

# **Thai Life Insurer Efficiency**

**submitted by**

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## THAI LIFE INSURER EFFICIENCY

Thitivadee Boonyasai, Ph.D.\*

### ABSTRACT

The study global objective is to provide an analysis of the efficiency of the Thai life insurance industry during 1990-1997. This research utilizes data envelopment analysis (DEA), a mathematical programming approach, to calculate efficiency. To investigate productivity changes, a Malmquist analysis is used to determine whether and the extent of efficiency changes.

This study found that the Thai life insurance industry seems to have regressed in terms of efficiency after 1992. This drop in total efficiency was due to the inability of the average firm to keep pace with the best-practice life insurer as well as to loss in scale efficiency. This may be because Thailand did not adopt more liberal policies and maintained restrictive regulatory regimes.

The evidence suggests that, during 1990-1997, productivity growth was stimulated, particularly during 1995-1997. Productivity growth in the Thai life insurance market was caused primarily by technological change due to an expanding production frontier rather than an improvement in technical efficiency. Study result is consistent with the view that a host-country insurers benefit from foreign investment. Study results, hence, provide some evidence supporting Thai regulatory changes that would enable host-country insurers to benefit from a more open market.

### INTRODUCTION

Potential cost savings arising from *Total or Technical* efficiency in the life insurance industry are important to both firm managers and regulators. Efficiency insurance markets are better at allocating resources and at enhancing consumer choice and value than are inefficient markets.

Information about the size of such efficiencies is important because it may assist regulators and insurance companies since the worst practice, relative to the best practice, may not be able to survive in the long run. Therefore, if the problem is detected early, the adverse economic impact caused by financially inefficient insurance companies on economic welfare can be minimized.

The purposes of this study are as twofold: (1) to determine Thai life insurer efficiencies (e.g., technical efficiency, purely technical efficiency, and scale efficiency) and (2) to investigate Thai life insurer productivity changes (total factor productivity, technological change, technical efficiency change, purely technical efficiency change, and scale efficiency change). The study global objective is to provide an analysis of the efficiency of the Thai life insurance industry..

### MODEL AND METHODOLOGY

This research uses data envelopment analysis, a mathematical programming approach. To investigate productivity changes during 1990-1997, a Malmquist analysis is used to determine whether and the extent of efficiency changes.

### DATA SOURCES

The data used in this study are drawn from the annual reports filed by insurers in Thailand and the financial statistics publications reported by the International Monetary Fund. Data were collected as from 1990 until 1997. According to Thai annual reports, the total life insurance company population varies from 12 to 25 during the study period 1990 to 1997.

### EMPIRICAL RESULTS

We analyze performance of the Thai life insurers, from 1990 to 1997, in terms of their total efficiency and productivity growth. A set of linear programming calculates the within-year output-oriented total efficiency and between-year output-oriented productivity change.<sup>1</sup> This section begins with a brief background of the Thai economic and regulatory environment. This is followed by the descriptive and empirical results.

#### The Thai Insurance Environment

Insurance was first introduced into Thailand in the early 1900s. In 1939, all foreign insurance companies left Thailand following the outbreak of the Second World War. In 1949, American

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<sup>1</sup> Within-year efficiency measures efficiency in year  $t$ . Between-year productivity change is the ratio of the efficiency in year  $t+1$  to that in year  $t$ .

International Assurance, a subsidiary of the AIG, was the first foreign company to return to Thailand after the cessation of hostilities. In Thailand, life insurance policies are classified as ordinary life insurance, group life insurance, industrial life insurance and fraternal life insurance.

The growth of life insurance premiums during the period from 1990 to 1997 was substantial, not only in absolute amounts but also as a percentage of GDP. The premium of 19.42 billion baht (approximately US\$693.41 million), written in 1990, increased to 57.22 billion baht (approximately US\$1.47 billion) in 1997. The average annual growth rate of life insurance premiums from 1990 to 1997 was 16 percent whereas GDP grew on average of 11 percent annually during the same period.

The life insurance penetration ratio (premiums to GDP) was 1.19 percent in 1997. Life insurance density (premiums per capita) was US\$24 per capita in 1997. For comparison, the US life insurance penetration was 3.75 percent of GDP and life insurance density was US\$1,079 per capita.

