

**Key Thoughtz:**

- The AMLCD business is capital intensive. Variable costs dominate however.
- Operating cash flows depend on material contribution margins, primarily.
- Expanding capacity faster than the ability to sustain or increase contribution margins leads to negative pre-finance cash flows.
- A competitor can collapse in the attempt to win the race if it tries to close the gap too fast.

## The Rise and Fall of Chi Mei Optoelectronics

**T**he rise and fall of Chi Mei Optoelectronics provides an object lesson for all producers striving for dominance in a capital-intensive industry wherein material costs constrain cash flow. The company expanded its capacity faster than it expanded its ability to forward integrate and to create value. In the end, Chi Mei Optoelectronics lost the ability to stand alone, so it merged with a more forward-integrated company.

In this commentary, we examine public disclosures by Chi Mei Optoelectronics (CMO, TSE: 3009) to shed light on the result of rapid capacity expansion. We find that monies invested in an effort to catch up with industry leaders generate large negative pre-finance cash flows. This finding correlates with earlier studies showing diminishing returns to scale: prices fall as fast or faster than cash costs do. Thus, efforts to catch-up destroy value unless the producer forward integrates sufficiently to capture additional value.

### Foundation

The history of Chi Mei (Group) is remarkable in three respects. The family founders guided employees away from reverence for family members and toward respect for professional managers. The group found that aggressive expansion, when it was the leader, led to scale benefits. The group also valued forward integration and sought ways to extend from core materials to components and finished goods. In hindsight, each of these company characteristics affected strategic choices made by CMO over the years.

As listed below, Chi Mei ("Unique Beauty") started with a retail store but the founder's son soon ventured into plastics. By the mid 1990's Chi Mei had become one of the larger polystyrene and ABS plastic producers in the world. Competition increased as a result of the Asian Currency Crisis, however, so the group forward integrated into plastic parts for computers, computer manufacture (via subsidiary Arch Technologies), color filter fabrication and AMLCD.

- 1950: Shu-Ho Shi opens the Chi Mei retail store for children's clothing in Taiwan.
- 1953: Chi Mei starts making plastic toys and household goods.
- 1957: Hsu Wen-lung, the founder's son, begins manufacture of acrylic sheets.
- 1968: Chi Mei produces polystyrene.
- 1997: the company announces plans to produce AMLCD.
- 1998: the company creates Chi Mei Optoelectronics (CMO).
- 1999: Fujitsu agrees to transfer AMLCD technology.
- 2001: CMO acquires the former IBM fab in Yasu, Japan and operates the subsidiary as International Display Technology; CMO also agrees to supply NEC with laptop panels and forms an IC design subsidiary, Himax Technologies.
- 2004: Hsu Wen-lung steps down as chairman after the mainland Chinese government labels him "a shameless anti-Chinese bigot."
- 2005: CMO acquires Westinghouse Digital Electronics for assembly of modules in Ningbo, China; it sells International Display Technology (IDTech) to Sony.
- 2008: CMO invests more in its OLED subsidiary CMEL and also invests in a solar cell (photovoltaic) subsidiary.
- 2009: CMO halts construction and equipment installation at the new Gen-8 fab; later, it announces merger with Innolux Display.

### Acquisition

The roots of CMO were planted in 1997 when Chi Mei Electronics was formed to make color filter sheets for STN and TFT LCD. This initial venture in display components was significant because no other Taiwanese company developed color filter capabilities until the following decade. This component supplier was merged with CMO in 2000, which reduced dependence on purchased components and gave CMO a cost advantage over Taiwanese rivals for a time.

CMO was formed in 1998. Core AMLCD technology came from the national research institute (ITRI-ERSO) and from Fujitsu. That Japanese producer decided to forego organic growth and trade its know-how for a share of CMO production in 1999. That was one of several such technology-capacity agreements struck between Japanese and Taiwanese companies at the time. (Korean producers had already become the new industry leaders and Japanese companies were changing their corporate priorities.) As a result, Fujitsu became the producer's largest customer in 1999–2000. Most of the panels shipped were for laptops in the 12" to 14" range.

