sector in Millions of EUR (based on data from
www.bsi.si)

increased severity in approval of credits, and the rise in credit costs.

Based on these facts we propose some directions for the estimation
of the cost of capital. We note that in recent years there is an extremely
unstable period for the financial markets. It will be a result of this cri-
sis, too, that the levels will drastically change in the future. However, the
real assessment of these conditions is impossible to make, however, the
calculations should be based on objective assessments and historical and
long-term data, beyond the period of one economic cycle.

THE EXAMPLE OF CALCULATION

We present the estimation of a long-term pre-tax capital cost for a reg-
ulated Slovenian company that is operating in the field of electric distri-
bution. The cost of equity is calculated based on the CAPM model. Cal-
culation is made based on data from a mature and developed US market
that has a long history, which allows estimation based on historical data.
Based on the data of a mature market (risk-free rate, beta, market risk
premium), and by taking into account the characteristics and differences
between the US capital market and Slovenia (in particular, the risks and
inflation), by applying Damodaran's methodology, we estimated the cost
of equity capital. A reliable estimation based on Slovenian capital market
data is not possible; combining data from different markets (the EU) in
the CAPM would reduce the consistency of the model and the reliability
of the estimation. We used and calculated the variables as follows:

- For the expected real risk-free rate we used the average yield to ma-
turity of 'WTP30A29, 30-Year 3–7/8% Treasury Inflation-Indexed
Bond, Due 4/15/2029,' which was 0.45% on March 30. 2012 (monthly
average). The average yield, calculated from a series of average
monthly yields in the period from April 1999 to March 2012, is 2.51%.
We obtained the data from the Federal Reserve Bank of St. Luis web
page (www.stlouisfed.org).

- For the expected inflation we used 2%, which is in line with the target inflation of the European Central Bank (2009) (official goal is 'slightly below 2%'). We believe that in times of market uncertainty this is the best possible estimate of the future inflation because long-term goal of the economic policy is to reach the announced inflation target.

We calculated the nominal risk free rate with the Fisher's equation as follows:

$$r_f = (1 + r_r) \cdot (1 + \pi) - 1 = (1 + 2.46\%) \cdot (1 + 2\%) - 1 = 4.56. \qquad (6)$$

If we compare this estimate with a current yield to maturity of the long-term Slovenian government bond, it can be noticed that this estimate is slightly lower. A long-term Slovenian government bond yield was 5.82% in April 2012. It needs to be taken into account that current market conditions are not representative so the use of current data needs to be avoided.

- For the market risk premium, we use the average of the equity risk premium for the American market calculated by Damodaran (http://pages.stern.nyu.edu/~adamodar/). This equity risk premium is 3.99% and can be considered as a long-term equilibrium market risk premium. It is calculated as an average from the forecasted premiums time series (1960–2011) calculated with the expected dividend growth model. We added the country risk premium for Slovenia, which was 1 percentage point. According to Damodaran (http://pages.stern.nyu.edu/~adamodar/) the Slovenian credit rating A2 (www.moodys.com) reflects a 1% point of additional premium for default risk, which needs to be multiplied with the global average of equity to bond market volatility (1.5). This results in 1.5% of country risk premium for Slovenia. The calculated market risk premium for the Slovenian market is thus 5.49% (3.99% + 1.5% = 5.49%). We obtained all the data from the Damodaran (http://pages.stern.nyu.edu/~adamodar/).
- For the estimation of individual risk, we use the estimated unleveraged betas from Damodaran. The industry betas are calculated with a linear regression function, using the returns of stocks in the industry as the dependent variable and the returns of the NYSE composite index as independent variable (the relevant time series covered last five years). The calculated industry beta is the average of all calculated betas in the industry. The unleveraged betas are calculated

with the Hamada's equation taking into account the average debt to equity ratio in the industry. The data for the companies are from the Value Line database. The beta for the Electric Utility (central) is calculated from the 21 companies in the industry. The beta for the Electric Utility (central) was 0.47.

- We calculated the leveraged beta with the Hamada's equation. The company was financed as 40% of debt and 60% with equity capital and we presume that the company will not change its capital structure in the future. The company has a 20% effective tax. The calculated levered beta was:

$$\beta_1 = \beta_u \left[1 + (1 - T) \frac{w_d}{w_s} \right] = 0.47 \left[1 + (1 - 0.2) \frac{0.4}{0.6} \right] = 0.72. \quad (7)$$

- We calculated the cost of equity capital with the CAPM as follows:

$$r_i = r_f + \beta(r_m - r_f) = 4.56\% + 0.72 \cdot 5.49\% = 8.51\% \quad (8)$$

- For the cost of debt, we used the estimated risk free rate plus the premium for the long-term debt for the AAA rated company, which is 1.75 percentage points. The resulting cost of debt was 6.31%.

- The estimated pre-tax WACC for the selected Slovenian company which operates in the field of electric distribution is estimated as follows:

$$\text{WACC} = w_d r_s + \frac{w_d r_s}{(1 - T)} = 0.4 + 6.31\% + \frac{0.6 \cdot 8.51\%}{1 - 0.2}$$
$$= 8.91\%. \quad (9)$$

Conclusion

The paper tackles the estimation of weighted average cost of capital (WACC) for developing financial markets for regulated industries from the perspective of the current financial crisis. The cost of capital is crucial in capital budgeting decisions, performance evaluation and in our case, business regulation. It is the yield that investors require for their investments and it is used as a discount rate to calculate the present value of the expected free cash flows of the company. In times of financial crisis an obvious question arises, i. e. how to estimate an appropriate WACC.

