



## A fuzzy multi-criteria model for the industrial cooperation program transaction strategies: A case in Taiwan

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### ABSTRACT

In international trade offset practices (in Taiwan known as industrial cooperation program, ICP) have received increased attention over the past 20 years. In the coming 10 years, the Taiwanese government may expend roughly US\$16 billion for purchasing Patriot-III missiles, P-3 long-range anti-submarine planes, and diesel-engine submarines from the United States through foreign military sale, and can achieve US\$8 billion ICP credit the largest in Taiwanese history. Offsets or ICP can be regarded as fuzzy multiple criteria decision-making (MCDM) problems, therefore, the fuzziness and uncertainty of subjective perception should be considered. This paper provides an alternative approach, the non-additive fuzzy integral, to deal with the fuzzy MCDM problems especially when there is dependence among considered criteria. The main purpose of this paper is to discuss with Taiwan's ICP Optimal Offset Transaction Policy and propose a framework of drawing on ICP credit in future. This paper considers the four aspects of policy, ability, economy, and environment, to establish a set of fuzzy AHP multiple criteria decision mode to identify the evaluative criteria variables and project item's order for ICP project. This decision mode was identified as a workable method.

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### 1. Introduction

The definition of offsets includes a broad range of complex compensatory terms by foreign trade partners as a condition of sale, particularly for military and aerospace products. Offset agreements are very flexible, and they allow many combinations of different contracts at the same time. Now, times and circumstances have changed, but offsets remain. The concept of offset is a relatively new development for most defense companies and governments that are now involved in it. Although some of the basics are old such as barter, its modern sophistication is new and dynamic. Buyers' governments and firms ask for offsets that require industry and commercial compensation as a condition for the purchase of military exports.

Offsets arose in the late 1950s and early 1960s in response to the legitimate need to rebuild the industrial base for defense in Western Europe and Japan. At that time, offset agreements may have been justifiable for reducing the impact of military equipment purchases on the budgets and trade accounts of these countries. Neuman (1985) said offsets have contributed to rationalization, standardization, interoperability (RSI) modernized the arms inven-

tories of the alliance, and strengthened transatlantic defense ties in NATO countries. Office of Management and Budget (1987) believed that offsets also contributed to commerce with the Eastern Bloc due to the impossibility of exchanging their currencies with the Western market.

The concept of offsets is a leading-edge marketing tool for most defense companies and governments that are now involved in it. Foreign governments and firms ask for offsets that require industrial and commercial compensation as a condition for the purchase of military exports. Kremer and Sain (1992) said the offset agreement may be part of a government-to-government agreement or commercial sale of defense articles or services. Since 1975, many countries purchasing major equipment have required offset agreements to boost their industrial economies. Waller (2003) believed that the world's defense environment has been significantly changed in the world after the Cold War and the breakup of the Warsaw Pact. Within this new environment of mega-defense suppliers chasing fewer customers, offset packages play a more critical role in global defense procurement competitions. Originally, offsets were provided only by the US and former Soviet Union but, today, they can be provided by European countries (UK, France, Germany, and Italy), Japan, Israel, and South Korea. So, offsets have already become competitive tools for in the defense market. If a seller wants to triumph over other competitors in the worldwide defense market but does not offer an offset, it has no chance to win.

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If a country asks for a technical capability upgrade using an advanced technology transfer from a seller country, this request becomes one of the main conditions for offset. The basic philosophy behind a countertrade or offset agreement is to structure the commitment so that the seller, who will fulfill a contract, rewards the buyer. Palia and Liesch (1997) thought countertrade has many benefits and many latent motives. Radasch and Kwak (1998) found that the motivating factors may be the potential for economic or social growth, advanced technology or increased sales for other domestic goods in exchange for the buyer's purchase.

This paper is organized as follows. Taiwan's background and environment about ICP transaction strategies are presented in Section 2. Section 3 introduce theoretical framework including setting up a hierarchy frame for ICP transaction strategies, determining the fuzzy criteria weights, performance matrix, and the fuzzy synthetic utility values. The empirical results and interpretations are presented in Section 4. Finally, we conclude this paper in Section 5.

