

**An Application of Boolean Methods of Qualitative Comparison to the Turkish Study:
Implications for Porter's Diamond**

1.2 Clustering and Industrial Development (Competitive)

Asst.Prof.Dr. Özlem Öz

Department of Business Administration

Middle East Technical University, 06531, Ankara, Turkey

Tel: +90-312-210 3061 Fax: +90-312-210 1243 E-mail: oz@ba.metu.edu.tr

Abstract

Porter's (1990) diamond framework, which is based on detailed case study analyses of over one hundred industries from ten nations, provides a coherent explanation concerning the role of a nation in influencing the international competitiveness of an industry. According to Porter, there are four major determinants of international competitiveness, which are defined in the diamond framework: 'factor conditions', 'demand conditions', 'related and supporting industries' and 'context for firm strategy and rivalry'. The interactions amongst these four determinants form the basis of a system, making the resulting advantage sustainable. Porter particularly emphasises the phenomenon of clustering, which is associated with the inter-plays amongst the internationally competitive related and supporting industries in a nation. A well-functioning cluster facilitates the process of innovation, especially in a geographically proximate environment. Such an environment also encourages new business formation, a process that creates the necessary pressure on existing firms to upgrade their advantage. Furthermore, firms in these clusters can share activities and thus enjoy externalities. Because of all these factors, nations are likely to be competitive in groups of linked industries.

The diamond framework has attracted outstanding attention in the academic literature and has been applied to more than 40 countries and regions either by project teams headed by Porter himself or other scholars. Predictably, these applications have generated interesting results, some of which are supportive of the framework, while others are not. The results of an earlier study by the author of this paper, for instance, suggest some major areas in the framework (especially domestic rivalry and the role of government) where one or more of the Turkish case studies contradict Porter's relevant hypotheses (Öz, 1999). A problem, which still remains though, is whether those results are particular or whether they point to more general sources of competitive advantage, leading us to a discussion of generalisability in case study research. The present article tackles this issue by using a technique developed by Ragin (1987) for comparing the material derived from case studies, which is based on the principles of Boolean algebra. By using Ragin's method, it is possible to compare the results of a study with the theoretical propositions as well as the results of the earlier studies conducted within the framework of the same theory. In this paper, Ragin's method is applied to the Turkish results, which are then both compared with the theoretical propositions outlined in the diamond and the results of an earlier study in the framework of Porter – namely, the Canadian study (Porter and The Monitor Company, 1991), which is the only earlier application providing a detailed table regarding the key results, making it possible to apply the technique. Interestingly, the paper concludes that the Turkish study is, in fact, more supportive of the diamond framework than the Canadian study. One specific finding, which reinforces Porter's aforementioned strong argument is that uncompetitive industries are unlikely to have well-developed clusters. Overall, Ragin's method is shown to be useful in making explicit and robust deductions regarding the logical implications of qualitative research findings.

Keywords: Diamond Framework; Clusters; Competitiveness; Logic; Turkey; Canada

AN APPLICATION OF BOOLEAN METHODS OF QUALITATIVE COMPARISON TO THE TURKISH STUDY: IMPLICATIONS FOR PORTER'S DIAMOND

Porter (1990) argues that there is a need for a new paradigm in order to understand in full why a nation succeeds in particular industries but not in others. In order to derive this new analytical framework, which he calls the 'diamond', he conducts a study of ten nations. The nations studied are mostly developed countries: Denmark, Germany, Italy, Japan, Sweden, Switzerland, United Kingdom and the United States, with the exception of South Korea and Singapore, which are accepted as newly industrialised countries. In light of information from over one-hundred case studies selected from these countries, Porter finds that four attributes of the home country environment –namely: 'factor conditions', 'demand conditions', 'related and supporting industries', and 'context for firm strategy and rivalry'- play a major role in shaping the context that allows domestic firms to gain and sustain competitive advantage. He also includes the roles played by the 'government' and 'chance' as factors influencing the functioning of these four major determinants.

Porter's (1990) diamond, however, needs further investigation, especially in application to developing countries, since he has constructed the framework mainly from the case studies of the industries in the selected developed nations. A study of Turkey, a middle income developing country, which has recently opened up its economy to the international market, presents a good opportunity to contribute towards the achievement of this undertaking. Inspired by these facts, I have applied the framework to Turkey and conducted detailed case study analyses of five Turkish industries (Öz, 1999). A summary of the major results of this study is provided in the following pages.

When comparing the results of the Turkish case study analyses with the theoretical propositions as well as the results of other replications, however, one unavoidably faces the problem of generalisability in case study research. The present article tackles this issue by using a technique developed by Ragin (1987) for comparing the material derived from case studies, which is based on the principles of Boolean algebra. By using Ragin's method, it is possible to compare the results of a study with the theoretical propositions as well as the results of the earlier studies conducted in the framework of the same theory. In this paper, Ragin's method is applied to the Turkish results, which are then both compared with the theoretical propositions outlined in the diamond and the results of an earlier study in the framework of Porter – namely, the Canadian study (Porter and The Monitor Company, 1991), which is the only earlier application providing a detailed table regarding the key results, making it possible to apply the technique. The structure of the paper is as follows. First, Porter's diamond and the key findings of the Turkish study are summarised. Then, the major issues that might emerge when using the case-oriented approach, and a summary of Ragin's method are presented. The next section provides an application of Ragin's method to the Turkish results, which are compared to the theoretical propositions in the diamond as well as the results of an earlier study (the Canadian study) conducted in the same framework. The paper ends with a discussion of the major conclusions.

