

CAUSAL AND INFLUENCE ANALYSIS OF FDI FLOW TO CHINA USING FUZZY COGNITIVE MAPS (CASE STUDY 1998-2016)

ABSTRAK

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China as a major emerging market, is attracted significant flows of Foreign Direct Investment (FDI) to become second largest receipt. This research briefly examines the determinants of FDI obtained from literature and secondary data from World Bank and Global Competitiveness Index within 1998-2016, updating from prior research within 1996-2012. Fuzzy Cognitive Maps (FCMs) is employed as an analysis method to investigate the causal-effect relationships between the determinants by the application of soft computing technique of FCM using FCM Mappers. Furthermore, FCM simulation of concepts/parameters change to understand the causal influence amongst concepts. The FCM simulation handle efficiently with complex modeling problems to assess determinants of FDI Flow to China.

Keyword : FDI, Determinants of FDI, China

INTRODUCTION

Trevino and Mixon Jr (2004) briefly examined attracting Foreign Direct Investment (FDI) has become an essential part of development strategies among countries. In the 1990s, FDI became the largest single source of external finance for developing countries. By 1997, FDI accounted for about half of all private capital and 40% of total capital flows into developing countries. In the past, governments in many developing countries often saw multinational enterprises (MNEs) as part of the development problem, due to assertions of exploitation of the environment and of the labor force.

At present, MNEs are considered as part of the development solution for several reasons, for instance, governments in developing countries acknowledge that they need outside capital to achieve their development objectives, partly because industrial nations have stabilized foreign aid and development loans. Export-oriented FDI brings relief from rampant foreign exchange shortages and recognizing the reversal of portfolio investment is less costly, a fact that exacerbated recent financial crises in a number of developing countries, governments now prefer FDI (UNCTAD, 1999). Host-country governments recognize that MNEs have access to resources other than capital, that can assist with their development (such as technology, management and access to foreign markets).

Recognizing the long-term costs of failure to integrate their economies into the global environment, developing countries have opened up their markets in order to attract more FDI. It has been established several theories to explain this phenomenon. The macroeconomic approach (Trevino and Mixon Jr 2004) emphasizes why net investment among pairs or groups of nations tends to flow in certain patterns. This theory attempts to explain FDI behavior with macroeconomic variables, such as inflation, national income and exchange rate behavior.

As described at Strategic Factors Affecting Foreign Direct Investment Decision (Trevino and Mixon Jr, 2004), with developing countries undertaking market reforms and becoming more receptive to FDI, researchers have begun to apply an institutional theory from the strategic management literature to understand this phenomenon. Institutional theory emphasizes the influences of systems surrounding organizations that shape

organizational behavior and decision making. As such, it attempts to explain the organization-environment interface. Trevino and Mixon Jr (2004) added the role of institutions in an economy is to reduce transaction and information costs by reducing uncertainty and by establishing a stable structure that facilitates interactions. Empirical research using an institutional theoretical approach has emphasized the study of political risk, bilateral investment treaties, foreign investment and trade regulations, and capital markets liberalization in an attempt to explain FDI.

Ali and Guo (2005) described China comprehensively, by far the largest recipient, and in 2004 surpassed the USA as host destination. It has consequently attracted an increasing attention from multinational businesses. Since China adopted the reform and opening-up policy in the late 1970s, foreign investment has played an increasingly important role in its economic growth. World Investment Report for 2004 by the United Nations Conference on Trade and Development showed China absorbed a total of US\$53.5 billion worth of foreign direct investment (FDI) in 2003. The Xinhua News Agency, quoting The National Development Reform Commission, China's top economic planning agency, reported that foreign investment in 2004 rose to US\$60 billion, a 13 per cent increase over 2003. Contracted investment was US\$153.5 billion in all of 2004, up one-third year-on-year. Other statistics also point to the importance of foreign capital in China's economic growth. Many offer special incentives to foreign investors, such as tax holidays, tariff reductions or exemptions, and subsidies for infrastructure.

Compared with real GDP and real export activities, real FDI in each economy fluctuates considerably. China and Hong Kong, and possibly in Singapore are exception. Thus, one may doubt the importance of FDI on an economy. Furthermore, except China and, to a lesser degree, Hong Kong, real FDI tends to decrease after the 1997 Asian financial crisis, prompting one to wonder whether inward FDI in these other countries were redirected to China, and thus reducing the influence of FDI on GDP. It should be pointed out, however, that, while the size of FDI may be very small compared with the level of GDP and even exports, it has been observed that FDI generally goes to the key industries like electric and electronic and high-tech

manufacturing sectors of these economies, and plays a crucial role in promoting technology transfer and exports in these sectors.

Thus, FDI may have a strong influence on the growth of GDP in a country (Ali; Guo, 2005). Besides, the growth of world foreign direct investment (FDI) in recent years has been remarkable. The US dollar value of world FDI flows reached US\$1.3 trillion in 2000 from just over US\$200 billion in 1993. In 1980, FDI stock represented the equivalent of only 5 percent of world GDP; this percentage had almost tripled to 14 per cent by the end of the 1990s. The share of developing countries in FDI flows has been raised from 17.1 per cent in 1988-90 to 21.4 per cent in 1998-2000 (UNCTAD 2000).

