

International Journal of Latest Trends in Finance & Economic Sciences

E-ISSN: 2047-0916

Volume 1 No. 2

June 2011



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United Kingdom
Web: excelingtech.co.uk
ojs.excelingtech.co.uk/index.php/IJLTFES

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The Role of Corporate Governance in Transition Countries

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Abstract - Corporate governance has come to the forefront of academic research due to the vital role it plays in the overall health of economic systems. The wave of U.S. corporate fraud in the 1990s was attributed to deficiencies in corporate governance. The recent 2008-2009 global financial crisis, triggered by the unprecedented failure of Lehman Brothers and the subprime mortgage problems, renewed interest in the role corporate governance plays in the financial sector. The development of a strong corporate governance framework is important to protect stakeholders, maintain investor confidence in the transition countries and attract foreign direct investment. This paper looks at the role of corporate governance in European transition countries in their transformation to a market economy. The paper compares the different levels of corporate governance established among the transition countries. Using synthetic taxonomic measures a study is conducted to look at the degree of corporate governance development by the new EU 2004 and 2007 accession transition countries and the convergence of corporate governance regimes across the countries. Our results indicate that transition countries that are closer to the English legal origin made greater strides in capital market and corporate governance development.

Keywords – corporate governance, transition countries, emerging economies, legal heritage and transitional reforms, market transition

1. Introduction

Corporate governance generally refers to the set of rule-based processes of laws, policies, and accountability that governs the relationship between the investor (stockholder of a company) and the investee (management). Corporate governance attracted a great deal of attention in the aftermath of the Asian financial crisis of 1997-1998 and the early 2000s U.S. corporate scandals, like Enron and World Com. However, once the threat of global contagion financial crises passes, corporate governance was relegated to the back of academic research. The current global financial crises of 2008-2009 caused by the “excesses of capitalism” once again brought attention to the importance of effective corporate governance practices. With ever more closely integrated globalized financial markets, the newly emerging European transition economies particularly have been hit hard by the adverse impact of the current global financial crisis. Both the European Bank for

Reconstruction and Development (EBRD) and the OECD promote the development of sound corporate governance for transitioning economies and developing economies through their initiatives, the *Corporate Governance Sector Assessment Project* (CGSAP begun in 2002) and *Principles of Corporate Governance* (1999, 2004, 2009), respectively.

A strong corporate governance foundation is important for a growing market economy. It has to include the integrity and transparency of financial and corporate operations, checks and balances in compliance with applicable laws, the practices of sound financial and corporate operations and accounting practices that are in accordance with international standards. In the legal sector, laws that are enacted must be timely and consistently enforced. The laws must be clear and consistent: in areas of orderly entry and exit of firms, property and asset protection of investors and transparency of the legal system. Establishing effective corporate governance is of particular importance for transition countries because its success is crucial not only for the growth of a healthy corporate sector but also for sustaining a healthy market economy. Bekaert et al (2001) find that the liberalization of financial markets in transition countries increases economic growth by about 2 percentage points per year. Some countries like Romania, Ukraine, and Georgia have very low effective corporate governance with high incidences of corruption and fraud in the political and economic systems. Other countries like Poland, Hungary and Latvia have established relatively effective corporate governance with greater achievements made toward market-based economies.

The problems facing transition countries are different from those facing other emerging countries by their nature of transforming from a centrally planned economy to an open market economy. For transition countries with no initial capitalistic framework in place, institutional frameworks in all sectors, both private and public, which support a capitalistic business environment, have to be created simultaneously: securities laws, corporate laws, accounting standards, sound business practices and ethics, and a judiciary and regulatory system. The importance of corporate governance for transition countries revolves on transitioning to private ownership and control. The parallel creation and quality of a system of corporate governance and institutions are therefore crucial for the development of a sound private market economy. A healthy business sector then promotes and sustains

productivity and long-term economic growth. Although transition countries swiftly established political and economic market institutions in the early 1990s in the first phase of transformation, the transition from a relationship-based to a rule-based political and economic system is more difficult and slower. In particular, “crony capitalism” tends to be more prevalent in transition and emerging economies with the politically well-connected parties able to influence business practices and legislations in their favor.

The focus of this paper is the challenge that transition countries face moving from a politically-based relationship to one of a rule-based relationship and the role of corporate governance as a major factor in the unprecedented transformation of transition countries to a market economy. The question of interest is to what extent corporate governance has, or the lack thereof, contributed to the transformation and development transitioning to a market economy. The question of corporate governance therefore extends well beyond the corporate sector to impact national economic development as well for the transition countries.

2. Literature Review

The Asian crisis brought the issue of corporate governance to the forefront of research. Most of the studies on the developing and emerging countries focus on the agency problem and weak, dispersed investors. Later studies focus on corporate governance in developed economies especially after the U.S. corporate fraud scandals. The topics range from internal and external governance, the role of the Board of Directors, incentives and compensations, ethics and transparency. Most are based on the Anglo-American (common law) models (Chew and Gillan, 2005). This model of widely dispersed shareholders where no single shareholder owns a majority stake is the basis of most corporate governance studies. Most authors argue that the protection of investors’ interests can be effectively enforced through a strong corporate governance system (Shleifer and Vishny, 1997; Glaeser et al, 2001; Hanousek and Kocenda, 2003).

The Anglo-American corporate governance system differentiates the shareholders from the stakeholders with a well-developed external equity market system to monitor the manager. The additional protection and voice afforded a dispersed shareholders group in the Anglo-American model is the liquidity of the market to allow exit strategy in the event of weakening internal corporate governance. The well developed financial market in developed economies with rating agencies, market scrutiny and access to timely information is another layer of protection for the dispersed shareholders. Another body of studies tests the adoption of common laws (Anglo-American) versus civil laws (German-French) in the protection of investors (Coffee 1999, Pistor, 2000; Mahoney, 2001). Mahoney (2001) finds that nations that adopted the common laws (English) rather than the civil laws

(French) system of corporate governance provided better protection for investors and have better developed financial markets. Mahoney concludes that, during the period under study from 1960-1992, common law countries experienced faster economic growth than civil law countries because common law is more supportive of private economic enterprises and property protection while civil law is more oriented toward government intervention and restrictions.

Corporate governance studies naturally move to focus on the transition countries in their unprecedented mass privatization of state-owned enterprises (SOEs) and the structure wherein they operate to transform successfully to a market economy. Studies on corporate governance structures in transition countries debated various issues: the type of ownerships (concentrated versus dispersed), the mode of privatization, adequacy of shareholder protection and whether legal structures must precede privatization. Ownership structures in transition countries are still evolving. Widely held firms are not the norm due to the small and relatively illiquid underdeveloped capital markets. Corporate governance studies performed on developed countries therefore may not be applicable to transition countries with such different initial conditions. The corporate governance problems in transition countries are likely to be different from developed countries. Studies on corporate governance in transition countries may therefore have to take this into account.

A body of studies looks at whether a transition country’s past legal heritage (German, French) influences the adoption of the current legal structure and corporate governance or whether the Anglo-American system is more prevalent (Pistor, 2000; Martynova and Renneboog (2009). In Romania and Poland, the mass privatization and dispersed ownerships to employee owners and institutional intermediaries help to promote the development of the capital and securities markets (Gray and Hanson, 1993). Their main argument is that the German-Japanese model of active shareholding monitoring through intermediaries (banks, outsider, employee-owners) can develop closer ties to firm managers, better access to information, and deeper business knowledge than the Anglo-American model of dispersed shareholders. The German-Japanese model of more concentrated ownership with corporate governance assigned to intermediaries may therefore be more appropriate for transition countries. This argument is supported by other studies. Shleifer and Vishny (1997) and Rajan and Zingalies (1998) maintain that concentrated corporate ownership structures are a response to the agency problem and poor ownership protection for investors. Studies by La Porta et al (1997, 1999, and 1999) also support this hypothesis and that the degree of ownership rights and protection affects corporate behavior and, consequently, economic development. On the other hand, Miwa and Ramseyer (2000) argue against concentrated shareholders and creditor banks but rather dispersed shareholders are more effective in controlling managers in transition

countries where the legal environment is ineffectual, a situation similar to late nineteenth-century Japan. This body of literature looks at the differing degree of legal protection with different corporate governance structures depending on whether concentrated or dispersed ownership is present.

Privatization of state-owned enterprises goes beyond just transferring the assets to private ownership in transition countries. Privatization has to be evaluated in terms of three areas: the creation of a system of corporate governance to foster a healthy environment

government ownership still¹, moral hazard incentives, *kwangsi* (relationships), and agency problems outweighed emerging corporate governance practices. Lin (2001) finds that managers, while gaining greater autonomy from the “corporatization” of Chinese state-owned enterprises, manage the company badly and misuse it for self-dealings and embezzlements.

Privatization of former state-owned assets to private ownership does not guarantee that the agent will act in the best interest of the principle in transition countries with no existing institutional foundation to support

Table 1 - Studies on Privatization Effects on Corporate Governance in Transition Countries

Study	Country of Study	Positive Findings
Estrin et al (2009)	CEEB	For CEEB countries, mostly positive effects but quantitatively smaller for foreign owners; For CIS countries, positive or insignificant effects for foreign owners but negative or insignificant effect.
Frydman, Hessel and Rapaczynski (1999)	Czech Rep., Hungary and Poland	Privatization to outsider owners rather than corporate insiders has greater performance effects because of greater entrepreneurial skills.
Coffee (1999)	Poland and Czech Rep.	Slower privatization and state-created monitors through investment funds (Polish National Investment Funds - NIFs) subscribed to by individuals and common law system outperforms the rapid privatization and inadequate legal structure.
Study	Country of Study	Negative Findings
Hanousek and Kocenda (2003)	Czech Rep.	Disperse ownership and lack of regulations created a weak management environment; Improvement in corporate governance after 1995 improved firm profitability
Black et al (1999)	Russia	Asset stripping by insider managers, massive theft by kleptocrats, self-dealings, no restructuring, corruption. Effective institutional structure matters more and must precede privatization.

for businesses to flourish, the advancement in legal and enforcement infrastructure, and self-sustaining economic growth. There are a number of studies on the positive and negative effects of privatization in transition countries (Table1).

Privatization of state-owned enterprises is seen to be the vehicle by which transition countries are transformed to a market economy and takes different forms. The expectation is that private ownership would spur profit-oriented managers toward market restructuring leading to economic growth under the presumption of the principal-agent model. In most transition countries this expectation has been unfulfilled due to the lack of effective corporate governance and a major obstacle to a friendly business environment (Meyer, 2003). In transition countries, the problem of corporate governance progress is exacerbated by the vested interest of the powerful and highly concentrated owners with ties to the political structure. This cronyism relationship breeds corruption that plagues the early transformation efforts of most of the transition countries. This is particularly prevalent in transition countries like China, Russia, and Bulgaria. In China when the state-owned enterprises were “corporatized” with majority

private ownership. Questions of the role and rights of various stakeholders (manager-employee owners, government, outsiders, managers, investors, employees) of the privatized firms with differing interests have to be determined within a legal and regulatory structure.

The Russian experience questions whether mass privatization is the answer in transforming from central-planning to a market economy. Russia’s mass privatization to concentrated manager ownership was the antithesis of privatization success: insider self-dealings, corruption, incompetent management, asset stripping and the destruction of minority shareholders’ value. Rapid mass privatization without the preceding legal and enforcement infrastructure to prevent insider self-dealings and corruption impedes effective corporate governance and the development of an honest business climate (Black et al, 1999).

Glaeser et al (2001) finds that prior to 1990s reforms the Czech securities market was much larger

¹ The four state-owned Chinese banks were privatized through IPO offerings in mid-2000s raising unprecedented capital funds globally with majority stakes still held by the government.

than the Polish market. The creation of an independent, strong securities commission by Poland to enforce corporate governance promoted rapid capital market development and a growing business sector. Today the Polish stock market, the largest of all the transition countries by market capitalization, has two tiers of trading: the organized market and the over-the-counter market (launched in December 2008). In contrast, the Czech Republic experience of employing a small ineffective securities commission office in the Ministry of Finance and extensive corruption led to corporate asset stripping and expropriation of wealth from minority shareholders by controlling shareholders and the politically connected government officials, undermining investor confidence and financial market development (Hanousek and Kocenda (2003).

2. Corporate Governance in Transition Countries

The difference in the corporate governance problem in transition countries is one of controlling versus minority shareholders problem. The early privatization of the state-owned enterprises (SOEs) resulted in mostly concentrated ownership by dominant or block-shareholders, (institutional investors - Hungary, management buyout (MBOs) or management-employee buyouts (MEBOs) - Poland, employee-owners - Czech), giving these controlling shareholders considerable greater control over corporate assets than their stock ownership warranted. Of even greater concern than the concentrated ownership is the prevalence of complex ownership structures through cross-shareholdings, multiple-class shareholdings with different voting rights, pyramidal corporate shareholdings. A landmark study by Bebchuk et al (1999) shows that "expropriation costs" are very large when such complex shareholdings are used to increase control rights beyond their cash-flow rights, even larger than concentrated ownerships.

The role of corporate governance to under girth weak competitive market mechanisms and democratic political institutions is the complementing factor necessary to sustain the long-term modernization of the transition countries. In other words, the "principal-agent" relationship that governs most capitalist societies that provides the incentives and environment in which investors (principals) can reap the profits of their investment through their corporations (agents) and the behavioral relationship are determined by a set of corporate governance standards. EBRD's *Legal Indicator Surveys* reports that transition countries have an implementation gap between the enactment of laws and its enforcement.

Unlike developed countries in the United States and United Kingdom with widely dispersed shareholders, the principal-agent corporate governance problems are primarily due to the agent (manager) perpetrating embezzlement and fraud. The corporate governance regime of the English legal origins (US-UK) emphasizes

Another study shows that Poland and Hungary's effective centralized regulatory enforcement of securities laws through a strong securities commission is more effective than judicial enforcement in the protection of the principle's rights (Oman et al, 2003). This body of literature questions the benefit of mass privatization before effective legal and corporate governance structures are in place, and should precede privatization. The good news for transition countries is a study by Durnev and Kim (2005). They find that despite a weak institutional environment firms with good future investment prospects would involuntarily practice good corporate governance attracting more shareholders and increasing firm value. They find that a firm's market value increased by 9% if the firm's governance score increased by 10 points out of the maximum 100 points.

the protection of shareholders from being expropriated by the firm's management. In contrast, the European legal origin countries (French-German) emphasize the protection of stakeholders (state, blockholders, employees) from expropriation.

A relationship-based system and investor expropriation tends to prevail in emerging economies. In Russia, Bulgaria and elsewhere mass privatization enriched the oligarchs and the politically well connected. The "cronyism" and relationship-based structure carried over from the communist era with most of the post-communist corporate owners part of the politically connected or political elite is difficult to root out. The lack of effective corporate governance, in particular, Russia, engenders a hostile business environment: corruption, organized crime, a bias judicial system and government interference.

In the post-socialist European countries, the set of corporate governance standards adopted varies which may depend on past legal heritage. The group of Central and Eastern Europe and Baltic (CEEB) nations has a German legal heritage which includes the Czech Republic, Estonia, Croatia, Latvia, Lithuania, Poland, Hungary, the Slovak Republic and Slovenia. The group of South East European (SEE) nations has a French legal heritage which includes the Bulgaria, Yugoslavia, Romania, Bosnia and Albania. The last group consists of most of the Commonwealth of Independent States (CIS). Pistor (2000) finds that past legal heritage is not significant in explaining what predominant system of legal structure will be adopted by the transition countries. Rather, the adoption during the initial transformation period is driven more by the desire to converge with the EU legal system with an eye to attaining accession or the US system. Pistor also observes that differences in legal reforms among the transition countries are due primarily to policy makers responding to economic changes: greater privatization engenders better protection of creditor's and stockholder's rights or whether the dominant external advisors are from the US or EU. Mahoney (2001) similarly argues that a nation directly or indirectly

adopts a set of legal structure in response to change rather than solely because of its past legal heritage.

Poland and the Czech Republic are good examples of differences in privatization, corporate governance development and economic growth. An interesting study by Coffee (1999) compares the differences between Poland and the Czech Republic experience (Table 2). Both countries adopted corporate law system based on the German civil law heritage. The important difference is that despite the German heritage, Poland's securities regulations and practices follow the common law system of the Anglo-American more closely: greater private ownership protection, stringent disclosure standards and a strong enforcing securities commission agency. Coffee concludes (1) that better securities regulation to protect minority shareholders from expropriation is more effective than ineffective corporate laws, (2) that the Anglo-American common laws structure of corporate governance outperforms the German-French civil law structure despite their legal heritage. The result is the successful growth of equity financing for businesses in Poland with a growing healthy growing stock market. The Polish stock market is one of the largest among the transition countries with a market capitalization of US\$175.85 billion in 2010; in contrast, the Czech Republic stock market capitalization is only US\$68,831.

Table 2 shows that none of the EU2004 or 2007 countries achieved "Very High Compliance" in meeting the OECD Principles fully. Poland, Hungary and Latvia are rated "High Compliance" with Lithuania moving from "Medium Compliance" to "High Compliance" from 2002 to 2005. Countries with "High Compliance" have existing laws implemented that fulfill the majority of OECD Principles. Capital markets are well established, existing legislation have to be improved and enforced, and an enhancing of the judiciary system to adjudicate corporate governance issues competently and fairly. In "Medium Compliance" countries, most of the laws meet the OECD Principles but requiring consistent and effective implementation and enforcement and further reforms needed, and capital markets are established but small: the Czech Republic, Estonia, Slovakia, Slovenia, Bulgaria and Croatia. In the "Low Compliance" category, Romania, basic corporate laws are established but of questionable quality, capital markets are under-developed or non-existing, and legal institutional structures in the enforcement of the laws are needed (Chen, 2004).

A recent study by Martynova and Renneboog (2009) creates corporate governance indices to capture the major factors of corporate governance as reflected in the country's capital market laws. The study looks at whether 30 European countries and the US, including

Table 2. EBRD Corporate Governance and Market Indicators in Transition Countries

Country EU Accession	EBRD Corporate Governance Ranking 2002	EBRD Corporate Governance Ranking 2003	EBRD Corporate Governance Ranking 2005	Stock Market Capitalization 2008 (% of GDP)	Domestic Credit to Private Sector 2008 (% of GDP)	Projected Foreign Direct Investment 2008 (US\$ mils)	Projected Real GDP Growth 2008 (%)
Czech Republic (2004)	C	C	C	25.5	51.0	5,500	4.6
Estonia (2004)	C	C	C	8.6	91.9	800	3.5
Hungary (2004)	B	B	B	12.1	67.6	1,000	1.7
Latvia (2004)	B	B	B	4.9	89.6	2,000	3.5
Lithuania (2004)	C	B	B	8.0	60.0*	1,300	6.5
Poland (2004)	B	B	B	21.0	55.0	15,000	5.1
Slovakia (2004)	C	C	C	5.4	44.7	2,000	7.0
Slovenia (2004)	C	C	C	22.5	85.6	592	4.3
Bulgaria (2007)	C	C	C	18.5	74.5	7,937	5.5
Romania (2007)	D	D	D	11.2	38.5	10,963	5.0
Croatia (likely)	C	C	C	40.4	67.1	4,806	4.5

Rating Legend: A - Very High Compliance ; B - High Compliance; C - Medium Compliance ; D - Low Compliance

Source: EBRD Transition Reports; Chen, 2004; Transition Report 2005-Annex 1.2.

* 2007

the new EU countries, over 15 years have converged in corporate governance regimes. In particular, the authors take into account the heritage of common laws or civil laws of the respective countries in constructing the indices. In particular, their indices are constructed by applying "...unique corporate governance database that comprises the main changes in corporate governance regulation in US and all European countries [...] over the last 15 years. The database is based on the study of various corporate governance regulations, on the results from a detailed questionnaire sent to more than 150 legal experts, and on direct interviews with some of these experts (Martynova and Renneboog 2009, p. 9)." The study concludes that countries of German legal heritage and the EU 2004 accession countries give more decision rights to shareholders. In contrast, countries of English legal heritage and the EU2007 accession countries provide trustees and representatives (Board of Directors) of the stockholders with more control. Creditor protection is stronger among former communist countries and less in French, German and Scandinavian legal origin countries. Continental European countries are mostly characterized by stakeholder-based regime compared to the US-UK stockholder-based regime. Scandinavian and German legal origins, and the EU2004 accession countries, afforded the least protection for investors. Lastly, the authors find that countries of English legal origin provide the highest protection for shareholders.

The question is to what degree has corporate governance development progress among the new EU transition countries. Our paper is based on the Martynova and Renneboog (2009) study. Using the indices created by the Martynova and Renneboog (M-R) study, we investigate the degree of corporate governance development among the EU2004 and EU2007 accession countries. We seek to confirm if the results from our study indicate a convergence of corporate governance among the new EU countries and if legal heritage plays an important role in the adoption of corporate governance emphasis and whether one regime has comparative advantage over the other. This has implication as to which direction of corporate governance regimes the transition countries should continue to emphasize and adopt.

