

Lecture 21 - Pre-lecture reading

We Bulldoze and cellular- lessons in growth and fast depreciation

Creating a simple “public” business: We Bulldoze, Inc.

In upcoming lectures we want to understand financial issues and management motives in some new ways. To simplify that understanding we have created a small and simple company having nothing to do with the huge and complex cellular businesses. In general, we will seek to understand issues in terms of We Bulldoze and then extend them to improve our understanding of cellular.

The goal of our little company is to get involved in clearing and preparing land for local home builders. Specifically, we want to buy 10 bulldozers at \$1 million each and do work for local home builders at \$250/ hr. There is a lot of construction going on, and we expect to get 2000 hours of revenue per bulldozer per year. We will rent a building for \$50K per year for our business headquarters, garage and repair shop. We will employ one manager @ \$150K, 10 bulldozer operators @ 120K each, one office manager @ 30K, and one maintenance person for \$80K (+ \$120K for parts). Our bulldozers will last about 10 years, so we need to take 10% depreciation as an expense per year. Saving the depreciation will allow us to replace our ten bulldozers in ten years.

To raise the \$10M for our bulldozers, we will sell shares of stock. We could sell a million shares for \$10/share or 10 shares for \$1M/share. It doesn't matter for the economics, but investors seem to prefer shares costing \$10-100 dollars, so we will offer a million shares at \$10/share. Let's say that in our current world, the investors want a 10% return on their investment (\$1/share), so we show them our “business plan.”

Original balance sheet, P&L for our first year and new balance sheet after first year

Balance Sheet after Purchase of equipment Assets \$10M Cash \$0 Equipment \$10M Liabilities & Eq \$10M Equity \$10M	Results of 1st year operations Oper Revenue \$5.00M Expenses \$3.50M Salaries \$1.450M fuel \$0.80M Maintenance \$0.20M Rent \$0.05M Depreciation \$1.00M BT Earnings \$1.50M Tax \$0.50M AT Earnings \$1.00M Divd \$1/share \$1.00M (10% return on shares)	Balance Sheet after 1st year Assets \$10M Depr acct \$1M** Equipment \$9M* **After 10 years, we will have \$10M in a “depreciation account” to buy new bulldozers, so the company can go on! Liabilities & Eq \$10M Equity \$10M *10 Bulldozers (depreciated)
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They are happy with a return of 10% as a cash dividend every year, so they invest in our company.

Dividend or re-investment in “growth”—a classic option

If all goes well, at the end of the first year we have an option. We can deliver the \$1M profit to our investors as a dividend of \$1/share (the 10% we predicted in our plan above). But suppose business is good and there is enough work for 11 bulldozers. We could use our profit of \$1M to buy another bulldozer, thus creating growth in our business. Why would the stockholders agree to this (after all, the dividend was why they invested)? The answer is that the reinvestment option (shown below) could provide a greater return than 10% in the longer term. We show revenues increasing by 10% but expenses increase by less than 10% (there is still one manager and one office manager and (we will assume) one maintenance person, and there is still one building. This is a real-world look at SG&A increasing more slowly than revenue in a growing company. As a result, earnings will increase—not by 10% but by 13%. Of course, the \$1.13 dividend in year two doesn't make up for losing the \$1 dividend in year one, so why would the investors agree to invest their dividend in another bulldozer? The answer is that the share price should also increase. If new buyers of our shares want the same 10% return that the original investors did, they should be willing (after year two, based on the dividend of \$1.13) to pay \$11.30 for the shares that we bought for \$10.00. At the end of year two, they would (arguably) have a dividend of \$1.13 and a share worth \$11.30, for a total gain of \$2.43. For a truly fair comparison we should assume that the first dividend of \$1.00 could have been invested in something else yielding 10%. In that case, the dividend option would yield \$2.10, compared to the growth option yielding \$2.43.

