

## Objective

- Gastric cancer is one of the most common neoplasms in the world. 988,000 cases were diagnosed in 2008 worldwide and 737,500 individuals died of this disease. In Korea in 2008 gastric cancer was the most common cancer (ASR 41,4 per 100,000 persons) and the third leading cause of cancer deaths (ASMR 14,6 per 100,000 person-year).
- In accordance with the guidelines edited by the Japanese Gastric Cancer Society (JGCS) surgery (gastrectomy) is the primary method of treatment in the case of non-metastatic cancer. National Cancer Institute (USA) recommendations are consistent with JGCS.
- The purpose of this study was to compare cost-effectiveness of harmonic scalpel used in open gastrectomy with the conventional method of gastrectomy (open surgery) in gastric cancer patients in Korea.

## Methodology

- A cost-effectiveness analysis was conducted, resulting in total cost and effectiveness of gastrectomy with harmonic scalpel and conventional open gastrectomy. The following clinical endpoints were considered: surgery time, intraoperative blood loss, length of postoperative hospitalization, rate of postoperative complications.
- Data on clinical effectiveness were obtained from clinical trials gathered in the systematic review of literature.
- The analysis was carried out from the public payer perspective in one-surgery time horizon. Due to the fact that the refund scheme in Korea allows for patient's co-payment for medical services, total costs of treatment can be higher.
- Cost data were collected by interviews with surgeons in Korea. Seven cases of harmonic scalpel gastrectomy and two cases of conventional gastrectomy were analyzed.
- The following cost categories were obtained: surgical instruments (harmonic knife generator – fee for operation, harmonic scalpel tip, staplers and sutures, other), hospitalization costs (together with length of postoperative hospitalization), blood transfusion cost (together with the number of blood units transfused during operation), surgeon's fee for operation and other costs (all reimbursement costs not included in the listed categories).
- Due to the length of time horizon, both clinical effectiveness and costs were not discounted.
- In the base case analysis, data on clinical effectiveness were taken from all clinical studies found in the systematic review. Data on overall complications rate were taken into account. In the case of cost data, conservative assumptions were made in order to assess total costs of surgery.
- One-way sensitivity analyses were conducted in order to assess the influence of assumptions regarding input parameters, on final results. The following parameters were tested: source of effectiveness data (only from RCT or observational study), differentiation of cost of hospitalization based on rate of major complication, no differentiation of cost of surgery based on time of surgery and surgeon fee, postoperative complications data in clinical effectiveness (only major complications included), blood cost calculation (based on accurate usage of blood in units).
- The analysis was performed with a model developed via MS Excel®. Deterministic analysis and PSA were performed.

## Clinical efficacy

- In order to identify all clinical trials, systematic reviews of MEDLINE (via PubMed) and KoreaMed databases were performed. One RCT (Tsimoyiannis 2002) and one observational study (Mohri 2007) were found.

Table 1. Data on clinical effectiveness in clinical trials

Category	Harmonic scalpel	Conventional
Mohri 2007		
Operation time [min]	238.5	283.8
Overall postoperative complications rate	0.115	0.269
Blood loss [ml]*	271.23	647.26
Tsimoyiannis 2002		
Operation time [min]	184.0	190.0
Overall postoperative complications rate	0.200	0.450
Postoperative hospital stay [day]	9.30	12.50
Blood loss [ml]	318.00	580.00

\* In the study by Mohri 2007, blood loss was reported in grams. Conversion into ml was performed

## Results

- In one-surgery time horizon gastrectomy with harmonic scalpel is connected with shorter hospitalization time, smaller intraoperative blood loss, shorter time of postoperative hospitalization and smaller number of postoperative complications in comparison to conventional open gastrectomy. Differences are statistically significant for each endpoint.
- In one-surgery time horizon gastrectomy with harmonic scalpel compared to conventional open gastrectomy is connected with higher cost of operation and total cost. The differences are not statistically significant.
- Incremental cost per one minute of surgery saved, per unit of blood saved, per hospitalization day saved and per one postoperative complication avoided were calculated.
- Gastrectomy with harmonic scalpel is associated with shorter operation time with probability equal to 99,2%, and with less intraoperative blood loss, shorter time of postoperative hospital stay and smaller number of postoperative complications with probability equal to 100%.
- Gastrectomy with harmonic scalpel is associated with smaller total cost with probability equal to 17,9%.