3. Methodology and Empirical Investigation

In our paper we construct the synthetic taxonomic measure (SMR) to evaluate eleven transition countries (EU2004 and EU2007 accession countries in Table 2) in terms of the degree of corporate governance development. The SMR measure defines the distance between the certain benchmark and the analyzed countries (i.e. objects) in a multidimensional space. The corporate governance regimes are characterized by four variables that represent the corporate governance indices constructed by the M-R study in the four areas:

(i) anti-director index (LLSV), (ii) shareholder rights protection, (iii) minority shareholder rights protection and, (iv) creditor rights protection. The benchmark is defined as the hypothetical object that is characterized

- either by the maximal values of indices evaluated for the 11 transition countries under study,
- or by the averages of indices benchmark evaluated² for the countries that are classified by M-R according to their respective legal origin: English (Ireland, UK and USA (Delaware)), French (Belgium, France, Greece, Italy, Luxemburg, the Netherlands, Portugal and Spain), German (Austria, Germany and Switzerland) and Scandinavian (Denmark, Finland, Iceland, Norway and Sweden) legal origin.

Employing these indices we construct the synthetic measure that contains partial measures of corporate governance development to obtain the ranking of the eleven transition economies over four years³: 1990, 1995, 2000 and 2005.

The taxonomic measure SMR_{it}^i for the i -th country in t -th period of time (see Hellwig, 1968):

$$SMR_{it}^i = 1 - \frac{q_{it}^i}{\bar{q}_t + 2 \cdot S_{qt}} \quad i = 1, 2, \dots, n; \quad t = 1, 2, \dots, T \quad (1)$$

Where q_{it} is the distance of the i -th object from the benchmark:

$$q_{it}^i = \sqrt{\sum_{j=1}^k (z_{jt}^i - z_{jt}^0)^2} \quad (2)$$

evaluated for standardized variables z_{jt}^0, z_{jt}^i

that describe the benchmark and the i -th investigated country, respectively, for each

period t and the j -th variable: $z_{jt}^i = \frac{x_{jt}^i - \bar{x}_{jt}}{S_{jt}^x}$ -

standardized variables, $x_{jt}^i, \bar{x}_{jt}, S_{jt}^x$ -

observations of for the i -th country, average and standard deviation, respectively.

The benchmark is defined as:

$$z_{jt}^0 = \begin{cases} \text{average} \{z_{jt}^l\} \text{ for } x_{jt}^l; l\text{-"type" of legal origin} \\ l=1,2,\dots,A \\ \max \{z_{jt}^i\} \text{ for } x_{jt}^i \text{ describing transition countries} \\ i=1,2,\dots,11 \end{cases} \quad (3)$$

² These averages were calculated by Martynova and Renneboog (2009) p. 31 – 34.

³ We choose the corresponding years and the transition countries that were considered in the Martynova and Renneboog study.

Other symbols denote: \bar{q}_t , S_{qt} - the average and the standard deviation of distances q_{it} , respectively:

$$\bar{q}_t = \frac{1}{n} \sum_{i=1}^n q_t^i \tag{4}$$

$$S_{qt} = \sqrt{\frac{1}{n} \sum_{i=1}^n (q_t^i - \bar{q}_t)^2} \tag{5}$$

As mentioned, the synthetic measures SMR^i for each transitional country are constructed employing $k = 4$ variables using the M-R corporate governance indicators: (i) anti-director index LLSV, (ii) shareholder rights protection, (iii) minority shareholder rights protection and (iv) creditor rights protection in Eq.(2) for five different benchmarks in Eq.(3).

Using as the benchmark maximal value of each of the four variables in Eq. (3),

$$z_{jt}^0 = \max_{i=1,2,\dots,11} \{z_{jt}^i\} \text{ for } x_{jt}^i \text{ describing the transition countries}$$

the country ranking is constructed only for comparison within the group of transition countries. Employing the

compare each transition country to the corporate governance of countries with these legal origins, respectively.

The countries under study are grouped according to the specified four ranking classifications (Table 3):

Table 3. Classifications of SMR Country Rankings

$SMR^i \geq SMR + S_{SMR}$	Class I - Best
$SMR + S_{SMR} > SMR^i \geq SMR$	Class II - Good
$SMR > SMR^i \geq SMR - S_{SMR}$	Class III - Average
$SMR^i < SMR - S_{SMR}$	Class IV - Bad

where: SMR is the average of SMR^i , S_{SMR} is the standard deviation of SMR^i

The country rankings results based on the SMR^i measures, evaluated for the different benchmarks, are presented in the tables below. A comparison of the SMR results to the EBRD country rankings for 2005, where data is available for the same year, is also performed (Table 2). However, all transition countries are classified only to the three

Table 4. SMR^i Values and Country Rankings Comparison to EBRD Indicators (Benchmark: Maximal Values of 11 Countries)

Country	SMR^i 1990	Country	SMR^i 1995	Country	SMR^i 2000	Country	SMR^i 2005	EBRD 2005
Poland	1	Lithuania	0.849579	Lithuania	0.802455	Croatia	0.857103	C
Lithuania	0.835432	Poland	0.842124	Croatia	0.754699	Czech	0.643115	C
Latvia	0.652312	Croatia	0.74272	Poland	0.647564	Lithuania	0.610393	B
Croatia	0.638329	Latvia	0.623543	Slovenia	0.492673	Latvia	0.486355	B
Slovenia	0.610588	Slovenia	0.520134	Bulgaria	0.42807	Poland	0.455114	B
Slovak	0.489508	Slovak	0.491794	Romania	0.369786	Romania	0.434137	D
Romania	0.423409	Czech	0.466147	Czech	0.344482	Hungary	0.400301	B
Hungary	0.400041	Estonia	0.345724	Latvia	0.31596	Slovenia	0.392329	C
Bulgaria	0.271779	Romania	0.306983	Hungary	0.308682	Estonia	0.30624	C
Czech	0.212065	Bulgaria	0.180464	Estonia	0.194933	Bulgaria	0.251406	C
Estonia	0.104785	Hungary	0.061291	Slovak	0.081475	Slovak	-0.03024	C
SMR	0.512568	SMR	0.493682	SMR	0.43098	SMR	0.436932	
S_{SMR}	0.256284	S_{SMR}	0.246841	S_{SMR}	0.21549	S_{SMR}	0.218466	
$SMR - S_{SMR}$	0.256284	$SMR - S_{SMR}$	0.246841	$SMR - S_{SMR}$	0.21549	$SMR - S_{SMR}$	0.218466	
$SMR + S_{SMR}$	0.768852	$SMR + S_{SMR}$	0.740523	$SMR + S_{SMR}$	0.64647	$SMR + S_{SMR}$	0.655399	

averages of the countries with the different types of corporate governance legal origins (English, French, German and Scandinavian) as the benchmarks, we

classes of B (High Compliance), Medium Compliance (C), and D (Low Compliance).

Table 4 shows the SMR rankings for all the eleven countries taking the maximal values of the variables for the eleven transition countries as the benchmark. Poland is consistently classified in class I except in 2005 (class II). Based on the EBRD 2005 ranking, Poland is ranked as meeting high compliance of OECD principles in corporate governance.⁴ This corroborates the literature indicating that Poland's corporate governance in legal reforms and practice is much further in development than most of the other new EU countries. Poland may represent the convergence of corporate governance regulations among the European transition countries. After achieving 2004 EU membership, Poland may have less incentive to improve on their corporate governance practices. Political inertia in reforms is a major factor in

Based on the assumption of English heritage origin of corporate governance, Poland is consistently classified in class I (1990, 1995 and 2000) (Table 5). Poland seems to be evolving closer to the English heritage in corporate governance regime. Although the EBRD ranking in 2005 is still ranked as high compliance the 2005 SMR ranking grouped Poland in class II, indicating a decrease in corporate governance practices. The furthest from the English legal origin of corporate governance by SMR ranking are the Czech Republic (in all years), Latvia (2000 and 2005), Hungary, Estonia, and Slovak Republic (in various years). Croatia seems to be consistently ranked in class II in all years except 2005 and ranked by 2005 EBRD as medium compliance.

Table 5. SMR^i Values and Country Rankings Comparison to EBRD Indicators (Benchmark: English Legal Origin)

Country	SMR^i 1990	Country	SMR^i 1995	Country	SMR^i 2000	Country	SMR^i 2005	EBRD 2005
Poland	0.918058	Poland	0.763707	Poland	0.78206	Bulgaria	0.900395	C
Lithuania	0.748956	Slovenia	0.739397	Bulgaria	0.760754	Lithuania	0.81125	B
Latvia	0.616791	Lithuania	0.627971	Croatia	0.603225	Romania	0.729487	D
Croatia	0.557151	Estonia	0.573946	Romania	0.583021	Estonia	0.719269	C
Slovenia	0.52724	Croatia	0.511059	Lithuania	0.577751	Slovenia	0.675227	C
Romania	0.409534	Slovak	0.49512	Slovenia	0.52486	Hungary	0.548224	B
Slovak	0.356412	Romania	0.365029	Estonia	0.524576	Croatia	0.481943	C
Bulgaria	0.330519	Latvia	0.361139	Hungary	0.351828	Poland	0.422198	B
Hungary	0.279237	Bulgaria	0.274213	Slovak	0.168429	Slovak	0.362373	C
Estonia	0.174498	Czech	0.207345	Czech	0.141036	Latvia	0.151583	B
Czech	0.13651	Hungary	-0.00679	Latvia	0.084246	Czech	0.010951	C
SMR	0.459537	SMR	0.446558	SMR	0.463799	SMR	0.528445	
S_{SMR}	0.229768	S_{SMR}	0.223279	S_{SMR}	0.231899	S_{SMR}	0.264223	
$SMR - S_{SMR}$	0.229768	$SMR - S_{SMR}$	0.223279	$SMR - S_{SMR}$	0.231899	$SMR - S_{SMR}$	0.264223	
$SMR + S_{SMR}$	0.689305	$SMR + S_{SMR}$	0.669837	$SMR + S_{SMR}$	0.695698	$SMR + S_{SMR}$	0.792668	

stalling reform efforts after post-accession. Lithuania and Croatia are also consistently classified in class I. Croatia is still an accession country and may be making greater efforts to implement a corporate governance regime that induces investor confidence and favorable EU scrutiny. The Slovak Republic (2000 and 2005) and Estonia (1990 and 2000) are consistently classified in the last class with a medium compliance rating by EBRD. The Czech Republic (1990), Hungary (1995), and Bulgaria (1995) are also classified in class IV.

Table 6 presents the assumption under French legal origin. Croatia, Bulgaria and Estonia are consistently classified in class I under this assumption. Poland, in the early phase of reforms, is ranked in class I in 1990 but moved further away in 1995 (grouped in class IV). Similarly, Croatia moves from class I (1990 and 1995) to class II (2000) to class III (2005) under the French legal origin. This is consistent with the above analysis that Croatia is moving closer to the English legal origin and away from the French origin over the years under study.

⁴ None of the transition countries were ranked by EBRD as having met the criterion of "Very High Compliance".

Under the assumption of German legal origin, Poland is ranked in class I in 1990, in class IV in 1995, in class III in 2000, and in class II in 2005 (Table 7). Poland had very close German ties, culturally and

origin. In particular, the 2005 SMR rankings indicate that Latvia, Croatia, and the Czech Republic are moving away from the German legal origin while Poland (class II) is moving closer. It is worth noting that Romania,

Table 6. SMR^i Values and Country Rankings Comparison to EBRD Indicators (Benchmark: French Legal Origin)

Country	SMR^i 1990	Country	SMR^i 1995	Country	SMR^i 2000	Country	SMR^i 2005	EBRD 2005
Poland	0.933239	Croatia	0.720599	Bulgaria	0.955499	Bulgaria	0.950134	C
Croatia	0.812832	Estonia	0.697538	Romania	0.806468	Estonia	0.917265	C
Lithuania	0.662734	Latvia	0.62765	Poland	0.793812	Romania	0.887066	D
Latvia	0.620844	Slovak	0.535809	Croatia	0.773079	Lithuania	0.798724	B
Slovenia	0.547685	Romania	0.528948	Estonia	0.675098	Hungary	0.694573	B
Slovak	0.54173	Czech	0.473446	Hungary	0.496203	Poland	0.491809	B
Romania	0.512885	Lithuania	0.427126	Czech	0.465364	Slovak	0.456048	C
Bulgaria	0.327424	Bulgaria	0.413182	Lithuania	0.376983	Latvia	0.445202	B
Hungary	0.272488	Slovenia	0.367146	Slovak	0.364012	Croatia	0.370359	C
Estonia	0.14995	Poland	0.033136	Latvia	0.35644	Slovenia	0.337462	C
Czech	0.111506	Hungary	0.032577	Slovenia	-0.0464	Czech	-0.02028	C
SMR	0.499392	SMR	0.44156	SMR	0.54696	SMR	0.575305	
S_{SMR}	0.249696	S_{SMR}	0.22078	S_{SMR}	0.27348	S_{SMR}	0.287653	
$SMR - S_{SMR}$	0.249696	$SMR - S_{SMR}$	0.22078	$SMR - S_{SMR}$	0.27348	$SMR - S_{SMR}$	0.287653	
$SMR + S_{SMR}$	0.749089	$SMR + S_{SMR}$	0.66234	$SMR + S_{SMR}$	0.82044	$SMR + S_{SMR}$	0.862958	

historically. Poland seems to be less consistent in corporate governance regime under the German legal origin unlike under the English legal origin assumption. The Czech Republic, Bulgaria, and Latvia tend to be ranked in the last class, furthest from the German legal

ranked by the 2005 EBRD as low compliance, is ranked in class I under the German legal origin assumption.

The assumption of the Scandinavian legal origin indicates that Estonia, Croatia, and Bulgaria, (with the

Table 7. SMR^i Values and Country Rankings Comparison to EBRD Indicators (Benchmark: German Legal Origin)

Country	SMR^i 1990	Country	SMR^i 1995	Country	SMR^i 2000	Country	SMR^i 2005	EBRD 2005
Poland	0.876171	Croatia	0.750556	Poland	0.89398	Romania	0.802215	D
Croatia	0.804995	Czech	0.709007	Bulgaria	0.858094	Hungary	0.801308	B
Lithuania	0.716983	Slovak	0.696155	Croatia	0.791055	Bulgaria	0.78566	C
Slovak	0.60327	Latvia	0.5483	Romania	0.62936	Estonia	0.72264	C
Slovenia	0.598221	Slovenia	0.522737	Hungary	0.513456	Poland	0.636037	B
Latvia	0.445008	Romania	0.431526	Slovenia	0.496099	Slovak	0.588902	C
Romania	0.418069	Estonia	0.406909	Lithuania	0.366384	Lithuania	0.468566	B
Hungary	0.37304	Lithuania	0.374945	Czech	0.356701	Slovenia	0.398672	C
Czech	0.236708	Bulgaria	0.214557	Slovak	0.341297	Latvia	0.250166	B
Bulgaria	0.198421	Hungary	0.122887	Estonia	0.32578	Czech	0.146915	C
Estonia	0.091184	Poland	0.083275	Latvia	0.0183	Croatia	0.060792	C
SMR	0.487461	SMR	0.441896	SMR	0.508228	SMR	0.514716	
S_{SMR}	0.24373	S_{SMR}	0.220948	S_{SMR}	S_{SMR}	S_{SMR}	0.257358	
$SMR - S_{SMR}$	0.24373	$SMR - S_{SMR}$	0.220948	$SMR - S_{SMR}$	0.254114	$SMR - S_{SMR}$	0.257358	
$SMR + S_{SMR}$	0.731191	$SMR + S_{SMR}$	0.662844	$SMR + S_{SMR}$	0.762342	$SMR + S_{SMR}$	0.772074	

exception of Poland in 1990) in the early years, are closest in corporate governance regime, ranked in class I (Table 8). In contrast, Croatia moved from class I to

having a later start in initiating reforms than the other countries.

Table 8. SMR^i Values and Country Rankings Comparison to EBRD Indicators (Benchmark: Scandinavian Legal Origin)

Country	SMR^i 1990	Country	SMR^i 1995	Country	SMR^i 2000	Country	SMR^i 2005	EBRD 2005
Poland	0.913378	Estonia	0.706666	Bulgaria	0.99121	Estonia	0.920104	C
Croatia	0.860684	Croatia	0.704835	Romania	0.798075	Bulgaria	0.908508	C
Lithuania	0.640857	Latvia	0.580987	Estonia	0.720176	Romania	0.858102	D
Latvia	0.562903	Slovak	0.528994	Poland	0.717598	Hungary	0.760926	B
Slovak	0.548015	Romania	0.500772	Croatia	0.667701	Slovak	0.717413	C
Slovenia	0.52975	Czech	0.470374	Hungary	0.516058	Lithuania	0.598138	B
Romania	0.499958	Slovenia	0.451747	Slovak	0.489502	Poland	0.561142	B
Bulgaria	0.315405	Lithuania	0.429782	Czech	0.487926	Latvia	0.532547	B
Hungary	0.26523	Bulgaria	0.405074	Latvia	0.366541	Slovenia	0.272477	C
Estonia	0.162682	Hungary	0.053021	Lithuania	0.257995	Croatia	0.141482	C
Czech	0.127487	Poland	-0.01103	Slovenia	-0.0459	Czech	0.061239	C
SMR	0.493305	SMR	0.438293	SMR	0.542443	SMR	0.575643	
standard	0.246652	standard	0.219146	standard	0.271222	standard	0.287822	
$SMR - S_{SMR}$	0.246652	$SMR - S_{SMR}$	0.219146	$SMR - S_{SMR}$	0.271222	$SMR - S_{SMR}$	0.287822	
$SMR + S_{SMR}$	0.739957	$SMR + S_{SMR}$	0.657439	$SMR + S_{SMR}$	0.813665	$SMR + S_{SMR}$	0.863465	

class IV in 2005 which is consistent with the previous analysis that Croatia is moving closer over time to the English legal origin. Romania is ranked in class II reflecting the least corporate governance afforded investors in 2005 which is consistent with the 2005 EBRD ranking of low compliance.

However, Bulgaria and Romania are relatively late accession countries and their desire to accede to the EU membership may spur these countries to improve their corporate governance in practice to a greater degree in later years than post accession countries like Poland or the Czech Republic with fewer incentives after achieving EU membership. Therefore, Bulgaria and Romania's compliance with OECD corporate governance principles is not ranked highly by EBRD

4. Conclusion

Transition countries that are more advanced in capital market development seem to be converging towards the English legal origin regime of corporate governance, in particular, Poland. The later EU2007 accession countries like Bulgaria, Romania and accession country Croatia also seem to be moving toward the English legal regime over time as well. The later EU2007 accession countries seem to learn from the experience of the earlier accession countries and lean towards the English legal origin regime. Some of the transition countries have also regressed over time as measured by the SMR rankings, in particular, Poland

Comparing the SMR and EBRD rankings in 2005, the biggest similarity is seen for Tables 4 and 6. Continental Europe may be closer in convergence in corporate governance regime to the French legal origin, although it is observed by Martynova and Renneboog that "the French legal origin countries have evolved and reach a level closer to the English origin standard" (p. 20). The difference between the SMR and EBRD rankings among some of the transition countries may be due to the issue of improvement in stockholder rights and protection on the books and the actual legal enforcement of those rights. The consistent and timely enforcement of an investor's legal rights are either subverted by cronyism as in Bulgaria, or the onerous process of getting legal redress even in countries that are in the forefront of corporate governance, like Poland.

from the English legal regime. Other countries are the Czech Republic and Latvia. Estonia seems to be moving towards the Scandinavian and German regime of less protection for investors. Given that continental transition countries are mostly characterized by stakeholder-based regime, the paper shows that the later trend in most of the countries is towards a stockholder-based US-UK regime.

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Landscape: A New Vector in the Concept of Sustainable Development?

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Abstract - The main objective of this paper is to discuss if landscape can be associated with sustainable development at the conceptualization level and in its program of operation research. It starts with the analysis of the concept of sustainable development in an historical perspective that put attention to the way it was constructed, as the emergence of environmental threats was imposing a new reflection to decision makers. Then it analyses the fundamental issues that this conceptualization put to the three pillars of approach: economic, environmental and social, and the way they must reconcile. Finally the concept of landscape is introduced and its role in the support of sustainable development is discussed. The landscape as a concept that, both, incorporates a vision of the global system of interactions between natural and human aspects in the territory, and a practice of intervention on the area (aiming to develop the quality of living from a perspective of intergenerational equity) emerges as an integral element of sustainable development concerns.

Keywords: Development, Sustainability, Landscape.

1. Introduction

Sustainability and sustainable development are terms widely recognized in ordinary language that people use today. However, the concept is relatively recent. It was only in the UN Conference of Rio de Janeiro, 1992, that the concept of "Sustainable Development" was placed on the agenda for the first time.