CMO acquired additional technology in 2001 when it acquired an 85% interest in International Display Technology from IBM. Until then, IBM had operated the 550 x 650 mm substrate fab in Yasu, Japan as

part of a joint venture with Toshiba. The technology used at that site was owned by IBM, however, so it was severable. Through this deal, CMO acquired valuable know-how and overseas marketing organizations. Most of the panels made in the IDTech subsidiary were sold in Japan. NEC was a key customer. The line was later sold to Sony, who needed more capacity for its small display products. CMO kept the marketing organization, however, because it had become a key operating unit.

Improved marketing capabilities and acquired panel technologies helped CMO extend its reach into the desktop display market. In 2001, CMO sold most of its larger panels to Arch Technologies until that Chi Mei affiliate was sold. By 2002, most panel shipments went to other Taiwanese OEM who assembled PC monitors. Such success was constrained by capacity for larger panels, however. Several attempts were made in 2002 and 2003 to obtain funding and to establish module assembly operations in China.

As noted in the Taiwan press throughout 2002–2003, Chinese officials disapproved of Hsu Wen-lung, chairman of CMO, because of his pro-independence (from the mainland) views. Chi Mei had taken CMO public in 2002, so CMO was a natural target for Chinese polemics. Thus, while AU Optronics (TSE: 2409) and other competitors were establishing themselves in China, which was becoming the center of OEM activity, CMO was stuck on the mainland with limited means. This situation led Mr. Hsu to resign, allowing a professional manager, (Frank) Liao Chin-hsiang to take the chair.

This change in management marks a profound change in CMO strategy. From 2004 through 2007, the company expanded rapidly and organically to challenge AU Optronics, the island's leading AMLCD producer. The strategy of aggressive expansion worked for Chi Mei Industrial in the plastics business but it was a prime mover then, not a follower.

## Expansion

With a new face, CMO was able to gain a foothold in China by acquiring former Westinghouse Digital Electronics assets in 2005. The acquired plant in Ningbo was readily converted to assemble CMO display modules. More importantly, CMO was able to use a run-up in panel prices in early 2004 to float a convertible bond that helped fund the acquisition and most of a new fab.