Instead of paying a dividend we could buy another bulldozer (creates earnings growth)

Balance Sheet after 1 st year	Results of 2 nd year operations	Balance Sheet after 2 nd year
Assets \$11M Depr acct \$ 1M Equipment \$10M* Liabilities & Paid-in Eq \$11M Equity \$10M Retained earn \$ 1M *11 Bulldozers (10 depreciated)	Oper Revenue \$5.50M Expenses \$3.81M Salaries \$1.57M fuel \$0.88M Maintenance \$0.21M Rent \$0.05M Depreciation \$1.10M BT Earnings \$1.69M Tax \$0.56M AT Earnings \$1.13M Dividend \$1.13M Shares worth \$11.30 After first year?	Assets \$11.00M Depr acct \$ 2.10M Equipment \$ 8.90M Liabilities & Paid-in Eq \$11.00M Equity \$10.00M Retained earn \$ 1.00M

What is unrealistic about this example is the idea that management would go back to its investors with this proposal. People who invested in our company expecting a 10% dividend would have been “dividend oriented” in the first place. The idea of suddenly not getting the expected dividend check would probably feel like a betrayal of their trust. Will the share prices really increase? Perhaps they were planning a vacation with that dividend check. On the other hand, many investors prefer investing in growth companies. They are willing to take more risk for the potential of a greater return. Dividend companies and growth companies are popular, but they tend to attract different groups of investors. This issue can cause problems when a growth company stops growing, as it did with the cellular providers. Going from dramatic growth to no growth (as cellular seems to have done) can disappoint long-term shareholders and cause problems for management, as we will see in the next lecture. For the moment, we will shift our focus to depreciation and explore the potentially dramatic effect of “fast depreciation.”

Depreciation and fast depreciation- some surprising results

We expect to have to replace those bulldozers in 10 years, so we show a depreciation expense of 10%, or \$1M per year, which we plan to use to buy 10 new bulldozers in 10 years. To be clear, that \$1M set aside for replacing bulldozers in 10 years isn't money someone gives us for that purpose. It's an expense we take out of our revenues (just like salaries, except it isn't necessarily spent yet). The government sees it as replacing a loss (the loss in company assets caused by the wearing out of our bulldozers) so it is money that we get to keep that isn't taxed (they don't treat it like profit). Importantly, they also don't care what we actually do with it. They assume we know best how to use it to get the highest value for our company. If our plan was to close down in 10 years, we could give the depreciation money back to our investors every year (as “return of investment capital”). In ten years we would have paid back their investment while (hopefully) paying a 10% dividend every year until then. Obviously, most companies wouldn't do that, but it would be allowed.

In the other direction, we could use depreciation to buy an added bulldozer every year to make more money. That would cause a problem in 10 years when the first 10 bulldozers have to be replaced, but the government wouldn't care.

But what if we knew something the government didn't know? What if the new bulldozers we are buying are made better than older ones? The government has old information and is unwittingly allowing us “fast” (10-year) depreciation but we expect our bulldozers to last 20 years. We can use that seemingly trivial mistake by the government to double our profits. That a boring concept like depreciation could have such dramatic results seems hard to believe, so we need to see how this works.

The magic of fast depreciation

Let's assume there will be enough business for 20 bulldozers and we are confident our bulldozers will last for 20 years (not the 10 years the government is assuming). We therefore buy a new bulldozer every year from the depreciation account. Note that we are buying the new bulldozers with pre-tax money (so it's like buying new base stations at a 35% discount (now 21% with the new tax law, but it's been 35% in the past).

Assuming full use, a new bulldozer will add \$500K to our revenues and will only add \$232K to our expenses (\$120K for an operator and \$12K for repair parts+\$100K additional depreciation). We won't need a new manager, or office manager, or maintenance person (as expected, growth makes us more efficient). Our profits will increase by $(\$500K - \$232K) \times .65 = 174K$ per year for each new bulldozer and there's plenty of building going on, so we plan to buy 1 bulldozer from depreciation money every year for the first 10 years. We plan to stay at 20 bulldozers after year 11.