The concept was formalized by the Report "Brundtland" in 1987, where sustainable development was defined as *the development that meets present needs without compromising the ability of future generations to meet their own needs* (World Commission on Environment and Development (1987), *Our Common Future*). Until then, it was still a systematic debate between an ecologist vision that put in question the model of development based on unlimited consumption and an economic view, which did not accept limits to resource consumption and economic growth. Afterwards, the concept of sustainability introduced the need to accept an increase in standards that allow its continuity in time.

Economic growth is a "one-dimensional" phenomenon, quantitatively measured by specific indicators, ranging from gross domestic product or per capita income, up to industrial production index. The development, in turn, is distinguished from a mere quantitative growth to the extent that, far from being a one-dimensional phenomenon, puts into question the quality of the relationship that man establishes with the wild nature and introduces the socio-cultural values; thus, subtracting the cost of its gross degradation on the indicators of economic growth. Adding up: to be durable, the development will have to meet present needs without compromising future generations.

The term has this double meaning that a simple semantic analysis appears to boost. *Development* as progress toward a more perfect state than before, improving the welfare and quality of life; and *Sustainable*, the one that can sustain, or below, that can be extendable. In an integrative perspective, Sustainable Development suggests economic growth with social dimension that supports a proper intertemporal management of natural resources and the environment.

Although established, the concept is far from being perceived in the same way by all stakeholders. The discussion around the concept, and in particular its operationalization, remains open. According to several experts, the worst that could happen would be to drive the concept to a situation of banal commonplace, with no content. Particularly - if it could not introduce new rules in the global game and public policies to a more equitable and efficient management of the gifts of the Earth.

Our analysis starts from an approach based on the historical perspective to highlight the evolution of the concept due to the emergence of environmental problems and evaluate how the various scales (local/national/supranational) were responding to new realities;

Then, we switch to the identification of the key pillars of the concept approach (economic, biophysical and socio-cultural) to assess the needs and possibilities for a comprehensive analysis;

Finally, one wonders to what extent, the landscape, whether natural or humanized, can be another vector for sustainable development at the conceptual level and its implementation.

2. Evolution of the Concept of Sustainable Development: Historical Perspective

The Industrial Revolution, beginning in the eighteenth century, made the world smaller. Trade and all kind of exchanges became general. The natural resources began to be exploited in a systematic, intensive and unlimited way. The man had not (yet) need to worry about what would be left to later generations, nor about the imbalances caused by the liberal model of development spurred by the Industrial Revolution.

The rapid economic growth of post-war (1945-1975; the 30 "Glorious" years) led to serious environmental problems, of which only became aware in the 70s, when it was discovered that the economic activities caused visible and localized environmental damage, such as waste, gases from factories, soil erosion, pollution of water courses, etc.. Also, the officers were easily identifiable. Thus, awareness started mainly at the local level.

In the 80s, it was discovered, and made known to the public, the existence of global phenomena of pollution and climate change, the hole in the ozone layer, acid rain, desertification, greenhouse effect, deforestation, etc. These violations of natural resources are diffuse and their origins and relationships of cause and effect are not clearly identifiable. The problems of the environment became global problems.

At the same time, it appeared that economic growth was no longer supplied for the vast majority of populations, particularly in the South, where there was a large population growth that had disastrous effects on social conditions and caused serious damage in the environment. Thus, with extreme accuracy, it could be stated that "poverty is the most severe pollution".

The overall size of the problem has helped bring this debate to the level of international organizations.

Thus, already in 1962, the publication of the work of biologist Rachel Carson, entitled *Silent Spring*, made the international community to know more qualified information and data about the great danger posed by the use of agro-chemicals on crops, which gave rise to a large discussion on the preservation of the planet's natural resources.

In this line, in 1968, UNESCO organized a first international Conference on the rational management and conservation of the Biosphere.

Four years later, in 1972, the Club of Rome published the *Meadows Report*, usually known for his theory of "Zero Growth". Assuming that the non-renewable resources of the planet are not unlimited, the authors argued that the levels of use and consumption could not be maintained forever. In this report, the scientists concluded that the only way to curb the inexorable scarcity of natural resources was to drive the growth to a zero level. This proposal led to a strong

criticism because the idea went against the dominant ideology at the time, according to which only the growth of economic activity was synonymous of prosperity.

Also in 1972, the pollution problems led the UN to convene an international meeting in Stockholm. It was in the preparation of this meeting that the cosmic vision of the humanist Dubos, embodied in his work *Only One Earth*, was condensed in his famous phrase "think globally, act locally".

In this first United Nations Conference on Environment and Development, the participants, trying to find a compromise between economic and ecological imperatives, concluded that economic growth would not be, in itself, objectionable but, nevertheless, it should be associated with the "desideratum" of ecological feasibility and of recognized benefit to humans.

Although this meeting did not really put into question the models of development or international relations, at least it raised the creation of national and international environmental institutions. It appeared, then, the former Ministries of Environment. In the context of the then-called European Economic Community it was time for the 1st Action Program on Environment and, in Portugal, it was created, within the JNICT, the National Commission for the Environment.

The scientific community was progressively mobilized around the challenges of reconciling economic growth and environmental protection. After a final rejection of the idea of zero growth, the demand for another model of development was structured, little by little, around the concept of *Eco-Development*.

In 1980, the IUCN (International Union for the Conservation of Nature) provided a scientific basis to alert the world about the political impact of human activities in the renewal of land resources and referenced, for the first time, a concept that helped eco-development to emerge: sustainable development.

In 1987, the United Nations Commission on Environment and Development, known as the Brundtland Commission, published a report, *Our Common Future*, which emphasized "the progression of ecological interdependence among nations". The report highlighted the correlation between economic development and ecological issues and defended the eradication of poverty as a fundamental and indispensable condition for developing a viable Planet. This document presented the official definition of the concept of Sustainable Development, focused on four main aspects:

- Preservation of Nature
- Elimination of Poverty
- Economic Growth
- Assurance of Legacy for Future Generations

This document recommended the total rethink of the rules of human behavior for a thoughtful and rational environmental management and a development

that did not benefit a minority at the expense of most or all of the future.

The Brundtland Commission popularized the term "*sustainable development*", defined as the transformation process that meets the needs of the present without compromising the ability of future generations to meet their own needs. So, sustainable development is not an "equilibrium", but rather a process of change, in which the exploitation of resources, the choice of investments and the orientation of development are determined by both the current needs and future needs.

It can be argued that the concept of sustainability herded the notion of *Ecodevelopment* developed by Ignacy Sachs and Maurice Strong. This conceptualization had a short shelf life. The concept was based on the ideas of social justice, economic efficiency, safe ecological conditions and respect for cultural diversity. International agencies tried to tame its meaning, for its disclosure.

Now, note that, at the European level, this year of 1987 was designated as the "Year of the Environment" and that the environmental dimension was included in the text of the Single European Act. This was followed, since the early 1990s, by the relevant work of the European Agency for the Environment. In Portugal, this framework leads to the emergence, in 87, of the Law on the Environment and the Basic Law of Associations of Environmental Protection and the subsequent (1990) creation of the Ministry of the Environment and Natural Resources.

In the late 80s, facing the increasingly concrete ecological threats and the worsening of the social conditions in the southern countries, the United Nations decided to convene a second Ministerial Conference on Environment and Development, exactly 20 years after the Stockholm Conference. This was the Conference of Rio de Janeiro, June 1992, called the "Earth Summit". This "Earth Summit" represented a relevant step. Decision makers and a significant number of State's Presidents and Kings were mobilized for the event, responding to the call of the civil society, and agreed on the importance of considering the interaction between social, economic and environmental impact and reviewing them as parts of a whole, in preparation of future public policy. So, at the end of the Conference, 182 governments officially recognized the need to implement sustainable development on a global scale, through the adoption of the Rio Declaration on the Environment and Development, and by adopting the Global Plan of Action on Sustainable Development included in the Agenda 21. In the Rio Summit were also approved by the international community, the Convention on Climate Change and the Convention on Biological Diversity.

The proposed measures are not mandatory, their application is left to the states, which, however, are pledged to "cooperate in good faith and in the spirit of

solidarity for the implementation of the principles" of Rio. We quote and adapt, for its importance, the contents of the Preamble of the 1st chapter:

"Humanity is at a defining moment in history. We are confronted with a perpetuation of disparities between nations and within nations, the worsening of poverty, hunger, health and illiteracy, and the continuing deterioration of ecosystems on which we depend for our well-being. However, if we integrate the concerns about the environment and development and pay them more attention, we can meet basic needs, raise the level of everyone's life, protect and better manage ecosystems and ensure a more prosperous and secure future. These are goals that any nation cannot achieve alone but the task is possible if we all work together under a partnership for sustainable development".

In 1995, in Copenhagen "Summit of Man", the world community returned to the Rio themes and, once again, recognized the need to design a new development model, based on the assumptions of the sustainable development.

In Kyoto, 1997, the central theme of the conference was tied to climate change, but the issue of sustainability, on a global scale, was also in evidence.

As a result of the growing concerns of large sectors of the global population, more recently, in September 2002, in the Johannesburg Summit, the world leaders declared that the deep rift between rich and poor represents a major threat to world stability and prosperity, and approved extensive plans to combat it, in which the main global specific targets focus on poverty reduction, water and sanitary conditions management and child mortality reduction. It was also reaffirmed, in addition to the assumption of the commitments on the Agenda 21, the intention of regulating the functioning of markets and the facilitation of capital and investment flows mobility, in order to properly integrate developing countries in the benefits of global development.

At the same time, it was emphasized the concern with environmental issues related to the loss of biodiversity and the depletion of fish stocks, with the advance of desertification, climate change, natural disasters and the growing vulnerability of developing countries. Finally, despite its size and scope, the Plan of Implementation resulting from this summit, calls for 2015, to halve the proportion of the world population who lives on less than \$ 1 per day, to halve the number of people living without water and sanitary conditions, as well as to reduce, by two thirds, the mortality rates and infant mortality under five years, and maternal mortality, by three quarters.

Close, the international community discussed again the fundamental issue of climate change, in Copenhagen and Cancun. The evaluation of the results of the Kyoto Protocol and the design of new mechanisms and targets for the reduction of CO₂ emissions were the fundamental goals to be obtained. Even if the results were not conform with the expectations, especially in

the case of the Copenhagen Conference, a basket of new tools and commitments were possible, putting again the focus on the cooperation between interested parties.

3. The Pillars of Sustainable Development

In the formation of the concept of Sustainable Development, clearly emerged three typical approaches that reflect the major concerns of humanity, starting from quite different areas and converging on the concept, giving it the necessary consistency to enter and remain in the consciousness of the growing number of people who are mobilized around the Sustainable Development.

It is relevant, in the concept of Sustainable Development, the confluence of the economic approach, the biophysical/environmental approach and the social/cultural approach. We then try to summarize each one of these approaches and discuss its main problematic.

3.1. Economic Approach

The economic approach to sustainability aims to maximize the economic benefits resulting from the operation of a given set of existing assets, without compromising the future of those assets. Economists relate "sustainability" with the preservation of the stock of productive capital.

Sustainable development finds its objective in the maximization of the flow of benefits generated by a set of assets without compromising future generations. This requires the preservation, or even increase, the asset base over time. Is, therefore, included here, as a primary concern, the economic growth.

The novelty, compared to the traditional attitude of most conventional economics, stems from the measurement of the asset base of a country that can be extended to include the "natural capital" beyond the "productive capital" (the capital goods produced by man) itself and the "human capital".

This "natural capital" is here understood in view of the Capital Theory framework: natural resources are considered as any other capital resources, in that its consumption can be deferred in time, that is, it is possible to conserve the resources in the present to increase the possibilities for future consumption. The issue of investment (conservation) / disinvestment (exploitation-present use) in the resources should be understood as a simple problem of intertemporal consumption. The central objective is reflected in the utility maximization of consumers, the problem being subject to the inter-temporal budget constraint.

There are, however, specific and very important aspects to consider in the management and economic exploitation of these assets:

- The "produced capital" is not independent of "natural capital", since the man often resorts to the second to produce the first;
- Natural capital performs life support functions that are not performed by the man-made capital (e.g. ozone layer);
- The economic interpretation of substitutability between assets cannot easily apply to natural capital due to its multifunction.

These points highlight some key issues in sustainable development.

First, attention is given to the rules of efficient use of nonrenewable resources and a more conservationist use of renewable resources that will allow a recovery of stocks. In fact, the pressure on resources can create difficulties in the production of capital goods that are directly derived from the exploitation of natural resources. Note, for example, as high oil prices, a result of overexploitation of the deposits, may affect potential rates of economic growth, whether in developed or in developing countries.

The second aspect is that time scales and rhythms of change of human life (especially with regard to economic growth) and the biosphere do not always coincide. This must be reflected in a prudent view of the surrounding human activity. It is a kind of recognition of the "smallness" of man in relation to the wider ecosystem in which it appears.

Finally, some authors argue that it is essential, when developing a sustainable economy, maintaining the natural capital stock, as the technology improves the efficiency of resource use and man can create substitutes for this natural capital. This concept may have some acceptance in some restricted types of resources, but we should not give it an universal scope, which is the inability to ensure that technology can always provide replacements in time.

These concerns are mainly due to efficiency issues but issues of income distribution and equity problems in the development process, still have a significant role in this discussion. The issue of sharing the benefits arising from development, and getting the environmental conditions to support this development, are, certainly, not the least complicated. Take, for example, the whole discussion around the Kyoto Protocol and how some countries call for operating rules of the market in emissions of greenhouse gases that do not interfere in the growth capacity of their economies.

Likewise, in the economic approach, the issue of vulnerability and resilience of economies in developed and developing countries is very important because it's very low the margin of flexibility between sustainability and un-sustainability. Any shock, mainly external, may have severe consequences for society.

3.2. *Biophysical/Environmental Approach*

Biophysical scientists relate "sustainability" with the regeneration capacity and integrity of physical and biological systems. In the biophysical perspective, the concept of sustainability is linked to the idea that the dynamics of the processes of the natural environment may become unstable as a result of pressure imposed by human activity. It is intertwined with issues of biodiversity and species conservation.

According to some authors, the sustainability, in this type of scenario, is reachable, maintaining the stability of such systems, by reducing human pressure on ecosystems. The stress of human origin must therefore be compatible with the overall stability of the system. This desideratum can be achieved only by protecting the resilience of fragile ecosystems and the maintenance of natural capital. Thus, this approach is to emphasize the importance of concepts such as carrying capacity (corresponding to the maximum stock of resources consistent with environmental conditions).

Ecological sustainability implies basically the preservation of biodiversity at a precaution level. In this context, it is meant by biodiversity (as defined by the UN Environment Program / Intergovernmental Negotiating Committee for the Convention on Biological Diversity), the genetic viability, ecological and taxonomic coverage among living organisms, including the variability within species, between species and biotic components of ecosystems. Biodiversity conservation is the basis for sustainable development. It supports the productive chains. In practice, the values of future requirements are unpredictable, and given that the current knowledge of ecosystems is insufficient to be certain of the role and impact caused by the removal of one of its components, a cautious approach is needed. In the long term, consumption of natural resources must not exceed the rate of renewal.

3.3. *Socio-Cultural Approach*

The sociologists relate "sustainability" with the concern of the adaptability and preservation of social and cultural systems. Thus, this approach emphasizes the crucial importance for sustainable development of socio-cultural aspects, such as values, beliefs, lifestyles and institutions that organize and regulate social activities.

This approach introduces the analysis on very relevant topics:

First, the issue of the methodologies of valuation of natural and environmental goods and services, especially when there are no markets or markets functioning are very distorted. This perspective emphasizes that the value of natural resources is influenced not only by economic factors but also by underlying socio-cultural values of peoples.

Another aspect, relevant to this type of approach, has to do with the wide disparities in wealth on the

planet (with the associated risk of wars, conflicts over scarce resources, migration and other effects of instability), obviously not desirable or sustainable from a social standpoint.

Moreover, this approach shows that the increasing access to media of the poorest countries, and the diffusion of the image of the richest, have created expectations that the governments can not meet with current resources and policies.

The central idea is that, just as it is intended to maintain biodiversity, it also must maintain cultural diversity, since, otherwise, it is likely to lose valuable information, held by traditional cultures, with potential improvement of our knowledge on how to achieve better levels of sustainability. Given the need of changing the dominant paradigm in industrial societies (which emphasizes on capital-intensive growth), it is stressed that the diversity of human cultures and societies, and the wisdom they contained, can be used more effectively.

We point out another significant aspect: the impacts resulting from the exploitation of the environment, such as the greenhouse effect and resulting climate change, may unpredictably alter the way humans relate to the same environment so that it justified a heightened attention to sociological questions. Finally, we must not forget that the sustainability of modern network society, depends not only on cultural pluralism, but also on how it is encouraged and managed.

3.4. *Reconciliation of Approaches*

Any of the previous approaches have always sought the best use of resources to maximize social welfare, with lower costs.

Naturally, these objectives include the control and the maximization of some performance indicators, as a function of a set of variables, subject to the restrictions of its own natural dynamics.

But involves, also, some indicators of equity. There is currently a growing consensus that it is increasingly difficult to ignore the political issues of intergenerational equity (and intra-generational equity), because it becomes necessary to take measures to ensure the continued presence of the human species. For example, one of such measures could be the suspension of the creation of intergenerational externalities that result from an unsustainable management of renewable resources. Future generations will, if nothing is done otherwise, have to afford the cost of any reduction of capital flows caused by the reduction or degradation of the current stock of renewable resources. Problems arising from the use of existing resources such as groundwater contamination, climate change, placement of radioactive waste, overfishing, etc., should be considered, whilst bearing in mind the welfare of future generations.

This does not necessarily mean that anyone ignore the problems of intergenerational equity today, on behalf of future generations. The issues of poverty and differentiation in the current access to the amenities and benefits of development are fundamental in defining the "sustainability".

Note, however, how these issues suggest concerns arising from both aspects of economic, environmental and social analysis and require a multidisciplinary approach bringing together the economic, biophysical and socio-cultural dimensions.

In this perspective, we can say that the reconciliation of these approaches is essential and especially in terms that relate to the operationalization of the concept of sustainable development. Although this analysis is beyond the scope of this work, we stress the importance of the following questions:

- The economic modeling and the internalization of externalities;
- The valuation of assets and environmental impacts,
- The definition of the battery of indicators of sustainability,
- The definition of practical goals for sustainable development at different spatial scales (local, regional, global)

The economic modeling allows us to study rigorously interrelated issues, although the economic, "traditional", models have great difficulty in contemplating environmental effects and enhancing externalities. One of the most promising approaches to global sustainable development implies the appreciation of the various environmental and social components with its subsequent incorporation into conventional economic models of decision-making.

On the other hand, numerous issues emanating from the different approaches underscore the need of decision-making structures in enjoying, in addition to the qualitative information they provide, information or any quantitative assessments. That is, information such as to assign an economic value to a given resource, whatever. The choice between public policies based on criteria of cost-benefit analysis indicates how essential are the development of methodologies for environmental enhancement and valuation.

This question leads us to the mandatory question of sustainability indicators. The definition of practical goals for sustainable development and the design of appropriate policies, require further indicators that serve both to characterize the baseline, identify the desired targets and evaluate the performance. It is precisely at this level that it is justified a reconciliation of the approaches. Although they can keep some indicators of a more restricted to each of the approaches, it is obvious the need for indicators of multidimensional and intersecting thematics (corresponding, in fact, to the multidimensional sense of the concept of sustainable development). These, as well as the formulation of the

action lines of a sustainable development policy, at various spatial scales, are issues that justify, themselves, an independent research program.

4. The Landscape as a vector for Sustainable Development

The concept of landscape is complex and allows for different approaches depending on the objectives and methodological position of the researchers.

The concept has itself evolved, progressively moving from the understanding of landscape as a *visual entity* (relating to landscape as a complex biophysical, but, above all, with the way it is visually identifiable), to a view that sees the landscape not only as a sum of various geographical elements but as *the result of the dynamics of space* evolution. The result of physical, biological and human dimensions reacting dialectically, make the landscape a unique and indivisible reality, in perpetual evolution (so, instable).

Note that the tender of this concept, the landscape may have both an *objective component*, comprising the physical support and the biological action of man, but, also, a *subjective component*, which corresponds to how each combination of these elements is analyzed by a specific observer.

Although there is not (still) a universal definition, there has been a convergence towards the concept of integrating the various views of different schools - from those that understand the landscape as a backdrop, the ones who sees the landscape as identifying the specific site with cultural expression, going to those that define the landscape as a system/ holistic entity.

In a perspective of analysis that may be significant in terms of approaching the concept of landscape to the concept of sustainable development, it is noted that some authors refer the interaction between the natural system and social system as conferring a territorial and cultural dimension to the landscape. They see this in the sense that the way the communities take "ownership" (in a symbolic meaning) of the present landscape varies, both, with the natural system and with the values of the society on which it operates. In this sense, the introduction of the subjective component mentioned above is difficult to measure but essential.