THE DIAMOND FRAMEWORK

For a better understanding of the diamond framework, it is necessary to summarise how Porter explains each determinant. For the first determinant, that is, factor conditions, Porter (1990) makes two distinctions. Accordingly, factors of production are first grouped into two: basic and advanced factors. His second distinction is built on 'specificity', resulting again in two

groups: general and specific factors. Porter believes that basic and generalised factors are either inherited or easy to create, and the advantage stemming from them is not that difficult to replicate, hence not sustainable. Advanced and specialised factors, on the other hand, are viewed as being a more decisive and sustainable basis for competitive advantage. Regarding demand conditions, Porter thinks that home demand has a considerable influence on competitive advantage, and he presents the composition, the size and pattern of growth, and the internationalisation of home demand as three broad attributes of it. Porter gives particular emphasis on the existence and nature of the clustering activity, which is associated with the inter-plays amongst the internationally competitive related and supporting industries in a nation. A well-functioning cluster, according to Porter, facilitates the process of innovation, especially in a geographically proximate environment. Such an environment also encourages new business formation, a process that creates the necessary pressure on existing firms to upgrade their advantage. Furthermore, firms in these clusters can share activities and thus enjoy externalities. Because of all these factors, nations are likely to be competitive in groups of linked industries. Porter defines the fourth broad determinant as including the strategies and structures of firms as well as the nature of domestic rivalry. The existence of intense domestic rivalry in particular is of special importance since it encourages firms to upgrade. Chance events are by definition beyond the control of firms but may create forces that reshape the industry structure, allowing shifts in competitive position. Finally, Porter sees the role of government in the competitive development of an industry as an important but indirect one, mainly through influencing the four major determinants of competitive advantage.

According to Porter (1990), the complete framework, which he calls the 'diamond' (see Figure 1), is a dynamic system in which all elements interact and reinforce each other. It is, in fact, this systemic nature that makes it difficult to replicate the exact structure of the industry

in another context, creating therefore an environment conducive for developing a sustainable advantage.

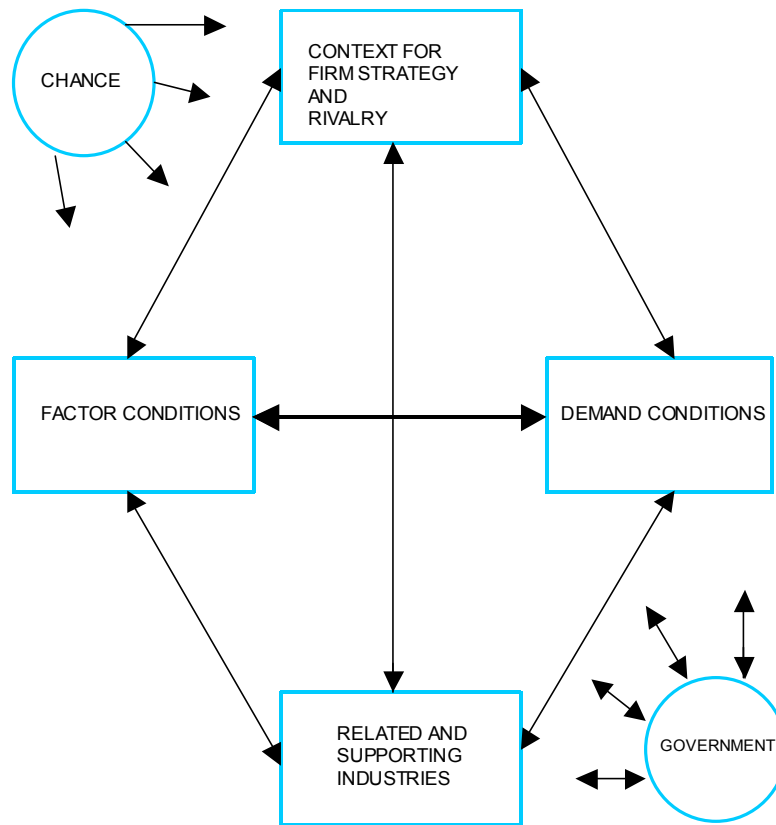


Figure 1 The Diamond Framework

Source: Porter, *The Competitive Advantage of Nations*, 1990, p. 127 (revised in Porter, 1998)

Porter's diamond framework presented in his book *The Competitive Advantage of Nations* (1990) has attracted considerable attention. In addition to the ten nations included in the original work, others, including Canada, have also been studied by the project teams headed by Porter himself, and other researchers have applied the framework to several other countries such as Austria, Ireland, and Turkey.