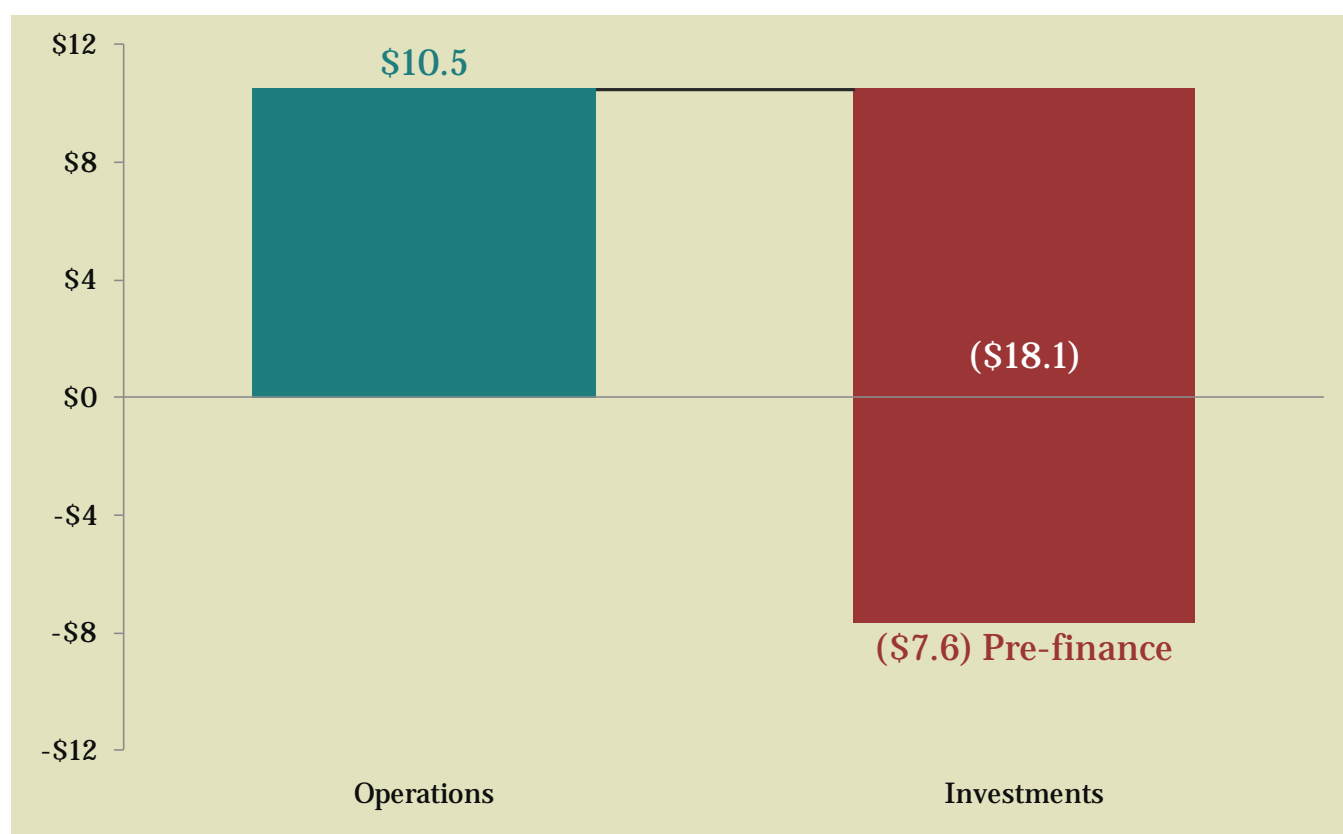
Additional capacity was needed if CMO hoped to preserve its shares of the burgeoning desktop and emerging TV display markets. Rival AU Optronics had nearly twice as much capacity as CMO did in 2004 and

## The Rise and Fall of Chi Mei Optoelectronics > Expansion

CMO was in negotiations to sell its capacity in Japan. The management team aimed to catch-up as soon as possible. As a result, CMO spent a total of \$15.8 billion on property, plant and equipment from 2004 through 2009. Unfortunately, the assets generated only \$2.1 billion of operating profit over those six years. CMO was unable to drive costs down as fast as its competitors drove prices down.

Deteriorating conditions are best illustrated by this plot of total cash flow during the eight years CMO was a public company. For simplicity, this study sums the annual consolidated cash flows and converts these to US dollars using the official exchange rate of 31 December 2009.

