



CHAPTER 5

RESULTS OF THE STUDY

The results of the study on economic loss from work accident in Thailand, 2000, and determinants of work injury rate are presented in five parts as follows:

- 5.1 Monetary value of economic loss from work accidents in 2000
- 5.2 Opportunity loss for family members
- 5.3 Proportion of economic loss when compared with compensation payment, Gross Domestic Product (GDP), and employees' earning
- 5.4 Sensitivity analysis of economic loss from work accidents
- 5.5 Determinants of work injury rate in Thailand

5.1 Monetary Value of Economic Loss from Work Accidents in 2000

5.1.1 Direct loss from work injury (DL1 and DL2)

In 2000, there were 179,566 approved work injuries. WCF paid 1,256.81 million baht for medical treatment, rehabilitation, funeral expense, and compensation for death; permanent disability or temporary disability. Compensation for work injury cases in 2000 amounted to 1,105.15 million baht, and 151.66 million baht for the previous years' injury cases. (Table 5.1)

Considering work injury cases in 2000, 636.36 million baht were paid for compensation, 456.92 million baht for medical treatment (DL1), 1.86 million baht for rehabilitation (DL2), and about 1 million baht for funeral expenses, as shown in Table 5.1.

Table 5.1: Items of workmen's compensation payment, 2000

Item of payment	Amount (baht)
Medical treatment (DL1)	456,924,941
Rehabilitation (DL2)	1,864,468
Compensation	636,357,420
Funeral grant	9,999,929
Sub-total	1,105,146,758
Compensation for previous year's injuries	151,662,033
Total	1,256,808,790

Source: The Office of Workmen's Compensation Fund, 2001

5.1.2 Earning loss from premature death (IDL1)

Table 5.2: Present value of earning loss due to premature death

Unit: thousand baht

Age	No. of deaths	Earning loss at earning growth rate			
		6%	8%	10%	12%
≤14	2	7,388	10,597	15,577	23,384
15-19	27	89,264	128,034	188,210	282,531
20-24	90	267,841	375,624	538,262	785,778
25-29	145	402,499	545,965	753,550	1,055,945
30-34	101	237,168	311,315	414,237	557,833
35-39	103	194,247	244,252	309,969	396,615
40-44	49	72,206	86,158	103,302	124,396
45-49	51	49,671	56,894	65,313	75,129
50-54	31	21,461	23,618	26,006	28,648
55-59	9	3,441	3,643	3,854	4,076
60+	12	1,429	1,470	1,511	1,553
Total	620	1,346,615	1,787,569	2,419,790	3,335,888
Average / case		2,172	2,883	3,903	5,380

From Table 5.2, the study reveals that the present value of earning loss from 620 premature deaths is 1,346.61 million baht or an average of 2.17 million baht per death, when earning growth rate at 6% is applied. However, the earning loss may increase up to 1787.57 million, 2419.79 million and 3,335.89 million baht or an average of 2.89 million, 3.90 million, and 5.38 million, if earning growth rates of 8%, 10% and 12% are applied respectively.

5.1.3 Earning loss from permanent total disability (IDL2)

The present value of earning loss from permanent total disability is 37.25 million baht or an average of 2.32 million per case when 6% earning growth rate is applied. The loss may increase up to 92.721 million baht or an average of 5.79 million per case, if the earning growth rate of 12 % is applied. (Table 5.3)

Table 5.3: Present value of earning loss due to permanent total disability

		Unit: thousand baht			
Age	No. of cases	Earning loss at earning growth rate			
		6%	8%	10%	12%
20-24	4	14,242	19,973	28,622	41,783
25-29	3	5,032	6,827	9,422	13,202
30-34	3	5,838	7,663	10,196	13,731
35-39	4	10,415	13,097	16,620	21,266
40-44	1	1,140	1,360	1,630	1,963
45-49	0	0	0	0	0
50-54	1	580	639	703	775
Total	16	37,248	49,558	67,194	92,721
Average / case		2,328	3,097	4,200	5,795

5.1.4 Earning loss from permanent partial disability (IDL3)

According to Boonsothornsathit (1991), the average of workdays charged of permanent partial disability is 382.58 days, and the number of workdays lost for medical and rehabilitation treatment was 40 days. These figures are applied to estimate the economic loss from permanent partial disability from work injuries.