In the paper, we argue that the most accurate for this purpose is a long-term WACC, which takes into consideration a long-term stable yield of capital. We argue that since an investment is a long-term decision of the company and its cash flows are estimated on long run, also the adequate WACC has to be considered from a long-term perspective. Thus, it has

to be calculated free of short-term cyclical movements of the economy (e. g. the risk premium and inflation premium), or – similarly – these movements have to be properly taken into account. Following this belief, we propose in the paper some solutions that could be used for calculating WACC for a regulated industry on the developing financial markets in times of market uncertainty and financial crisis.

In a dilemma, whether to use nominal or real WACC, we opt for nominal WACC. We argue that this is the most appropriate and in fact simple, given that we can avoid estimation of inflation expectations and (most importantly) revalorization of assets.

When deciding on pre- vs. post-tax WACC, the final answer depends upon the purpose of the calculation and the background of calculating WACC. Pre-tax WACC provides an adequate cash flow to the company's owners, but it can be obtained only after the payment of corporate taxes. From this point of view, the interpretation and application of the estimated WACC are relatively simple. In the case of post-tax WACC, some adjustments should be made. An advantage of post-tax WACC is its consistency with the business practice, transparency, and a simple and accurate clearance of tax rate (i. e. simple and implicit application of effective tax rate) (Independent Pricing and Regulatory Tribunal of New South Wales 2002). On the other hand, the pre-tax WACC is generally used for regulated branches, especially because of its simplicity, while the risk of an inadequate effective tax rate use (i. e. too high or too low tax rate) has to be taken into consideration.

The general dilemma in calculating WACC is whether to use short- or long-term oriented WACC. The tradeoff is between short-run accuracy and long-run stability of WACC. Our argument is that long-run WACC should be taken into account for valuing investment opportunities, as short-term movements in the relevant variables are irrelevant for long-term investors. Following this belief, the calculation of WACC is simplified to estimation of debt cost (e. g. risk-free rate plus debt risk premium) and the cost of equity (which can be simply calculated using CAPM model employing among others long run and stationary market risk premium).

We have presented an example of capital cost estimation for a Slovenian company, which operates in the field of electric distribution using our proposed methodology. The presented methods could be used for other companies in Slovenian regulated industries and other developing financial markets taking into account the specific properties of financial

markets and companies. The result of the case study is limited to the presented company.

Notes

1 This holds for final calculation of WACC (according to equation 1) as well as for estimating input variables for WACC calculation, e. g. beta coefficient if we use CAPM methodology for the calculation of the cost of equity capital.

2 If a company utilizes the tax relief, we can take as a tax rate the expected effective tax rate (that represents the tax rate that will be actually applied).

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Promoting Corporate Social Responsibility in Logistics throughout Horizontal Cooperation

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This paper discusses how Corporate Social Responsibility (CSR) can be promoted in Logistics and Transportation (L&T) companies by means of Horizontal Cooperation (HC) practices. The L&T sector is experiencing important changes because of new trends in markets and society. These changes have a strong impact on the way L&T companies develop their distribution activities. On the one hand, globalisation and increasing competition are creating incentives for these companies to cooperate in different ways – with the aim of becoming more efficient by sharing resources and reducing costs. On the other hand, the increasing sustainability awareness within society is pressuring L&T companies to integrate CSR principles into their strategies and policies. Accordingly, this paper discusses the current trends in these areas and offers some examples of how HC can contribute to reduce both distributions costs as well as the environmental impact of the distribution activities.

Key Words: corporate social responsibility; green logistics; horizontal cooperation

JEL Classification: M14; C61; C63; L92

Introduction

During the last few years, customers are increasingly seeking benefit in the products they demand. Nowadays, this benefit comprises not only products and services with high quality and cheap prices, but also products and services, which are socially and environmentally respectful. Today's customers are worried about sustainable development, and Corporate Social Responsibility (CSR) is currently considered as the main contribution of corporations to sustainable development (Bansal 2005). In a brad sense, CSR entails the adoption by organisations of a very wide

range of polices and compromises covering social, environmental and economic dimensions and their translation into processes to be applied over the whole organisation's influence area.

In this new context, companies no longer can base their commercial strategies in achieving competitive advantages on the traditional 'four Ps' (price, product, promotion, and place), as they can be used to externalise negative impacts. Instead, the 'four Rs' (reliability, responsiveness, resilience, and relationships) are now considered to provide real added value, and logistics play a key role in all of them (Waters 2010). Globalisation has also introduced several changes in Logistics and Transportation (L&T). Globalisation of production and markets has caused supply chains to stretch and become less predictable. L&T companies now deal with an increasing competition where international L&T companies are coping with local markets, reducing profit margins, and reducing the number of available service providers (Verstrepen et al. 2009).