**Total Cash Flow 2002–2009 (billions USD)**

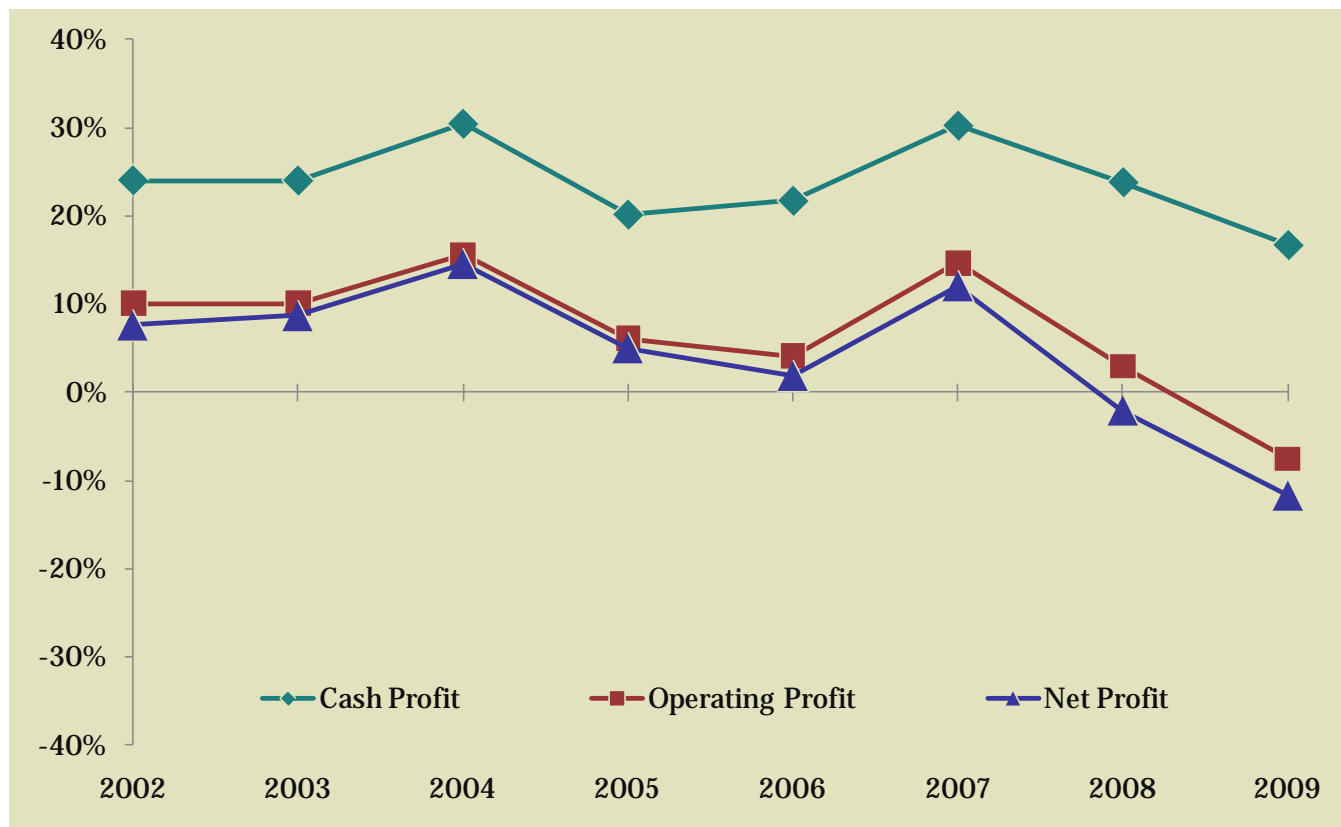


Source: company disclosures; US Federal Reserve

This producer generated \$10.5 billion of cash from operations but invested \$18.1 billion. That meant CMO had to finance \$7.6 billion or more to fund itself. As time went on, lenders and stock buyers found it harder to believe that CMO would become self-supporting. One reason for this was their analysts could measure consolidated results for a number of AMLCD producers. Changes in Taiwan's accounting rules (GAAP) eliminated a number of peculiarities after 2007 and made operating results more like those reported in Korea. If we plot results reported by CMO, we can see evidence of diminishing returns.

## The Rise and Fall of Chi Mei Optoelectronics > Contraction

### CMO Profit Margin Development, 2002–2009



Source: company disclosures of consolidated results

We can see two business cycles over the eight years. There are two peaks but the ones in 2007 are slightly lower than the peaks in 2004. The valley in 2009 is also lower than the valley in 2006; it is closer to the level experienced by competitors with longer histories in 2000–2001. Analysts could see that these results were not much worse than those reported by the larger AU Optronics, which reported an average operating profit margin of 8% compared to 5% for CMO over the years. This suggested that getting bigger wasn't much better, especially if you had to borrow more to catch up.