To provide a complete review of criticisms of Porter's diamond framework is not the aim in this paper (see Öz, 1999 for a detailed review). However, amongst the important criticisms,

we can include the following. Rugman and D'Cruz (1993) and Rugman and Verbeke (1993) argue that double and/or multiple-linked diamonds may reflect the sources of competitive advantage better than Porter's single diamond framework. Some scholars (e.g. Stopford and Strange, 1991) criticise Porter's lack of formal analytic modelling, while others (e.g. Bellak and Weiss, 1993; Dunning, 1992; Grant, 1991) challenge the originality of the framework. Porter is also criticised about his treatment of macroeconomic policy (e.g. Daly, 1993), the lack of clear definitions of determinants as well as of several key terms (Grant, 1991), and not paying enough attention to modern trade theory (Bellak and Weiss, 1993) as well as the role of national culture (Van den Bosch and Van Prooijen, 1992). The methodology Porter employed has also been the subject of much criticism (e.g. Bellak and Weiss, 1993). The heavy dependence on world export shares as a measure of international competitiveness (Cartwright, 1993; Grant, 1991; Rugman and D'Cruz, 1993), the inadequate treatment of the relatively less competitive industries (Harris and Watson, 1991; Yetton et al., 1992), and Porter's treatment of multinationals and foreign direct investment (Bellak and Weiss, 1993; Dunning, 1993; Hodgetts, 1993; Rugman and D'Cruz, 1993; Rugman and Verbeke, 1993; Rugman, 1991) are the major criticisms related to the methodology. The diamond framework itself has also been criticised. The intensity of criticisms, for instance, increases when the issue at hand is the importance Porter (1990) attributes to the relationship between domestic rivalry and international competitiveness (Smith, 1993). The indirect role Porter envisages for government, on the other hand, makes this diamond element one of the most criticised areas of his study (Harris and Watson, 1991; Stopford and Strange, 1991; Van den Bosch and de Man, 1994).

THE COMPETITIVE ADVANTAGE OF TURKEY (1)

Following Porter's methodology, the Turkish study first identifies the internationally competitive industries and clusters of the Turkish economy. The results reveal that Turkey not only increased its overall exports after the 1980 liberalisation (2) but also achieved a deepening in the existing clusters, although it failed to establish itself in other ones. Despite improvements, in other words, the Turkish economy continues to be dependent on relatively few clusters, the most noteworthy being textiles/apparel, food/beverages, materials/metals and housing/household. Another striking feature is the negligible presence in the machinery category of many clusters. Instead, Turkish advantage seems to be concentrated in the 'primary goods' category and to a lesser degree in specialty inputs. The results also show that Turkey's position is particularly weak in the semiconductors/computers, health care, office, and defence clusters.

According to Porter (1990), to explore the underlying reasons behind this competitive structure, we should turn to the 'diamond' and try to see how each determinant functions and interacts with the others in a particular sector by analysing its history. Accordingly, apart from the examination of secondary data, field interviews with company executives, government officials and industry association representatives have been conducted to perform this analysis, again following Porter's methodology. The industries chosen for the detailed case studies are the Turkish glass (competitive), construction (competitive, service industry), leather clothes (competitive, loss in position), automobile (uncompetitive) and flat steel (competitive, negative trade balance) industries. Table 1 summarises the finalised assessments

concerning the effects of the different parts of the diamond on the competitive advantage of all industries studied, as well as the key findings that do not comply with the framework.

TABLE 1 SOURCES OF INTERNATIONAL COMPETITIVENESS IN SELECTED TURKISH INDUSTRIES

DIAMOND ELEMENT → INDUSTRY ↓	FACTOR CONDITIONS	DEMAND CONDITIONS	RELATED & SUPPORTING INDUSTRIES	FIRM STRATEGY, STRUCTURE & RIVALRY	THE ROLE OF CHANCE	THE ROLE OF GOVERNMENT
GLASS INDUSTRY (competitive)	H	M	H	H *no domestic rivalry	L	H * more direct
CONSTRUCTION INDUSTRY (competitive)	H	M	M	H	H	L
LEATHER CLOTHES INDUSTRY (competitive, loss in position)	L * imports basic raw materials	M	H	H	H	L
AUTOMOBILE INDUSTRY (uncompetitive)	L	L	L	M * issue of foreign ownership	M	L * more direct
FLAT STEEL INDUSTRY (competitive, negative trade balance)	L * imports basic inputs	M	M	H *no domestic rivalry	L	M * more direct

Source : Öz, 1999

KEY: The effect of the diamond element on the competitive advantage of the industry has been assessed either as 'high' (H), 'medium' (M) or 'low' (L).

With regard to the factor conditions, the Turkish glass, construction and automobile industries confirm Porter's (1990) hypothesis. The former two competitive industries derive considerable advantages from basic and generalised factors like lower cost labour and raw materials. The uncompetitive automobile industry, on the other hand, cannot derive much

advantage from factor conditions except from lower cost labour. The weaknesses they all suffer concerning advanced and specific factor conditions like industry specific research and education institutions and infrastructure are also in line with Porter's findings, since he argues that many industries in a developing country are more likely to derive most of their advantages from the basic and generalised factors. The leather clothing and flat steel industries, however, require special consideration here since both have to import a considerable part of their inputs. Regarding the flat steel industry, the motive of the Turkish government was to establish an indigenous iron and steel industry as a way to achieve industrialisation, and not much attention was paid to the availability of the necessary factors and related infrastructure. In the leather clothes industry, on the other hand, although the cost advantage is now by no means guaranteed due to increasing wages and the necessity to import more than 50% of the raw leather, cheap raw leather and low cost labour were amongst the important factors in the early development of the industry. It is, in other words, possible to explain this situation within the diamond framework.