Going further, the development of an ecological perspective emphasizes the landscape as the result of the relationship between nature and society based on a material set of space that exists as a structure and ecological system, regardless of its perception. This interdisciplinary and holistic approach of landscape ecology (seen as the level of organization of ecological systems rather than the ecosystem; characterized by its heterogeneity and dynamics and governed, in part, by human activities; existing independently of their perception) reinforces the concept of landscape as a system. In this case, it is suggested a complex and dynamic system in which the natural factors and cultural

factors influence each other and evolve together in time, *determining and being determined by the overall structure.*

To this extent, the understanding of the landscape implies knowledge of factors ranging from relief to flora, climate, structure of land use, environmental and cultural events, the economy and the expressions of artistic activity, etc. A true multifaceted reality.

In the report "*The Face of Europe*" it is proposed a vision of landscape as a concrete and characteristic product of the interaction between human societies and cultures with the natural environment. Thus, landscapes may be identified as spatial units where specific elements and processes are subject to permanent changes (dynamic systems). This interaction between natural and cultural components gives rise to the notion of *landscape character*. At different scales, landscapes express the uniqueness of each place and identity, reflecting the natural and cultural history of a territory. The landscape is just the visible result of the processes of interaction between a-biotic, biotic and human dimensions that vary by place and time and contribute to a given character and identity of the place.

In this definition, the division between the natural landscape (as a result of exclusive interaction of physical and biotic factors prior to human action) and the humanized landscape (as a result of human actions on the natural landscape) is exceeded, and the traditional opposition between urban and rural landscape surpassed.

It should then ask: To what extent can the landscape be understood as a vector of sustainable development, both conceptually, and in terms of operationalizing the concept?

After what we have been explaining on the emergence of the concept of sustainable development: the different approaches it converges (economic, biophysical and socio-cultural), its systemic and dynamic perspective, the advantages and difficulties of its operation; and what we saw about the way the concept of landscape has evolved: from a perspective that departs, increasingly, from a mere role of backdrop, into a vision of a global system that emphasizes the interactions between nature and human activity on the territory, also through a systemic and dynamic perspective; the answer is easier.

The landscape, we can tell, means a part of the territory, as perceived by people, whose character comes from action and interaction of natural and human factors. The landscape is, above all, an important element of quality of life of communities (urban and rural areas, degraded areas and of great quality, areas such as notables as the areas of daily life). This relationship with the quality of life of the communities, and interest in its "maintenance" for future generations, connects directly with the objectives of sustainable development.

The purpose of landscape quality can designate, for a specific landscape, the formulation, by public authorities, of the aspirations of populations in relation to landscape features of their living environment. Likewise, the consideration of interactions between natural features (biophysical / environmental) and human aspects (economic, social and cultural) approach the concept of landscape with the concerns of multidisciplinary approach that the concept of sustainable development aims.

In a draft of the *Sustainability Focus Group*, to discuss issues relating to harmonization between the practices of "management" of the landscape, a group of architects, sustains the desiderata of sustainable development. In the report "*Sustaining Landscapes, Landscape Architecture and Sustainable Development*" this relationship is studied. Their concerns are revealing the importance that is given to the landscape in the context of demand towards sustainability.

First, it is restated that the term landscape acquires a broader definition when used in relation to sustainable development. In fact, it is, no longer, just a cultural and social concept, much less just a visual concept. The landscape becomes, so to speak, the environment changed and seized by the people that, simultaneously, fit our current lives and the lives of future generations. Since men are part of the natural world and depend on it, the concept embraces all other forms of life and the interactions that make up this global system.

And then added: The landscape has an interest and an important role in the cultural, ecological, environmental and social development.

At the same time, it is a feature that is helpful to the economy and whose protection, management and planning, can create jobs.

The landscape contributes to the formation of local cultures and the well-being of people and for the consolidation of identity.

The landscape is a mainstay of quality of life.

The landscape is a key element of the welfare of the individuals and communities - their protection, management and planning reinforces the sense of common responsibility.

In this context, the report recommends that the practice of landscape architecture should recognize that:

- The landscape is our common living environment and quality care,
- The landscape is a life support, a source of food and other forms of wildlife support,
- The landscape corresponds to a legacy of cultural, even emotional subjects, at various scales,
- The landscape changes through a combination of environmental factors (in a lato sense) and can be destroyed or enhanced by man,
- Landscapes are multifunctional and are appreciated in many ways.

This requires a clarification of the direction (forward the profession) in order to operationalize its role in achieving sustainable development. In particular, we emphasize the need for community involvement and a transparent and accountable decision-making process. Also, in the area of "transformation" operations over the landscape, in the sense of a more operational intervention on reality, it is stated, un-equivocally, the important role of landscape as a vector of sustainable development.

Moreover, the actual level of difficulties in operationalizing the concept of sustainable development, the parallels are evident. In fact, the biggest problems arise here (too). The difficulties associated with measurability and the definition of indicators, face landscape conceptualization in the keywords of the "political landscape" (objectives, targets and evaluation of results).

5. Concluding

Few concepts have attracted, so intensively, both public and academic domains, as the Sustainable Development. This represents a policy goal for many nations, occupying a crucial place in the paragraphs of Agenda 21, which, at the Earth Summit- Rio92, took the overall stock of the global efforts of development for the future of humanity.

In order to reconcile the challenges of environment and economy into a development perspective with intergenerational equity, States are encouraged to pursue a global partnership and to commit themselves into a constructive dialogue, to create an efficient global economy and more equitable balance with respect for environmental, social and cultural rights.

The scope of the concept (generating some confusion), makes that sustainable development concept is often used as a black box, interpreted differently by economists, ecologists and philosophers. In essence, they put themselves the problems of operationalizing the concept, especially in the definition of sustainability indicators and assessment methodologies, in order to obviate the falling down into the void of banality of such an important concept to humanity.

The landscape as a concept that, both, incorporates a vision of the global system of interactions between natural and human aspects in the territory, and a practice of intervention on the area, aiming to develop the quality of living from a perspective of intergenerational equity; emerges as an integral element of sustainable development concerns. This is the fundamental result of our investigation.

Beyond the aforementioned issues of how to put in operation the concept of sustainable development, some questions remain as clues for future research. Our proposal is the following: There is a major rift between two opposing interpretations of sustainable development: "weak sustainability" and "strong

sustainability". The first leads to the so-called Hicks-Solow-Hartwick rule and treats sustainability as a new form of economic efficiency extended to the management of nature. It is thus an approach closer to the conventional paradigm of economics and more focused on concerns of the economic approach. The proponents of "strong sustainability" consider that efficiency is an inadequate criterion to satisfy the concerns of sustainable development, involving the "Steady State". They reflect a desire to integrate economic and ecological concerns. Legacy of natural capital is imposed. Attention is made to intrinsic values of nature and human culture.

This division obviously has consequences, in the rules and in the sustainability indicators, and may involve an effect of more or less evidence of the role of landscape as a vehicle for sustainable development.

A final note, about the reflex of such preoccupations on the Portuguese Policy of Regional Development. As most of the rural, and even urban, areas are to be developed with a focus on the services sector, the re-qualification of natural and humanized landscapes gets a new meaning and relevance (particularly when there are tourism proposals), in terms of the sustainable development of all the country and of all of its diverse parts.

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An Approach to Earned Value Analysis (EVA): An Application to a Practical Case

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Abstract: Nowadays, consumers are becoming more and more demanding about the quality of the service that are offered to them. To meet these demands, companies do great efforts to offer a high and consistent level for their services. Such an objective can only be achieved if companies have internal capabilities to be, not only effective in delivering what is expected from them, but also efficient in the way their service is performed. It is intended with this work to implement EVA to a specific project using EVA as a methodology.

The main conclusion is that EVA allows a more effective control of the development of projects. It can also be add that good planning and a well-defined organisation of projects are crucial for the quality of the information produced by EVA. It can also be said that EVA must be supported by a very strong method on cost data collecting. On the other hand, EVA has a very strong temporal limitation because it doesn't take into account the critical path of the project. Therefore, EVA must always be followed by a Gant graph. These conclusions are supported and commented during this work.

Keywords: Project control, EVA, information systems.

1. Introduction

In an increasingly demanding world, where markets have an extreme competitiveness customer satisfaction is increasingly the central focus of any company that wants to be successful. This satisfaction comes not just from the quality and performance of a product but also from the time/value relationship in its production. It is important to note that today environmental and social concerns are increasing. Thus, a good allocation of resources in order to minimize wastes is considerably important.

For a project's management to be successfully made, it is necessary the project to be completed within the scheduled time, considering the minimum cost and the best possible quality. In other words, indicators of cost, scheduling, quality, productivity, raw materials consumption and waste may be considered to measure the success of a project. To make possible such analysis, it is necessary to implement a control system. It allows to find discrepancies between what was planned and what was

accomplished. Considering that, the manager will have at this moment all the information necessary to find the causes of the deviations and to implement corrective measures he considers to be relevant.

EVA-Earned Value Analysis is a technique that allows the control evaluation at any time, the performance of time, cost and scope of the project. This means that it compares the planned deadlines for completion of tasks (scheduled work), with tasks actually performed (earned value) from the perspective of planned costs and actual costs incurred. So, the importance of this technique offers an accurate and complete diagnosis of deadlines and costs of a project at any stage of its implementation allowing an efficient supervision and a proper view about its progress.

2. Aim

It is intended to implement EVA to the project SMOPI (this project addresses the main problems in the functioning of the heating and radiation from the pyrolysis furnace and proposes a monitoring system online that will allow very substantially to reduce the consequences of working situations in the transient regime, responsible for the most significant mechanisms degradation in this kind of equipments), by creating a spreadsheet where daily costs incurred by each worker on each task are introduced, in order to make a close and detailed monitoring of the project. This will allow that the results presented by EVA methodology are correct and that the predictions made by this approach are as close as possible to the reality.

3. Methodology

The implementation of EVA to a running project is made. The necessary data are collected through meetings with the team that is responsible for monitoring the projects. If all the data regarding the current development of the project were not available, some assumptions and some scenarios are created in order that the actual EVA model may produce values possible to be interpreted. Follows the analysis and the discussion of the results and yet the interpretation of the possible scenarios created. Finally, the quality of the results and suggestions for a possible implementation of Eva are made.

4. How to Apply EVA

First of all, in order to apply EVA, it is necessary that the project it is well planned. The project should consist of a list of tasks, with small and manageable work elements easily assigned, monitored and executed. Subsequently, each task must have its start date and its end date well established. Additionally the hours of work that are expected to be spent on each task have to be well defined as well. It is important to collect information such as:

- the precedence in relations among tasks,
 - the critical path,
 - clearances noncritical tasks,
 - available resources,
- and to carry out
- risk analysis, and
 - contingency plans.

EVA is not a tool to be easily used once the project has to be thought out, planned and carried out in a specific structure already outlined for the use of EVA (Wilkins, 1999).

As far as the project is in progress, for using EVA it is necessary to collect, on a regular basis, the information on the real costs and the percentage of completion of each of the tasks. These values are related to the tasks undertaken and completed as well as the ones initiated and not completed since it is assumed that for tasks that have not yet begun, both of these values are zero.

To apply EVA methodology it is necessary, at first, to follow five steps (Wilkins, 1999):

1. Defining the Work Breakdown Structure (*WBS*) to divide the project into small chunks, allocating costs to each activity, calculating the required time for each activity and confirming the plan.
2. Identifying the components that compound the activities of the project. The *WBS* provides the framework for identifying the components of the project and each activity has to be associated with an element of the *WBS*.
3. Identifying and allocating costs to each activity. This resource consumption can be expressed in work hours or in monetary units.
4. Calculating the deadlines for each activity (it shows the resources spent on each project phase).
5. Confirming the plan; this confirms the allocation of resources (it is tested if there are the financial and material resources needed to carry out activities in each period of project).

After these first five steps of preparation, it becomes possible to conduct periodic reviews of the project, involving:

1. The update of the calendar, the updating of the progress of the activities.
2. The implementation of the actual costs of each activity.

3. The calculus of the variables of EVA and the preparation of reports.
4. The careful analysis of the variables and the drawing of the necessary conclusions about the project progress.

4.1. Primary Variables

The key variables for the implementation of EVA are presented next:

- The actual Cost of Work Performed (*ACWP*),
- The budgeted Cost of the Work Performed (*BCWP*), and
- The budgeted Cost of Work Scheduled (*BCWS*).

ACWP can be defined as the amount of money spent to finish a task, if already completed, or, as the amount of money spent until the moment, in a given task if it has started but its implementation has not yet been completed. If the project is analyzed as a whole, the *ACWP* is the total sum of *ACWP*'s of all tasks that have already begun, whether they have already been completed or not.

BCWP is the budget set in the original plan of a task regardless of the money that was actually used to complete it. For a task that has not yet been completed, the *BCWP* is the original budget of the task multiplied by the percentage of completion of a specific task until the moment considered. *BCWP* is the total sum of the *BCWP* for all tasks that have already begun, whether these have been completed or not.

BCWS is the monetary value that was supposed to be spent on tasks that were expected to be completed by then. For tasks whose completion should have been reached, *BCWS* is the budget of the original task, whether it is actually completed or not. For tasks which implementation should have been started but not completed, *BCWS* is the original budget of the task multiplied by the percentage that is expected to perform it until the date considered. As with previous variables, the total *BCWS* is the sum of the *BCWS* for all activities.

It should be noted that these three variables are in fact functions of time, either for individual tasks or for the project as a whole, and must be recalculated whenever the model applies EVA. This observation is easily understood since, as time passes, more money is spent, more work is done, and the simple advance of time makes that what is expected to be spent and what is expected to be achieved are successively changing (Cesarone, 2007).

4.2. Secondary Variables

Once calculated the primary variables, ie, the *ACWP*, *BCWP* and *BCWS* either for tasks that should have begun by the date in question, either for the overall project, it is time to calculate the value of the secondary variables.

Scheduled Variance (*SV*) compares the progress made with the expected progress, dividing this difference

by the expected progress. Thus, it provides information on the percentage of variation or deviation from what had been previously planned. This variable can be calculated by the following expression:

$$SV = \frac{BCWP - BCWS}{BCWS}$$

If SV is positive, the activity that is being examined is ahead of what was previously expected. If not, SV has a negative value and the activity is delayed.

On the other hand, Cost Variance (CV) compares the incurred cost with the planned cost of the tasks that were actually carried out. The normalization of this value is done by dividing the planned cost for the percentage of deviation from the original plan. The expression for calculating this variable is

$$CV = \frac{BCWP - ACWP}{BCWP}$$

If CV is positive, the activity in question may have had a lower cost than the forecasted. On the contrary, if CV shows a negative value, the task has exceeded the budget until the date in question.

Another variable which interpretation may be relevant is time change, or Time Variance (TV). This variable is the difference in time between the earned value ($BCWP$) and the planned value ($BCWS$).

Continuing a temporal analysis, the final variation of the terms, or Delay at Completion (DAC), is calculated as the difference between the projected date for completion of the project (TAC - Time at Completion) and the date initially planned for the end of the project (PAC - Planned at Completion). Thus the following expression can be used:

$$DAC = TAC - PAC$$

By turn, Scheduled Performance Index (SPI) gives a relationship between $BCWP$ and the planned value ($BCWS$) in a given date. SPI shows the conversion rate of the predicted value in earned value, up to that date, and can be calculated using the following formula:

$$SPI = \frac{BCWP}{BCWS}$$

For a better understanding of SPI concept, consider $SPI = 0.9$. This means that 90% of the budgeted time was converted into work. Thus, it is apparent that there was a 10% loss in the available time. One can then

generalize by saying that if the value of SPI is equal to 1, the planned value was fully added to the project. Following the same logic, a SPI value of less than 1 indicates that the project is delayed and a value of more than one SPI , that it is advanced.

Another ratio which analysis can also be quite indicative of the project progress is the Cost Performance Index (CPI). Here a relationship between $BCWP$ and actual cost of the project ($ACWP$) is given. CPI shows the rate between the actual consumption and the aggregate values in the same period and may be calculated using the following expression:

$$CPI = \frac{BCWP}{ACWP}$$

If $CPI = 0.9$ is considered, this means that for every €1 of capital consumed, only 0.9 € are in fact being converted to final product and, as such, there is a loss of 0.1 € per each 1 € spent. Again, a CPI value equal to 1 indicates that the amount spent by the project was completely earned and, as such, the project is within budgeted. If CPI is less than 1, the project is spending more than expected and there will probably be an extra cost at the end of it. Similarly, if the CPI is greater than one, the project is to cost less than budgeted.

For each time EVA is recalculated, it is important to determine the Estimate at Completion (EAC). This variable informs about the expected evolution of the project costs and the fact that such a measure can be determined is one of the great advantages of EVA. The value of EAC can be calculated using the following formula:

$$EAC = \frac{BAC - BCWP}{CPI} + ACWP$$

To use this formula some assumptions have to be accepted. Firstly, the current cost of the project must be greater than planned, for work already performed ($ACWP > BCWP$). Thus, if costs continue this trend, it is easy to see that the estimated cost at the end of the project (EAC) will be much higher than budgeted at Completion - BAC on this date. Thus, the EAC formula represents the work that it is not yet been completed ($BAC - BCWP$), dividing it by the CPI . Later, the cost of work completed ($ACWP$) is added, which is seen as a sunk cost.

Finally, it is possible to calculate the Variation at Completion (VAC) by subtracting the EAC to BAC , as it is showed by the following expression:

$$VAC = BAC - EAC$$

The list of secondary variables is based on the "paper" prepared by Giacometti *et al* (2007).

4.3. How to Improve EVA Performance

As it was seen earlier, EVA is a very efficient and useful technique to evaluate a project's performance. However, it still has some flaws which reduce its applicability. In order to eliminate these flaws, Rodney Howes, a professor at the University of South Bank, London, conducted a study which develops a hybrid approach that attempts to answer such faults.

In fact, traditional EVA evaluates the cost performance using the Cost Variance (*CV*) and Cost Performance Index (*CPI*) which gives a very useful measure unit. However, the Estimated Cost to Completion (*ECC*) and Forecast of Project Completion Cost (*FCC*) are based on past performance, and often, this is incorrect because the future work can be quite different from the one already done. Another limitation of EVA is that the Scheduled Variance (*SV*) is purely related to the performance of cost and does not take into account the time related to the completion of tasks in their logical sequence. This is a very serious limitation because the cost is not directly proportional to time. Finally, in its most basic version, EVA does not take into account variations in the project in the form of additions or omissions.

Being aware of such faults, Howes (2000) developed a methodology for cost and schedule that can give a better, and more robust and reliable analysis of the project which is called Work Package Method (*WPM*). This new methodology considers the project as a set of small inter-related packages on time and sequence. These packages are classified as completed, under way or about to start. The occurrence of variations to the initial project budget (*BCWS*) could be identified and taken into account. Thus, the omissions would be deducted and their effect over time would be counted. The additions would be computed and compiled as identifying factors. Thus, delays caused by changes to the packages would be evident.

Howes (2000) has in fact refined and improved the performance of traditional EVA to introduce a hybrid approach based on work packages and temporal logic analysis to which he gave the name of *WPM*. This tool allows to regularly update the project cost and its time performance restricting the calculation of EVA to individual packages.

5. Case study – Project SMOPI

The main objective is the implementation of EVA model to the SMOPI project, which is still in development.

As with any project, there is a list of activities by which the project is developed. In the case of SMOPI, the list of activities is as follows in fig 1.

Figure 1- List of Activities - SMOPI

1	Preliminary studies
2	Techniques specifications
3	Acquisition and development of new knowledge
4	Development
5	Construction of prototypes, pre-sets and experimental setup
6	Tests
7	Promotion and disclosure of results

Each of these activities consists on tasks to be accomplished. In its simplest form, these tasks are mini-objectives, "milestones" to be achieved at all times.

6. Implementation of EVA

Now is holding up the implementation of EVA model to the SMOPI project. To simplify the calculations, the values of "overhead" were not taken into account.

6.1. First Point of Control - 3 months

EVA is a project control methodology and as such, tracks progress and makes forecasts for the project. Doing this first test three months after the start of the project, it is always necessary to calculate the expected scenario, according to the forecasts and to the previously planned and the real scenario.