The application of CSR to the area of L&T is widely known as logistics social responsibility. Carter and Jennings (2000, 9) define LSR as 'the socially responsible management of the supply chain from a cross-functional perspective.' Apart from the standard policies and practices that companies acting according to CSR principles are expected to integrate – which include stakeholders' engagement and transparency, among others –, logistics social responsibility comprises some specific activities related to the sustainable management of the supply chain. These activities are purchasing management, transportation, packaging, warehousing management, and reverse logistics (Ciliberti, Pontrandolfo and Scozzi 2008b). Therefore, it is possible to find several works in the scientific literature which propose the integration of corporate social responsibility and sustainability principles in logistics (Carter and Jennings 2002; Ciliberti, Pontrandolfo and Scozzi 2008b; Miao, Cai and Xu 2012). Many of those works pay special attention on the environmental pillar of sustainability, and they deal with important negative impacts such as pollution or fuel consumption.

From an integrated sustainability point of view, these works could be classified as 'Business Cases' (Bieker et al. 2001). This is because their ultimate goal is to increase corporate benefits, because of both eco-efficiency and social productivity. Logistic social responsibility is aimed at reaching sustainability in a practical way, balancing eco-efficiency, social productivity, and social equity. The compromise among the social and environmental aspects must be taken into consideration too.

Optimisation has traditionally been used to reduce costs in logistics. Optimisation methods can be used, for example, to determine optimal stock levels (Sevastjanov and Dymova 2009) or to reduce transportation costs (Tsao and Lu 2012). Transportation is a major task in any logistics service. It also represents the largest proportion of the total logistics cost (Rushton, Croucher and Baker 2006). Therefore, researchers have historically devoted heavy efforts to optimise transportation costs. When optimising transportation costs, several measures can be used in the objective function, which is generally defined to pursue the maximum profit or, alternatively, the minimum cost. These components can be then combined with other objectives, for example: reduction of emissions or a fairer workload distribution among workers. This paper illustrates some examples on how horizontal cooperation practices can contribute to promote CSR in the L&T sector by reducing the company costs as well as the environmental emissions and negative social impacts.

The remaining of this paper is structured as follows: the following two sections complete a literature review on the topics CSR and HC, respectively; then, two visual examples contribute to illustrate the potential benefits of HC practices and their relationship with CSR; some numerical experiments contribute to get a quantitative measure of the benefits that can be attained by using HC in logistics and transportation. Finally, a conclusion section highlights the main contributions of this paper.

Corporate Social Responsibility in Logistics

CSR can play a fundamental role in achieving worldwide objectives of growth, competitiveness, better governance, and overall sustainable development. Those companies acting according to CSR principles are expected to contribute to economic development while improving the quality of life of the workforce and their families, as well as of that of the local community and society at large (Holme and Watts 2000). It is therefore worth advancing in those efforts aimed at promoting CSR practices at any level. According to CSR principles, companies adopting CSR are compelled to integrate ecological and social aspects into their decisions and actions across their supply chains (Ciliberti, Pontrandolfo and Scozzi 2008a), and they should hold themselves accountable for the social and environmental impacts arising from their activity. Of course, logistics represents a key element at most stages of the products' lifecycle.

The logistics and transportation sector is global in nature, and it has a great variety of impacts that can affect the economic, environmental,

and social dimensions of society – both in positive and negative ways. As an increasingly important sector on a global level, a wide range of stakeholders are progressively gaining interest in what these organisations are currently doing as well as their future plans with regards to sustainability. The importance of the application of CSR principles in logistics has been widely recognized by scholars and practitioners (Poist 1989; Carter and Jennings 2002; Ciliberti Pontrandolfo and Scozzi 2008b), who use the term Logistics Social Responsibility (LSR) to refer to the socially responsible management of logistics. Modern logistics are no longer limited to the mere management of transport and storage of physical goods. Instead, nowadays they have been extended to the coordination of all phases identified in the course of supply, production and sale of a company and its relations with the rest of the environment in which it operates (Pulina and Timpanaro 2012). In this regard, the Council of Supply Chain Management Professionals (2013) define logistics management as 'that part of the supply chain process that plans, implements, and controls the efficient, effective forward and reverse flow and storage of goods, services, and related information between the point of origin and the point of consumption in order to meet customers' requirements.' From this definition, it can be derived that logistic management encompasses several processes such us inbound and outbound transportation, warehousing, inventory management, management of third-party logistics service providers, sourcing and procurement, packaging and assembly, or customer service – which includes the movement and management of products and resources after the sale and after delivery to the customer.

There is not a global agreement on what practices are included in LSR, and several frameworks can be found in the literature. According to the proposal of Poist (1989), LSR includes employee training, philanthropy, environment, urban renewal, workplace diversity, health and safety, and community issues. Carter and Jennings (2002) defined an integrative framework comprising a wide set of specific activities for the socially responsible management of purchasing, transportation, and warehousing management. The aforementioned authors classified these activities into broad categories, including environment, ethics, diversity, working conditions and human rights, safety, and philanthropy and community involvement. In a similar way, Ciliberti, Pontrandolfo, and Scozzi (2008b) proposed taxonomy with 47 LSR practices, classified in five broad categories, including: purchasing social responsibility (24), sustainable transportation (13), sustainable packaging (2), sustainable ware-

housing (2), and reverse logistics (6). Finally, the model used by Miao, Cai and Xu (2012) considers five main dimensions to deal with for a sustainable management of logistics: supplier selection, product delivery to customers, environmental protection, humanity to employees, and philanthropy/community aspects.