When we consider the second determinant, home demand conditions, we see that the results of the Turkish case studies largely confirm Porter's (1990) hypothesis. Turkey is a developing country with a large and rapidly growing population, meaning that many industries are far from being mature, or, at least, face a considerable potential increase in demand. Income levels are, however, still rather low, restricting this potential. Moreover, the fact that, overall, the industries studied do not derive substantial advantages from the demand conditions is also in line with what Porter envisages for a developing country.

One of the strongest hypotheses proposed by Porter (1990) is that the internationally competitive industries of a nation tend to cluster together. The Turkish glass and leather

clothing industries confirm this hypothesis. The case of the Turkish automobile industry is also supportive of this argument, since we have an uncompetitive industry surrounded by a cluster of other weak industries. In the cases of the construction and flat steel industries, the existence of some related and supporting industries that are not internationally competitive do not pose a challenge to the framework. Rather, this might stem from the restrictions imposed by the level of economic development attained in Turkey. In other words, it is probably unrealistic in a developing country setting to expect all industries that are related to one internationally competitive industry to be competitive as well.

With regard to the last determinant, which Porter calls as the ‘context for firm strategy and rivalry’, two major issues arise. The first one is that entrepreneurial and managerial skills are amongst the leading assets of the Turkish firms, for almost all industries studied. The second issue relates to the other element included in this category: the intense domestic rivalry in the internationally competitive industries of a nation, which is one of the strongest conclusions reached in Porter’s study. This is indeed the case for the Turkish construction and leather clothes industries. The easy life the uncompetitive Turkish automobile industry enjoyed until very recently is also in line with this argument. The Turkish glass and flat steel industries, however, pose a challenge to this hypothesis since we have two internationally competitive industries, where there is virtually no domestic rivalry.

Chance events have usually been favourable for the industries studied. The construction and leather clothes industries, in particular, have benefited from the emergence of geographically proximate new markets, especially the Russian Federation and the C.I.S..

Regarding the role of government, in the glass, automobile and flat steel industries, which are all capital-intensive, the role of the Turkish government has been rather direct. It could be argued that this is, in fact, in line with Porter's argument since he envisages a more direct role for government in developing countries. However, the role the Turkish government played, particularly in the glass and flat steel industries, was arguably even beyond that extended role. In Porter's view, a more direct role for government involves direct supports like subsidies and temporary protection. The Turkish government, however, did not only support or protect but it initiated the founding of a large-scale glass industry in Turkey. This was probably the right decision since the level of technological competency and capital accumulation in Turkey at the time (in the 1930s) did not allow the exploitation of the existing opportunity by the private sector alone. It is very interesting, in terms of Porter's ideas, that it actually turned out to be a success story.

The Turkish study should be, of course, considered along with the other national studies conducted in the framework of Porter (1990), the ten included in the original study as well as the following replications. Although, in the main, the results of the Turkish study are in line with Porter's findings, they also suggest major areas in the framework –especially domestic rivalry and the role of government–, where one or more of the Turkish cases contradict Porter's hypothesis. A problem, which still remains, then, is whether those results revealed by the Turkish case studies are particular or whether they point to more general sources of competitive advantage. This question, apart from calling for further research in the corresponding areas, leads us to a discussion of the issue of generalisability in case study research, which is the main focus of this article.

THE CASE-ORIENTED APPROACH

The virtues of qualitative research in general and case studies in particular are well understood. Apart from providing valuable insights, case studies provide richness of information not usually obtained through quantitative methods. Generalisability in case study research, however, constitutes a problem, which particularly manifests itself while comparing case studies. It is, of course, not possible to talk about generalisability of case studies in a statistical sense and to treat the number of cases examined as sample units. According to some (e.g. Yin, 1994), however, it is possible to make 'analytical generalisations' -as apposed to 'statistical generalisations'- deriving from the case study material. Then the number of cases studied becomes a choice similar to selecting the confidence level in a statistical study.

Although the task of comparing narratives has attracted considerable attention (for instance, see Abell, 1987 and 1992; Ragin and Zaret, 1983; Ragin, 1987), applications to management problems, which are much needed, have remained limited despite the wide spread use of case study research in the management field. Porter's (1990) influential study presented in *The Competitive Advantage of Nations* is, in fact, a very good candidate for such an application. As mentioned above, in light of information from over one-hundred case studies selected from ten countries, Porter has identified the key attributes of the home country environment seen as the major determinants of international competitive advantage. The key question is to clarify the logical deduction process hidden in this analysis. A systematic technique "for comparing 'what is essentially going on' in each of a number of cases" (Abell, 1992: 1), which should precede such analytic generalisations, would therefore be helpful in making this process explicit.