Table 5.4: Present value of earning loss due to permanent partial disability

Unit: thousand baht

Age	No. of cases	Earning loss at earning growth rate			
		6%	8%	10%	12%
≤14	3	552	792	1,164	1,748
15-19	381	84,730	121,531	178,650	268,181
20-24	805	165,274	231,782	332,139	484,871
25-29	807	147,779	200,453	276,668	387,693
30-34	605	96,396	126,532	168,364	226,728
35-39	423	54,994	69,152	87,757	112,288
40-44	217	20,713	24,715	29,633	35,684
45-49	143	10,498	12,025	13,804	15,878
50-54	67	2,943	3,239	3,567	3,929
55-59	34	881	933	987	1,044
60+	31	320	329	338	347
Future					
earning loss	3,516	585,079	791,481	1,093,071	1,538,391
Earning loss					
during treatment		39,379	39,379	39,379	39,379
Total		624,458	830,860	1,132,450	1,577,770
Average / case		178	236	322	449

From Table 5.4, the present value of future earning loss from permanent partial disability is 585.08 million baht when 6% earning

growth rate is applied. The earning loss during medical and rehabilitation treatment is 39.38 million baht. Therefore, the economic loss from permanent partial disability is 624.46 million baht or an average of 0.18 million baht per case. However, the earning loss may reach 1,577.77 million baht or an average of 0.45 million baht per case, if the earning growth rate of 12% is applied.

5.1.5 Earning loss from temporary disability (IDL4)

The earning loss from temporary disabilities is calculated on the basis of the Labour Protection Act (1998) which requires employers to provide at least one holiday per week, and 13 national and religious holidays. Therefore, the total number of workdays per year is 299 days. The earning loss from 48,338 cases of temporary disability for longer than 3 days is 211.81 million baht or representing an average of 4,382 baht per case. The earning loss from 127,076 cases of temporary disability not more than 3 days is 56.16 million baht or representing an average of 442 baht per case. (Table 5.5)

Table 5.5: Present value of earning loss from temporary disability by region

Region	Unit: thousand baht			
	Temp. disability > 3 d.		Temp. disability ≤ 3 d.	
	cases	earning loss	cases	earning loss
Bangkok	11,079	70,314	32,251	19,707
Bangkok's vicinity	17,681	82,995	55,587	25,121
Central	9,937	31,838	23,966	7,393
North	2,516	5,964	5,066	1,156
Northeast	1,851	4,345	3,666	829
South	5,274	16,357	6,540	1,953
Nationwide	48,338	211,813	127,076	56,158
Average / case		4.382		0.442

5.1.6 Economic loss from work injuries in Thailand

5.1.6.1 *Earning loss from work accidents by region*

Considering indirect economic loss at all levels of severity occurring in each region, Bangkok accounts for the maximum loss, followed by Bangkok's surrounding vicinity and the Central region. The earning loss in Bangkok is 816.79 million baht when 6% earning growth rate is applied, and may increase up to 1,904.55 million baht if 12% earning growth rate is applied. The earning loss on a nationwide basis is 2,276.3 million baht, 2,935.9 million baht, 3,887.4 million baht and 5,274.3 million baht if 6%, 8% 10% and 12% of earning growth rates are applied respectively. (Table 5.6)

Table 5.6: Present value of earning loss from work accident by region

Region	No. of injury	Earning loss at earning growth rate			
		6%	8%	10%	12%
Bangkok	44,068	816,793	1,056,742	1,402,145	1,904,546
Bangkok's surrounding vicinity	75,092	734,189	944,493	1,250,608	1,700,866
Central	34,800	364,073	469,241	620,564	840,696
North	7,804	93,052	119,550	157,126	211,007
Northeast	5,745	115,479	150,831	201,426	274,626
South	12,057	152,705	195,101	255,536	342,609
Nationwide	179,566	2,276,291	2,935,958	3,887,405	5,274,350