The Thai insurance market has long been protected from international participation, limiting foreign shareholdings in domestic companies to a maximum of 15 percent and restricting newly licensed insurance companies according to the Non-life and Life Insurance Act in 1983. However, Thailand is a member of the WTO and is committed to liberalization of its insurance industry in accordance with GATS. As a result, since 1992, Thailand has progressively liberalized its insurance market.

In 1992, the limited foreign equity restriction was increased to 25 percent by the Non-Life and Life Insurance Act of 1992. In 1997, after a 15-year restriction on new licenses, 28 new insurance companies--12 life and 16 non-life insurance companies--received an approval to operate. In addition, to favor further liberalization, Thailand planned to increase the foreign ownership limit to 49 percent and finally remove remaining foreign ownership restrictions.

#### Insurance Market Structure

The Thai life insurance market is highly concentrated. The concentration ratio of the top four firms from 1990 to 1997 was 86 to 90 percent. AIA, a branch office of the AIG, has had a highest market share and recently had a 49 percent market share.

#### Data and Output and Input Specification

All data used in the Thai life insurance study were obtained from the Department of Insurance. The total life insurance population ranges from 12 life insurers in 1990 to 25 in 1997. Ordinary life insurance premiums ( $y_1$ ), group life insurance premiums ( $y_2$ ), industrial life insurance premiums ( $y_3$ ) and investment income ( $y_4$ ) are proxies for outputs. Input variables are salaries, wages and commissions ( $x_1$ ); physical capital measured by investment on real estate and operating assets ( $x_2$ ); financial capital measured by capital and surplus ( $x_3$ ); and business and services expenses ( $x_4$ ).<sup>2</sup> Means, standard deviations, minimums, maximums, growth rates and shares of the output and input variables from 1990 to 1997 are summarized in Table 1.1.<sup>3</sup>

<sup>2</sup> Eight of 111 observations had negative financial capital during 1990 to 1997. Firms having negative financial capital are excluded.

<sup>3</sup> Negative annual growth rate is not included in the sample.

TABLE 1.1 (a)  
SUMMARY OF STATISTICS OF  
THE THAI LIFE INSURANCE INDUSTRY, 1990-1997

Outputs and Inputs	Mean	Std	Min	Max
Ordinary Life Premium (y <sub>1</sub> )	2,447.82	5,280.17	0.00	25,844.09
Group Life Premium (y <sub>2</sub> )	82.33	145.08	0.00	834.86
Industrial Life Premium (y <sub>3</sub> )	397.52	968.70	0.00	4,633.92
Investment Income (y <sub>4</sub> )	577.84	928.79	19.49	4,578.94
Salaries, Wages and Commissions (x <sub>1</sub> )	999.35	1,667.41	0.00	7,836.75
Real Estate and Operating Assets (x <sub>2</sub> )	59.68	925.72	0.00	4,093.13
Financial Capital (x <sub>3</sub> )	1,431.09	2,465.42	12.88	13,388.14
Business and Services Expense (x <sub>4</sub> )	115.20	135.37	0.89	475.25

Note: Currency is in millions of baht

TABLE 1.1 (b)  
ANNUALIZED GROWTH RATE OF TOTAL OUTPUTS AND INPUTS  
FOR THE THAI LIFE INSURANCE INDUSTRY, 1990-1997

Outputs and Inputs	1990-1997
Ordinary Life Premium (y <sub>1</sub> )	15.89
Group Life Premium (y <sub>2</sub> )	29.04
Industrial Life Premium (y <sub>3</sub> )	9.63
Investment Income (y <sub>4</sub> )	17.16
Salaries, Wages and Commissions (x <sub>1</sub> )	15.84
Real Estate and Operating Assets (x <sub>2</sub> )	14.38
Financial Capital (x <sub>3</sub> )	36.15
Business and Services Expense (x <sub>4</sub> )	7.72

TABLE 1.1 (c)  
SHARE OF OUTPUTS AND INPUTS  
FOR THE THAI LIFE INSURANCE INDUSTRY, 1990-1997

Outputs and Inputs	1990-1997
Ordinary Life Premium (y <sub>1</sub> )	69.83
Group Life Premium (y <sub>2</sub> )	2.35
Industrial Life Premium (y <sub>3</sub> )	11.34
Investment Income (y <sub>4</sub> )	16.48
Salaries, Wages and Commissions (x <sub>1</sub> )	31.85
Real Estate and Operating Assets (x <sub>2</sub> )	18.86
Financial Capital (x <sub>3</sub> )	45.62
Business and Services Expense (x <sub>4</sub> )	3.67

### Total Efficiency

Here, we examine the Thai life insurance efficiency. We employed the computed technical or total efficiency (TE), purely technical efficiency (PTE) and scale efficiency (SE) estimates (one for each sample firm) from 1990 to 1997. Thus, we have a total of 103 observations in the panel.