Table 2. Clinical effectiveness results

Category	Harmonic scalpel	Conventional
Surgery time [minutes]	214.80	243.02
Intraoperative blood loss [units]	0.65	1.37
Hospitalization time [days]	9.30	12.50
Postoperative complications number [per patient]	0.17	0.35

Table 3. Cost analysis results (k KRW)

Category	Harmonic scalpel	Conventional
Operation cost	4,691.12	4,244.44
Hospitalization cost	386.68	519.73
Total cost	5,077.79	4,764.16

Table 4. Results of cost-effectiveness analysis (ICER) – base case analysis [k KRW]

Clinical effect	Surgery time	Intraoperative blood loss	Hospitalization time	Postoperative complication
Harmonic vs Conventional	11.12	432.32	98.01	1,803.37

Figure 1. The CE plane for operation time and total cost

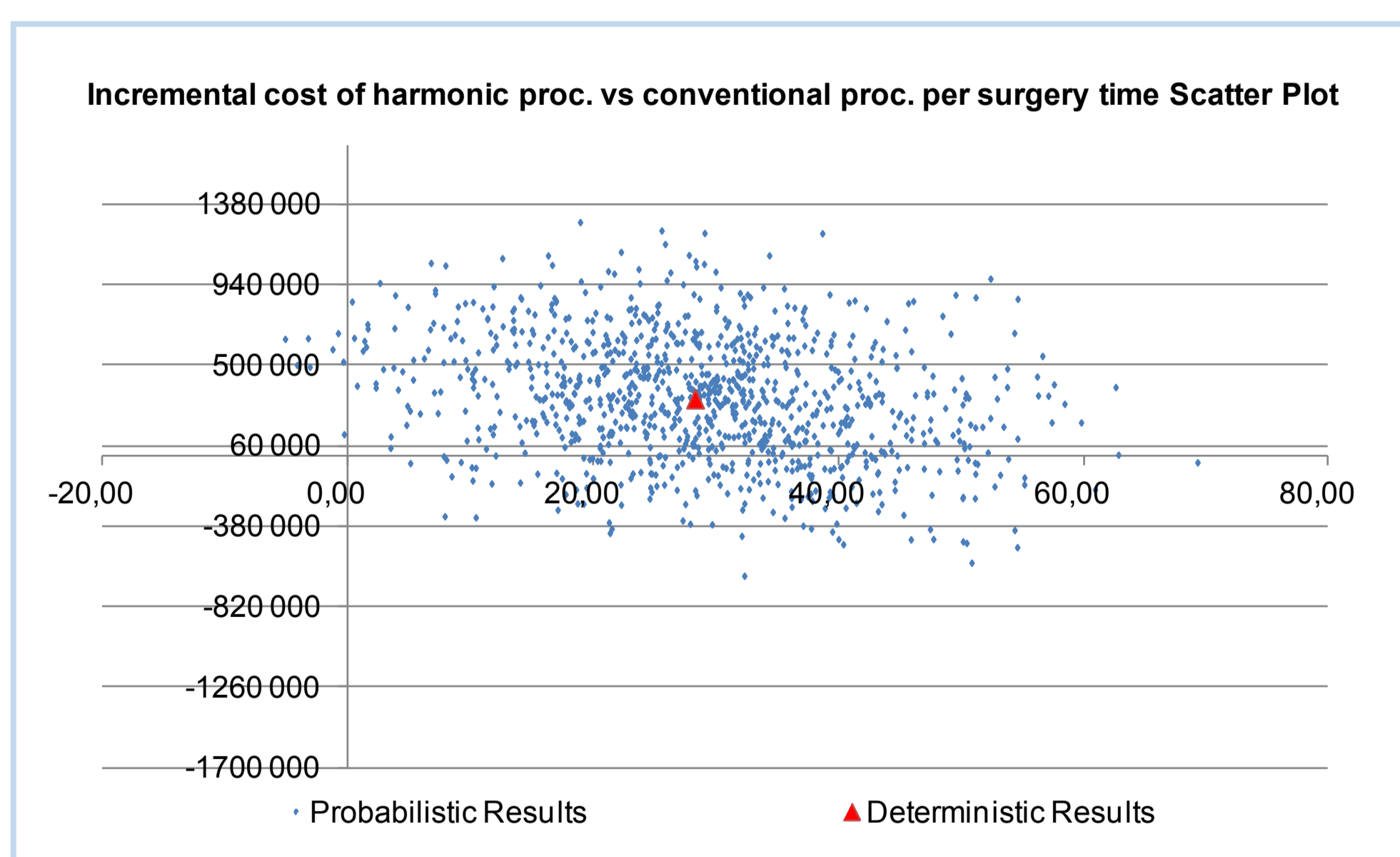
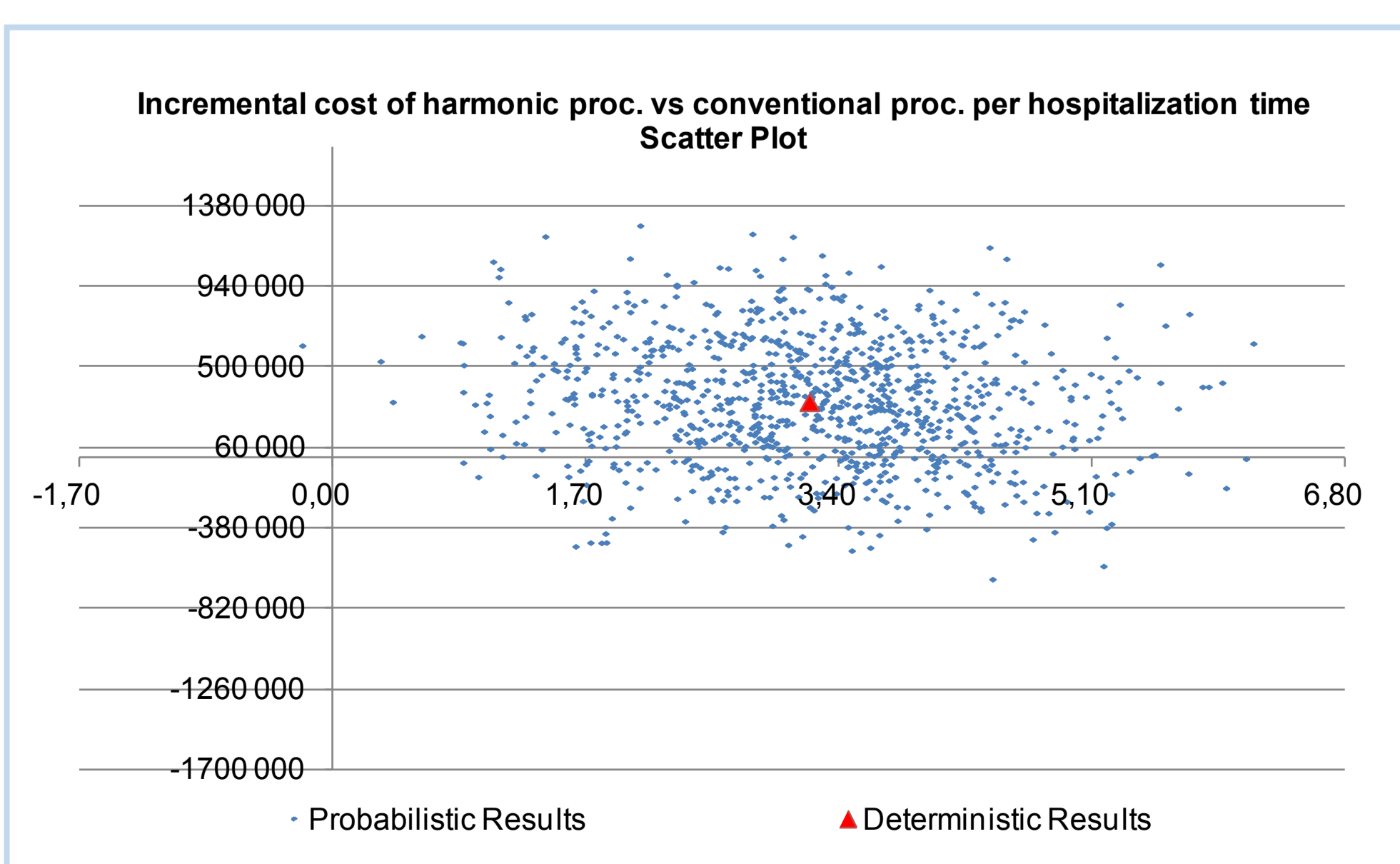


