THE BUSINESS SECTOR

When we talk about investment from an economic perspective, we are not talking about corporate stock and bonds. We will define investment as plant, equipment, and inventories.

Components of Investment

Plant and equipment are also known as capital assets, capital goods, or capital stock. Plant can be thought of as buildings, structures, factories, etc. Structures include not just commercial buildings but also residential homes. Equipment is machinery, furniture, computers, etc. The last category, inventory, is the smallest component and the most volatile. It is considered by many to be a key link in business cycles. Business spending on investment is a barometer of economic activity as well as being one of its major components, since investment is more volatile than consumer spending on non-durables and services.

Please note that I often use the terms investment, capital, and capital goods somewhat interchangeably.

Components of Investment, 1997
$ Billions

	$ B	%
Residential Structures	327.9	26.1
Nonresidential Structures	240.2	19.1
Equipment	620.5	49.4
Change in Inventories	67.4	5.4
Total Gross Private Domestic Investment	1,256.0	100.0

Source: Survey of Current Business

Investment Expenditure Function

What are the major factors affecting demand of investment? Demand for capital is a derived demand. If demand for pizza is down, then demand for pizza ovens will go down. If demand for professional services such as lawyers, accountants, etc. declines, then demand for office space will decline.

Income (Induced Investment)

From the prior discussion, it is obvious that income is one of the major factors. The major factor actually. Income or revenue that is generated by the capital will be a function of its productivity and revenue per unit of product or service (that is, price). For example, let's say that a pizza oven can bake 100,000 pies per year and can be expected to last 5 years. Given its cost, what additional revenue will it generate? As a measure of revenue we will use the contribution margin per unit. It is, in this case, a measure of revenue after the other variable costs have been subtracted: price - average variable cost. It also measures the additional revenue that only the capital is responsible for. Assuming that we can sell all of the pies we can bake at a contribution margin per unit of $.50, this oven generates $50,000 per year or $250,000 over the life of its operation. If the oven costs $25,000, then the decision would be to buy it.

From the above discussion, one can infer that income is the major factor affecting investment. By definition, income minus expenses equals profit. No income, no profit! Investment increasing due to income is called induced investment. There are several reasons for this. Income finances investment. More specifically, it is retained earnings (profits not paid out) that buys new assets. Poor income causes little new investment. From yet another perspective on this issue, banks will not lend to businesses to

finance asset growth unless they see income. Income services the loan. If a bank has to foreclose, chances are very good that it will lose money on selling the assets used as collateral to satisfy the loan.

This contains somewhat of a circular argument. Firms need assets to generate income. For example, for Wal-Mart to continue growing, it must open new stores. New stores are new assets. Without new assets, new income is not generated. Consequently, it is current profitability that must generate investment funds.

In yet another twist to this story, it would not make sense for a firm to open new stores if it did not expect additional sales and profits. It isn't just current profitability, but future expected sales, income, and profits that enter into the equation. To summarize, because demand for capital goods is a derived demand, income increases consumer demand, and sales, which in turn, increases capital goods demand.

Another perspective on the influence of income is the amount of income generated per unit of capital. Often the word 'return' is used in place of income. Income is directed related to quantity of services produced by a unit of capital. When we speak of output we speak of productivity. The additional output generated by one unit of input is called its marginal productivity. In economics, we compare the marginal benefit, in this case, return and productivity, against the cost in acquiring the capital to determine the optimal level of capital for an individual firm. Corporations use a variation of this in capital budgeting where they calculate the present value of the earnings stream and compare it to the original cost. If benefits exceed costs, they acquire or proceed with the project.

Autonomous Investment Demand

Again inferring from the previous discussion, other factors influencing investment are anything that affect either profitability or productivity of capital goods such as the stock of capital goods on hand, operating and maintenance costs, government policies and taxation, technological change, and interest rates. When graphing investment expenditures against income, these would be the items that cause the line to shift, hence the term, they could be called determinants of investment but we will avoid that terminology here.

Capital Stock

There are several aspects of the stock of capital assets that must be considered. First, there is the quantity of capital stock. Second, its age and condition. Finally, technology. To some extent these are all interrelated in that they impact the productivity of capital.

Let' consider the quantity of capital stock. It does not make sense to build additional facilities when you are using only 50% of your capacity. If utilization is 85% and you expect continued sales growth, then start building. It usually takes a minimum of two to three years to build a factory and break it in. As is true for a firm is true for the entire economy, if the nation's capacity utilization is in the low 80's then one cannot expect an increase in capital spending. However, as that number reaches 90%, increases in capital spending can be expected.