The estimated TE, PTE and SE are reported in Table 1.2. For total efficiency, the results show that, after 1992, total efficiency decreased. A decrease in total efficiency was due to an inability of the average firm to keep pace with the best-practice life insurers (purely technical efficiency) as well as to loss in scale efficiency.

TABLE 1.2  
MEANS OF EFFICIENCY FOR  
THE THAI LIFE INSURANCE INDUSTRY, 1990-1997

Year	TE Total Efficiency	PTE Purely Technical Efficiency	SE Scale Efficiency
1990	0.947	0.974	0.968
1991	0.968	0.979	0.988
1992	0.982	0.987	0.994
1993	0.973	0.988	0.984
1994	0.913	0.946	0.962
1995	0.927	0.935	0.991
1996	0.948	0.977	0.970
1997	0.862	0.903	0.949

The decrease in purely technical efficiency since 1992 implies that the average firm was further behind the best-practice life insurer after 1992. Two possibilities could explain this result. The average firm could be in decline or the best-practice firm could be becoming more efficient.

Turning the issue to scale efficiency, we see that a negative impact on scale efficiency occurred after 1992. This could be expected given the way Thailand regulated insurance prices. With regulated prices above marginal cost, "big" firms arguably had incentives to produce more than the optimal quantity to gain or protect market share. Table 1.3 results are consistent with this view. After 1992, although a number of firms operated at constant returns to scale, there was a general trend for several to operate at decreasing returns to scale. If firms are trying to grow, they may sacrifice short-run efficiency costs for long-run market share. This could explain why, after 1992, firms are scale inefficient.

TABLE 1.3  
DESCRIPTION OF RETURNS TO SCALE  
FOR THE THAI LIFE INSURANCE INDUSTRY, 1990-1997

	1990	1991	1992	1993	1994	1995	1996	1997
CRS	8	6	9	8	7	8	8	13
DRS	1	2	-	-	5	5	3	10
IRS	2	1	1	3	-	-	2	2

### Productivity Changes

Productivity change results are summarized in Table 1.4. The annual entries in each column are geometric means of results for individual insurance companies, and the last column is geometric means of the annual geometric means.

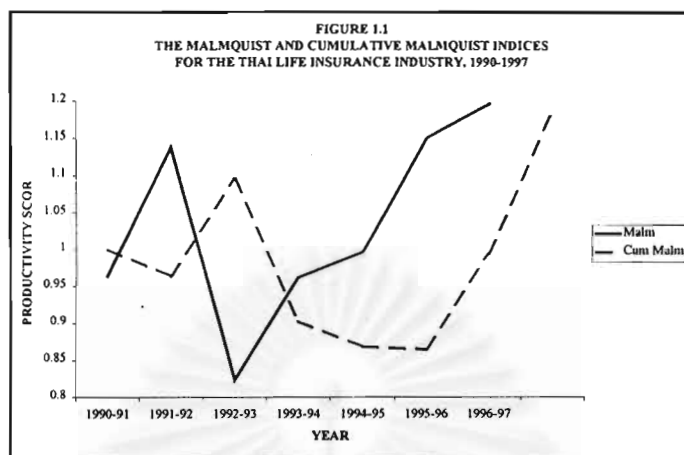
The geometric means of the Thai Malmquist indices exceeded unity in the last two periods, between 1995-1997. This means that productivity grew from 1995 to 1997. For the 1990-1997 period, the geometric means of annual Malmquist indices

TABLE 1.4  
 GEOMETRIC MEANS AND DIRECTION OF  
 PRODUCTIVITY CHANGE INDICATORS  
 FOR THE THAI LIFE INSURANCE INDUSTRY, 1990-1997