An interesting method addressing the problem of comparing case studies has been developed by Ragin (1987) (3). After introducing the basics of Ragin's method, and, thus, clarifying the fact that it is a perfect match for our need of comparing case studies that reveal combinations of conditions which result in competitive or uncompetitive outcomes, the following pages present the results of an application of the method to the Turkish study. As mentioned earlier, the Turkish results are then compared to the theoretical propositions of the diamond framework as well as the results derived from Porter's Canadian study (Porter and The Monitor Company, 1991). The fact that both the Turkish and Canadian studies present overall evaluation tables provides a unique opportunity to apply the approach developed by Ragin to compare the Turkish results with the results of an earlier study using the same framework.

RAGIN'S METHOD

According to Ragin (1987), comparison of case studies is not easily achieved with statistical methods based on linear algebra, whereas Boolean algebra provides a useful basis for qualitative comparison. The Boolean approach, known as the algebra of logic and as the algebra of sets, uses binary variables, '1' denoting presence and '0' denoting absence. As a convention, uppercase letters indicate the presence of a condition/outcome and lowercase letters indicate its absence.

Constructing a truth table is the first step in the use of Boolean algebra. Accordingly, the conditions as well as the combinations of these conditions associated with the presence and absence of the outcome variable need to be determined. Truth tables, then, will have as many rows as there are logically possible combinations of values on the causal variables. If, for instance, there are five binary independent variables, the truth table will have 2^5 , that is 32

rows. Here, it should be noted that the number of cases is not a major consideration for the Boolean approach. Cases having the same combination of values are all represented by a single row in the truth table. We are, in other words, rather interested in different combinations of values that exist as well as their output values rather than the actual number of instances of each combination. This is totally consistent with the previously mentioned approach of not considering the number of cases as sample units. Instead, we should be able to compare the differences amongst the combination of conditions and reach a conclusion regarding what these cases as a whole tell us. The Boolean approach, as a result, is both holistic and analytic.

In accordance with the previously mentioned rationale, for a given combination of binary independent variables, the dependent variable also takes the value of either 1 (indicating the presence of the outcome) or 0 (indicating the absence of the outcome). The essence of the method is to employ some fundamental laws of Boolean algebra in order to reduce this information to a simplified Boolean equation. This provides the finalised logical implications derived from a comparison of our case study results.

The fundamental rules of the method can be summarised as follows. In Boolean algebra, addition is equivalent to the logical operator OR, and multiplication indicates logical AND. These basic rules are used to reach the first primitive expressions representing the combinations of conditions associated with a certain outcome. To reduce such primitive expressions, the concept of Boolean minimisation is used, which requires that "if two Boolean expressions differ in only one causal condition yet produce the same outcome, then the causal condition that distinguishes the two expressions can be considered irrelevant and can be removed to create a simpler, combined expression" (Ragin, 1987: 93). Expressions produced

using this simple minimisation rule are called 'prime implicants'. To be able to determine which prime implicants are logically essential, a tool named 'primary implicant chart' is used in an attempt to "cover as many of the primitive Boolean expressions as possible with a logically minimal number of prime implicants" (Ragin, 1987: 97). The chart shows the coverage of original terms by prime implicants and thus makes it possible to include only the logically essential prime implicants in the final reduced Boolean expression.

To understand the combinations of conditions associated with the absence of an outcome De Morgan's Law is used. The Law is a short cut for minimising negative instances since it enables us to obtain the solution for negative outcomes deriving from positive outcomes. Finally, to map areas of agreement and disagreement between the theoretical expectations and the results of the empirical cases, the intersection of the two Boolean expressions representing these conditions needs to be considered.

The diamond elements described by Porter (1990) correspond to conditions necessary to form a truth table in Boolean analysis. The dependent variable is international competitiveness, which takes the value '1' if the given combination of variables has been assessed as providing international competitiveness, and '0' otherwise.

The notation followed throughout the article is:

A: Factor Conditions

B: Demand Conditions

C: Related and Supporting Industries

D: Context for Firm Strategy and Rivalry

E: Government

R, T, V, W : Outcome (Dependent) variables

REVISITING THE TURKISH RESULTS BY THE HELP OF RAGIN'S METHOD

This section presents an application of Ragin's (1987) method to the Turkish industries studied. The results of the Turkish study will first be contrasted with the theoretical propositions, and then with the results of the Canadian study. A simultaneous comparison of the Turkish and Canadian analyses with the theoretical propositions of the diamond framework will then follow.

The Turkish Study vs. the Theoretical Propositions

We can apply the Boolean approach by taking the determinants 'factor conditions' (A), 'demand conditions' (B), 'related and supporting industries' (C), 'context for firm strategy and rivalry' (D), and 'government' (E). Note that we are excluding 'chance' from the initial combination of conditions that are defined in the diamond framework. A justification for excluding 'chance' is that chance events are unpredictable and beyond the control of firms. Also, it is a necessity to exclude chance events for comparison purposes since the role attributed to them is not clear in most of the Canadian industries studied by Porter. When the 'low' (L) category in Table 1 is coded as '0', and 'high' (H) and 'medium' (M) categories as '1', the outcome equation (R) representing the commonality of the competitive conditions implied by the Turkish cases becomes:

$$R = BCD \quad \text{(Equation 1)}$$

According to this equation, the presence of demand conditions (B), related and supporting industries (C), and context for firm strategy and rivalry (D) all together is the commonality of the combinations whose outcome has been assessed as internationally competitive.