5.1.6.2 Total economic loss from work accidents

Considering economic loss from all levels of severity, direct loss, comprised of medical and rehabilitation treatment, is 458.79 million baht. The total loss is 2,735.08 million baht, 3,394.75 million baht, 4,346.19 million baht and 5,733.14 million baht, representing an average loss per injury of 15,232 baht, 18,905 baht, 24,204 baht and 31,928 baht, if the earning growth rates of 6%, 8%, 10%, and 12% are applied respectively. The average economic loss from work injury in Thailand per worker under the WCF coverage amounts to 505 baht, 627 baht, 802 baht and 1,058 baht when different earning growth rates are applied. The study also reveals that the indirect loss is in the range of 6 to 12.5 times greater than the direct loss. (Table 5.7)

Table 5.7: Present value of economic loss from work accident in Thailand by item of losses, 2000

		Unit: thousand baht			
Items of loss	No. of cases	Earning loss at earning growth rate			
		6%	8%	10%	12%
Direct Loss		458,789	458,789	458,789	458,789
-Medical treatment	(DL1)	456,925	456,925	456,925	456,925
-Rehabilitation	(DL2)	1,865	1,865	1,865	1,865
Indirect Loss		2,276,292	2,935,958	3,887,405	5,274,350
-Premature death	(IDL1) 620	1,346,615	1,787,569	2,419,791	3,335,888
-Permanent total disability	(IDL2) 16	37,248	49,558	67,194	92,721
-Permanent partial disability	(IDL3) 3,516	624,459	830,861	1,132,450	1,577,771
-Temporary disability > 3 days	(IDL4) 48,338	211,813	211,813	211,813	211,813
-Temporary disability ≤ 3 days	(IDL5) 127,076	56,158	56,158	56,158	56,158
Total economic loss	179,566	2,735,081	3,394,747	4,346,195	5,733,139
Average loss per case (baht)		15,232	18,905	24,204	31,928
Average loss per worker under WCF (baht)		505	627	802	1,058

5.2 Opportunity Loss for Family Members

Opportunity loss for family members is calculated with an assumption in the context of Thai society that family members always take care of their patients or injured members. The estimation applies the number of workdays lost at the ratio of 1:1 and the average regional per capita income from NSO. (Appendix2, Table2.6) The calculation of family opportunity loss takes into account only the number of total partial disability and temporary disability cases.

The family members' opportunity loss from all regions is 218.56 million baht. Bangkok's surrounding vicinity accounts for the highest family opportunity loss of 111.04 million baht, followed by Bangkok. The region that has the minimum family opportunity loss is the Northeastern region, merely 2.67 million baht. (Table 5.8)

Table 5.8: Family opportunity loss from work accidents by region

Unit: thousand baht		
Region	Per capita monthly income	Opportunity loss
Bangkok	7,794	63,408,690
Bangkok's surrounding vicinity	7,794	111,041,243
Central	3,715	27,402,764
North	2,538	4,507,342
Northeast	1,990	2,670,419
South	2,897	9,531,026
Total		218,561,484

5.3 Proportion of Economic Loss Compared with Compensation Payment, GDP, and Employees' Earning

Data shows that the earning loss is in the range of 4.30 to 9.01 times the compensation payment when the earning growth rates of 6% to 12% are applied. Comparing to 4,904,725 million baht of GDP at the current market price, the economic loss from work accidents accounts for 0.056% to 0.117% of Thailand's GNP. The average economic loss per worker under WCF accounts for 0.698% to 1.46% of yearly earnings of private employees. (Table 5.9)

Table 5.9: Total economic loss from work accidents as compared with compensation payment, GDP, and employees' earning

		Earning growth rate			
		6%	8%	10%	12%
Total economic loss vs. Compensation payment	(times)	4.30	5.33	6.83	9.01
Total economic loss vs. GDP	(%)	0.056	0.070	0.090	0.117
Average loss per worker vs. Employees' earning	(%)	0.698	0.866	1.109	1.463