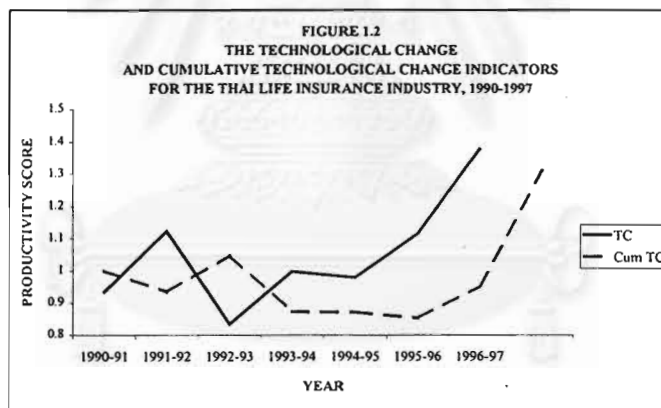
	1990-91	1991-92	1992-93	1993-94	1994-95	1995-96	1996-97	1990-97
<b>Malmquist</b>	0.964	1.137	0.824	0.962	0.996	1.150	1.196	1.025
Gain	5	8	4	5	8	9	10	
Loss	4	1	6	6	4	4	2	
No Change	-	-	-	-	-	-	-	
<b>TC</b>	0.934	1.122	0.833	0.998	0.979	1.115	1.377	1.039
Progress	7	7	5	5	7	10	12	
Regress	2	2	5	5	5	3	-	
No Change	-	-	-	-	-	-	-	
<b>TEC</b>	1.032	1.011	0.988	0.964	1.017	1.032	0.869	0.986
Gain	2	3	-	1	4	4	1	
Loss	2	-	3	2	2	2	5	
No Change	5	7	7	8	6	7	6	
<b>PTEC</b>	1.008	1.009	0.999	0.958	0.984	1.053	0.855	0.979
Gain	1	1	-	-	1	2	1	
Loss	1	-	1	2	2	2	4	
No Change	7	8	9	9	9	9	7	
<b>SEC</b>	1.024	1.004	0.989	1.007	1.034	0.980	1.016	1.007
Gain	3	2	1	2	2	3	2	
Loss	-	1	2	1	2	3	4	
No Change	5	6	7	8	6	7	6	

Note: The Malmquist Index is productivity change  
 TC is technological change  
 TEC is technical efficiency change  
 PTEC is purely technical efficiency change  
 SEC is scale efficiency change

suggest a 2.5 percent annual productivity increase. The cumulative Malmquist index shows that productivity did not grow until the last two periods (1995-1997) (see Figure 1.1).<sup>4</sup>



During 1990-1997, a 3.9 percent per annum technological progress, as defined by technological change (TC) greater than 1, occurred. The cumulative TC indicator indicates that the frontier shifted out only in 1995-1997 (see Figure 1.2). This relatively rapid increase in technological change tell us something about what is happening in the Thai life insurance market.

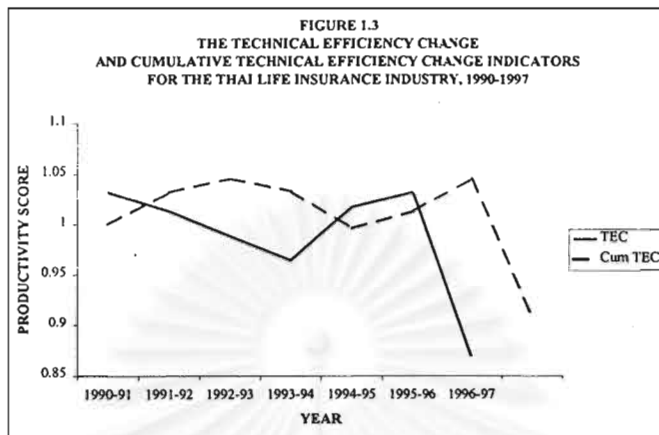


Recall that the PTE in Table 1.2 showed that the average firm fell further behind the best-practice life insurer; that is, the average firm lost ground to the best-practice firm. However, we see that the frontier for the best-practice firms is apparently shifting out faster than the average firm can respond. As mentioned above, this rapid technological progress occurred only in 1995-1997. Therefore, it may be too soon to see the effect on other firms. If the technological change as measured by a frontier shift continues, it suggests that a small group of the best-practice firm could be pulling away from the average firm in the market.