The importance of a sustainable management of logistics has also been recognised by the Global Reporting Initiative (GRI). The GRI is the most relevant institution in the sustainability-reporting context, and it has developed what is considered the best-known framework for voluntary reporting of environmental and social performance by business and other organisations worldwide. This framework is the GRI Guidelines for Sustainability Reporting. While these guidelines are designed to be applicable by almost any kind of organisation, GRI has also developed a specific supplement for the logistics and transportation sector (Global Reporting Initiative 2006). This supplement provides special attention to the sustainable management and transparent disclosure of information in the logistics and transportation sector, which is especially important for assessing the triple bottom line performance of companies operating at the sector. In this regard, the supplement emphasizes the need of identifying the environmental and social impacts of the organisation's method of ship disposal or other types of transportation fleet disposal. To help organizations, the supplement also proposes some complementary environmental performance indicators to be included in the sustainability reports of L&T companies. Those indicators are related to the description of the following topics:

- Breakdown of fleet composition.
- Policies and programmes on the management of environmental impacts – such as using hybrid vehicles or improving route planning.
- Initiatives to use renewable energy sources and to increase energy efficiency.
- Initiatives to control urban air emissions in relation to road transport (e. g., use of alternative fuels, frequency of vehicle maintenance, driving styles, etc.).
- Policies and programmes implemented to manage the impacts of traffic congestion (e. g., promoting off-peak distribution, new inner city transport modes, percentages of delivery by modes of alternative transportation, etc.).
- Policies and programmes for noise management/abatement.

- Environmental impacts of the organisation's major transportation infrastructure assets and real estate.

Horizontal Cooperation in Logistics

Globalisation has brought important changes in the way Logistics Service Providers (LSPs) operate. This is due, in part, to the growing intensity of competition, which has resulted in an increasingly challenging scenario. Nowadays, customers expect goods to be delivered in the right amount, at the right time and place, in perfect condition and at the lowest possible price. Today, customers require a wider variety of services as well, and they are increasingly searching for LSPs that can offer them full packages of logistics services. Under this new reality, cooperation appears as an interesting commercial strategy for LSPs companies, either vertically with customers or horizontally with other LSPs (Schmoltzi and Wallenburg 2011).

By cooperating, LSPs can reduce operational costs, reach wider markets and offer integrated service packages to their clients. Vertical cooperation is generally known as supply chain management. This concept has been widely addressed in the literature, and while many definitions can be found (Chistopher 1992; Simchi-Levi, Kaminsky and Simchi-Levi 2000), most of them share the concept of cooperation among companies involved in the lifecycle of a product or a service, from raw material to distribution to costumers. Whereas the literature is plenty of works about supply chain management, from both academics and practitioners, the study of horizontal cooperation is still in an early stage. Bahinipati, Kanda and Deshmukh (2009, 880) define horizontal cooperation as 'a business agreement between two or more companies at the same level in the supply chain or network in order to allow ease of work and co-operation towards achieving a common objective.' According to the definition provided by Cruijssen, Dullaert and Fleuren (2007), horizontal cooperation is about identifying and exploiting win-win situations among companies that are active at the same level of the supply chain in order to increase performance. To this end, cooperating companies are expected to reach agreements by means of dialog and partnership, both of which are key factors to promoting CSR. The literature on HC emphasizes that it can improve the performance of both core and non-core LSPs processes (Esper and Williams 2003).

Economic motivations of horizontal cooperation have been widely treated in the literature. Thus, for instance, Cruijssen, Dullaert and

Fleuren (2007) found that significant cost reductions and productivity increases are seeing as the most important opportunities of horizontal cooperation. Schmoltzi and Wallenburg (2011) found that, apart from those identified by Cruijssen, Dullaert and Fleuren (2007), the motivational factors driving cooperation also include service quality improvement and market share enhancement. In addition, some researches also argue that horizontal cooperation can increase the performance of companies by providing access to additional knowledge and to new financial resources or markets (Sakakibara 1997). Reasons linked to eco-efficiency – such as reducing fuel consumption – and social productivity would be enclosed within these economic motivations, as both of them pursue an economic profit aligned with environmental and social sustainability.

There are, however, several social and environmental issues which can also motivate horizontal cooperation in the field of logistics and transportation, and which can therefore promote the development of corporate social responsibility in the logistics and transportation sector. Regarding social issues, satisfaction and life quality of transportation workforce can be considered one of the most important benefits of horizontal cooperation in L&T sector. As it will be discussed in the following examples, also environmental benefits can be derived from HC practices.

EXAMPLE 1: BACKHAUL STRATEGIES

One of the aims of horizontal cooperation in logistics is to contribute to reduce empty backhauls or deadheading (return trips with no load). According to a report from the European Commission (2011), empty backhauls represent about 25% of road transportation activities in Europe. Therefore, regulations exist so that haulers crossing foreign countries during their return trip home can pick up loads in countries where the vehicle is not registered. This practice, called 'cabotage,' helps to optimize the use of capacity of the hauls. The upper part of figure 1 shows a typical non-cooperative scenario where each service provider (square node) designs its own set of routes to deliver its own customers (set of nodes represented by a common symbol). In contrast, the lower part of figure 1 shows the same routing problem in a cooperative scenario, where backhauling strategies are considered – i. e. some routes are merged in order to increase the actual utilization of vehicles during a roundtrip. The comparison of both figures provides a first intuitive idea regarding the benefits, in terms of routing distances and number of necessary vehicles that can be reached throughout horizontal cooperation.