Over the last decade FDI flows have grown at least twice as fast as trade. Empirical evidence that FDI has made a positive contribution to the economic growth of developing countries has accumulated fast. (Jayachandran; Seilan, 2010). Jayachandran; Seilan (2010) also reported among the cross-country studies which found positive impacts of FDI on economic growth in developing countries. In general, most governments believe inward FDI can contribute to the growth of the host country's economy. Not surprisingly, since the 1980s, attracting FDI has been one of the most important policy goals of developing countries.

At present, further economic development of China depends to a large extent on continuous FDI and policy-making that will facilitate inward investment. Moreover, China's entry to the World Trade Organization (WTO) suggests that trade will play an important role in the country's economic development. So, under this new international environment, multinational enterprises bid China to exploit some conventional advantages such as low labor costs, or they have other motives to meet challenges of the new point of view by international competition. They export about 57 percent of the country's total goods and services and account for 11 percent of local employment. China's preferential foreign investment policies, inexpensive labor, increasing purchasing power and improving investment environment, especially after entry into the World Trade Organization (WTO) in 2001, have made the country a favorite destination for global investment (Ali; Guo, 2005).

RESEARCH METHOD

Fuzzy Cognitive Maps (FCMs) are fuzzy-graph structures for representing causal reasoning. The fuzziness allows hazy degrees of causality between hazy causal objects (concepts). The graph structure allows systematic causal propagation, in particular forward and backward chaining, and it allows knowledge bases to be grown by connecting different FCMs. FCMs are especially applicable to soft knowledge domains.

Causality is represented as a fuzzy relation on causal concepts. A fuzzy causal algebra for governing causal propagation on FCMs is developed. (Kosko, 1985). Most knowledge is specification of classifications and causes. In general, the classes and causes are uncertain (fuzzy or random), usually fuzzy. This fuzziness passes into knowledge representations and on into knowledge bases, where it leads to a knowledge acquisition/processing tradeoff. The fuzzier the knowledge representation, the easier the knowledge acquisition and the greater the knowledge-source concurrence. But the fuzzier the knowledge, the harder the (symbolic) knowledge processing.

The first step when preparing a fuzzy cognitive map and the identification of and rationale for those requisite factors (concepts) that constitute part of it. The following nineteen factors (concepts) have been selected, based on the literature review relates to FDI Flow to China from World Bank and Global Competitiveness Index within 1998-2012, updating from prior research. This is the first step in the development of an expert system module that will help in the decision making process, through the design of the knowledge representation and the design of reasoning with FCM to automate the decision making process.

The second step in preparing fuzzy cognitive maps is establishing the causal relationships (positive, negative, or neutral) amongst the various factors (concepts). This is a critical step because an articulate analysis is required to determine how and why the values of factors or concepts change over time. Several concepts adopted from previous study.

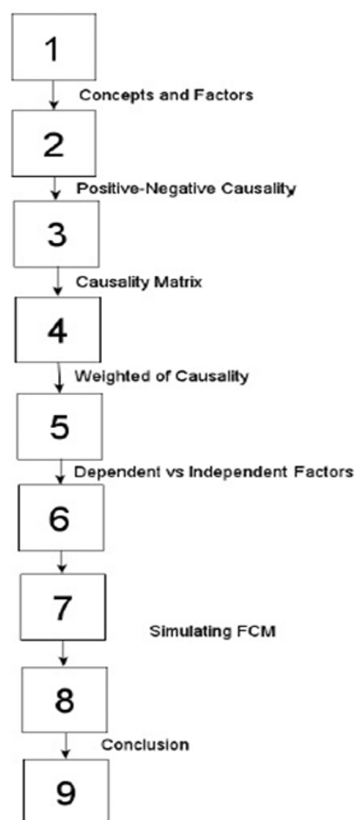


Figure 1. Steps in Designing Cognitive Maps
Source :Aspuru, 2008

RESULT AND DISCUSSION

Based on Aspuru's (n.d.) work within Fuzzy Cognitive Maps Theory : Implications for Interdisciplinary Reading : National Implications (Calais, 2008), nine steps are employed in designing a cognitive maps.

We can conclude identification of factors, specification of relationships, levels of all factors, intensities of causal effects, changeable factors versus dependent factors, simulating the fuzzy cognitive maps, modifying the fuzzy cognitive maps, simulating the modified fuzzy cognitive maps, and the latest is conclusion.

The fuzzy cognitive map's changeable factors associated with the causal relationship between FDI Flow to China and other nineteen factors are broadly grouped into three major categories (Marial A. Yol et al. 2009) : economic conditions, host country policies and Multinational Enterprise (MNE) strategies. Under economic conditions, the important factors include the size of markets, natural resource availability, location, and competitiveness. Under the host country policies, the main components are macroeconomic policies.

It can be concluded that the factors to be examined are infrastructure, Health, Natural resources availability, size and growth of market, Country risk, competitiveness of the country, Exports, Intellectual property rights, Education, Labor cost, Total employment, Exchange rates, Political Stability, Control of corruption, Voice and accountability, Wealth, and also Imports.