5.4 Sensitivity Analysis of Economic Loss from Work Accidents

Since there is no universal acceptable rate of discount and it depends on social value of judgement and social time preference, this study conducts a sensitivity analysis by applying the discount rates of 5%, 10%, and 15% in the estimation. The sensitivity analysis shows that, at 6% earning growth rate, indirect loss decreases from 2,276.3 million baht to 1,376.8 million baht and reaches a minimum of 985.39 million baht, when 5%, 10%, and 15% discount rates are applied respectively. However, indirect loss may increase up to a maximum of 5,274.35 million baht if 12% earning growth rate and 5% discount rate are applied. (Table 5.10)

Table 5.10: Sensitivity analysis of indirect loss from work accidents

Unit: thousand baht

Discount rate	Indirect loss at earning growth rate			
	6%	8%	10%	12%
5%	2,276,291.5	2,935,957.9	3,887,405.1	5,274,350.0
10%	1,376,782.0	1,649,736.9	2,024,728.9	2,546,946.2
15%	985,385.3	1,171,009.5	1,290,720.4	1,520,599.7

Data also shows that minimum total economic loss is 1,444.17 million baht when 6% earning growth rate and 15% discount rate are applied. However, the economic loss may increase up to 5,733.14 million baht if 12% earning growth rate and 5% discount rate are applied. (Table 5.11)

Table 5.11: Sensitivity analysis of economic loss from work accidents

Unit: thousand baht

Discount rate	Economic loss at earning growth rate			
	6%	8%	10%	12%
5%	2,735,080.9	3,394,747.3	4,346,194.5	5,733,139.4
10%	1,835,571.4	2,108,526.3	2,483,518.3	3,005,735.6
15%	1,444,174.7	1,629,799.0	1,749,509.8	1,979,389.1

5.5 Determinants of Work Injury Rate in Thailand

5.5.1 Characteristics of factors determining work injury rate

According to the methodology described in previous chapter, the work injury rate as specified as the function of economic status, economic structure, safety policy and law enforcement, including WCF coverage. Time-series data of work injury rate and factors determining work injury rate during 1981-2000 have the following characteristics:

- Injury rate has an average rate of 39.0 per 1000 workers, with a minimum of 32.32 and a maximum of 46.65.
- Proportion of non-agricultural GDP has an average of 85.36, with a minimum of 79.95% and a maximum of 89.51%.
- Safety inspection coverage has a minimum of 0.95%, and a maximum of 6.59% in respect of all workplaces. The average inspection coverage is 3.81%.
- WCF coverage has a minimum coverage of 51.05% and a maximum of 75.75 % with an average coverage of 63.37% of total workers.
- Budget allocated to occupational health and safety promotion has an average of 65.22 million baht with a minimum of 9.82 million baht, and a maximum of 207.27 million baht.
- Proportion of workers in manufacturing and construction has an average of 55.42% of total workers with a minimum of 46.72% and a maximum of 60.14%.

Table 5.12: Characteristics of factors determining work injury rate

	Min	Max	Median	Average	S.D.
Injury	32.32	46.65	37.99	39.00	4.39
GDPgt	-10.50	13.30	5.90	6.28	5.29
Nonagri	79.95	89.51	86.49	85.36	3.56
Ins	0.95	6.59	4.31	3.81	1.86
WCF	51.05	75.75	65.99	63.37	7.97
Budget	9.82	207.27	33.61	65.22	64.95
MCon	46.72	60.14	57.04	55.42	4.05

5.5.2 Dummy variables and work injury rate

Work injury rate according to dummy variable is reported as follows:

- Dummy1: The average work injury rate during the absence of notification on employees' work safety (dummy1=0) is 38.35 while during the presence of such notification (dummy1=1), reach an average rate of 39.156.
- Dummy2: The average injury rate during the absence of notification on safety committee (dummy2=0) is 39.23, is higher than that in the presence of the notification (dummy2=1).
- Dummy3: The average rate before the economic crisis (dummy=0) is 39.916 while the average rate during crisis (dummy3=1) is 35.31.