Figure 2. The CE plane for intraoperative blood loss and total cost



- One-way sensitivity analysis results support the results of base case analysis. In five scenarios gastrectomy with harmonic scalpel results in better clinical effectiveness and higher costs (statistical significance was not evaluated). In one scenario (when differentiation of cost of surgery is based on rate of major complications) both clinical effectiveness and difference in total cost are in favor of harmonic scalpel gastrectomy resulting in harmonic scalpel operation as dominant over conventional gastrectomy.

Table 5. One-way sensitivity analysis results

Scenario	Differences (Harmonic scalpel vs Conventional)				
	Operation time [minutes]	Intraoperative blood loss [units]	Hospitalization time [days]	Postoperative complications [rate]	Total cost [k KRW]
Base case	28.21	0.73	3.20	0.17	313.63
Scenario 1	45.30	0.84	-*	0.15	338.75
Scenario 2	6.00	0.58	3.20	0.20	453.94
Scenario 3	28.21	0.73	3.20	0.17	-1056.40
Scenario 4	28.21	0.73	3.20	0.17	483.25
Scenario 5	28.21	0.73	3.20	0.15	313.63
Scenario 6	28.21	1.00	3.20	0.17	300.67

\* not assessed in this scenario; Scenario 1: clinical effectiveness only from Mohri 2007 study; Scenario 2: clinical effectiveness only from RCT; Scenario 3: differentiation of cost of surgery based on rate of major complications; Scenario 4: no differentiation of cost of surgery based on time of surgery and surgeon fee; Scenario 5: only major postoperative complications were included in the analysis; Scenario 6: blood cost calculation based on accurate usage of blood in units

## Conclusions

The use of harmonic scalpel in gastrectomy in gastric cancer patients generates better clinical effectiveness than conventional open gastrectomy and the differences are statistically significant.

Difference in total cost between harmonic scalpel gastrectomy and conventional open gastrectomy is not statistically significant.

Results of one-way sensitivity analysis show that in some cases open gastrectomy with harmonic scalpel could lead to potential savings in costs.

In the base case analysis the differences in effectiveness are statistically significant (favoring open gastrectomy with harmonic scalpel) while the difference in costs is not statistically significant. For this reason open gastrectomy with harmonic scalpel can be considered as a superior intervention.