6.1.1. Estimated Situation

According to the original timetable, at 3 months, the situation should be:

Table 1 - Predicting SMOPI - 3 months

Tasks performed	Performed status (Forecast)
1.A - Study of Hardware Installation in the Furnace	100%
1.B - Study of System Acquisition, Storage and Data Transfer	25%
1.C - Model Study of Coking	50%

Analyzing the form, it is possible to know the cost of each task:

Table 2 – Description of task 1A

Technical Staff Code	Technical Staff Name	Hours Worked (h)	Cost by hour worked	Total
0.1	José	45	34,74 €	1.563,30 €
0.2	Carlos	30	25,13 €	753,90 €
0.3	Ivo	120	26,31 €	3.157,20 €
0.4	Rui	55	26,31 €	1.447,05 €
				6.921,45 €

Technical Sub-contractors	Employee sub-contractor name	Hours Worked (h)	Cost by hour worked	Total
	Matos	25	70,00 €	1.750,00 €

Table 3 – Description of task 1B

Technical Staff Code	Technical Staff Name	Hours Worked (h)	Cost by hour worked	Total
0.1	José	285	34,74 €	9.900,90 €
0.3	Ivo	212	26,31 €	5.577,72 €
0.6	Rui	212	19,71 €	4.178,52 €
				19.657,14 €

Technical Sub-contractors	Employee sub-contractor name	Hours Worked (h)	Cost by hour worked	Total
	Matos	40	70,00 €	2.800,00 €

Table 4 – Description of task 1C

Technical Staff Code	Technical Staff Name	Hours Worked (h)	Cost by hour worked	Total
0.3	José	145	26,31 €	3.814,95 €
0.4	Rui	355	26,31 €	9.340,05 €
1.1	Pedro	35	32,93 €	1.152,55 €
1.2	Luis	140	21,99 €	3.078,60 €
1.4	Celso	75	26,81 €	2.010,75 €
1.6	Nuno	130	16,96 €	2.204,80 €
1.9	Manuel	285	22,58 €	6.435,30 €
1.10	Sandra	305	15,58 €	4.751,90 €
				32.788,90 €

Technical Sub-contractors	Employee sub-contractor name	Hours Worked (h)	Cost by hour worked	Total
	Matos	20	70,00 €	1.400,00 €

At this point, the cost of each task and its degree of progress is known. It is possible to calculate now how much it should have been spent on each task at 3 months and therefore how much it should have been spent in total:

Cost of task 1A (forecast)	Cost of task 1B (forecast)	Cost of task 1C (forecast)
8.671,45 €	5.614,29 €	17.094,45 €
Total Estimated Cost		31.380,19 €

6.1.2 Real Situation

At this moment, the real situation regarding the project is according the following:

- Task 1A was more difficult than originally thought so the technicians have dedicated over 5% of their time to it so that it was finished on time.
- Due to technical problems, the task 1b delayed 1 month. The control at 3 months had not yet started. This event causes that 2.B and 4B are also delayed one month.
- Task 1.C has delayed one week its start making that 3.C and 4.C also are delayed one week.

Given these assumptions, the scenario for three months is as follows:

Table 5 – SMOPI Real Situation– 3 months

Tasks Performed	Performance Status (Real)
1.A - Study of Hardware Installation in the Furnace	100%
1.B - Study of the Acquisition System, Storage and Data Transfer	0%
1.C - Study Coking Model	46%

As the task 1A will be more expensive because workers have spent more hours than anticipated, the task 1B has not yet begun; and task 1C is one week late. The actual costs of the tasks are:

Cost of Task 1A (Real)	Cost of Task 1B (Real)	Cost of Task 1C (Real)
9.105,02 €	0,00 €	15.669,91 €
Total Estimated Cost		24.774,94 €

As can be seen after 3 months from the start of the project, in the project an amount of 6,605.25 € is spent less than the expected. However, is it a good sign? In fact, more work may have been developed or a lesser amount of spending made than the expected, to make the same quantity of work. However, often this is not the case. A lesser amount of money spent than the expected may indicate that the project is delayed and, as such, the amount spent is not the amount that was owed to be spent

Let's apply EVA variables and see the conclusions.

6.1.3. Calculation of EVA Variables and First Conclusions

The application of the following formula is made with respect to each of the tasks that now should have been completed or initiated. Then, it is the same analysis for the project as a whole:

Table 6 - Primary and Secondary Variables - Task 1A

ACWP	9.105,02 €
BCWP	8.671,45 €
BCWS	8.671,45 €
Schedule Variance (SV)	0
Cost Variance (CV)	-0,05
Scheduled Performance Index (SPI)	1
Cost Performance Index (CPI)	0,95

As can be seen, *ACWP* is greater than *BCWP*, indicating that it is spending more than expected. This is evidenced by a negative *CV* or a *CPI* lesser than 1, i.e. the task 1A, from each € 1 of capital consumed just 0.95 € are converted into the final product.

On the other hand, *BCWP* is equal to *BCWS* indicating that the task did not deviate temporarily from what has originally been planned. This is clearly visible by an *SV* equal to 0 or an *SPI* equal to 1.

It may seem strange that *BCWS* is equal to *BCWP* since a greater amount was spent than the expected. However, when a task is completely full, its *BCWP* is equal to what had been planned (*BCWS*), although it has been spent a greater or a lesser amount. It is for this reason that the implementation of EVA requires not only that the project has been conceived and structured by tasks for a possible implementation of EVA, but it has been thought by people with great experience because, as can be seen, initial estimates are very important and determine the purchased value.

Table 7 - Primary and Secondary Variables - Task 1B

ACWP	0,00 €
BCWP	0,00 €
BCWS	5.614,29 €
Schedule Variance (SV)	-1
Cost Variance (CV)	0

In this case, the task 1B has not even started yet so there was no spent money. In fact, as *SV* has a negative value the task is overdue, but as *SV* is equal to -1 this means that the task is not only delayed but also it has not started yet. It is understood also that *CV* is equal to 0 because the task has not started yet, there was no spent money yet and, consequently, there cannot be any deviation.

Table 8 - Primary and Secondary Variables - Task 1C

ACWP	15.669,91 €
BCWP	15.669,91 €
BCWS	17.094,45 €
Schedule Variance (SV)	-0,083
Cost Variance (CV)	0

Scheduled Performance Index (SPI)	0,92	
Cost Performance Index (CPI)	1	
Cost of task 1A (real)	Cost of task 1B (real)	Cost of task 1C (real)
9.538,6 €	0,00 €	14.245,38 €
Total Estimated Cost		23.783,97 €

In Task 1C, *ACWP* equals *BCWP* and consequently, *CV* is equal to 0 and *CPI* is equal to 1. In fact, the money spent is exactly what was intended to spend.

On the other hand, *BCWP* is lesser than *BCWS* and this is visible because *SV* is negative and *SPI* lesser than 1. In this case, 92% of the expected budgeted time was converted into work, so there was an 8% loss in the time available.

In fact, if it is only compared *ACWP* and *BCWS*, it is possible to make the mistake of saying that the amount spent could be lesser than the expected. This would be great. For this reason, there is a variable *BCWP*, or acquired value. The ideal situation would have *BCWP* greater than *BCWS*, indicating that the task would be advanced and an *ACWP* lesser than *BCWP*, indicating that a lesser amount is spent than what was due to the percentage of work performed.

Following this analysis for all the tasks separately, it is possible to do the following analysis for the project as a whole:

Table 9 - Project – Overview - Primary and Secondary Variables - Project 3 months

ACWP	24.774,94 €
BCWP	24.341,36 €
BCWS	31.380,19 €
Schedule Variance (SV)	-0,22
Cost Variance (CV)	-0,02
Scheduled Performance Index (SPI)	0,78
Cost Performance Index (CPI)	0,98

As can be seen, this is the worst possible scenario. The project not only is delayed as it is spending more than the expected. Although EVA shows that the project, at this time, is late, it is not possible to inform if the project will be delayed when it is complete. For this reason, it is always necessary to monitor the implementation of EVA with a Gant chart, or any other graphics where are visible the precedence between tasks, to understand if the delays which occur at some point will affect the scheduled completion date of the project. The Gant chart complements the EVA and allows to verify if delays occur in the critical tasks (automatically delaying the project) or in secondary tasks. Even if there is the

second case, if the delays are greater than the gaps of these tasks, the project also delays.

The final budget forecast (*BAC*) is € 1,082,348.88. Calculating *EAC* a value of € 1,101,627.86 is obtained. Although EVA cannot predict whether the project will be late, informs that supported on this trend the project will cost more € 19,278.98 (*VAC*) than initially budgeted.

6.1.4 Sensitivity Analysis

In order to examine how EVA performs facing different situations of different severity, sensitivity analysis will be made now. So, and assuming the same assumptions created for this control point at 3 months, two scenarios will be discussed:

- A first scenario where the observed failures are more severe (the task 1.A requires more 10% of workers time, the task 1.B has not still started and the task 1.C is 2 weeks delayed)
- A second more optimistic scenario (task 1A requires only 1% of the workers time, the task 1.B has not still started and the task 1.C is just 1 day delayed).

Applying the first scenario, i.e., exacerbating the initial assumption conditions, the real new costs of € 23,783.97 for new tasks, and the new total costs spent are:

In this case, an amount of € 7596.22 is spent lesser than the expected and lesser € 990.97 than the situation described in the scenario with the initial assumptions. Looking more closely each task, it can be seen that *CV* of task 1A is replaced by a *CV* equal to -0.1 and a *CPI* equal to 0.91. This kind of values was expected because the costs of this task were all enhanced in the same scale. For its part, the *SV* of task 1.C is replaced by a *SV* equal to -0.167 and a *SPI* of 0.83. These values are also expected because the delayed time was twice the one expected on the initial assumptions. However, looking at the project as a whole, it appears that the *EAC* is equal to € 1,123,303.66, and so, the project will cost more € 40,954.8 than originally planned. If this value is compared to the *VAC* obtained for the initial assumptions (€ 19,278.98), it can be seen that there is a slight worsening of the situation. In fact, it was expected to spend more because the conditions were worse than the other situation but EVA does not convey this information in a linear way. The worse the situations are, the worst are the estimates provided by EVA.

Let's see if this trend continues for the most optimistic scenario. The values of the tasks are:

Cost of task 1A (real)	Cost of task 1B (real)	Cost of task 1C (real)
8.758,16 €	0,00 €	16.752,56 €
Total Estimated Cost		25.510,73 €

As expected, the cost of task 1A is very close to the estimated cost as the workers are working only 1% more than the allotted time. Simultaneously, the cost of the task 1.C is also very close to the estimate because the task is

49% while provisionally would be 50%. Obviously, the actual cost at this point deviates a bit more than expected because the task 1.B still has not been started.

Looking at the project as a whole, it appears that the *EAC* takes the value of € 1,086,040.48, only € 3691.60 more than was initially expected. In fact, EVA is a tool sensitive to the deviations, not dealing with these variations in a linear way. Simplifying a little the following statement, it can be said that EVA comprises more than € 1 spent today could mean spending more than € 2 at the end; but spending more € 2 may mean spending more than € 5 or € 6 at the end. The worse the present conditions are, the worse are the forecasts provided by EVA.

6.2 Second Point of Control - 12 months

Next, the same analysis made earlier will be held but at 12 months from the start of the project. Note that it is imperative to update calendar whenever it is applied EVA, i.e., to make this analysis at 12 months, the timetable should be the one after the control at 3 months (A.3) and not the original. In fact, over the costs of the tasks, updating the calendar or not has no impact. However, in relation to timings is easy to understand why there is a need to update the calendar. Imagine, for example, that a project delayed in the first month but then will not delay anymore. If an inspection after the first month of work is made, in fact, it is possible to ascertain that the project is delayed. However, unless the schedule is updated when we return to do a checkpoint, the result will be that there is yet a delay. That is, if one reads the report he can think that tasks have delayed again, when in reality the tasks are progressing at the pace that was predicted but were late in the first month.

6.2.1 Estimated Situation

According to the updated timetable after 3 months (A.3) control, the theoretical situation is as follows:

Table 10 - Expected SMOPI - 12 months

Tasks Performed	Performance Status (forecast)
1.A - Study in the Furnace Installation Hardware	100%
1.B - Study System Acquisition, Storage and Data Transfer	100%
1.C - Model Study of Coking	100%
1.D - Study Model Carburetion	67%
1.F - Study of Creep Damage Model	33%
2.A - Technical Specification of Hardware Installation in the Furnace	100%
2.B - System Specifications	100%
3.C - Pre-Development Model Coking	100%
4.B - Development of the Acquisition, Storage and Data Transfer	60%
4.C - Model Development Coking	22%
5.A - Prototype Hardware Installation in the Furnace	100%

6.A,B,C - Field Tests (Since we're halfway through the year 2010, it is assumed that half hours were spent in this task)

Following the same reasoning used to calculate the theoretical costs of these tasks, it is possible to come to the following values:

Cost of Task 1A(Forecast)	8.671,45 €	Cost of Task 1B(Forecast)	22.457,14€
Cost of Task 1D(Forecast)	18.439,17 €	Cost of Task 1F(Forecast)	35.194,79 €
Cost of Task 2B(Forecast)	29.584,45 €	Cost of Task 3C(Forecast)	21.933,95 €
Cost of Task 4C(Forecast)	9.446,95 €	Cost of Task 5A(Forecast)	13.580,22 €
Cost of Task 1C(Forecast)	34.188,90 €	Cost of Task 2A(Forecast)	10.207,50 €
Cost of Task 4B(Forecast)	22.527,81 €	Cost of Task 6A,B,C (Forecast)	9.395,49 €
Total Cost (expected)		235.627,81 €	

6.2.2 Real Situation

Keeping the events that were manifested at 3 months, the new records are now:

- Task 1.D delays its start in three months and, to try to compensate the lost time, workers work 10% more time than the expected.

- Tasks 2.B and 5.A used less than 5% of the expected time.

Given these assumptions, the scenario for 12 months is as showed table 11.

Table 11 - Real Situation SMOPI - 12 months

Tasks Performed	Performance Status (Real)
1.A	100%
1.B	100%
1.C	100%
1.D	33%
1.F	33%
2.A	100%
2.B	100%
3.C	100%
4.B	60%
4.C	22%
5.A	100%
6.A,B,C	Took up half of hours spent

Again, taking into account the changes in the percentage of tasks completion and hours spent by workers, the real costs are:

Cost of Task 1A (Real)	9.105,02 €	Cost of Task 1B (Real)	22.457,14 €
Cost of Task 1D (Real)	10.040,13 €	Cost of Task 1F (Real)	35.194,79 €

Cost of Task 2B (Real)	28.105,23 €	Cost of Task 3C (Real)	21.933,95 €
Cost of Task 4C (Real)	9.446,95 €	Cost of Task 5A (Real)	12.901,21 €
Cost of Task 1C (Real)	34.188,90 €	Cost of Task 2A (Real)	10.207,50 €
Cost of Task 4B (Real)	22.527,81 €	Cost of Task 6A,B,C (Real)	9.395,49 €
Total Cost (Real)		225.504,11 €	

Again, the amount spent is € 10,123.79 lesser than the expected. This applies to EVA variables on each task separately and subsequently to the project as a whole.

6.2.3 Calculation of EVA Variables and Conclusions

Although it is necessary to calculate all variables for all tasks, here it will be presented only the most relevant. In this case, they are the tasks 1D and 2B:

Table 12 - Primary and Secondary Variables - Task 1D

ACWP	10.040,13 €
BCWP	9.127,39 €
BCWS	18.439,17 €
Schedule Variance (SV)	-0,505
Cost Variance (CV)	-0,1
Scheduled Performance Index (SPI)	0,495
Cost Performance Index (CPI)	0,91

In this case, the task is behind schedule (*SPI* lesser than 1) and spends more than expected (*CPI* lesser than 1). As this task is not finished yet, the *BCWP* is lesser than the *BCWS* once the task is delayed (and thus cost more). However, if the task was already completed, *BCWP* would be equal to *BCWS*, even if the task is behind schedule and had cost more because *BCWP* is the purchased value. Again, it is important to have a good planning, made by someone experienced and preferably with knowledge on the application of EVA.

Table 13 - Primary and Secondary Variables - Task 2B

ACWP	28.105,23 €
BCWP	29.584,45 €
BCWS	29.584,45 €
Schedule Variance (SV)	0
Cost Variance (CV)	0,05
Scheduled Performance Index (SPI)	1
Cost Performance Index (CPI)	1,05

Although 2B is late due to a delay in 1B, this task has been completed so that its *SPI* is equal to 1.

On the other hand, as would be expected, CPI is greater than 1, indicating that the amount spent is lesser than the expected.

Finally, the project is analyzed as a whole:

Table 14 - Project - Overview Primary and Secondary Variables - Project 12 months

ACWP	225.504,11 €
BCWP	226.316,03 €
BCWS	235.627,81 €
Schedule Variance (SV)	-0,04
Cost Variance (CV)	0,0035876
Scheduled Performance Index (SPI)	0,96
Cost Performance Index (CPI)	1,0036005

As can be seen through this analysis, the project is behind schedule (*SPI* lesser than 1) but has spent lesser than was originally expected (*CPI* greater than 1). Also noteworthy is that the same analysis was done at 12 months but with no update schedule. As it was expected, SV gave a more negative value and *SPI* a less positive value. This is because, to update the schedule, it is already known that 4B and 4C are going to delay (hence no longer delays). In fact, on this analysis at 12 months, only the delay of 1D was not foreseen and the values of SV and SPI shows that.

In this case, the *EAC* is € 1,078,465.89 which shows that, supported in this trend, an amount of less € 3,882.99 was spent than the originally planned.

6.3 Third Point of Control - 18 months

Following the same reasoning used in the previous analysis and updating the calendar with the changes at 12 months (A.4), it is not necessary to present the theoretical situation. It is easily calculable. It is noteworthy that on this date it was expected that an amount of € 400,615.45 was already spent. Again, if the calendar was not updated, this value would be greater because there would be to take into account the delays that have already occurred and others that are allowed to be anticipated, thus no longer be considered delays, or rather, they are delays but they are expected delays.

6.3.1 Real Situation

Keeping the scenario that was manifested at 12 months, the new records are now:

•Tasks 1.E and 1.F began on schedule but are now one month late because each employee spent less 3% than the time that they should.

Given these assumptions, the scenario for 18 months is as follows:

Table 15 - Real Situation SMOPI - 18 months

Tasks Performed	Performance Status (forecast)
1.A	100%
1.B	100%
1.C	100%
1.D	100%

1.E	86%
1.F	90%
2.A	100%
2.B	100%
3.C	100%
4.B	100%
4.C	97%
5.A	100%
6.A-H	(As this is the end of the year all hours are appointed for this task 9)

Note that the task 1E should be complete all the 6 months of the planned 6. As the task has begun on schedule but it is lasting more one month, there are 6 complete months of the 7 that the task will take in reality. The same reasoning may be applied to 1F.

Thus, applying the same reasoning used here to calculate costs for each task, the actual cost is € 383,430.53, i.e., less € 17,184.91 than what was estimated.

6.3.2 Calculation of EVA Variables and Conclusions

Again, the calculations are presented only for the tasks most relevant:

Table16 - Primary and Secondary Variables - Task 1E

ACWP	23.757,99 €
BCWP	24.492,77 €
BCWS	28.574,90 €
Schedule Variance (SV)	-0,14
Cost Variance (CV)	0,03
Scheduled Performance Index (SPI)	0,86
Cost Performance Index (CPI)	1,030927835

Table17 - Primary and Secondary Variables - Task 1F

ACWP	92.175,16 €
BCWP	95.025,93 €
BCWS	105.584,37 €
Schedule Variance (SV)	-0,1
Cost Variance (CV)	0,03
Scheduled Performance Index (SPI)	0,9
Cost Performance Index (CPI)	1,030927835

Once both tasks 1.E and 1.F follow the same standard, the following analysis is valid for both. How *ACWP* is lesser than *BCWP*, the task is spending less than expected (a good result). How *BCWP* is lesser than *BCWS*, the tasks are overdue (bad news). The ideal situation would have *BCWP* greater than *BCWS*, i.e. would be advanced, and *ACWP* lesser than *BCWP*, i.e., spending lesser than expected for that level of achievement.

Analysing the project as a whole, it is possible to have now:

Table 18 - Project - Overview Primary and Secondary Variables – Project 18 months

ACWP	383.430,53 €
BCWP	385.974,88 €
BCWS	400.615,45 €
Schedule Variance (SV)	-0,038
Cost Variance (CV)	0,007
Scheduled Performance Index (SPI)	0,96
Cost Performance Index (CPI)	1,0066

As shown, the project continues to delay (96% of the expected time budgeted was turned in work which results in a loss of 4% in the time available) but spend less than expected (for each € 1 of capital consumed, € 1.0066 being physically converted into work).

In this case, the *EAC* is € 1,075,214.03, i.e., EVA provides that at the end of the project are spent € 7134.85 less than expected.

6.4 Fourth Point of Control - 36 months

This control point is made upon the completion of the project, or better, on schedule for completion of the project.

Following the updated timetable for the control after 18 months (A.5), the expected total cost for this project is € 686,888.08. In fact, the cost will be the *BAC*, i.e. € 1,082,348.88 as reported earlier but was not taken into account the overheads or any item regarding the purchase of equipment.

6.4.1 Real Situation

Although it is not considered any further changes until the end of the project, the delay already occurred in 1F causes delays in 4F and, so, it also delays the project, which will last 37 months. In this case, the actual cost of the project in this date is € 683,904.51.

Again it is spending less than expected but does EVA confirm that this is a good sign?

6.4.2 Calculation of EVA Variables and Conclusions

Calculating EVA variables for task 4F:

Table 19 - Primary and Secondary Variables - Task 4F

ACWP	48.539,29 €
BCWP	48.539,29 €
BCWS	48.539,29 €
Schedule Variance (SV)	0
Cost Variance (CV)	0
Scheduled Performance Index (SPI)	1
Cost Performance Index (CPI)	1

Despite being the only task that has not been completed and to be delaying the project in one month, it was already known that this would happen due to updated calendar that was performed at 18 months. As such, this task is not delayed in accordance with that update, it is relating the initial expectation.