Although the main goals of HC are to reduce shipping costs and also to provide a faster distribution service to customers, other important benefits are related to a reduction of the environmental impact of distribution activities. In the European Union, about 18% of the greenhouse gas emissions are due to road transportation (Hill et al. 2012). Thus, collaboration among partners in the transportation industry can help reducing environmental footprint as it can reduce the number of necessary trips and increase the efficiency of the haulers.

EXAMPLE 2: MERGING DEPOTS

Similar to the example above, the upper part of figure 2 shows a typical non-cooperative scenario where each service provider (square node) designs its own set of routes to deliver its own customers (set of nodes represented by a common symbol). In contrast, the lower part of figure 2 shows the same routing problem in a cooperative scenario, where each customer is delivered by its closest provider. The comparison of both figures provides a first intuitive idea regarding the benefits, in terms of routing distances, routing times, and gas emissions that can be reached throughout horizontal cooperation.

Numerical Experiments

Regarding the aforementioned multi-depot example, and in order to provide a quantitative estimation of the economic and environmental benefits that can be obtained throughout HC practices, we decided to run some numerical experiments based on classical benchmark instances for the Multi-depot Vehicle Routing Problem (MDVRP). These instances are available from http://neumann.hec.ca/chairedistributique/data/mdvrpv. In order to solve the MDVRP (collaborative scenario), we employed the algorithm developed by Juan et al. (2012). A standard personal computer, Intel® Core™2 Duo CPU at 2.4 GHZ and 2 GB RAM was used to perform all tests. Each instance was run 10 times, each time for a maximum period of 2 minutes. Results of these tests, comparing the collaborative scenario (Multi-depot VRP) with the non-collaborative ones (Multiple VRPs) are summarized in table 1 (instances p01 to p10). The table shows the details of each instance, that comprises the following: (1) instance name; (2) number of customers, n; (3) number of available vehicles, m; (4) number of depots, d; (5) maximum route length – when applicable; (6) maximum load capacity of any vehicle, Q; (7) the Best-Known Solution (BKS) for the collaborative scenario; (8) the Our Best Solution (OBS) – in terms
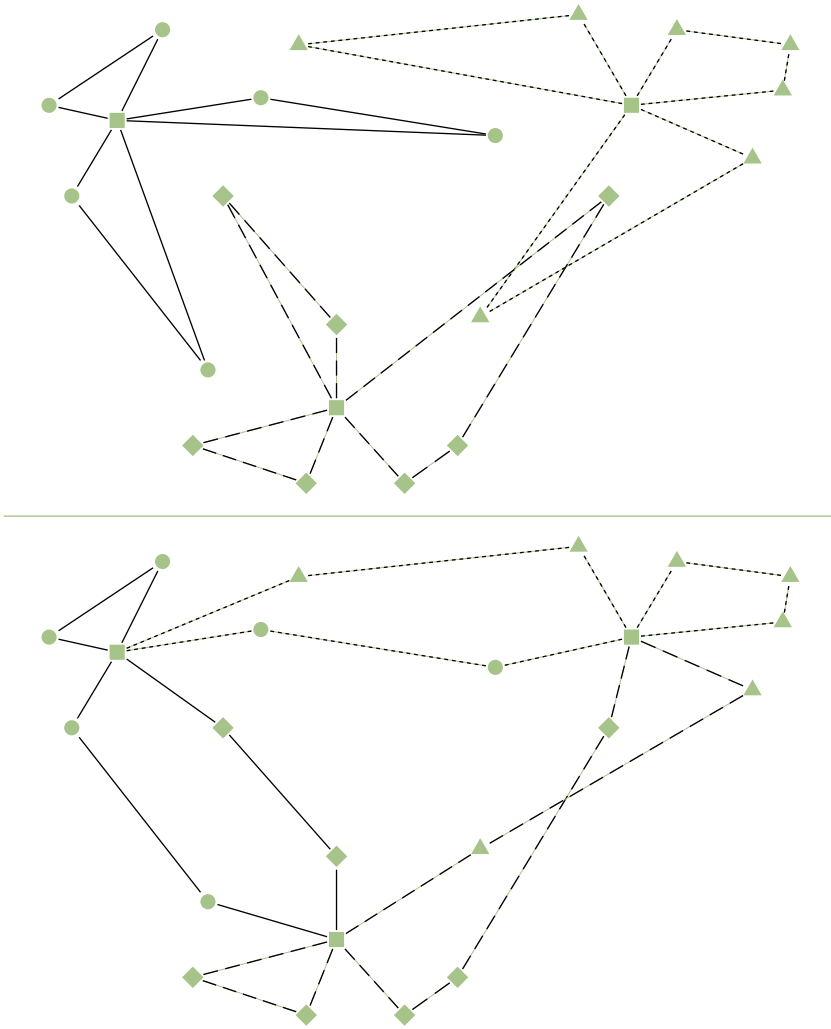
FIGURE 1 Backhaul Case with Non-Cooperative (above) vs. Cooperative (below)
Scenarios