## Abbreviations

ASR	Age Standardized Rate	KRW	Korean won (currency in Korea)
ASMR	Age Standardized Mortality Rate	PSA	Probabilistic Sensitivity Analysis
JGCS	Japanese Gastric Cancer Society	RCT	Randomized Controlled Trial

Figure 3. The CE plane for hospitalization time and total cost

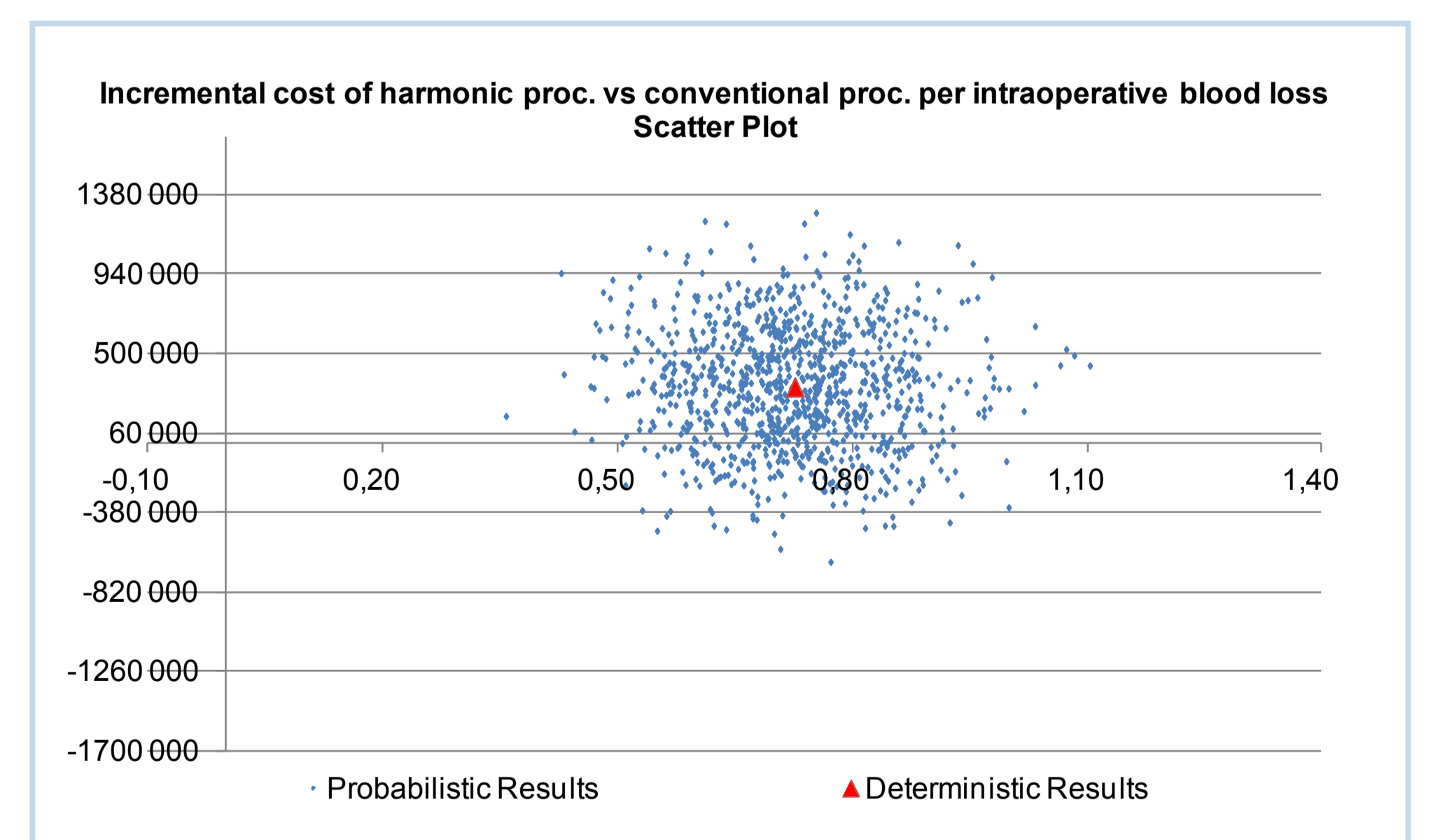


Figure 4. The CE plane for postoperative complication rate and total cost