Table 20 - Project - Overview Variables Primary and Secondary - Project 36 months

ACWP	683.904,51 €
BCWP	686.888,08 €
BCWS	686.888,08 €
Schedule Variance (SV)	0
Cost Variance (CV)	0,004343596
Scheduled Performance Index (SPI)	1
Cost Performance Index (CPI)	1,004362545

From 18 months timetable until now there has not been any change in tasks. As such, it was expected that no change in the schedule would occur, as shown by the SPI.

CPI is greater than 1, which indicates that the project is costing less than expected. For each € 1 of capital consumed, € 1.00436 are being converted to physically work.

Knowing that the *BAC* was € 1,082,348.88, and that in time, the *EAC* is € 1,077,647.59, the *VAC* is € 4,709.29, i.e., the project will cost less than initially expected. In fact, since the 18 months so far no work has changed. At 18 months, there was a tendency for tasks

costing less than expected and, so, was expected to spend less than € 7,134.85 which had been originally planned. In these second 18 months, the tasks were not affected so, the tendency has been blurred. As such in the end of the project it will pay € 4701.29 less than expected.

7. Conclusions

EVA is a methodology for project control and, so, should monitor their implementation. Naturally, the often the application of EVA and the less times passes between two applications more reliable will be the results and more timely may be detected failures and delays to take appropriate action.

EVA is not a tool of easy use and its implementation has costs, namely a platform to collect the costs associated with the project but also costs of personnel training. It is important that initially is resorted to the services of someone experienced in the implementation of EVA, not only because the tool itself, which has some nuances, but also because the project planning itself is critical to the success of EVA.

In this kind of analysis, EVA provides interesting information and conclusions. In fact, if a project is spending less than the expected, and assuming that the forecasts are good, this is not synonymous of a good performance. As shown in the EVA application, the task is often delayed and there is therefore not yet spent what was expected. On the other hand, as the name shows, EVA is based on the value purchased. For this reason, the planning and initial forecasts are so important, because even if a job cost more or less, when it ends, its acquired value is what it is initially planned and not the final value.

Through a sensitivity analysis performed at 3 months, where it was considered a worst scenario and a best scenario, it was found that EVA is sensitive to changes not only in relation to what was initially expected but also in the severity of these changes. In other words, this sensitivity analysis showed that the additional costs are exponential throughout the project. As such, a small variation in the costs incurred will be reflected in a small variation in the final cost of the project but a variation, for example, 5% higher, will not reflect on just 5% at the end of the project. This amount would be higher because this trend of cost is not linear.

It is also important to note that EVA is not about to make good estimates and to obtain data about the progress of various tasks (which can also be difficult if the staff is not accustomed to providing such information regularly). In fact, having data on current costs may also become a problem because many companies report their cost reports with several weeks of delay. Moreover, the cost of a required equipment for the project may not appear in official accounts of the company but this money is as if he had already been spent. As it is visible, there are many variables that can influence the results of EVA, fudging them.

Some repairs on the EVA tool.

EVA is a tool difficult to implement and, so, or the company already has an high organization and has a good computer system that allows to effectively manage the costs incurred or so the results do not reflect correctly what happens in reality.

EVA does not take into account the critical path. That is, as noted earlier, there are formulas that calculate time deviations and can even make predictions about the end date of the project. However, if a non-critical task is delayed one day (and has a margin), EVA will inform that the project will also be delayed (not necessarily the same one day). In fact, this is not true and that is why it is suggested that, parallel to the use of EVA, it is necessary to build Gant diagrams or even to do a critical path analysis as a way to fill this gap. As such, and because of this failure, may not make sense to calculate, at each checkpoint, the *SV* and *SPI* for the project in general. In fact, these variables calculated for each task individually provides information about their progress and if they are delayed or not. However, translating them for the project in general lays bare this limitation of EVA because, again, any delay in any task, however small it may be, will be reflected in a delay of the project and this may not be true.

The EVA does not identify the reasons for delays in the schedule or to variations in costs and has no ability to suggest corrective measures.

Finally, why may EVA be used? In fact, the main reason is to provide numerical data to the manager so that he can effectively monitor the project. However, if thought in a less rational and more emotional way, it is understood that nobody likes to see that he has had bad results. If the information obtained through EVA is published, everyone will work harder as a way to obtain better performances and a way to motivate all the personnel involved in the project.

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“On Rents of Fishing Grounds” Revisited

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Abstract - Since the 50s, the central idea in the Fisheries Economics is that, in conditions of free access and competition, the market will lead to market equilibrium solutions that imply the overexploitation of the resources. This fundamental result is due to Scott Gordon in his seminal article of 1954, “The Economic Theory of a Common Property Resource: The Fishery”, in the Journal of Political Economy.

But, in fact, another (more antique) article put the problem and suggested this approach to its understanding: In a short paper, in 1911 (exactly 100 years ago), the Danish economist Jens Warming, put this issue and made a very similar analysis for the fisheries sector.

The purpose of this research is to make a reflection on that paper and highlight the explanation proposed for the common property problem and, also, to study the legacy of this interesting fisheries economist to the History of Political Economy.

Keywords: *Common property, Rent dissipation, Fisheries, Jens Warming.*

1. Introduction

The origins of modern Fisheries Economics can be traced back in the 50s with the papers of Gordon (1954), Scott (1955) and Schaefer (1957).

In his seminal paper “The Economic Theory of a Common Property Resource: The Fishery”, Gordon argued that, in a situation of open access and competition, the market would not lead to the most efficient solution in resource use. The common property nature of fish resources implied that, in an unregulated fishery, the result would be the expansion of the industry to a point of economic, even biological, overfishing.

But, in fact, there is another, more antique, article that put the problem and suggested this approach to its understanding. In an article from 1911 (exactly 100 years ago), the Danish economist, Jens Warming discussed this issue and made a similar analysis, for the fisheries sector.

The purpose of this research is to make a reflection on that paper and highlight the proposed explanation for the common property problem. The paper studies the legacy of this interesting fisheries

economist to the History of Economic Thought and ask what went wrong and why did the important achievements of Warming’s research had not the justified academic applause and practical impact.

2. Notes on Jens Warming Life and Career

Jens Warming’s family belonged to the intellectual elite of Denmark. His father, Eugene Warming, was an important and influential professor of Botany in the University of Copenhagen and his contributions on Ecology were internationally recognized.

Jens Warming (1873-1939) was graduated in Law, in 1897, in the University of Copenhagen, and then went to the USA where he worked, teaching in a Danish school, in Nebraska. After his return to Denmark, he made a special master degree in Economics. This degree was usually given to lawyers who wanted to pursue a career in the administration.

Warming went on pursuing a remarkable career in the Danish Central Department of Statistics (1904-1919). He was not a “genuine economist” (Topp, 2008) but, at the same time, he went on being a part-time professor of Economics and Descriptive Statistics in the Danish Agricultural University and in the University of Copenhagen.

This lack of formal graduation in Economics gave him some bitter problems. He was frequently criticized for insufficient knowledge of Economic Theory and when he finally got a permanent tenure in the University was in Statistics, never getting the desired chair of Economics. Even his mentor, Harald Westergaard, leader professor in Economics in the University of Copenhagen, seemed not to understand the relevance of his work.

Jens Warming tried to get the tenure in Economics for two times but, in the first, it was another (later) well known Danish economist to be chosen - L. Birch, and in the second time, it was his previous student, Axel Nielsen, who got the professorship in Economics.

The personal animosity played an important role but it was, perhaps, his proactive attitude towards government regulation and intervention at the microeconomic level (that was not in accordance with the mainstream view of the 20s that the

deregulation was required) that gave him some objections in the academic playground (Topp, 2008).

His fundamental work rested in the Descriptive Statistics. In 1929, Warming published a textbook on Danish statistics with an applied economic perspective. For more than a decade, his book of Denmark characterization was extensively used by Danish economics students. Teaching economic theory was not, of course, his task, but in his statistics textbooks he went on partly disregarding that, making several critiques on mainstream economics and including his theoretical contributions, as it is the case of fisheries.

He also tried, from 1921, to write a textbook in Economics but it was never published because of the dispute between a professor of statistics and the professor of economics in the Copenhagen University.

After the flaw of getting the desired tenure in Denmark he went on trying to get applause, externally. In 1926, he submitted a 230 pages essay to an international competition on the Theory of Wages. He did not win the competition but he had an “honourable mention” and the recognition from foreign colleagues that made him to pursue his efforts in the economic area, finally publishing a paper in the esteemed *Economic Journal*.

His ability in recognizing and applying the *marginalist* revolution was evident and his developments in the area of wages and rents rested upon the most recent developments in Economics. The paper he published in the *Economic Journal*, made an interesting presentation of the multiplier (see Topp (1981) on the link between Keynes theory and Warming’s research). He also made important seminal references about the problem of identification in econometric analysis.

His work has only a few references (Wicksell and Marshall are the most cited; but also Fisher and Germanic authors, especially about the quantitative theory of money).

Another interesting fact of his career relates with the links with marine biologists.

Along the period of his research career the current situation in the sector of fisheries went on some important changes.

In 1883, Thomas Huxley said that probably all the great fisheries were inexhaustible but at the end of the 19th century this leading fisheries biologist (working in the northern Europe at the time) started to worry about the decline of fish stocks in the Baltic Sea and in the North Atlantic (see Eggert (2010)). That laid to the formation of the ICES (International Council for the Exploration of the Sea) in 1902. With headquarters in Copenhagen, ICES pretended to be a

forum of multidisciplinary discussion on practical fisheries problems.

Focus was still on Biology. Only in the fifties, the modern Economics of Fisheries (with the research of Gordon (1954) and Scott (1955)) and the modern Fisheries Biology (with the studies of Schaefer (1957) and Beverton and Holt (1957)) evolved. Jens Warming tried to communicate with Marine biologists and to present his vision about the relevance of Economics in the treatment of the problem. He sent his papers to important researchers in this area (H. Kyle, Petersen and Hjørt are most cited in Warming’s notebook). Even for the Danish prime minister, former fisheries minister, but with few results.

3. The Legacy of J. Warming

There are significant aspects of Warming’s legacy in Economics. Our approach highlights his contribution in the fisheries area and the innovative way he treats the problem of common property.

Since the seminal paper of Gordon (1954) the fundamental idea in Fisheries Economics is that the market will not lead to optimal exploitation of the resources. The common property nature of fisheries and the presence of externalities in the process of capture will lead to market equilibrium solutions that imply the overexploitation of the resources and the overcapacity in the industry – the “Tragedy of the Commons”, using Hardin’s (1968) metaphor.

Forty three years before the publication of Gordon’s seminal paper, Warming made an important investigation about the problems of open access in the allocation of a common-property resource and presented his results in a short article “Om Grundrente af Fiskegrunde” (“On Land-rent of Fishing Grounds”), published in the *Journal of the Danish Economic Association*.

After this article of 1911, he made several references of his results in two unpublished books: a textbook from 1921 and another 1926 manuscript. This manuscript, which was intended for an international audience, includes an English new version of his 1911 model and became the main ingredient of a second article on fisheries, in 1931. This model was also the centre of the sections on fisheries included in his textbooks from 1929 and 1938 (revised edition) about the socio-economic conditions in Denmark.

3.1. “On rent of Fishing Grounds”: open access and rent dissipation

In his most cited article, Warming compared the rent available from fishing grounds and land. Land is, in the most part, in private hands and land rents are a privilege of private landowners, whereas fishing

grounds are not privately owned but are considered common property. However, the differences do not change the basic economics of both forms of management. Warming stated that the common property nature of open access to fishing grounds without charges tends to decrease the rent and he proposed to alleviate this through transferable fishing licences.

To summarize the contribution of this first article:

The core idea reflected the marginal revolution. In a competitive economy a worker earns a wage equal to the value of his marginal product. But, according to Warming, there were examples in the economy where this did not hold. One of these exceptions was the case of the fisheries where the problems occurred due to a “lacks in the organization of society”.

These exceptions did not question the theory of marginal productivity as a general fundament but there were situations where these exceptions had practical relevance. Under open access, the potential rent in a fishery is dissipated. As no one has property rights over the resource and there is no possibility of exclusion, the constant entrance of a newcomer in the fishery will not cess until the difference between revenues and costs are zero, that is, until all the rents are dissipated.

Biological regulation, as closed seasons or mesh size specification, can prevent the biological overexploitation of resources but not the economic over-exploitation. Even the use of licences with the objective of maximizing maximum sustainable yield (MSY) would not maximize the total rents. In fact, the “economic optimum” level of fishing effort is in the point where marginal revenue equals the marginal cost. That is, the economic optimum stands at a level equivalent to the monopoly case. Anthony Scott would refer this, in 1955, as the “sole owner” situation, which is now commonly recognized as the one that guaranties the maximum economic yield (MEY).

He also pointed out that a tax, equal to the difference between average and marginal revenue at the optimal level, will lead to an optimal fishery. This idea is also very interesting, clearly reminding the proposals of Pigou, in the 20s, to internalize the external effects.

We note that these results are very close with those of Gordon and Scott in the fifties.

Of course, as Topp (2008) points out, even if the theoretical fundamentals and arguments are the same, the articles are very different with respect to scope and composition and perhaps that explains the different forms they were seen and used by the

academic community. The Gordon article was directly focused on Fisheries Economics and resulted from a program of investigation which, at the time, tried to apply the economic theory to fisheries contemporary programs. This article was published in a highly considered journal (*The Journal of Political Economy*) and when there was a group of researchers very interested in the results of public regulation in this area.

Warming’s findings reflects his study about the flaw of competitive market. It did not deal with contemporary and international debate on regulation. However, it contains important elements of fisheries management that had no explicit reference in Gordon’s article. Perhaps for economists this debate did not seem very important but that would have been important for biologists and executives. A very interesting example is the concept of MSY.

3.2. “The Danish Right to Eel Weir”: Rights based Management

In his first article, Warming did not elaborate much regarding the implications, in practical terms, of his proposals. The basic guidelines of thought were that a free market economy did not automatically lead to optimality and that government regulations were needed. The suspicion about the “invisible hand” was a recurrence in his work.

Twenty years later, in 1931, he published another article going into new details and presenting a graphical presentation to explain his findings:

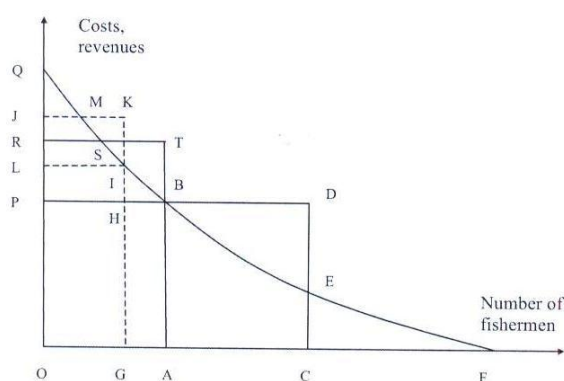


Figure 1 The correct number of fishermen (OA) with a single owner of the rights to a fishing ground, compared to the number (OC) with no owner at all (full freedom)

The returns from fisheries are shown in the vertical axis, whereas in the horizontal axis we have the fishing effort measured by the number of fishermen.

The curve QF shows the diminishing returns as the fishing effort increases. The line PD represents the marginal cost.

In this context, total benefits are maximized when the number of fishermen is OA, and the total income of fishermen is the area OABP.

Warming compares fishing with farming and states that the number of workers hired by a profit maximizing farmer will be such that the last worker hired produces as much as he receives in wages.

The total income from fishing is, in fact, OABQ. So, the value PBQ is the sea rent for access to the resource on the fishing grounds. If no one collects this sea rent and fishing is free, the average income of OA fishermen will be higher than AB and, as this rent is divided among fishermen, their mean income rests AT, that is, the median height of OABQ, so the value RSQ is equal to the value STB.

Of course, high average profit draws more people into fishing. Equilibrium is achieved where fishing effort is OC and total income is equal to the total cost of fishing: so, PBQ=BED. The additional fishermen produce only ACEB and could produce more in some other pursuit. They only receive the required ordinary income by having PBQ added to their production. The sea rent is wasted in the sense that it subsidizes the income of extra fishermen whose production do not correspond to their wages.

Finally, he maintains that in order to prevent that the number of fishermen goes up to OA, fees should be collected for the licences. A private owner (or a government agency) would collect such fees and the fee ought to be BT, to result in the optimal number of people in the fishing activity. This would provide PBTR in the form of fees.

He introduces some additional features: A right for the coastal owner to charge a fee for this fishing right in the areas near the coast implied a regulating effect that corresponds to the property right of land. The right of the owner to regulate the entry prevents the excess of fishing effort and maximizes the rent guaranteeing the optimal number of fishers.

Warming also stated that free access can lead even to a negative marginal product implying the utilization of immature stocks. So, even in times of high unemployment (and that was the case in the 30s) it was better to keep away from fishing the superfluous fishers.

We note that this article was also a response to a specific situation in the context of Denmark fisheries. In fact, Danish fishers demanded, at the time, that the "Right to Eel Weir" should be abolished.

This right to eel weir was an exception from the freedom of access that was the general rule in Danish fisheries. According to the Danish Fisheries Act (from the end of the XIX century) no one could be excluded "from a properly visited and marked fishing ground". But there was an exception. Traditional

Danish Law granted shorefront owners the right to set eel traps in the sea adjacent to their land property and property owners were entitled to charge fishers for permission to set traps in some of this specified offshore areas.

In one of their annual Assemblies, the Danish Fishing Association proposed to abolish private eels trapping rights with unanimity. Warming's article was a protest against this change in *governance*. Warming opposed the introduction of free access to replace rental fishing in the limited area in which the latter had applied. He argued that this would lead to the total dissipation of rent.

So, his article was derived from a political debate on whether to abolish the legal title of the owners of the foreshores to restrict the access and to impose fees on those granted permission. Warming was in favor of maintaining the existing system: his argument was that it produced the optimal regulation result. Instead of abolishing this system, he proposed that it was a benefit to introduce a similar system in all sea governance (although it seemed to Warming that was impractical because of the dimension of the transaction costs - negotiation and control, involved).

The debate, in 1931, faded away, leaving the law unchanged but when the debate was revived, in 1955, the economic arguments of Warming remained ignored and the Danish parliament abolished the right in 1956 (Gislason, 1995). Private rights of shorefront owners to set eel traps adjacent to their property were abolished and the owners were compensated for this loss of privilege.

We must also note that his clear opposition to maintain extra-workers in fishery, appealing to the economic efficiency in the sector, could not be well accepted at the time.

In the 30s, Great Depression was at higher level in Denmark. But (still) Warming argues strongly against using employment in fisheries as an alternative in recession days, because extra fishers will impose an extra-external cost to the other fishermen, dissipating the potential rent. And he added another problem: the typical inertia in this sector where socio-professional mobility is difficult. After entering, the superfluous fishers will not move fast enough for more productive sectors when the recession is over.

4. Conclusions

It's not easy to make a balance of the relevance of Warming's work to Political Economy, but we can summarise the achievements and ask what went wrong in his trajectory.

The fundamental achievements were:

- A. The central idea that relates the open access with the dissipation of rent and its corollaries:
- the market failure resulting from insufficient specification of property rights,
 - the overexploitation and overcapacity resulting from these specific conditions of market operation,
 - necessity of public regulation, including some kind of rights based management to mitigate the market inefficient allocation.
- B. His previous comments on regulation methods to internalise the external costs associated with the capture process:
- the fees from licences, in a sense that reminds the pigouvian taxes,
 - the presentation of licences and other forms of property rights as possible tools for sea governance and fisheries management, that reminds the Coasian solutions.

What went wrong? Why did important achievements have not the justified academic applause and practical impact?

First, there are some difficulties of academic nature.

The fact that his article on fisheries was published in a Danish journal and in the original language of the author was a significant factor for its weak disclosure. Only in the 80s, an English translation of the seminal article of 1911, by an important fisheries economist, P. Andersen, and a study from Hannesson and Anderson (1981) on the contribution of Warming, gave the relevance that Warming's legacy deserved.

However, is to be noted that, in the 50s, during a round table, promoted by FAO, to discuss the advances in Fisheries Economics, one of Warming's former Icelandic students (O. Bjornsson) called the attention to the work of Warming and made an English presentation of his model.

Last year, 2010, the journal *History of Political Economy* published an English version of his article from 1931, translated by H. Eggert.

Note that the personal animosity and suspicion in the academic circuit that we referred in the beginning, made difficult his task. Also, some singular idiosyncratic aspects, as the one of not including extensive bibliographical references, were not conform the usual "correct policy" in academic context.

Second, we must note that his findings and recommendations were not in line with the mainstream.