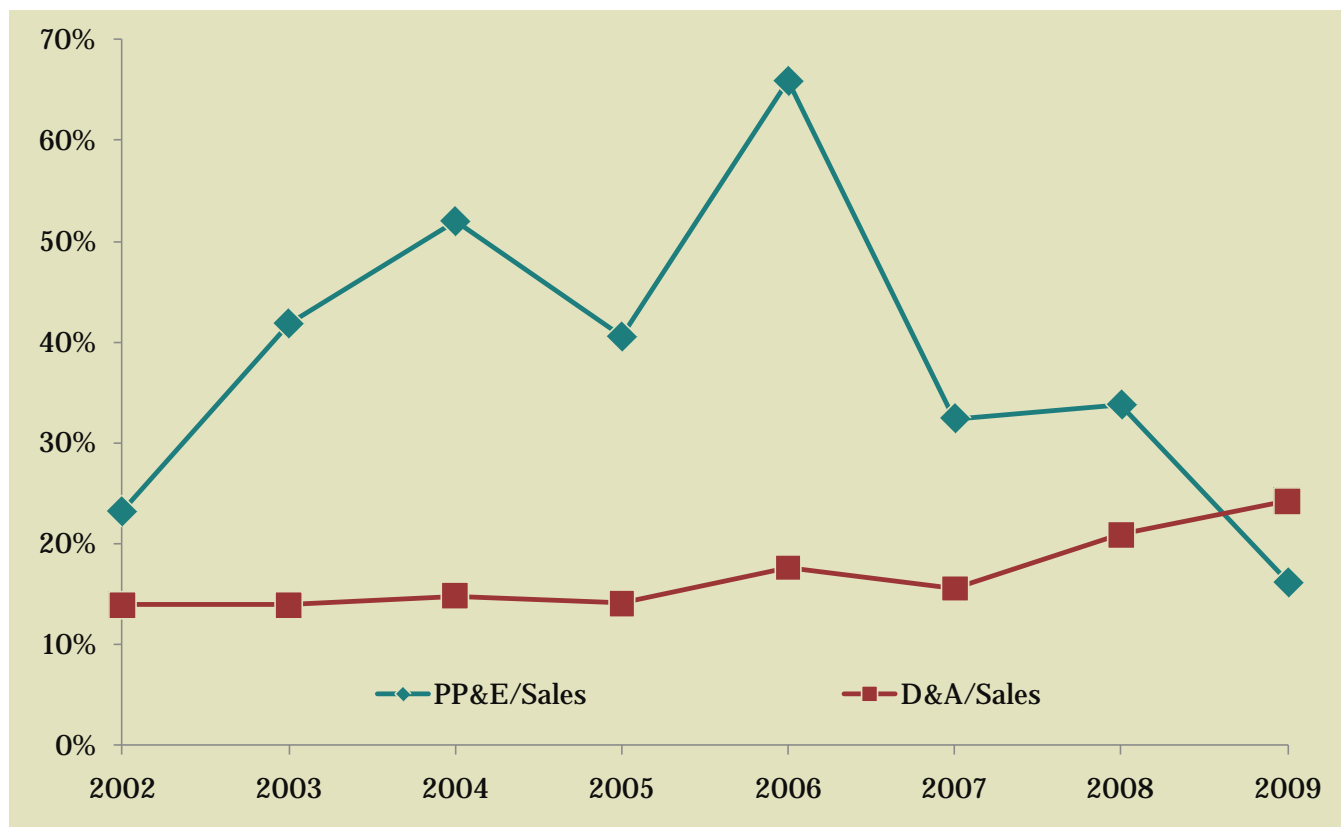
## Contraction

The rush to close the capacity gap led CMO into a funding gap as credit tightened globally in 2008. Corporate debt rose above 1.4 times equity in 2008 and return on capital turned negative. The company was forced to halt expansion, leaving a new fab facility unfinished. That left the assets already in place unproductive but executives had few alternatives at the time. Worse, depreciation charges for past investments were still increasing in 2008 and 2009 as panel prices were decreasing.

## The Rise and Fall of Chi Mei Optoelectronics > Integration

The following chart plots capex (PP&E) and depreciation (and amortization, D&A) as percentages of sales. We can see how CMO increased capex so that it reached 66% of sales in 2006. That was the year LCD TV really roared onto the scene in most regional markets. Since then, CMO was forced to reduce capex relative to sales but D&A charges became a larger portion of sales from 2007 through 2009.