Our total added profits from the new bulldozers will be about 174K in year 2, \$348K in year 3, etc., up to \$1.74M in year 11 (a total of \$9.57M extra profit through year 11). We don't have to replace our original bulldozers after year 10 because they will last for 20 years, so the extra \$1.74M per year for the 10 new bulldozers will go on for another 9 years, creating another \$15.66M in added profits by the end of year 20, when we have to replace the original 10 bulldozers. We have spent our depreciation money on the 10 new bulldozers, but we have already depreciated the second 10 bulldozers, and we haven't spent that money, so we buy 10 replacement bulldozers with that money at the end of year 20. In years 21-30 we continue to make an added profit of \$1.74M/year, for a total of another \$17.4M. We will be replacing the second 10 bulldozers in that decade (one at a time), but we have depreciation money (\$1M a year) from the 10 we just bought. After 30 years we will have created a total added profit of \$42.6M simply because the government gave us 10-year depreciation on bulldozers that actually depreciate in 20 years. We used that early money to create a company that is twice as big and more than twice as profitable (while paying dividends every year). We gave our investors an added \$42.6M on top of the \$30M in dividends they expected, and that will go on forever, just because of unrealistically fast depreciation. [Note that we didn't get more depreciation (the total amount can't exceed the price of the bulldozer minus its scrap value) but we got it earlier, and spent it earlier, and got more depreciation on the new ones before we had to replace the old ones, and we did it all with pre-tax money.]

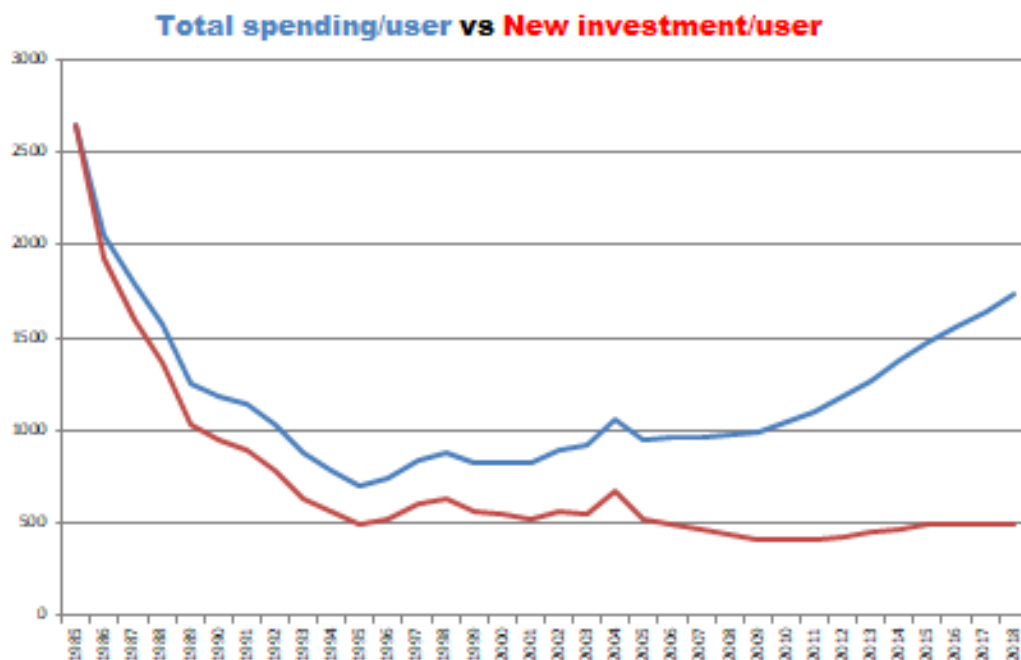
Another point worth mentioning is that this strategy was only possible with a growth strategy that could use the depreciation money. Clearly, accounting strategy is a very real part of business strategy, but how does this relate to cellular?