A lot of his results were indeed interesting in practical terms for fisheries regulation, but derived from an economic analysis. That economic perspective had no impact on the decision-makers of fisheries management. In fact, only in the 60s and 70s the Economics of Fisheries went on being really considered. Until the Second World War the management of fisheries were only administrative and the focus (and the decisions) came exclusively from Biology.

Even for economists it seems that his results were always in the opposite side of the mainstream. He proposed a regulation approach where economists and the fishers associations proposed more liberalisation. He proposed the creation or, at least, maintaining the existing property rights when everyone defended the free access.

But, at the same time, he was against the use of fisheries as a sector to absorb the unemployment resulting from Depression. That is, his defence of economic efficiency and sustainability of the sector put him in the unpleasant role. It seems that he was always on the "wild side of the street".

Note also that there is a miss in his work. In fact, what is missing is the description of the dynamic nature of the problem of fisheries management that went, in the early 70s, to solve the model by applying a capital theoretic framework (that gave to the Fisheries Economics research a real "gold period").

Finally, note that his ideas have, nowadays, even if his name is not cited, a real relevance.

His preoccupation with superfluous workers in fisheries is now the subject of an important discussion on the Common Fisheries Policy (CFP) reform (see Coelho et al, 2011). The CFP points to the necessity of making the balance between the social stability in the coastal areas mostly dependent on fishing, with the objective of getting sustainable fisheries (implicating a reduction in fishing effort to put it in line with the necessary renewal of the stocks). But these are contradictory objectives. To solve this equation is, perhaps, the major difficulty in the process of reform that is intended for 2012. And now, with the economic crisis and the high levels of unemployment in the E.U., it seems more difficult to ask for a reduction of capacity.

Some problems (as the case of "quota hopping") are creating the idea that a system of quotas and TACs are not enough to get sustainable fisheries. That is, the command and control instruments, that made the core of the conservation and management regime of the CFP, can have results in terms of biological over-exploitation but, as Warming defended, cannot solve the economic problem. This problem rests, basically, in its common property nature. The solution of the externalities associated

implies an economic analysis and the introduction of Rights Based Management methods. They are also in discussion in the next CFP reform.

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Exploring Impact: Negative Effects of Social Networks

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Abstract - The sociological literature on social networks emphasizes by and large positive network effects. Negative effects of such networks are discussed rather rarely. This paper tackles negative effects by applying economic theory, particularly neoclassical theory, new institutional theory and the results from experimental economics to the concept of social networks. In the paper it is assumed that social networks are exclusive and since exclusiveness affects the allocation of resources, negative external effects may occur. The argument of the paper is that it is not only advantages for network members that need to be investigated but also the disadvantages for non-network members. The results have two implications. The first one is for economic policy, which often fosters social networking while ignoring their negative externalities. The second one is for network research that can benefit from a more rigorous application of economic theories.

Keywords - social networks, network effect, network externality, transaction costs, negative effects

1. Introduction

Social networks have become a core topic among others in social sciences in the last decades. Social network theory was one of the sociologists' answers to new institutionalism which emerged in economics some decades ago. Granovetter's seminal work on embeddedness of social action [1] attacks economists' views on markets and on hierarchies [2][3][4][5] alike [6][7]. The concepts of social embeddedness of individual action and of social networks have been the battle horse for New Economic Sociology since the mid-1980s [8]. Apart from science, these concepts have also gained considerable support on the political arena. Political organizations such as the EU provide incentives—mainly in the form of monetary subsidizing—fostering networking of individuals, e.g. entrepreneurs or researchers. Some politicians apparently expect that positive effects of social networks emerge also for groups other than network members. For instance, social networks may speed up the production and flow of knowledge and other goods in a society. Negative effects of social networks are largely ignored both in the sociological

literature and by political actors. Yet, negative effects may emerge not only for network members, but also for non-network members and for societies at large. In this paper the focus is on such negative effects of social networks. The aim of the paper is to address this deficit and to add critical thoughts to the ongoing discussion on social networks, which we consider biased and in favour of positive network effects.

A social network (SN) is formed by individuals connected by links. A SN can have a horizontal or vertical structure¹, for instance between buyers and sellers in a market. A SN is not complete so that not all individuals in a society are members. Thus a SN is exclusive by definition. Examples are networks of entrepreneurs who share factor inputs ([9] for industrial districts), networks of scientists who exchange knowledge [10][11], networks of workers who set up a trade union, networks of consumers or sellers (e.g., [12][13][14]). A common feature of SN is that they influence markets: the market for consumer goods is influenced by entrepreneurs' decisions to collude, the market for scientific goods is influenced by scientific networks, trade unions influence the labour market and organized consumer groups influence prices and quality of products. The decision to form and to contribute to a SN does not merely affect the well-being of those individuals who are in the network but also the well-being of non-network members. Effects on third parties can be positive or negative.²

In economics, the terms 'network effect' and 'network externality' are often used interchangeably [15]. Liebowitz and Margolis [16] identify a network externality as a network effect that allows realizing additional gains through network participation (cf. also [15]). The presence of a network externality implies that decisions of certain individuals influence the well-being of others either directly or indirectly. Katz and Shapiro [17] coined the term network externality and referred to it mainly as positive consumption externalities (cf. additionally [18][19]).

¹ A SN may have the form of a star, a circle or a Y.

² Negative effects also occur for network members. The spread of a computer virus or of diseases is much faster if actors are linked than if they are not. Compare [23] who refers to the epidemiology literature and formalizes in a model the spread of infections in networks. See also [24] for a model on the spread of (mis)information in networks.

For instance, if many individuals decide to purchase the same telecommunication service, communication among these individuals is facilitated and a positive network effect occurs [20]. The term network externality hints at the existence of a market failure [21]. As in the communication example, network effects and externalities are discussed most often for the demand side of an economy but they are also prevalent for the supply side (cf. [15] for a recent review on empirical findings). In this paper the focus on SN is on the supply side. The consequence of negative effects is that (certain) non-members of SN experience losses, while those in the SN experience gains (cf. e.g., [22]).

The structure of this paper is as follows. In the second section traditional economic theory which does not deal with institutions is used. Although this theory suffers from a shortcoming when applied to real life situations, it serves well as a reference point of efficient allocations and also explains why individuals could have an incentive to set up a SN. In the third chapter SN are considered as institutions in the sense of New Institutional Economics. As institutions, SN compete with alternative institutions for the allocation and distribution of resources. Since all institutions are related to specific transaction costs, different costs emerge if different institutions are used as allocation mechanisms. For the analysis the focus is on the transaction cost theory. In the fourth section the empirical results of network theory as found in experimental economics are discussed. The fifth section concludes.

2. Neoclassical Economics

Traditional theory implies the assumption of perfect markets and rational individuals. These assumptions help to identify efficient allocation of resources. In a model with a demand and a supply function a market clearing price and the related quantity in equilibrium are determined. Any distortions from this equilibrium lead to inefficient situations. Under the assumption of a perfectly competitive market, however, distortions do not occur. The rational individual is an optimizing agent with perfect foresight, for simplicity we may think of an egoist who maximizes material utility and is perfectly informed. As a starting point, this model can help us to illustrate negative effects of networks.

However, few economists restrict their thoughts to the perfectly competitive model. Instead, it is reasonable to assume that market distortions are possible. For example, we may think of an oligopoly which constitutes a collusion of suppliers. Then market outcomes are inefficient as compared to the outcome in a model of perfect competition. Information asymmetries and information costs [25][26][27] are another reason for the emergence of inefficiencies and can account for a market failure. If it is assumed that asymmetries occur, then they will have an effect on rational individuals' optimizing behavior. Furthermore, rational individuals have an

interest in creating and maintaining information asymmetries because these asymmetries facilitate higher gains (e.g., quasi-rents) than on a perfectly competitive market (cf. [28]). SN are related to information asymmetries. Since SN are exclusive, members of SN have different information from that of non-members. Rational individuals have an interest to replace or supplement the market as an allocation system through a SN because members are thus able to obtain individual gains. One of the consequences is that inefficiency occurs. If a SN is in place, non-members are worse off and the situation is Pareto inferior to the market situation. For instance, if a trade union organizes its members successfully, this SN may induce a wage rate above a market clearing wage with a possible consequence of an increasing unemployment rate in the industry. The situation with the SN in place may also be inferior according to the Kaldor-Hicks criterion, i.e. if the aggregated wage gains of union members are insufficient to compensate the aggregate wage losses of those becoming unemployed. In this case a negative effect occurs for the society at large.

Nonetheless, it is not ignored that in specific contexts setting up a SN may constitute a Pareto improvement. If a market does not exist and cannot be implemented (e.g., due to problems of adverse selection), then, despite the fact that demand and supply are positive, the equilibrium price and quantity in equilibrium are both zero. In this case the society is better off if exchange is initiated by a SN. This exchange is inefficient and discriminatory when compared with the equilibrium on a perfectly competitive market. It is, however, a Pareto improvement compared to a situation with zero exchange (cf. [29][30][31]).

To sum up this section, the argument is that the neo-classical model of perfect competition with its underlying assumptions cannot explain the existence of or the necessity for SN. Nevertheless, the concept of optimizing individuals is central for the explanation of SN. More minimalist assumptions such as information asymmetries make it possible to explain why SN come into existence and why SN can be stable. Firstly, they come into existence because they offer a way to diminish information asymmetries among members, e.g. reputation mechanisms [32]. Secondly, some individuals are better off if they are in the SN because they are able to extract quasi-rents when barriers to entry exist. A shift away from a SN—coming closer to the model of perfect competition—would induce losses for network members. Thus, once a SN is in place, it could be costly to implement a market (cf. [33]). Thirdly, the model of perfect competition provides us with a reference point of an ideal case. With this reference point inefficiencies induced by SN can be identified. In the next section SN are related to New Institutional Economics which operates with a different set of assumptions.

3. New Institutional Economics

New Institutional Economics takes into account the existence not only of information asymmetries, but also of bounded rationality, path dependence, and institutions, preserving the assumption of optimizing (or at least satisfying, cf. [34]) individuals. Institutions are norms and behavioral rules, decision making systems, organizations [35] or their combinations. In this sense a SN is an institution. Institutions can emerge spontaneously [36] or are created by individuals [37] who, for instance, set the rules of entry or rules for communication (e.g., as “market-makers” [38]). This applies also for a SN. For analytical purposes it is helpful to employ the concept of transaction costs³ from New Institutional Economics’, i.e. the costs of implementing and running an institution [39][40].

In this paper a distinction is made between the comparison of individual institutions on the one side and different structures of the same institution, on the other. The analysis starts with the comparison between individual institutions that serve the same aim. Transaction costs of these institutions can be contrasted—all other factors kept equal. A case in point is institutions that facilitate exchange such as markets, networks, or hierarchies. If transaction costs of markets are comparatively high but if a switch to an alternative institution with lower transaction cost is possible, then the situation is Pareto inefficient. Coase [41] explains the existence of the firm (as an institution) through lower transaction costs: specific processes bear lower transaction costs if a firm is used instead of market exchange. Another example is the institution of law. If law enforcement is not feasible due to high transaction costs, an alternative institution such as a SN can facilitate contract enforcement in specific environments at comparatively lower costs [42]. Closely related are problems of asymmetric information on markets, which may lead to adverse selection or moral hazard. The risks of falling victim to problems of information asymmetries can be reduced by SN [43][44]. These examples indicate that different institutions lead to a different size (but also a different kind) of transaction costs.

In the SN transaction costs of exchange are often reduced by eliminating anonymity. Instead of anonymous relations, relational contracts among network members emerge. Relational contracts regulate repeated interaction and individuals are not anymore anonymous (as in traditional theory) but have an identity (cf. [45][46]). Reputation is created through repeated interaction of SN members. Shared network identity makes the occurrence of a contract violation less probable to occur because a violator’s actions can be retaliated [42][1][47]. Consequently, a SN reduces insecurity over decisions of others because a SN limits the set of behavioral choices. In

this sense setting up and participation in a SN is an optimizing behavior under the assumption of bounded rationality (cf. [48]).

Next, negative effects are examined. A differentiation between effects for non-members and for members of SN is made. Since SN are exclusive, non-members cannot influence processes within the network but are affected by the decisions of network members. A case in point is a reallocation of given resources in such a way that network members receive more and non-members less of these resources. Political processes in which successful lobbying or rent-seeking of a SN leads to a reallocation of resources is an example at hand (cf. additionally [50]). Cartels and collusions on product markets provide further examples (cf. additionally [51]). Consequences of a reallocation can be an increase in inequality (e.g., in income or educational opportunities). Another effect can be that SNs are a cause for unexploited gains from trade (cf. [47]) because the number of trade partners is limited to SN members with the consequence that a deadweight loss occurs⁴.

Apart from that, members can also be exposed to negative effects. Business networks that are based on common religious background of its members [52] are an illustration. While the SN itself is beneficial for some members it is not necessarily beneficial for all members. Particularly if an exit barrier does not allow members to leave a SN, those members who would be better-off without the SN have to stay as members. For instance, business environments exist where a business loan can only be received by network members. Such a situation may be beneficial for some but not for all individuals in the SN (see [53]). In such cases a limitation of the exchange partners to SN members causes a negative effect. Another case of networks with negative effects on members is the creation of knowledge in science discussed by Jackson and Wolinsky [54]. The authors provide a model in which a researcher is working on projects with different co-authors. Links connect the researcher and her co-authors. If the researcher decides to build up additional links with new co-authors, her decision has a negative effect on the productivity of her already existing network. The model leads to the result that all previous co-authors are worse-off if the researcher decides to extend her network. The model hints at a set of specific problems: optimal network size and optimal network form.

Finally, the question about the negative effects of SN in the long run is posed. From a game theoretic perspective an institution constitutes a Nash equilibrium [55], so does a SN. Since Nash equilibria can be inefficient, a SN can constitute such an inefficient equilibrium. Such an inefficient

³ For the implementation of the concept see [41] and [49].

⁴ For an evaluation of the net effects of SN the Kaldor-Hicks criterion could be applied.

equilibrium can be observed if some members of the SN are worse-off compared to a situation without the SN, yet these members cannot exit the SN. In this case the SN is harmful because negative effects are not temporary but persistent over time. The concept of path dependence can explain the emergence of permanently inefficient SNs (cf. additionally [33]). Even when individuals are aware of negative SN effects, they cannot individually develop the institution to the better and collective action may be too costly to organize [50]. Consequently, inefficiency perpetuates.

Since SN are causes for positive and negative effects on its members and on non-members, the question of net effects of SN is important. One option for measuring these effects is provided through economic experiments. In the next section the potential of the experimental approach is outlined.

4. Experimental Economics

The literature provides a large number of case studies of SN, e.g. in the journal of Social Networks and in journals related to industrial organization. A recent economic survey of empirical studies on networks is provided by [15]. This section briefly refers to such empirical studies conducted by using economic experiments⁵. Economic experiments permit collecting data in a controlled environment and the method is incentive-compatible, i.e. provides incentives for participants to exhibit their preferences. Another advantage of economic experiments is that they enable us to derive generalizations which go beyond specific case studies.

Kosfeld [56] provides a survey of economic experiments related to networks. He distinguishes between four types of experiments on networks: coordination networks, cooperation networks, buyer-seller networks, and network formation. None of the mentioned experiments in Kosfeld's survey explicitly investigates negative network effects. The empirical findings of the summarized experiments are partly in line with the predictions derived from economic theories, the results are partly inconclusive. In the next paragraph Kosfeld's results are summed up.

First, experiments on networks in coordination games find out—by and large—that players converge to an efficient Nash equilibrium. Second, the results from experiments on cooperation in networks are inconclusive and are not always in line with theoretical predictions. Kosfeld's explanation of the results in these experiments is that learning from other players does not occur. Third, buyer-seller network experiments mainly center on specific simulated markets. Cassar et al. [61] have recently

addressed the problem of non-enforceable contracts in trade. In their experiments they find out that the implementation of networks leads to increased efficiency. This finding supports the previously mentioned institutional theory that networks as institutions can lead to higher efficiency if market imperfections exist. Fourth, most network formation experiments are directly or indirectly related either to the theoretical work of Jackson and Wolinsky [54] who introduced the concept of pairwise stability of links in networks, i.e. a bilateral agreement to establish a link between actors is necessary, or Bala and Goyal [62] who use unilateral link formation. Receiving non-rival information is the main advantage for individuals to connect with other individuals in these network models. Furthermore, the models consider the costs of being connected. The models tackle the questions of optimal network form and network size. Experimental studies investigate whether the predicted Nash equilibria with respect to network form and size are played. The experimental results demonstrate that several aspects seem to have an influence on what is actually played. Risk and fairness perception are among these aspects. Mantovani et al. [63] have recently shown that agents in a network experiment behave 'farsighted' (regarding future) with respect to the stability of a network.

To sum up, at present the experimental studies on networks focus primarily on whether or not a theoretically predicted Nash equilibrium is played and on the factors that lead to the emergence of a Nash equilibrium. None of the experiments focuses explicitly on network externalities, such as negative effects.

5. Conclusions

Furubotn and Richter [64] state that a thorough analysis of collective action in cases of organized group interests is still missing in economic research (but see [65]). Collective action is one of the strains of economic research that provides the appropriate analytical tools for revealing negative network effects. The very existence of SN is closely related to the aim of extracting rents [66][50]. According to Olson's [67][50] theory, the smaller the size of a group is, the more effective the organization of collective action among its members is, and hence the achievement of its goals. Thus exclusion from resources through non-membership in organized groups is a main feature of SN. Surprisingly, promoting SN has been adopted by international and national organizations as a standard policy tool. For instance, the European Union or national governments promote the emergence of scientific networks, of business clusters and other SN. The aim of such policies is to generate positive effects for members and non-members of the SN alike. However, negative effects caused by these SN are largely ignored (cf. [68] for SN in science). Taking these negative effects into consideration, a SN is not a cure for a problem but rather the cause of a disease.

⁵ Economic experiments have become a standard methodology in investigating decisions. For overviews on the method and on the main researched topics compare [57][58][59][60].

Indeed it prevents a society from finding more efficient institutional arrangements to solve social issues. Once a SN is installed, it is difficult to replace it even if it is inefficient and even if its inefficiency is observable and known. Self-enforcing mechanisms of SN can lead to an increase of transaction costs and are able to hamper economic growth and social change, a process which Olson illustrated in a historical example as 'institutional sclerosis'. The conclusion is that the rather one-sided view—as often employed in social sciences and in policy—that SN exercise positive effects, is to be replaced by a more rigorous analysis which incorporates negative effects as well.

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Rights to Fish and Rights to Manage: A Note on the Portuguese Fisheries Case

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Abstract - Rights Based Management schemes have already been experimented in some specific fisheries and localizations. These experiences have a lot of teaching results about good practices of sustainable management but, also, about the limitations and risks of these tools.

The aim of this paper is to evaluate the Portuguese experience with RBM. Our analysis highlights the participatory approach that is developed in the case of sardine fisheries, a proposal of management regime that is very interesting in the sense that it is not possible to talk strictly of rights to fish but, better, in “rights to manage”.

Keywords: Rights Based Management, Fisheries, Portugal

1. Introduction

One of the most relevant issues in the discussion of Common Fisheries Policy Reform is the subject of Rights Based Management and the feasibility of its introduction in the conservation and management regime of European fisheries, after 2012 (see, in the last number of this review, Coelho, Filipe & Ferreira, 2011).

All fisheries management systems in the world introduced, in the last two decades, some form of use rights to face the problems derived from the “common property” nature of fisheries. The idea of creating markets for fishing rights as a means of internalizing the externalities received considerable attention by the researchers in Fisheries Economics. Recently, a growing number of scientists and decision makers in this area went on supporting the role of this kind of tools in the design of Fisheries Policy.

The basic “format” is to create a market of individual transferable quotas (ITQs) and confide in the self-regulation of such a system to conduct the fisheries to the economic efficiency and to promote inter-temporal sustainable use of resources. But there are other interesting possibilities of making fisheries management with schemes that have a rights based proposal in its core fundamentals.

In general, first it is needed to determine the TAC (total authorized capture) that guaranties the sustainable use of the fish stock and divide this total amount in several unit quotas that are distributed between the fishing enterprises. Then, a market for quotas can also be created. The objective is that, because they are the

“real owners”, fishermen enterprises will internalize the effects of externalities. In the long run, the property rights will be driven to the most efficient agents, those that can allocate the resources in a perspective of optimal sustainable use along the time.

Rights Based Management schemes have already been experienced in some specific fisheries and localizations. These experiences have a lot of teaching results about good practices of sustainable fisheries management and also about the limitations and risks of these tools. But these methods are always studied in a perspective that highlights the “privatization” character associated with this solution. Of course, this is not unexpected. But, even in this kind of rights privatization, there is the expectation that the results of cooperation among enterprises could perform better solutions in resource use, especially when realizing that there is the facing of a “common”, renewable, mobile resource.

2. RBM in Portuguese Fisheries

“Fisheries” is an important sector in Portugal: almost 1% of gross value added. Seafood consumption per capita is one of the highest in Europe.