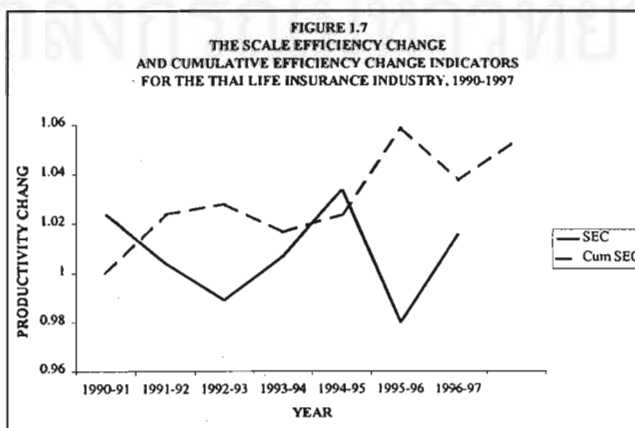
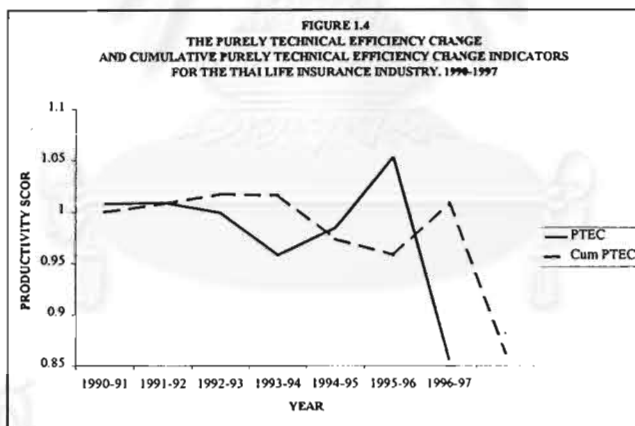
An improvement in total efficiency occurred after 1993, but total efficiency change declined during the last period (1996-1997). The cumulative TEC indicator shows that an increase in TE

<sup>4</sup> The cumulative Malmquist index (CMI) of year 1990 was assigned a value of one. The cumulative Malmquist index of year  $t$  ( $CMI_t$ ) =  $CMI_{t-1} \times MI_{t-1}$  where  $MI_t$  = the Malmquist index in year  $t$  and  $t = 1991, \dots, 1997$ .

improvement occurred after 1993, but an improvement in TE did not take place in 1996-1997 (see Figure 1.3). The geometric means of annual TEC indices suggest that an improvement in total efficiency decreased, at 1.4 percent per annum during 1990-1997. A decrease in TE improvement was due to a deterioration of PTE.



The growth of PTE decreased 2.1 percent per annum. The cumulative PTE indicator shows an improvement in PTE from 1993-1996 but a decrease in PTE from 1996-1997 (see Figure 1.4). However, we see that the degree in scale efficiency (SE) increased 0.7 percent annually during 1990-1997. The cumulative SEC indicator shows that the Thai life insurance business experienced scale efficiency gains after 1993 (see Figure 1.5).





Overall, the evidence suggests that, during 1993-1997, life insurers experienced an improvement in productivity, technological change and scale efficiency change. After 1993, an improvement in SE occurred, which caused the convergence of Thai life insurers' operation toward a long-run optimal scale. This trend, if it continues, causes the Thai life insurers to achieve profit-maximizing objective.

Table 1.4 also displays a count number of firms with respect to the direction of productivity changes. By looking at individual firms, we can see that, after 1992, a large number of Thai life insurers showed productivity gains, while a smaller number of firms showed productivity loss; that is, the proportion of firms that had productivity gains increased after 1992. In addition, there was an effect on productivity growth during 1990-1997. We see productivity growth especially during 1995-1997, as discussed above.

Also, increasing numbers of life insurers showed technological progress, while decreasing numbers of firms showed technological regress after 1992. This suggests that there was an increase in the proportion of life insurers that experienced an increase in technological change after 1992. This event linked to the frontier shift after 1992, although, again a rapid increase in the production frontier happened only during 1995-1997, as discussed above.