of distance-based costs – for the collaborative scenario; (9) the percentage gap between 7 and 8, which shows that the results obtained with our algorithm for the collaborative scenario are fairly competitive with the state-of-the-art results for these benchmarks; (10) the estimated emissions costs associated with OBS in 8, which have been computed according to Ubeda, Arcelus and Faulin (2011) – who proposed a table of coefficients to approximate these costs as a function of the truck load level and
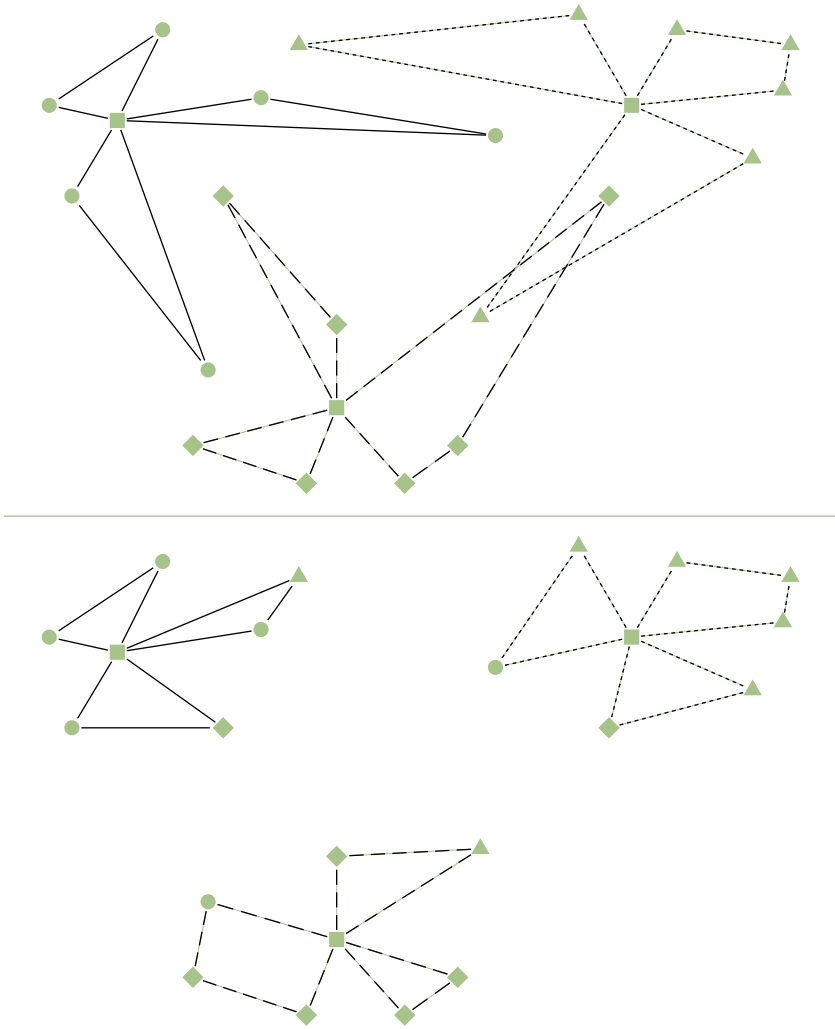
FIGURE 2   Multi-Depot Case with Non-Cooperative (above) vs. Cooperative (below) Scenarios

the travelling distances while covering each segment (edge) in a route; (11) our best solution – in terms of distance-based costs – for the non-collaborative scenario; (12) the gap between 9 and 11; (13) the estimated emissions costs associated with our solution in 11; and (14) the gap between 10 and 13.

First of all, it should be noticed that the approach we proposed to solve the MDVRP – i. e. the full-collaboration scenario – is quite competitive,

TABLE 1 Comparative Results for Instances p01 to p10

(1)	(2)	(3)	(4)	(5)	(6)	Cooperative Scenario (MDVRP)				Non-Cooperative Scenario			
						BKS		OBS					
						(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
p01	50	4	4	n/a	80	576.9	576.9	0.0%	509.8	622.0	7.8%	557.8	9.4%
p02	50	2	4	n/a	160	473.5	473.9	0.1%	433.1	518.7	9.5%	460.7	6.4%
p03	75	3	5	n/a	140	641.2	641.2	0.0%	580.9	679.9	6.0%	613.2	5.5%
p04	100	8	2	n/a	100	1,001.0	1,003.5	0.2%	865.1	1,021.6	1.8%	926.8	7.1%
p05	100	5	2	n/a	200	750.0	751.9	0.2%	683.6	766.9	2.0%	702.0	2.7%
p06	100	6	3	n/a	100	876.5	876.5	0.0%	762.3	918.6	4.8%	794.6	4.2%
p07	100	4	4	n/a	100	882.0	885.2	0.4%	796.9	905.6	2.3%	828.0	3.9%
p08	249	14	2	310	500	4,372.8	4,409.2	0.8%	4,012.4	4,456.4	1.1%	3,943.7	−1.7%
p09	249	12	3	310	500	3,858.7	3,882.6	0.6%	3,510.5	4,125.3	6.3%	3,452.7	−1.6%
p10	249	8	4	310	500	3,631.1	3,646.7	0.4%	3,346.0	3,882.1	6.5%	3,515.3	5.1%
Averages								0.3%			4.8%		4.1%

NOTES (1) instance, (2) n, (3) m, (4) d, (5) max. route length, (6) Q, (7) distance-based costs, (8) distance-based costs, (9) gap $7 - 8$, (10) emissions costs, (11) distance-based costs, (12) gap $9 - 11$, (13) emissions costs, (14) gap $10 - 13$.

showing average gaps of just about 0.3% with respect to the best-known solutions. The routing algorithm used inside this approach, i. e., the SR-GCWS-CS developed by Juan et al. (2011), is the same algorithm we use in solving the non-collaborative strategies (Multiple VRPs), which contributes to make a fair comparison among the different scenarios considered in this paper.