In the context of Fisheries Policy, the use of Rights Based Management (RBM) schemes in the Portuguese fisheries is still recent. The analysis of this experience is a “work in progress”. An interesting study carried out for the European Commission by a Consortium of Fisheries Research Centers¹ achieved relevant conclusions summarized below.

Currently, Portugal uses three types of RBM systems to manage its fisheries.

In general terms, drivers to the implementation of RBM systems in Portuguese fisheries have been conditioned by resource sustainability and fleet and community balanced equilibrium, at least in the short term.

Table 1: Portuguese Fisheries - RBM Systems

<ul style="list-style-type: none"> ▪ An ITQ system to manage the demersal fishery in waters of the NAFO (North Atlantic Fisheries Commission), Svalbard, and NEAFC (North East Atlantic Fisheries Convention) and Norway. These are mixed fisheries developed by trawlers that harvest demersal stocks as cod, and other species as shrimp, mackerel, blue whiting, herring, red fish, tusk, Greenland halibut, horse mackerel, etc.
<ul style="list-style-type: none"> ▪ Another ITQ system utilized in the swordfish fishery in the areas of jurisdiction of ICCAT (International Commission for the Conservation of Atlantic Tunas); It is applied to long-liners fishing to the north of 5° N parallel.
<ul style="list-style-type: none"> ▪ A Community quota approach applied to POs (Producer Organizations) comprising coastal boats fishing sardine. This is an approach in which POs receive a ceiling of catches by the national authorities but have the autonomy to impose restrictions on the vessels number of fishing days and catches.

3. ITQ Systems

In the first experiences of RBM, those that relates to ITQs systems, the main instrument used to manage fishing effort is an annual license to fish. The authorities grant licenses and permits on the basis of several criteria and requirements: status of the stock, operating areas, previous year's catch, gear selectivity, amount of fishing gear per vessel, vessel's characteristics and condition. Cases of repeated failure to comply with the rules may be cause for retirement.

3.1. Demersal Fisheries

In 1992, individual quotas per vessel were allocated for the first time. The objective was to regulate the distant water fishing, especially in the NAFO areas. These use-rights per vessel are transferable but subject to prior authorization. The bundle of property rights considers 13 trawlers fishing in these waters.

The fundamental problem to face is the difficult situation of some straddling stocks (as cod) that were the most focused species of this activity. Long distance fisheries always had a special tradition in Portuguese fisheries and presented perhaps the most efficient segment in the sector (at least, the best in terms of fleet modernization).

Quotas are established annually and depend on the level of the TAC. The surpassing of a given vessel's quota implies the reduction of its next year's share by the amount exceeded. Initial allocation of rights was undertaken on historical catch records.

Transfer of rights is allowed between boats in the initial census. Transfer between Portuguese boats and other Member States boats are allowed but only after permission from the Portuguese administration authorities.

There is a limit on participation, which is restricted to boats in the group of vessels established by Government Decision. New entrants can only enter the fishery when buying a vessel from the fleet. No new vessels and no new licenses are allowed. However, a new boat may replace an old one.

3.2. Swordfish Fisheries

Portugal also applies an ITQ system in the swordfish fishery that is based on a TAC recommended by ICCAT.

There are 61 vessels that participate in this swordfish fishery.

The Regulament 1221-A/97 established the census of long-liners with rights to fish in ICCAT waters to the north of 5° N. The census, established in 1997, comprises 52 vessels with fishing rights. Up to 9 long-liners of the census could be able to fish to the south of the parallel of 5° N but have to obtain a permit from the authorities and demonstrate navigation and security conditions. These fishing rights can be withdrawn or modified by national or Community decision.

Vessels that fish in the northern zone may fish in the southern zone but are allowed to catch swordfish only as an accessory catch and cannot surpass the 5% of the total catches per vessel.

The initial allocation of rights was done through historical catch records.

Transfer of rights is allowed only between boats in the long-line fleet. Limits on participation are restricted to boats in the original census. Transfer of right is allowed but it has to be communicated to the concerned authorities. As in the previous case, new entrants can only access to the fishing rights by buying a vessel from the fleet. No new vessels, and thus no new licenses, are allowed, but a new boat may replace an old one.

Note that no other Member States have access to the fishing rights distributed by Portugal under this RBM system.

The evaluation that can be made about the performance and risks of this management schemes leads to some significant conclusions, even if the research takes only at an "exploratory" level.

The first element to highlight is that there is no reference to concentration of fishing rights and the legislation does not make any special provision to avoid it. This is very interesting because it relates the most usual and important limitation that is appointed to this type of regulation methods: the possible concentration of property. In fact, a strong market power in a few hands of enterprises will lead to economic inefficiency.

Second, ITQs in demersal fisheries may have an impact on discards, but information is not yet available. It must be noted that separating the effects of discards from this approach could be difficult in a trawling fishery because by-catch is an issue closely related to

the trawling technology, especially in cases of mixed fisheries. Discarding of non-targeted species shall exist regardless of the rights based regime system.

In spite of this, everyone recognizes that the issue of individualization of quotas (allocation to individual fishermen) may exacerbate high grading and, in the absence of strong regulations to deter discarding, there may be an incentive for a certain level of discarding. But isolating and assessing the impact is a difficult issue to address.

4. “Rights to Manage” in Sardine fisheries

The third situation described in the table is very interesting in the sense that it is not correct to talk strictly of rights to fish but instead, better, in “rights to manage”.

Sardine is the main Portuguese species in terms of catch (36% of total landings).

The *participatory* approach that is applied to the case of sardine fishery involves 151 purse seiners.

In the past few years, this participatory approach to resource management has allowed national authorities and Producers Organizations to ensure the control and surveillance of the sardine fishery.

An important attention is given to the status of the stock and its capacity of recovery. Sardine is managed under an ‘Action Plan’ that aims at wider protection of juveniles and regulates harvesting and marketing. The measures adopted include restrictions on catches, catch handling and marketing. They also include annual restrictions on fishing effort and on the volume of landings by group of vessels in each PO.

The ‘Action Plan for Sardine’ takes technical restrictions that set up restrictions on the sardine fisheries. These regulations establish the limit of days to fish sardine - 180 days per boat. Portuguese authorities impose catch ceilings on POs based on scientific recommendations but can also grant rights to POs that are consequently empowered to impose restrictions (daily catch limits) to fishing boats.

POs receive a catch allocation from the Fisheries Administration and then divide it among its vessels. What is interesting is that the cooperation among POs (for example, in the Peniche area) has a significant role in the process of defining certain rules and fishing restrictions that may also surpass the proposed government measures, with the objective of better recovery of the stocks.

In the case of Peniche (Peniche is the Portuguese most important port of sardine landings), see Filipe, Ferreira & Coelho (2008) about the role of the two most important Producers Organizations – FENACOOPECAS & OPCENTRO

Rights are allocated to POs permanently. Vessels can be transferred from one PO to another but the catch ceiling set up for the PO receiving the new boat may not

be surpassed. This may lead to revision of the PO catch allocation.

Initially rights were allocated to POs by authorities on a historical harvest record basis. Newcomers are permitted to enter when buying a vessel. This is a coastal fishing activity. Therefore there is no access to nationals of other States member of EU.

In the case of sardine fisheries, the rights to manage can be seen as common pool rights for the members of the PO, thus concentration does not take place among the members.

There are some issues that relate the eventual capacity /necessity of protection of small- scale fisheries in the coastal areas. In fact, small purse seiners (< 50 GRT) also participate in the fisheries thus holding a right to access the resource. However, particular protective measures for small-scale are not found.

Effects on discards were not identified. As a fishery based on a small pelagic species, it is not expected to have acute discard problems. Moreover, the cooperation between the players in the game of such a participatory and community based approach may discourage discards and other undesirable behavior.

5. Conclusions

There is also a huge space for researching the impacts of a more extensive application of Rights Based Management to the European Fisheries.

The evaluation of Portuguese experience is interesting because it leads to the analysis of the impacts of different proposals of RBM schemes.

In particular, it seems very interesting (and deserving a more profound analysis) the case of sardine fisheries. The participatory approach to the proposed resource management is especially relevant because it introduces the possibility of “rights to manage” rather than rights to fish and puts another expectation on the issue of cooperation among partners.

With this approach it seems that a situation close to a “res communes” regime is being faced, in the sense of Bromley: the true “common property”, with a group of co-owners, perfectly defined, that manage the resource. The key words of such a proposal are “Co-Management”, Self-regulation and Cooperation.

In all the three cases summarized, there are important issues relating the social problems and the form they are faced in each of these approaches. The fundamental issue of rent distribution is not yet well documented and evaluated. But, of course, it is referred in all the interviews with the agents: fishermen, owners of the vessels, fishermen families, and coastal area authorities. It is an important area of future research.

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An Infinite Servers Nodes Network in the Study of a Pensions Fund

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Abstract: It is suggested a representation of a pensions fund through a stochastic network with two infinite servers nodes. This representation allows to deduce an equilibrium condition of the system with basis on the identity of the random rates, at which contributions arrive to the fund and pensions are paid by the fund, expected values.

Keywords - Pensions fund, stochastic network, tandem queues, Poisson process, Wald's equation

1. Introduction

Consider two nodes, service centres, A and B both with infinite servers. The traffic through arches a to e is as it is schematized in Figure 1.

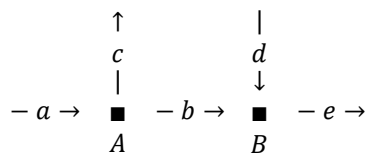


Figure 1. Traffic in the stochastic network

The users arrive to node A by arch a at rate λ_A . And the service time at this node is a positive random variable with distribution function (d.f.) G_A and finite mean α_A . After node A the users go to node B through b with probability p . Or just abandon the system through arch c with probability $1 - p$.

The users coming directly from outside through d at rate λ_B have also access to the service supplied at B , according to a positive random variable with d.f. G_B and finite mean α_B . The system is abandoned by these users through arch e .

In [1] this system is suggested as a representation of a pensions fund. So at node A arrive individuals that pay, during the service time, their contributions to the fund. The pensioners are at node B , which service represents their pensions payment by the fund. This representation reflects also the functions of the common social security funds and that is why it accepts the access of pensioners that have not

formerly participated, at node A , in the building of the fund.

The target of this study is, having this representation in mind, to obtain results about the transient behaviour of the system from the point of view of its equilibrium and autonomy.

2. The Fund Equilibrium

Let $N_A(t)$ and $N_B(t)$ be the random variables (r.v.) that represent the number of individuals by time t at nodes A and B , respectively. Consider also the sets of r.v., i.i.d.:

$$X_{A_1}(t), X_{A_2}(t), X_{A_3}(t), \dots, (X_{B_1}(t), X_{B_2}(t), X_{B_3}(t), \dots)$$

which designate the unitary contributions, pensions by time t , with mean $m_A(t)$ and $m_B(t)$ ¹.

The system is in equilibrium when the expected values of the rates at which the contributions are being received and the pensions are being payed by the fund are identical:

$$E \left[\sum_{i=1}^{N_A(t)} X_{A_i}(t) \right] = E \left[\sum_{j=1}^{N_B(t)} X_{B_j}(t) \right].$$

That is, by Wald's equation:

$$m_A(t)E[N_A(t)] = m_B(t)E[N_B(t)] \quad (1).$$

Eq. (1) just stays that at each instant the mean value of the unitary pension should be proportional to the mean value of the unitary contribution, with the ratio between the averages of the numbers of contributors and pensioners as proportionality factor. Being $t = 0$ the origin time, its solution corresponds, for $t > 0$, to the following pairs:

$$(m_A(t); m_B(t)) = \left(m_A(t); \frac{m_A(t)E[N_A(t)]}{E[N_B(t)]} \right),$$

where $m_A(t)$ is independent of the equilibrium.

¹ Under the term unitary contribution, pension, it is meant the amount of money that one individual pays, receives, by unit of time.

If the mean value of the unitary pension is initially 1, and grows continuously with an interest rate r ,

$$m_B(t) = e^{rt}$$

$$m_A(t) = e^{rt}(E[N_B(t)]/E[N_A(t)]).$$

It is elementary, after Eq. (1),

$$E[N_A(t)] < E[N_B(t)] \Rightarrow m_A(t) > m_B(t).$$

So, in equilibrium, the mean value of the unitary pension is smaller than the mean value of unitary contribution whenever the number of pensioners at B is bigger than the number of contributors at A .

3. The Case of Poisson Arrivals

If the arrivals from outside at nodes A and B are according to a Poisson process, with rates λ_A and λ_B , respectively, the system may be seen as a two nodes network where the first node is a $M/G/\infty$ queue and second a $M_t/G/\infty$ queue, see for instance [2]. So, $N_A(t)$ is Poisson distributed with parameter, see [3]

$$\lambda_A \int_0^t (1 - G_A(v)) dv.$$

The output of the first node is a nonhomogeneous Poisson process with intensity function $\lambda_A G_A(t)$ and, consequently, the global arrivals rate at node B is $p\lambda_A G_A(t) + \lambda_B$. Under this conditions $N_B(t)$ is Poisson distributed with parameter, see [4]:

$$\int_0^t (p\lambda_A G_A(v) + \lambda_B)(1 - G_B(t - v)) dv.$$

And Eq. (1) is written like this

$$m_A(t)\lambda_A \int_0^t (1 - G_A(v)) dv = m_B(t) \int_0^t (p\lambda_A G_A(v) + \lambda_B)(1 - G_B(t - v)) dv \quad (2).$$

When $t \rightarrow \infty$ the equilibrium conditions assumes the following form where $m_i = \lim_{t \rightarrow \infty} m_i(t)$, $i = A, B$:

$$m_A \lambda_A \alpha_A = m_B (\rho \lambda_A + \lambda_B) \alpha_B \quad (3).$$

If the service times at nodes A and B have d.f. concentrated in the intervals $[0, a]$ and $[0, b]$, $m_A \lambda_A \alpha_A = m_B (\rho \lambda_A + \lambda_B) \alpha_B$ for $t \geq a + b$.

4. Examples

In this section some concrete examples of service times distributions will be considered.

4.1 Uniformly Distributed Service Times

If the service times are uniformly distributed,

supposing that $\alpha_B < \alpha_A$, it is obtained for Eq. (2) in $0 \leq t < 2\alpha_A + 2\alpha_B$, not to repeat what has just been mentioned:

$$i) \quad m_A(t)\lambda_A \left(t - \frac{t^2}{4\alpha_A}\right) = m_B(t)\lambda_B \left(t - \frac{t^2}{4\alpha_B}\right) + m_B(t)p\lambda_A \left(\frac{t^2}{4\alpha_A} - \frac{t^3}{24\alpha_A\alpha_B}\right), \quad \text{if } 0 \leq \frac{t}{2} < \alpha_B$$

$$ii) \quad m_A(t)\lambda_A \left(t - \frac{t^2}{4\alpha_A}\right) = m_B(t)\lambda_B \alpha_B + m_B(t)p\lambda_A \left(-\frac{\alpha_B^2}{3\alpha_A} - \frac{t\alpha_B}{2\alpha_A}\right), \quad \alpha_B \leq \frac{t}{2} < \alpha_A$$

$$iii) \quad m_A(t)\lambda_A \alpha_A = m_B(t)\lambda_B \alpha_B + m_B(t)p\lambda_A \left(-\alpha_A - \frac{\alpha_A^2}{12\alpha_B} + t - \frac{(t-\alpha_A)^2}{4\alpha_B} + \frac{(t-2\alpha_B)^3}{24\alpha_A\alpha_B}\right), \quad \text{if } \alpha_A \leq \frac{t}{2} < \alpha_A + \alpha_B.$$

4.2 Exponentially Distributed Service Times

If the service times are exponentially distributed the equilibrium distribution is given by:

$$i) \quad m_A(t)\lambda_A \alpha_A \left(1 - e^{-\frac{t}{\alpha_A}}\right) = m_B(t)(p\lambda_A + \lambda_B)\alpha_B \left(1 - e^{-\frac{t}{\alpha_B}}\right) - m_B(t) \frac{\rho\lambda_A\alpha_A\alpha_B}{\alpha_A - \alpha_B} \left(e^{-\frac{t}{\alpha_A}} - e^{-\frac{t}{\alpha_B}}\right), \quad \text{if } \alpha_A \neq \alpha_B$$

$$ii) \quad m_A(t)\lambda_A \alpha_A \left(1 - e^{-\frac{t}{\alpha_A}}\right) = m_B(t) (p\lambda_A + \lambda_B)\alpha_A \left(1 - e^{-\frac{t}{\alpha_A}}\right) - m_B(t)p\lambda_A t e^{-\frac{t}{\alpha_A}}, \quad \text{if } \alpha_A = \alpha_B$$

4.3 Service Times with a Particular Distribution Function

Solving Eq. (2) in the way presented above becomes quite difficult with other standard distributions for the service times. So now it will be considered a collection of d.f.'s, see [5] and [6], for the service times given by

$$G_i(v) = 1 - \frac{(1 - e^{-\rho_i})(\gamma_i + \beta_i)}{\gamma_i e^{-\rho_i}(e^{(\gamma_i + \beta_i)v} - 1) + \gamma_i}, \quad v \geq 0, \gamma_i >$$

$$0, \rho_i > 0, -\gamma_i \leq \beta_i \leq \frac{\gamma_i}{e^{-\rho_i} - 1}, i = A, B.$$

The mean distribution is $\alpha_i = \rho_i/\gamma_i$. In this case Eq. (2) becomes

$$\begin{aligned}
m_A(t) &= \frac{\lambda_A}{\gamma_A} \ln \frac{e^{(\gamma_A + \beta_A)t}}{e^{-\rho_A}(e^{(\gamma_A + \beta_A)t} - 1) + 1} \\
&= m_B(t) \frac{p\lambda_A + \lambda_B}{\gamma_B} \ln \frac{e^{(\gamma_B + \beta_B)t}}{e^{-\rho_B}(e^{(\gamma_B + \beta_B)t} - 1) + 1} \\
&\quad - m_B(t)p\lambda_A I(t)
\end{aligned}$$

where

$$\begin{aligned}
I(t) &= \int_0^t \frac{(1 - e^{-\rho_A})(\gamma_A + \beta_A)}{\gamma_A e^{-\rho_A}(e^{(\gamma_A + \beta_A)v} - 1) + \gamma_A} \times \\
&\quad \frac{(1 - e^{-\rho_B})(\gamma_B + \beta_B)}{\gamma_B e^{-\rho_B}(e^{(\gamma_B + \beta_B)(t-v)} - 1) + \gamma_B} dv.
\end{aligned}$$

$I(t)$ is non-negative and not bigger than

$$\frac{(\gamma_A + \beta_A)(\gamma_A + \beta_A)^t}{\gamma_A + \gamma_B}.$$

4.4 Approximations

The Eq. (2) solution seems to be significantly more complex in circumstances different from those that have been mentioned. For instance, if the service times follow a LogNormal, Gama or Weibull distributions. In some cases, only the numerical solution can eventually be stained.

For appropriate values of t , the following approximations concerning the equilibrium conditions are suggested:

$$\frac{m_B(t)}{m_A(t)} \cong \frac{\lambda_A \alpha_A}{(p\lambda_A + \lambda_B) \alpha_B} \quad (4);$$

$$\frac{m_B(t)}{m_A(t)} \cong \frac{\lambda_A}{\lambda_B} \quad (5).$$

Eq. (4) seems reasonable for values of t big enough and Eq. (5) is preferred for t close to zero. For details see [7].

5. Observations

- Some values of the parameters p and λ_B have a special influence in the system behaviour. One may consider the suppression of the arch b when $p = 0$, of the arch c when $p = 1$ or of the arch d for $\lambda_B = 0$. Under those circumstances the traffic in those arches can be neglected.

It may be admitted that the ratio $m_B(t)/m_A(t)$ remains constant. This corresponds to the assumption that all the users of the system face identical

conditions of effort and benefit, independently of the moment they join the system. Eq. (3) supplies a natural candidate for the value of that constant: $\lambda_A \alpha_A / (p\lambda_A + \lambda_B) \alpha_B$. In such situation Eq. (2) should include an "excess" functions $h(t)$:

$$\begin{aligned}
h(t) &= m_B(t) \frac{\lambda_A \alpha_A}{(p\lambda_A + \lambda_B) \alpha_B} \int_0^t (p\lambda_A G_A(v) + \\
&\quad \lambda_B)(1 - G_B(t - v)) dv - m_A(t) \lambda_A \int_0^t (1 - \\
&\quad G_A(v)) dv.
\end{aligned}$$

The function $h(t)$ is also interpreted in the sense of the expected value of a random variable depending on t . This approach can be generalized in a natural way to some other predefined function $m_B(t)/m_A(t)$.

- Assuming that the system is initially empty appears to be a strong restriction of the analysis performed. When someone meets the system already in operation and does not know when it did start, the results that have been mentioned seem to have a lesser utility. In such case, there re-evaluation or finding a estimation procedure for the initial time are determinant for practical purposes .

Acknowledgments

The authors would like to thank to Professor João Figueira in particular his permission to use the results of [7] and [8].

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