The important effect of 10-year depreciation on cellular base stations

In cellular, depreciation for base stations has been set by the government at about 10-years (10%/year), which is typical for radio equipment. In fact, the base-station radios have been replaced three times (2G, 3G, 4G, 5G) in 40 years, so a 10-year life seems realistic. In fact, however, most of the million-dollar base station (the land, building, mast, and connection to the switch, and the "capitalized" legal expense to get permits) is seldom or never replaced, so a much longer life could have been realistic for most of the cellular base station. Since most of the investment in existing base stations doesn't need to be replaced, this unrealistically fast depreciation has allowed the providers to pay for about 76% of growth (new base stations) out of the depreciation account for existing base stations, with pre-tax money. They haven't had to find hundreds of billions of dollars in new investments to grow, and their shareholders have benefitted from this windfall. An accounting principle that is theoretically used to maintain the value of eroding assets is actually being used to buy new assets, since the old assets are not being replaced.

We can calculate this advantage for cellular growth using the CTIA data (see “CTIA data-1985-2020”). This is shown below where we compare the spending on growth and replacement to the spending after depreciation (which represents the real investment). The dramatic spending of the smart phone era disappears and we see a nice steady investment of about \$500/user through 2G, 3G and 4G, and since the revenue per user is rather steady as well, we can understand why (even with the huge amounts they were spending on 3G and 4G, their P&L seemed fine—they were saved from a much worse situation by fast depreciation).

The 10-year depreciation masked the huge increases in investment



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Note that the spending on things like new cells was correctly reported by the CTIA as “CapEx” (Capital Expenses), which includes both depreciation and new investment that goes into new assets. From our point of view, the takeaway is that the real physical depreciation that occurred was much less than the 10% a year that was allowed. If the government had allowed (say) 5% or less (20-year depreciation or more), the depreciation would have been much less per year. As a result, cellular providers would have had to look for much more new investment for their growth (which would have “diluted” the profit seen by the original investors) or reinvested a significant portion of their after-tax profit in new cells. Every dollar that wasn’t allowed as depreciation would have been taxed 35% (which would have reduced the amount available for spending on growth). The bottom line is that the apparent profitability of cellular systems (and the

dividends they were able to pay) would have been reduced significantly. By allowing 10% depreciation the government reduced the amount of new investment needed for growth and made cellular a much more attractive investment. We see from this that government policies on things like depreciation can significantly affect the profitability of companies during periods of growth.

If we calculate the Balance Sheet and P&L based on depreciated investment we see a much more impressive result. Instead of a profit of about 6% (based on the full amount spent on the systems) we see a profit of more than 30%.

Hypothetical financials with depreciation for a nationwide 4G system with 100M users

Balance Sheet (after depreciation and amortization)		Results of operations	
100M users at \$2K/user = \$ 50B		Revenue @ \$50/month/user	\$60B
Spectrum (a guess) = \$ 30B		TOT Expenses	\$22B
		SG&A	\$15B
		Depreciation (10 yr)	\$ 5B
		Amortization	\$ 2B
Total Assets =	\$80B	BT Earnings	\$38B
Shareholder equity	\$80B	Tax	\$13B
		AT Earnings	\$25B
		Return on equity	31%!!

This is obviously quite high, but shareholders in an established company don't measure profit against some ancient depreciated assets. They measure profit against current share price.

This now seems like an unbelievably high return on investment, but this business is now well established and investors no longer care about profit measured against old, depreciated assets. They now measure profit against the current share price. If they paid \$10 for a share of some company and its after tax earnings are \$1/share, it is delivering 10% profit. Similarly, they consider the value of the company to be the total value of its stock, which is called its "market capitalization" or "market cap" (Market cap = share price x total number of shares. Earnings/share = total earnings / market cap.

Up to this point we have implicitly suggested that the price of a share is determined by its earnings. For example, we were willing to pay \$10 for a share of We Bulldoze because we expected it to show a profit of \$1/share and we "demanded" a 10% return. We further assumed that if the profit increased to \$1.10 the share price would increase to \$11. The reality is quite different. Over the very long term (i.e., decades), we will see that stock prices (on the whole) tend to follow earnings (on the whole), but in the short term the share price of a particular company may be affected by a multitude of other

factors, from “breaking news” about the chief financial officer being arrested to a global pandemic. We will explore the issue of share price in the next lecture.