Now, regarding the gaps among collaborative and non-collaborative strategies, the results show that the horizontal cooperation is able to produce solutions outperforming non-collaborative strategies, both in terms of distance-based costs as well as in terms of emission costs. In the case of distance-based costs, the average gap between the collaborative strategy and the non-collaborative strategy is about 4.8%. In the case of gas emissions costs, the average gap between the collaborative strategy and the non-collaborative strategy is about 4.1%.

Conclusions

This paper has discussed the importance of considering Corporative Social Responsibility in logistics and transportation, and how it can be promoted throughout the use of Horizontal Cooperation practices. In effect, HC might imply a reduction not only of distribution costs, but also of pollutant gas emissions and delivery times – thus providing a better service to final customers. We have proposed two examples of HC practices that

can contribute to improve CSR in small- and medium-size enterprises. For one of these examples, we have carried out some numerical experiments to quantify the benefits that HC practices can offer. According to the experimental outputs, a horizontal cooperation strategy can contribute to a noticeable reduction in expected costs, both in terms of distance travelled as well as in terms of pollutant gas emissions. Additional savings in routing costs related to time or environmental factors could be also considered, thus making horizontal cooperation even a more desirable praxis for managers in the L&T field.

The results obtained in the numerical experiments are promising, and although the benefits obtained in simulated scenarios would differ from those obtained in real scenarios, there is no doubt that important savings and other benefits may be obtained through horizontal cooperation in transportation. However, in a globalised market, regulations can strongly limit horizontal cooperation agreements, and practices such as cabotage may be limited by local regulations with the aim of protecting local markets.

It is therefore unsurprising that regulators and policy makers are being encouraged to gradually open transportation markets, as it is expected it will increase the flexibility of operations and competition in national markets, whilst ensuring fair competition, maintaining adequate social norms and allowing important savings, thus contributing to the sustainability and social responsibility of the sector. In the case of the European Union, the High Level Group (2012) identified and researched four key obstacles to the creation of a Single European Transport Area, in which, in addition, cross-border cooperation needs to be explicitly promoted between Member States. Those obstacles, namely driver shortage, enforcement practices, cabotage practices, and lack of innovations and applications of good practice, are closely linked to sustainability issues, and many of the recommendations provided in this and other reports are in line with corporate social responsible principles.

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Ovire za zagotavljanje prehranske varnosti v Izraelu leta 2050
Efrat Hadas in Yoav Gal

Članek osvetljuje koristi dolgoročnega načrtovanja z namenom, da bi odločevalcem in politikom pomagali, da v proces zagotavljanja prehranske varnosti v Izraelu leta 2050 vključijo tudi razmišljanje po različnih scenarijih. Pričujoča študija obravnava vprašanje prehranske varnosti, ta korak pa je v nasprotju z načeli kmetijskega načrtovanja v preteklosti, ki se je osredotočalo predvsem na povečevanje dobičkov in se zanašalo na zaprte matematične modele. Dve skupini strokovnjakov sta določili omejitve proizvodnje, ki zadevajo dolgoročno načrtovanje in zmožnost zagotavljanja prehranske varnosti v teh pogojih. Ugotovljeno je bilo, da je za proces odločanja pomembnih pet ključnih dejavnikov: prebivalstvo, zemlja, voda, tehnologija in mednarodna trgovina. Podatki kažejo, da Izrael danes prek kmetijskih pridelkov uvaža velike količine virtualne zemlje in vode. Zaradi tega je treba pozornost odločevalcev odvrniti od doseganja kratkoročnih dobičkov in jo usmeriti k zagotavljanju dolgoročne prehranske varnosti.

Izbira med fizičnim in virtualnim nakupovanjem: primer poljskih porabnikov
Radosław Mącik, Dorota Mącik in Monika Nalewajek

Članek obravnava vedenje in preference poljskih potrošnikov v maloprodaji in izbiro ustreznega načina prodaje. Rezultati vključujejo zaznavne zemljevide, ustvarjene s pomočjo večdimenzionalnega skaliranja (MDS) na osnovi podatkov iz dveh študij iz leta 2008 in 2012, ki dajeta možnost ocenitve sprememb upočasnitve gospodarske rasti. Dvodimenzionalne rešitve zelo dobro ustrezajo podatkom in dopuščajo opis primerjanih formatov v smislu zaznane ravni osebnih interakcij s prodajnim osebjem in zaznanih skupnih stroškov za potrošnika. V analiziranem obdobju se je dojemanje diskontih trgovin bistveno spremenilo – prej so bile dojete kot podobne tržnici, sedaj pa so bliže priročnim manjšim trgovinam. Oblike virtualnih kanalov se še vedno dojemajo

kot ločena skupina v primerjavi s fizičnimi. Navedena pogostost naku-
povanja za 15 oblik iz obeh kanalov je primerjana s čustvenimi odnosi
do le-teh. Poleg tega je bil uporabljen postopek Unianova za iskanje
povezav s pogostostjo nakupovanja in demografskimi spremenljivkami,
kot tudi z načinom odločanja.