After construction of FCM tool for the approach of assessing FDI Flow to China, a number of simulations have been introduced and the decision-making capabilities of the technique will be presented by simulating and finding the predicted outcomes according to the available data as follows :

constantly increase – without strikes country competitiveness (IMF, 2012). While Voice and Accountability, Exchange Rate, and Intellectual Property Rights constantly settled.

Country Competitiveness is about competitively economic growth, social, and political issues in a country. When this concept is reduce, it means generally the country's value is also decreasing. Decreasing in market growth means there is something to do with the annual revenue of a country, and if this thing occur, there will be decision to cut the Labor Cost and hold the other cost, such as infrastructure. The final domino effect is incremental aggregate price which is inflation, and not surprising Country Risk increase and Control of Corruption less controlled.

Second Simulation :

Decreasing Exports level. It reveals that the effects of a decrease or increase in the level of Exports and the effects of a decrease or increase in the level of Country Competitiveness mirror each other at corresponding levels. These symmetrical results should not surprised because of the strong positive correlation between the concepts. To increase its level of Exports, China has implemented compulsory FDI policies. Compulsory policies required that FDI shall be able to keep a balance of exchanges, or make sure the proportion of their domestically made products in the total number of products reaches a certain benchmark, or a certain percentage of their products must

be exported (Laws on FDI in China).

Third Simulation :

The initial decrease of this kind of Natural Resource Availability strikes Market Growth,

Table 1.
Simulation Result of FCMappers

Concepts	Value 1	Value 2	Fuzzy Value
C1 : Voice and Accountability	0,5	0,5	Moderate Transparent
C2 : Official Exchange Rate Volatility	0,92	0,86	Highly Volatile
C3 : Total Employment	0,86	0,79	Highly Available
C4 : Natural Resources Availability	1	0,98	Highly Available
C5 : Location of Country	0,99	0,96	Highly Invested
C7 : Wealth (Per Capita GDP)	0,94	0,98	High Level of Wealth
C8 : Health	0,99	0,98	High Level of Health
C9 : Political Stability	0,6	0,57	Moderate Stable
C10 : Effectiveness of Government Policy	0,5	0,5	Moderate Effective
C11 : Education Level	0,59	0,56	Moderate Educated
C12 : Country Risk	0,5	0,5	Moderate Risk
C13 : Exports	0,89	0,81	Highly Exporting
C14 : Labor Cost	0,69	0,64	Moderate Cost
C15 : Infrastructure	0,99	0,97	Highly Infrastructured
C16 : Market Growth	0,99	0,98	Highly Level of Growth
C17 : Inflation Volatility (% consumer price)	0,95	0,89	Highly Volatile
C18 : Control of Corruption	0,77	0,73	Moderate Controlled
C19 : Intellectual Property Rights	0,5	0,5	Moderate Strong

Country Competitiveness is the first factor to be changed and that simulations have been run for selected values, as the prior research result. An initial decrease in Country Competitiveness strikes: Total Employment, Political Stability, Education Level, Country Risk, Labor Cost, Market Growth, Inflation, and Control of Corruption. Unlike from prior research, Wealth (from GDP variable) and Health (from Infrastructure variable)

Country Competitiveness, Exports, and Infrastructure.

Fourth Simulation :

It reveals that an initial decrease in Total Employment strikes increasing of Labor Cost and Market Growth. China's proactive policies toward FDI resulted in increasing inflow of foreign capital in the late 1980s and,

in particular, early 1990s. From mid1990s, while maintaining favorable environment for foreign businesses, government policies began to focus more on linking FDI promotion to domestic industrial objectives.

CONCLUSION AND SUGGESTION

Several conclusions can be drawn from the results derived from the prior research. The results obtained from the simulations can conceivably reduce the level of one concepts, while simultaneously reducing and increasing other factors. The prerequisite steps essential for achieving this are enumerated below. The data between square brackets are selected to justify each step.

An initial decrease in Country Competitiveness strikes Total Employment, Political Stability, Education Level, Country Risk, Labor Cost, Infrastructure, Market Growth, Inflation, and Control of Corruption but not so much. While Voice and Accountability, Exchange Rate, and Intellectual Property Rights constantly settled, unlike the prior research that also strikes Wealth and Health.

The effects of a decrease or increase in the level of Exports and the effects of a decrease or increase in the level of Country Competitiveness mirror each other at corresponding levels.

Natural Resource Availability initial decrease strikes The initial decrease of Natural Resource Availability strikes Market Growth,

Country Competitiveness, and Exports. Inflation also reducing the Market Growth as the causal factor how difficult to press the price in order to make it stable, while the Effectiveness of Government Policy constant settled because the policy seems unprecisely solve the problem occurred, commonly the same with prior research.

The effects of a decrease or increase in the level of Total Employment and the effects of a decrease or increase in the level of Labor Cost and Market Size mirror each other at corresponding levels.

This research needs elaborate more by adding micro-economy variables so it would be more comprehensive.

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