To specify the conditions that do *not* exist in the presence of international competitiveness, we apply De Morgan's law to equation 1:

$$r = b + c + d \quad (\text{Equation 2})$$

Verbal expression of this equation is that in the internationally competitive industries

- the absence of demand conditions (b), or
- the absence of related and supporting industries (c), or
- the absence of context for firm strategy and rivalry (d)

is *not* observed.

Given that Porter's (1990) main finding, which is the co-existence of all diamond elements in a competitive industry, can be expressed as

$$T = ABCDE, \quad (\text{Equation 3})$$

we can map areas of agreement and disagreement between the theoretical model and the results of analysis of the Turkish cases by examining the intersection of equations R and T, which gives T itself. Given that this intersection shows the subsets of combinations, which were both hypothesised and found, this result means that the theory is confirmed by the Turkish results.

The Turkish Study vs. the Canadian Study

In the Canadian study, Porter examines 25 industries in detail, and provides summary assessments of the effect of the different parts of the diamond upon the competitive advantage

of each industry studied in a table, which is reproduced in Table 2 (Porter and The Monitor Company, 1991).

Porter argues that many of the Canadian industries studied depend on basic factor conditions as the prime advantage, without having the ability to create the advanced and/or specific factors necessary for long term competitive success. Porter also concludes that few Canadian industries derive significant competitive advantage from related and supporting industries. Weaknesses in clustering activity, in fact, both reflect and contribute to the basic attributes of Canadian industry in that weak clusters and limited domestic rivalry in particular reinforce the cost orientation of Canadian firms. In the main, the patterns described above are interpreted as reflections of a distinctly Canadian economic system, which Porter calls ‘the old economic order’. The nature of this old economic order is such that all aspects are interrelated. Specifically, reliance on basic factors, which has been reinforced by firm strategies, government policies, home demand patterns, has led to limited domestic rivalry and factor creation mechanisms, and hindered the development of self-reinforcing clusters (Porter and The Monitor Company, 1991). Porter’s diagnosis of Canada’s economy as an ‘old economic order’ that urgently needs to be changed is generally not welcome by Canadian scholars (4). Criticisms especially concentrate on Porter’s scepticism about natural resource dependency in many Canadian industries and on Porter’s understanding of the role played by multinationals in the Canadian economy (5).

TABLE 2 SOURCES OF INTERNATIONAL COMPETITIVENESS IN SELECTED CANADIAN INDUSTRIES

DIAMOND ELEMENT → INDUSTRY ↓	FACTOR CONDITIONS	DEMAND CONDITIONS	RELATED & SUPPORTING INDUSTRIES	FIRM STRATEGY, STRUCTURE & RIVALRY	THE ROLE OF CHANCE	THE ROLE OF GOVERNMENT
NEWSPRINT	H	L	L	L	-	L
MARKET PULP	H	L	L	L	-	L
NICKEL	H	L	M	M	-	H
ALUMINUM	H	L	L	L	H	M
ATLANTIC GROUNDFISH	H	L	M	L	-	Negative
STYRENE	H	M	M	L	-	L
ELECTRICITY	H	M	H	M	-	H
BEEF PROCESSING (U)	M	M	L	L	-	M
MANUFACTURED HOUSING	H	M	L	L	-	M
AUTO PARTS	L	L	L	L	-	H
AUTO ASSEMBLY	L	L	L	L	-	H
PULP & PAPER EQUIPMENT	L	L	M	L	-	L
ICE SKATES	M	H	H	H	-	L
URBAN RAIL	M	M	M	L	M	M
FLIGHT SIMULATORS	M	L	L	M	-	L
INDUSTRIAL EXPLOSIVES	M	H	M	M	-	H
COMMUTER AIRCRAFT	M	M	M	L	M	M
CENTRAL OFFICE SWITCHES	H	H	M	H	M	M
GEOPHYSICAL CONTRACTING	H	M	H	H	-	H
CONSULTING ENGINEERING	M	H	L	H	-	H
WHISKY	M	L	L	M	H	Negative
LIFE INSURANCE	M	M	L	H	-	H
HUMAN BIOLOGICALS	M	L	L	L	M	M
WASTE MANAGEMENT	M	M	L	L	M	L
RADIATION	M	L	H	L	-	H

Source : Porter and The Monitor Company, 1991

KEY: H: High, M: Medium, L: Low, U: Uncompetitive

The last issue that should be noted here regarding the Canadian study is the fact that Canada is not amongst the ten countries studied by Porter in 1990, which led him to construct the diamond framework. In other words, when applying the framework to Canada, Porter's aim is not to understand the sources of competitive advantage theoretically, but rather to apply a previously constructed, already established framework to the Canadian context in an attempt to see the sources of advantage/disadvantage in the Canadian industries studied. The approach taken in this article, on the other hand, follows a different logic. Having concluded in the beginning of the paper that the diamond framework needs further investigation, the paper builds on the fact that there are some cases in Canada and Turkey that do not confirm Porter's hypotheses.