A smaller number of life insurers showed an improvement in TE, while a larger number of firms had no change in TE gains after 1992. This is because a small number of firms in the market showed an improvement in PTE and SE and a larger number of life insurers had no change in PTE and SE gains after 1992. Even so, an improvement in SE occurred after 1993, as discussed above.

## Conclusion

This study examined the efficiency of Thai life insurers. This section summarizes major study findings and discusses some of the study's managerial and policy implications. It also discusses directions of future research.

The Thai life insurance industries seem to have regressed in terms of efficiency after 1992. This drop in total efficiency was due to the inability of the average firm to keep pace with the best-practice life insurers as well as to loss in scale efficiency. This may be because Thailand did not adopt more liberal policies and maintained restrictive regulatory regimes.

What is interesting in the Thai life insurance market is that it appears that small life insurers were unable to expand their businesses because of scale inefficiencies. Scale inefficiency in the Thai life insurance industry is consistent with the view that large insurers were seeking to gain or protect market share. These large insurers, competing in a restrictive regulatory environment, were operating at decreasing returns to scale and, therefore, produced at greater than the optimum scale.

The evidence suggests that, after 1992, productivity growth was stimulated and a shift of production frontier occurred in the Thai life insurance business. The relatively rapid increase in technological change in recent years, for Thailand, apparently caused the frontier for the best-practice firm to shift out at a rate faster than that which the average firm could respond. Therefore, a small group of the best-practice firms could be pulling away from the average firm in the market.

The study finds that, during 1990-1997, the Thai life insurance market realized some productivity growth, particularly during 1995-1997. Productivity growth in the Thai life insurance markets was caused primarily by technological change due to an expanding production frontier rather than an improvement in technical efficiency. This result is consistent with the observation that Thailand having relatively low per capita GDP and low technology, as compared with other developed countries (e.g., USA), likely gained benefits from the transfer ideas, better skills and knowhow, technology and managerial techniques from foreign insurers. This is the type of a transfer that accompanies foreign investment in a host country (World Bank, 1998).

Thailand gained technological transfers from foreign companies during the 1990s due to the high volume of foreign direct investment (FDI).<sup>16</sup> Study results, hence, provide some evidence supporting Thai regulatory changes that would enable host-country insurers to benefit from a more open market.

<sup>16</sup> The average of the ratio of FDI to GDP in Thailand was 1.23 percent per annum during 1993-1996 (International Monetary Fund, 1997).

### Direction for Future Research

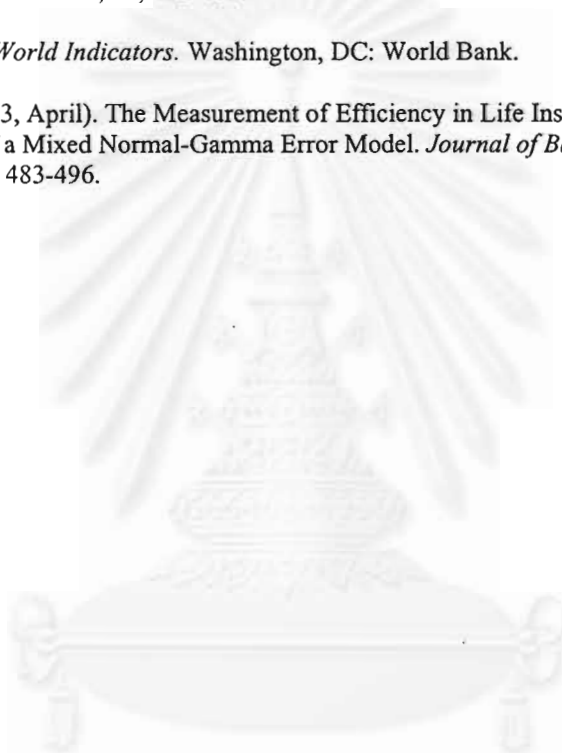
This study investigates the Thai life insurer efficiency, which is important to regulators, policy makers and consumers. Therefore, further research should be conducted to examine the linkage of liberalization and the efficiency of the Thai life insurance market. If the evidence suggests that efficiency favors liberalization, regulators should facilitate more effective regulation, especially as regards market conduct, competition law and prudential oversight (see Skipper, 1997). As a consequence, in the long run, a country can enjoy improvements in economic welfare via more efficient allocation of a country's resources.

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