Quarterly Share of Annual AMLCD Sales (USD base), 2003–2009



Source: company disclosures

The company was able to resume expansion after announcing the merger. Lenders rewarded both CMO and Innolux Display (TSE: 3481) with new loans even before the merger was consummated.

## Integration

There is reason for some optimism because the merged entity will have more prospects for forward integration than CMO had alone. In recent years, the Chi Mei Group benefitted from touch screens, signage displays or other value added to CMO panels by Chi Lin Technologies and its subsidiary, Chilin Displays. Such value accrued to Chi Mei (Group), which is a private company however. CMO shareholders had only a 5% equity stake in Chi Lin Technologies. In contrast, Innolux

Display has always assembled PC monitors and other products using its panels, so such value accrued to its shareholders directly.

Value added by forward integration increases a panel producer's return on invested capital (RoCE) substantially because assembly capacity may cost only 5% as much as fabrication capacity that feeds it. In addition, a smart producer can reduce total product cost by eliminating some manufacturing steps required when a panel maker hands its modules to a separate PC or TV assembler. The cost of incoming inspection can be eliminated for example. Over time, a forward-integrated producer can find other savings such as combining module packaging and TV packaging steps in a way that reduces labor and material costs. Assembling products and managing changes in customer specifications or order rates can increase operational complexity and overhead but from a capital perspective, such value added falls directly to the bottom line.

The opposite result occurs when a display producer sells lower-level products such as LCD cells. In such cases, the producer ships a cell composed of a TFT array and color filter array sandwiching the liquid crystal (fluid). Making such cells requires only one-half of the material cost of a full module but nearly all the fixed cost. As a result, selling cells shifts the producer's cost structure from 1/3 fixed cost to 2/3 fixed cost. If a producer allocates a significant portion of its fab capacity to such cell business, it loses the ability to turn down low bids because it must cover fixed costs. In addition to losing price power, the producer foregoes about one-half of its usual material contribution. That cuts sales revenue sharply and reduces return on capital. Reduced operational cash flows constrains the producer's ability to fund expansion without external finance.

That is what happened to CMO when it decided to capture share of the domestic Chinese TV market in 2008–2009. Chinese TV brands and their assemblers sought value-added opportunities and CMO was willing to sell them cells. Such transactions helped keep CMO fabs busy but they also transferred value from CMO to its customers.

As mentioned above, Chi Mei Group companies also added value to CMO panels but they did not create for CMO shareholders (other than Chi Mei itself). Chi Mei (Group) recognized the importance of assembling higher-level products from the outset. It established Arch Technologies in 1999, soon after launching CMO. That subsidiary was sold in 2001 but Chi Mei soon launched another product company: Nexgen Mediatech. Beginning in 2006, Nexgen Mediatech became responsible for Chi Mei brand products, chiefly PC monitors and TV sets sold in Taiwan.