Before proceeding with the application of Ragin's method to the Canadian analysis, there are two more points to note: First, 'chance' has not been included in the following analysis since its role is not clear in most of the Canadian studies (see Table 2). Second, the category 'low' (L) in Table 2 has been coded as '0', and 'high' (H) and 'medium' (M) categories as '1'. The resulting outcome equation (W) representing the commonality of the competitive conditions implied by the Canadian cases is:

$$W = Abce + bcdE + bCde + ABC + ABE + ACE + Ad \quad (\text{Equation 4})$$

which can be further reduced to

$$W = Abce + bcdE + bCde + ABC + ABE + Ad \quad (\text{Equation 5})$$

with the help of a primary implicant chart (see Appendix). One interesting implication is that we have conditions that result in competitiveness although just one determinant is present. The presence of combinations where only government (E) or factor conditions (A) exist in competitive industries is the reason Porter considers Canada a factor-driven economy at the expense of being the subject of severe criticism by the Canadian scholars. Similarly, the

combinations where only related and supporting industries (C) exist mainly relate to intensive FDI in Canada. The conditions that require the simultaneous presence of several diamond elements in the Canadian cases (ABC and ABE), on the other hand, differ from the results obtained in Turkey (i.e. BCD) which attribute less importance to factor conditions.

To see the combinations of conditions associated with the absence of outcome (competitiveness) in the Canadian study, we apply De Morgan's Law to equation 5, which gives

$$w = aB + aD + aCE + ace + BcD + bCD + bDE + cDE \quad (\text{Equation 6})$$

This equation gives similar results to equation 9 of the following section, the verbal expression for which can be found in the Appendix. We can map areas of agreement and disagreement between the theoretical model and the results of the Canadian analysis by examining the intersection of T and W, which gives T itself. Given that this intersection shows the subsets of combinations that were both hypothesised and found, this means Canadian results confirm Porter's main hypothesis ($T = ABCDE$).

A Simultaneous Comparison of the Turkish and Canadian Analyses with the Theoretical Model

When we consider the results of the Turkish and Canadian analysis simultaneously, the outcome equation representing the combinations associated with the presence of international competitiveness becomes

$$V = Abce + bcdE + bCde + ABC + BCD + ABE + ACE + Ad \quad (\text{Equation 7})$$

Note that this overall equation includes the Turkish results (equation 1) and the Canadian results (equation 4). The primary implicants in equation 7 can be further reduced with the help of a primary implicant chart, which gives

$$V = Abce + bcdE + bCde + BCD + ABE + ACE + Ad \quad (\text{Equation 8})$$

To see the combinations of conditions associated with the absence of outcome (competitiveness), we apply De Morgan's Law to equation 8, which gives (see Appendix)

$$v = aBc + abD + acD + ace + bcDE + BcDe + bcDe \quad (\text{Equation 9})$$

To locate the areas of agreement between the combined results of the Turkish and Canadian studies, and Porter's (1990) hypothesis, according to which all the determinants should be present if international competitiveness is to result, we should take the intersection of T and V. This gives an equation, which equals T itself, meaning that the results confirm the theory.

Lastly, a simultaneous consideration of the Turkish and Canadian studies enables us to investigate the commonalities of the uncompetitive conditions. The most interesting finding that can be drawn from the resulting equation is that 'c' (the absence of related and supporting industries) is a necessary but not sufficient condition, meaning that uncompetitive industries lack well-developed clusters, which is a noteworthy result given Porter's emphasis on the phenomenon of clustering.

CONCLUSIONS

This article has discussed the results of the Turkish study and compared them with the theoretical propositions in the diamond as well as a previous application in the same framework, that is, the Canadian study. Ragin's method enabled us to conduct a robust and detailed analysis of what the Turkish cases as a whole tell us, especially when compared to the

theory and the results of another application. A summary of major conclusions derived from this undertaking follows.

The first and probably the most noteworthy implication of the analyses conducted in this paper is that the diamond framework can also work in the context of a developing country, since the Turkish study has been found to be supportive of the theoretical propositions. The Turkish analysis reveals that the Turkish cases, as a whole, suggest three of the diamond elements –namely: demand conditions, related and supporting industries, and context for firm strategy and rivalry- as necessary but not sufficient conditions for international competitiveness.

Another interesting conclusion, this time derived from a comparison of the Turkish study with the Canadian one, relates to the importance attributed to factor conditions in competitive Canadian industries, which is inconsistent with the results derived from the Turkish cases, offering competitive combinations that lack factor conditions. It has been stated previously that Porter does not find the over-reliance on basic factor conditions healthy, which has been heavily criticised by several scholars. Many critics (6) are of the opinion that the reliance on basic factor conditions in general, and natural resources in particular is not necessarily undesirable, and that it is nothing wrong with it if countries have such resources and can obtain a high standard of living by exploiting them. Porter, however, does not mean that cost advantage is not important. He, instead, argues that it is preferable if it stems from relatively favourable productivity rates. An advantage that is largely dependent on the pure availability of natural resources, according to him, is vulnerable and hence not sustainable. It follows that it is not so desirable if the competitive structure of an economy is overwhelmingly based on those industries (Öz, 1999).