## 2. Taiwan's background and environment

The Taiwanese government is currently confronted with traditional industries forfeiting their competitiveness because of expensive labor hour and slow growth in high technology industries. In the meanwhile, the PRC's (People Republic of China) economy rises abruptly and PRC already become the most dynamic economic system in the world. Taiwan's export industries are moving to PRC to set up a factories and invest money because of the cheaper labor rates and the prodigious markets. For Taiwan to continue its economic growth, its Industrial Development Bureau (IDB) of Ministry of Economic Affairs (MOEA) (2004) announced that building up high-technologies industries and developing critical-technology are the main targets for upgrading industry.

### 2.1. Definition of ICP

The term industrial cooperation program (ICP) in Taiwan has the same meaning as offset agreement. Countries have different

definitions of offset (as Table 1) and different agencies handling them. US Department of Commerce (2003) declared that in Canada, a foreign firm participating in an important federal procurement project must submit an Industrial and Regional Benefit Program (IRB), which serves as one of the important factors of consideration in evaluating a firm. In Switzerland, a supplier of civil and military aircraft must procure from inside the country machinery, equipment, or components or parts of same value. In Australia, their Civil Offset Program also demands that for federal government procurement above a certain amount, there must be a commitment amount equivalent to 30% of the procurement price for promotion of industrial and technological development in Australia. Offset means the contractors of some important government procurement projects are required to commit an effort equivalent to the value of a certain percentage of the contract price of related projects. We can divide Europe, Asia, Middle East and North/South America four regions of purchasing and requiring offsets countries (as Table 2) in whole world.

### 2.2. Taiwan's ICP basis

Taiwan's ICPs are a measure implemented pursuant to the "Economic Revitalization Program – An Action Plan for the Promotion of Private Investment", which was passed during the 2338th Meeting of the Executive Yuan in 1993. At that time, the Taiwanese government expected major government procurement projects to yield a cooperative system with foreign enterprises and effective transfer of advanced foreign technologies. In view of the structural changes of overall economic conditions and the social environment, Taiwan's government focuses on industrial development for establishing high-tech industries and upgrading traditional industries. Therefore, it encourages industrial cooperation to achieve the following objectives:

- Recommend high-tech industries and critical technologies.
- Introduce and utilize foreign investments.
- Stimulate investment in domestic enterprises.

**Table 1**  
Definition and agency of offsets. Source: US Department of Commerce February 2003 Report to Congress (Appendix E).

Country	Definition of offset	Agency handling
Australia	Australian Industry Involvement (AII) and Defense Materiel Organization (DMO)	(DOD) Defense Acquisition Agency
Belgium	Industrial Benefit in the Field of Defense Procurement	Ministry of Economics Affairs
Canada	Industrial & Regional Benefits (IRB)	Industry Canada
Denmark	Industrial Cooperation Agreement (ICA)	Danish Agency for Trade and Industry (ATI)
Egypt	No. Official Policy	Not Specified
Finland	Industrial Participation	Trade Ministry
Germany	Industrial Balances (No. Official Policy)	The Federal Office for Defense Technology and Procurement
Greece	Policy of Offsets Benefits (O/B)	Hellenic Ministry of National Defense/General Armaments Directorate (GAD)
Israel	Industrial Cooperation Benefits (ICB)	Industrial Cooperation Authority (ICA), Ministry of Trade and Industry
Korea, South	Policy of Offset Benefits (O/B)	Defense Procurement Agency, Ministry of National Defense
Kuwait	Offset Program	Ministry of Finance, Program Executive Office PEO
Netherlands	Industrial Participation and Offset	Ministry of Economics
New Zealand	Defense Offsets Policy/ Industrial Involvement	Minister of Defense & Ministry of Commerce
Norway	Offset Program	Ministry of Finance
Philippines	Countertrade (Implementing Rules & Regulations)	Department of Trade/Industry
Saudi Arabian	Saudi Arabian Economic Offset Program	Economic Offset Committee (EOC)
South Africa	National Industrial Participation	Department of Trade/Industry
Spain	Industrial Cooperation	Ministry of Defense
Sweden	Offset and Participation Program	DOD
Switzerland	Defense Procurement and Offset Policy	DOD
Taiwan	Industrial Cooperation Program (ICP)	Ministry of Economic Affairs (Industrial Development Bureau)
Thailand	Countertrade Policy	Department of Foreign Trade, Ministry of Commerce
Turkey	Military Offset Policy and Guidelines	Undersecretary for Defense Industries (SSM)
UAE	The Defense and Procurement Policy of UAE	UAE Offsets Group (UOG)
United Kingdom	Industrial Participation (IP)	MOD/DESO

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