The age of the capital stock is a contributing factor to investment. Old equipment generally requires more maintenance and has higher operating costs than new equipment hence it has lower profitability new equipment very often consumes less power fuel or materials than older equipment. Older stock needs to be replaced, otherwise income generation fails and profits fall. Consider airlines, when planes reach twenty years it's time to buy new ones or else watch them fall out of the sky, not good for business. Airlines do not buy just one plane, they place orders for twenty to fifty planes. Because of this buying behavior, it is not uncommon to see cycles in the production of capital goods. If many

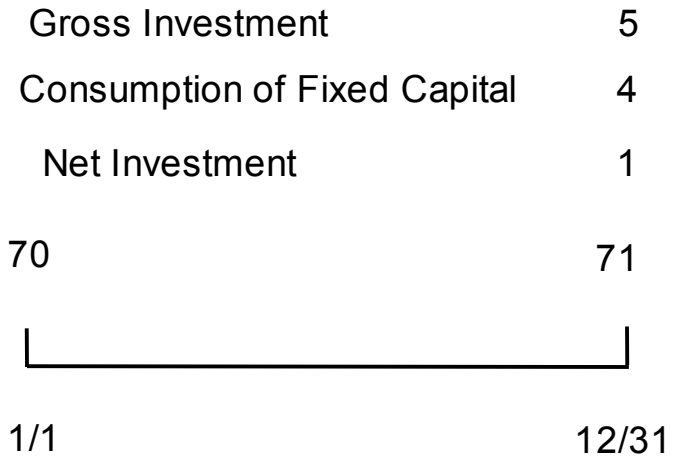
planes were purchased in 1970 with an average life span of 20 years, then one can expect other major purchases in 1990, 2010...etc.

As technology progresses, newer equipment may have capabilities that older equipment lack. New production technologies and products emerge constantly. Failure to invest in these areas leads to loss of market share and, ultimately, profits. Consequently, when a new technology starts to emerge, investment by interested companies skyrockets as in fuel cell cars. Fuel cells have been around since the early days of the US space program. Recently the technology to efficiently use other fuels than raw hydrogen have emerged. Spending on fuel cell car development has taken off like a rocket (pardon the pun). If the days of the internal combustion engine are ending, then new investment will need to be made in new fueling stations, manufacturing facilities, etc.

Investment spending can also be a trigger of technological change. Spending on research and development (R & D) creates new technologies, products, and production processes. For example, R & D spending by pharmaceutical companies leads to new drugs, which may require new capital spending in equipment and factories to produce them.

The link among all of these factors is the productivity of capital. Excess capital is not productive, old capital is not productive, and obsolete capital is not productive.

Every year capital is added to the old stock. This is called gross investment. Consumption of fixed capital (CFC) is the portion of fixed capital that is worn out or consumed. What may not be obvious is that a certain level of investment must take place to maintain the current capital stock. Often this is called depreciation but is not the same as accounting depreciation. Whereas accounting depreciation is an allocation of historical cost over the useful life of the asset, CFC is the economic value lost (at replacement value not historical cost) over the economic life. When gross investment has had CFC subtracted from it, the remainder is called net investment. Net investment represents the net growth of the capital stock. If there were no gross investment, the capital stock would shrink by the consumption of fixed capital. Hence some gross investment must take place every year just to maintain the capital stock which generates national income.



In this example, our beginning capital stock is $70 trillion. During the year, gross investment added is $5 trillion, but depreciation (formerly known as consumption of fixed capital) is $4 trillion, leaving net investment of $1 trillion and ending capital stock or investment of $71 trillion. Note that had there not

been any gross investment, the level of capital stock would have dropped from $70 trillion to $66 trillion. The implication is that any economy must engage in investment spending in order to maintain its level of capital stock. Failure to do so will lower the future availability of goods and services, i.e., your standard of living will decline. Just remember that portion of gross investment covering depreciation is really replacement of old capital stock and new investment is net investment.

This discussion raise another question as to why capital stock is so important. Part of the answer lies in the explanation about investment's long run effect - aggregate supply is increased. But it is more detailed than that. For labor to be productive, it must have capital stock. A farmer with a horse drawn plow can only plant a few acres a day compared to one with a large tractor. In the early 80's, it was widely circulated that American workers had five times the productivity of the Mexican worker. But then again, American labor had five times more capital. When new factories were opened in Mexico, the productivity differential narrowed considerably. From another perspective, workers producing more for us to consume raises our standard of living. Investment is one of the keys to economic growth.

Interest Rates

One of the major costs of acquiring an asset is the interest expense. That is why interest rates are a determinant of investment. Lower the interest rate and assets become more profitable hence more are supplied to see this calculate the monthly mortgage payment on a $100,000 home at 7 for 30 year loan it is $665.30 multiply by 360 months and total equals $239,509 10 becomes $315,926 in other words you've paid asset two three times.

Investment must be financed. The supply of fund for investment comes from savings. Firms compete for these funds among themselves and with government. Firms use several sources of funding. One, is undistributed corporate profits (retained earnings). This explains why investment shows a correlation with profitability. Remember that retained earnings are business savings. Savings finance investment. Secondly, the issuance of securities such as bonds or stock. Finally, firms may borrow from banks. Depending on market conditions, the mix of internal vs. external funding may vary. Existing debt levels have an effect on the ability of firms to issue more debt. Excessive debt loads may be considered risky by investors who then demand higher interest rates in compensation of this additional default risk.