Yet another important finding implied by the above analysis is that, unlike the Turkish industries, which require the presence of three of the diamond elements –namely: demand conditions, related and supporting industries, and context for firm strategy and rivalry- for international competitiveness to result, the presence of even one determinant is enough for some Canadian industries to be internationally competitive. The latter is clearly in sharp contrast to Porter’s systemic understanding of competitive advantage, which requires all elements of the diamond to be present and continuously interact with each other. In fact, Porter’s insistence on the systemic nature of competitive advantage is so strong that he thinks that to be competitive, an industry must derive extraordinary advantages from the rest of the determinants in case one determinant of the diamond framework is missing (Porter, 1990). As a result, we can conclude that ironically the Turkish study is more supportive of the diamond framework than the Canadian study, which has been conducted by Porter himself.

Ragin’s method also provides an opportunity to detect the commonalities of the uncompetitive conditions, which has been an area of much criticism for Porter’s study, as mentioned in Section 1. The analysis presented in this paper, nevertheless, reinforces Porter’s strong argument regarding the clustering activity in that uncompetitive industries are unlikely to have well-developed clusters.

Overall, this paper shows that the application of the technique developed by Ragin (1987) to management case studies can be very fruitful. It makes it possible to compare case studies and determine what those cases as a whole tell us. The method is, in fact, particularly useful in comparing a large number of cases. Moreover, it enables us to map areas of agreement and disagreement between the results of our case study analysis and the theoretical model as well

as the earlier applications. The method is effective in making explicit and robust deductions from case study research material, and serves to clarify the logical implications of qualitative research findings. By so doing, Ragin's method contributes significantly towards an improvement in comparative methodology, which is an area of vital importance for the management discipline as it is for many other areas of social science.

NOTES

- (1) This section summarises an earlier study (Öz, 1999) by the author of the present paper.
- (2) Starting from 1980, Turkey initiated a comprehensive stabilisation programme under the auspices of IMF and the World Bank, known as the 'January 24 Resolutions' in Turkish economic history, introducing structural adjustment policies intended to shift the economy from an inward-looking to an outward-looking orientation, emphasising export-led growth.
- (3) Ragin has been awarded the Stein Rokkan Prize in Comparative Research by the International Social Science Council for his contribution presented in the 1987 book *The Comparative Method: Moving Beyond Qualitative and Quantitative Strategies*.
- (4) See *Canada at the Crossroads Dialogue* section in Spring, Summer and Autumn (1992) issues of *Business Quarterly*.
- (5) The former will be discussed in the conclusion section. The latter is, on the other hand, not a central issue in this paper; interested readers might refer to Bellak and Weiss, 1993; Dunning, 1993; Hodgetts, 1993; Porter and Armstrong, 1992; Rugman and D'Cruz, 1993; Rugman and Verbeke, 1993; Rugman, 1991.

(6) According to Hodgetts (1993), for instance, Canada's firms have managed to turn the country's comparative advantage in natural resources into firm specific advantages in resource processing. Similarly, in Rugman's (1991) view, there is substantial value added due to managerial and marketing skills in the natural resource dependent sectors of Canada, and these are sustainable sources of competitive advantage.

APPENDIX

The verbal expressions for equations 5 and 9 are as follows:

$$W = Abce + bcdE + bCde + ABC + ABE + Ad \quad \text{(Equation 5)}$$

According to equation 16, the conditions associated with the presence of the outcome (competitiveness) include the following:

- the presence of factor conditions but absence of demand conditions, related and supporting industries, and government (Abce), or
- the presence of government but absence of demand conditions, related and supporting industries, and firm strategy, structure and rivalry (bcdE), or
- the presence of related and supporting industries but absence of demand conditions, firm strategy, structure and rivalry, and government (bCde), or
- the simultaneous presence of factor conditions, demand conditions, and related and supporting industries (ABC), or
- the simultaneous presence of factor conditions, demand conditions, and government (ABE), or
- the presence of factor conditions but absence of firm strategy, structure and rivalry (Ad).

$$v = aBc + abD + acD + ace + bcDE + BcDe + bcDe \quad (\text{Equation 9})$$

According to this equation, the following are not observed in competitive combinations:

- the absence of factor conditions and related and supporting industries when demand conditions exists (aBc), or
- the absence of factor conditions and demand conditions when firm strategy, structure and rivalry exists (abD), or
- the absence of factor conditions, and related and supporting industries when firm strategy, structure and rivalry exists (acD), or
- the simultaneous absence of factor conditions, related and supporting industries, and government (ace), or
- the absence of both demand conditions, and related and supporting industries when both firm strategy, structure and rivalry, and government exist (bcDE), or
- the absence of both related and supporting industries, and government when both demand conditions, and firm strategy, structure and rivalry exist (BcDe), or
- the absence of demand conditions, related and supporting industries, and government when firm strategy, structure and rivalry exists (bcDe).

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