Ključne besede: maloprodaja, preference potrošnikov,
   upočasnitev gospodarske rasti, demografija, načini odločanja
Klasifikacija JEL: M30, O33
Managing Global Transitions 11 (4): 23–42

Vloga informacijske asimetrije v finančnih metodah
Mahdi Salehi, Vahab Rostami, in Hamid Hesari

Nove naložbe so nedvomno temeljni kamen napredka in tekmovalno-
sti v današnjem svetu. Za zagotavljanje sredstev za te naložbe se upra-
blja različne finančne inštrumente; najpogostejša načina financiranja
v Iranu sta sta dolžniško in lastniško financiranje. Nekateri vlagatelji,
vključno z notranjimi vlagatelji, imajo dostop do internih informacij.
Bolj kot so interne informacije, večja bo razlika med ponujenimi in pri-
čakovanimi cenami, kar zmanjšuje dobičke vlagateljev, ki nimajo do-
stopa do internih informacij. Zato je pričakovati, da bo informacijska
asimetrija vplivala na financiranje naložb. Namen pričujoče študije je
preučiti odnos med informacijsko asimetrijo in načini financiranja (dol-
žniškim in lastniškim). Raziskava je bila opravljena na vseh podjetjih, ki
kotirajo na teheranski borzi in so poslovala v letih 2006–2010. S ciljnim
vzorčenjem je bilo izbranih 61 podjetij. Rezultati so pokazali, da ni sta-
tistično pomembne povezave med informacijsko asimetrijo in dolžni-
škim financiranjem; ugotovljena pa je bila statistično značilna pozitivna
korelacija med informacijsko asimetrijo in lastniškim financiranjem.

Ključne besede: informacijska asimetrija, dolžniško financiranje,
   lastniško financiranje
Klasifikacija JEL: D53, E44, C58
Managing Global Transitions 11 (4): 43–54

Ocena tehtanega povprečja stroškov kapitala za regulirane panoge gospodarstva na razvijajočem se finančnem trgu v času finančno-gospodarske krize
Igor Stubelj, Primož Dolenc in Mateja Jerman

Prispevek obravnava problematiko ocene tehtanega povprečja stroškov
kapitala (WACC) za regulirane panoge gospodarstva na razvijajočem se
finančnem trgu v času finančno-gospodarske krize. Zaostrene razmere

na finančnih trgih v zadnjih letih so botrovale pomembnim spremembam. Prišlo je do občutnega znižanja netvegane obrestne mere na razvitih finančnih trgih (na primer ZDA, Nemčija), hkrati pa zaradi povečane nestanovitnosti na trgu, do povečanja premij za tveganje. Slednje je še posebej očitno na razvijajočih se finančnih trgih, kjer je amplituda nestanovitnosti trga izjemno visoka. V takih okoliščinah je vprašanje, kako pravilno izračunati WACC. WACC je pomemben pri finančnih in investicijskih odločitvah podjetij. V prispevku argumentiramo, da je pri oceni WACC treba upoštevati dolgoročno stabilno donosnost kapitala in ne trenutne tržne pogoje. Na podlagi navedenega predlagamo nekatere rešitve, ki so uporabne za oceno WACC za regulirane panoge na razvijajočih se finančnih trgih v času tržne negotovosti. Kot primer predstavljamo oceno stroškov kapitala za izbrano slovensko podjetje, ki deluje v regulirani panogi električne distribucije.

Ključne besede: cena kapitala, CAPM, WACC, dobiček, tveganje
Klasifikacija JEL: G31, G32
Managing Global Transitions 11 (4): 55–77

Spodbujanje družbene odgovornosti v logistiki skozi vodoravno sodelovanje
Raúl León in Angel A. Juan

Članek obravnava možnosti za spodbujanje družbene odgovornosti v logističnih in prevoznih podjetjih s vodoravnim sodelovanjem. Panoga logistike in prevozov doživlja velike spremembe zaradi sprememb na trgih in v družbi, ki imajo močan vpliv razvoj distribucijskih dejavnosti logističnin in prevoznih podjetij. Globalizacija in vedno večja tekmovalnost po eni strani spodbujata ta podjetja k različnim oblikam sodelovanja z namenom povečevanja učinkovitosti s skupno rabo virov in zmanjševanjem stroškov. Po drugi strani pa vedno večje zahteve po trajnostnem razvoju silijo podjetja, da vključujejo v svojo strategijo in politiko tudi načela družbene odgovornosti. Pričujoči članek zato obravnava sedanje trende na teh področjih in predstavlja nekaj primerov zniževanja stroškov distribucije in njihovih okoljskih vplivov z vodoravnim sodelovanjem.

Ključne besede: družbena odgovornost, zelena logistika,
    vodoravno sodelovanje
Klasifikacija JEL: M14, C61, C63, L92
Managing Global Transitions 11 (4): 79–93

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Kim, J., S. J. Lee, and G. Marschke. 2005. 'The Influence of University Research on Industrial Innovation.' N B E R Working Paper Series 11447, National Bureau of Economic Research, Cambridge, M A.

Jackson, R. 1979. 'Running Down the Up-Escalator: Regional Inequality in Papua New Guinea.' *Australian Geographer* 14 (5): 175–84.

Lynd, R., and H. Lynd. 1929. *Middletown: A study in American Culture.* New York: Harcourt, Brace and World.

University of Chicago Press. 2010. *The Chicago Manual of Style.* 16th ed. Chicago: University of Chicago Press.