## The Rise and Fall of Chi Mei Optoelectronics > Implication

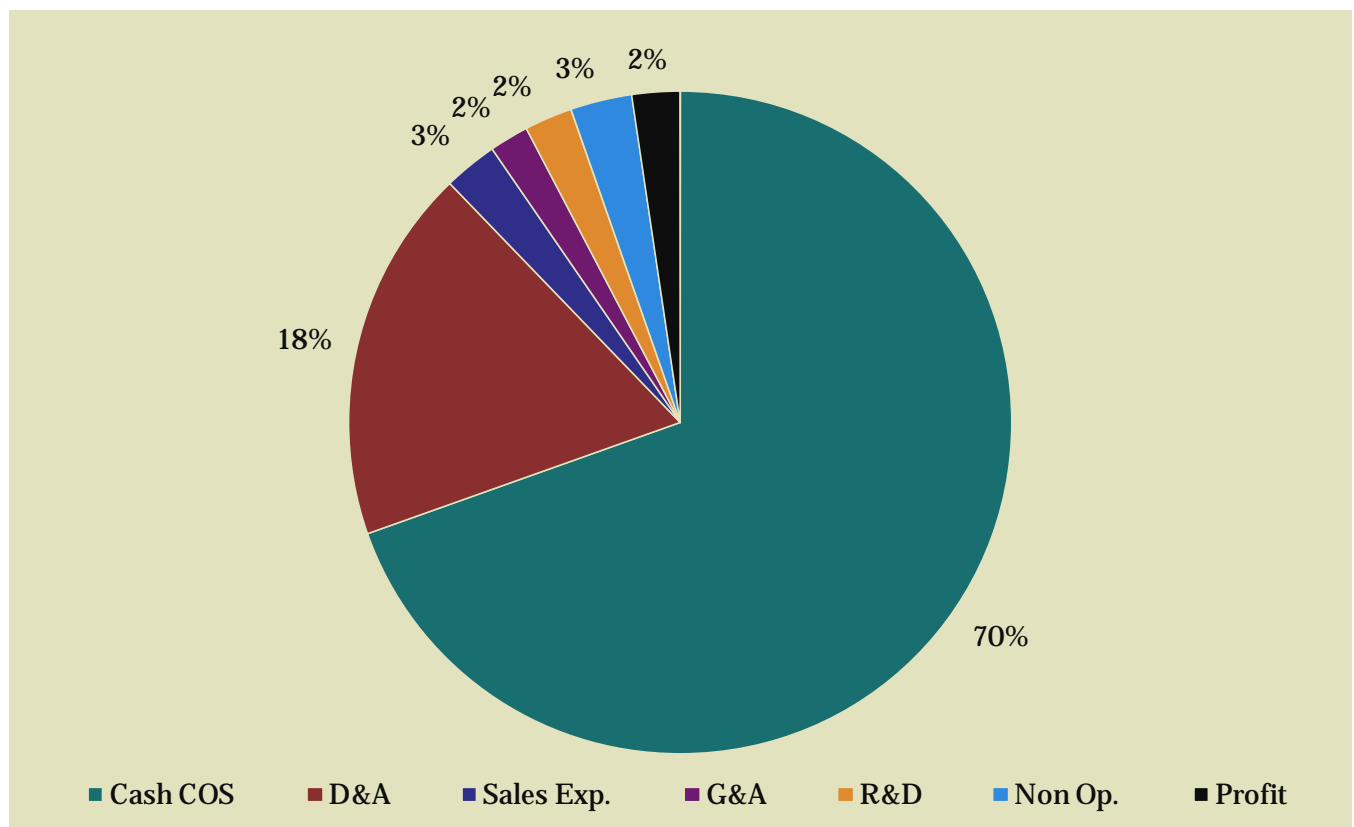
CMO shareholders did not benefit from the Chi Mei brand but they did benefit from the acquisition of Chi Hsin in 2009. CMO had owned more than 50% of that small panel assembler but the acquisition brought important know-how into the company. Integrating those operations may aid integration of CMO with Innolux Display in 2010.

### Implication

The history of CMO leads us to question the wisdom of new loans. We think the combined Chi Mei Innolux will have better prospects than either company had alone but we think history indicates economic profit will remain elusive.

As charted in the following figure, 70% of CMO sales went to material suppliers, workers and other cash cost of sales over the eight years. This amount is similar to that recorded by other AMLCD producers. Despite all the talk about fabs and technologies, AMLCD production remains a material resale business for the most part. Key suppliers make much higher profit margins than panel makers do and they obtain those margins using much less capital.

Aggregate Cost Structure, 2002–2009



Source: company disclosures

## The Rise and Fall of Chi Mei Optoelectronics > Implication

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The key differences between panel makers are their depreciation charges and organizational expenses relative to sales. Producers that expand more slowly may have less depreciation over time and producers with larger scale may have smaller organizations relative to sales. Bottom line, however, no producers are creating economic value.

*Data used in this study is available for download if readers want to delve more deeply:*

[www.bizwitz.com/Downloads/Numberz-20100228.xlsx](http://www.bizwitz.com/Downloads/Numberz-20100228.xlsx)



—David Barnes for BizWitz LLC, a consultancy specializing in electronic display and imaging business decisions through the supply chain from raw materials through retail, worldwide