Table 5.13: Comparison work injury rate with dummy variables

Variables		N	MEAN	S.D.	S.E.MEAN
Dummy1	0	4	38.350	2.726	1.363
	1	16	39.156	4.774	1.194
Dummy2	0	14	39.233	4.050	1.082
	1	6	38.440	5.485	2.239
Dummy3	0	16	39.916	4.212	1.053
	1	4	35.313	3.284	1.642

5.5.3 Model of work injury rate in Thailand

From regression analysis using ordinary least square (OLS) method, some variables of observations during 1981 to 1986 are not available. Therefore, only 14 observations (1987-2000) are included to the regression analysis. D1 is excluded due to no longer variation. Mcon is excluded due to multicollinearity and becomes redundant. The statistics of each determinant are as follows:

Proportion of non-agricultural GDP (Nonagri)

The results show that the proportion of Non-agricultural GDP is a significant explanatory variable for work injury rate at statistical level of

0.05. The coefficients are 3.06 and 3.02 in model 1 and model 2 respectively. (Table 5.14 and 5.15) This means that one percentage increase in non-agriculture GDP proportion may lead to an increase in the work injury rate by 3.06 to 3.19 per 1000 workers, holding other factors constant.

Dummy variable of economic crisis (D3)

The regression models show that dummy variable, used as the proxy for economic status, is a significant explanatory variable at statistical level of 0.05. The coefficient ranges from -8.91 to -8.67 . (Table 5.14 and 5.15) This means that during the economic crisis, holding other factors constant, the economic crisis causes the work injury rate to decrease by 8.67 to 8.91 per 1000 workers. On the contrary, in the absence of the economic crisis or upon the economic recovery, the work injury rate may increase by 8.67 to 8.91 per 1,000 workers.

The GDP growth rate

The GDP growth rate has coefficient of -0.57 . This reflects that, holding other factors constant, one percentage increase in GDP growth rate may reduce the work injury rate by 0.57 per 1,000 workers. However, this effect is not statistically significant.

Dummy of notification on safety committee (D2)

The presence of notification on safety committee (D2), has negative effect on the work injury rate with coefficient of -0.17 . This means that, holding other factors constant, law enactment may reduce the work injury rate by 0.17 per 1000 workers. However, the effect is not significant.

Budget allocated for occupational health and safety (Budget)

This variable has non-significant negative effect on the work injury rate. An additional one million baht spent on safety promotion may reduce the work injury rate by 0.07 per 1000 workers, holding other factors constant.

WCF coverage (WCF)

WCF coverage also has negative effect on work injury rate. The coefficient of -0.40 means that, one percent increase in WCF coverage may reduce the work injury rate by 0.40 per 1000 workers, holding other factors constant. However, this variable is not significantly explanatory variable of work injury rate.

The factor that has positive effects on the work injury rate is inspection coverage (Ins). The coefficient of 0.62 shows that one percent increase in safety inspection may render the work injury rate to increase 0.62 per 1000 workers. (Table 5.14) However, if this variable is excluded, the result in Table 5.15 may show that the coefficients of other factors are quite similar to those in model 1.

Table 5.14: Estimated model of work injury rate (Model 1)

Variable	Coefficient	t-Statistic
Constant	-191.5529	-2.302100
GDPgt	-0.571626	-1.912081
Nonagri*	3.067177	2.686984
D3*	-8.914970	-2.782288
D2	-0.166010	-0.056849
Ins	0.619145	0.918654
Budget	-0.070129	-1.341973
WCF	-0.401504	-1.493515
Adjusted R-squared	0.747948	
F-statistic	0.018112	

* Statistically significant at 0.05 level

Table 5.15: Estimated model of work injury rate (Model 2)

Variable	Coefficient	t-Statistic
Constant	-207.2015	-2.572893
GDPgt	-0.452275	-1.698811
Nonagri*	3.199658	2.857723
D3*	-8.673986	-2.746993
D2	-0.388639	-0.135062
Budget	-0.057672	-1.155707
WCF	-0.331541	-1.300529
Adjusted R-squared	0.753568	
F-statistic	0.008476	

* Statistically significant at 0.05 level