One constraint affecting investment is the desire to enjoy current consumption otherwise known as utility. No one lives forever, so understandably, there is a desire to enjoy the fruits of one's labor while one can. Some people are impatient and would rather spend now rather than invest and consume more later. Consequently, minimizing present consumption to maximize savings or investment may not be maximizing our personal happiness. That tradeoff between the present and the future is reflected in the interest rate.

The prices existing in the bond and stock markets help provide benchmarks to business as to the return required by investors. This then determines the profitability needed by capital asset projects to sustain firm profitability and consequently, the firm's stock price. If the market demands a return on capital of 15% then firms are not going to use funds to finance projects yielding only 10%.

Government Policies & Taxes

Taxes are a cost of business. Reduce that cost, and profits are increased. Increasing profits encourages suppliers to produce more. While this may increase supply in the short run, it doesn't necessarily increase investment in the long run. To understand this limitation one must consider demand as a constraint.

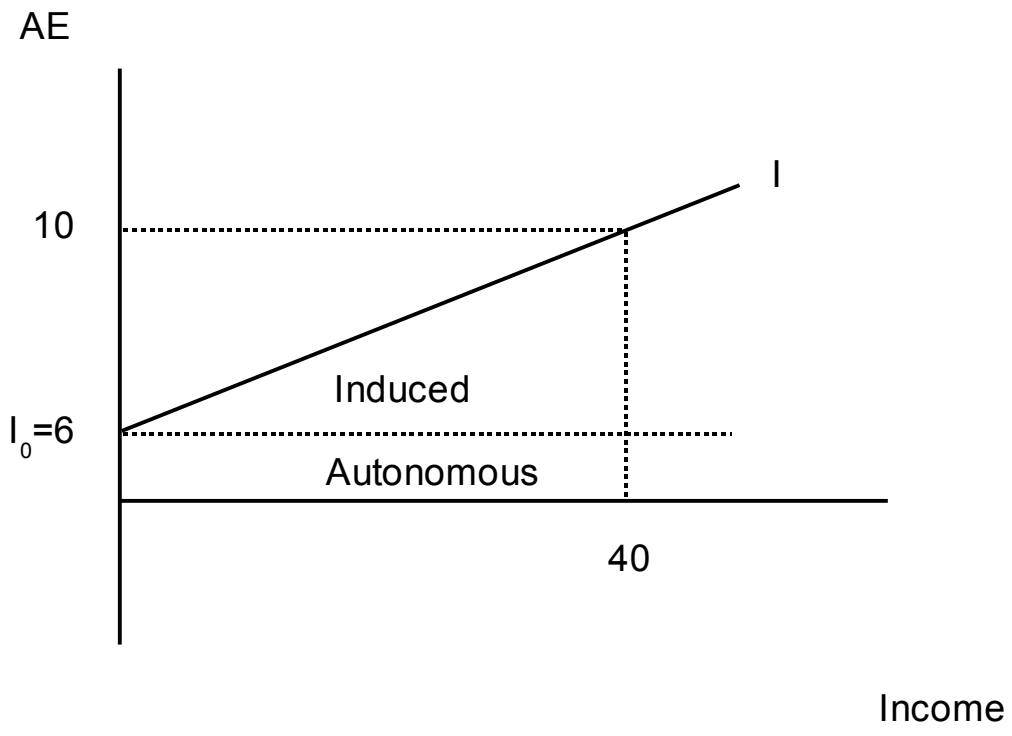
Referring back to the office space discussion, the banking crisis in the late 80's was triggered by a cut

in business taxes that made it seem profitable to build more office buildings. Cutting business taxes cuts costs which shifts any supply curve to the right, increasing supply.

There are three types of business tax reductions that are popular: investment tax credit (ITC), accelerated depreciation, and capital gains taxes. Let's take the example of the office building. The costs of construction is $100,000. Given a 3% ITC, you save $3,000 in taxes. A very nice tax break, calculated by multiplying 3% times the cost.

Let's say the building will normally last 40 years, so the straight line depreciation would be $2,500 per year, calculated by dividing $100,000 by 40 years. At a 20% tax bracket the savings would be $500, calculated by multiplying the depreciation of $2,500 by the tax rate of 20%. Under accelerated depreciation, you would give the building a ten year life. Now you can write off $10,000 depreciation per year, saving $2,000 in taxes. When the building is fully depreciated, sell it, and build another.

Finally let's say Congress passes a special capital gains tax rate of 10%. You sell the building costing $100,000 for $150,000 earning a $50,000 capital gain. Under the old tax rate taxes would have been $10,000, but under the capital gains tax rate, the tax would be only $5,000.



In the graph above, we look at investment from a macroeconomic perspective. The vertical axis is labeled AE which is Aggregate Expenditures. From a macroeconomic perspective investment can be viewed as an aggregate expenditure, a use of funds if you prefer. The slope of the investment curve is the Marginal Propensity to Invest (MPI). In this graph, the autonomous level of investment expenditure is $6 trillion per year. This is mostly the replacement expenditure necessary to maintain the current level of capital stock.

Variability of Investment Spending

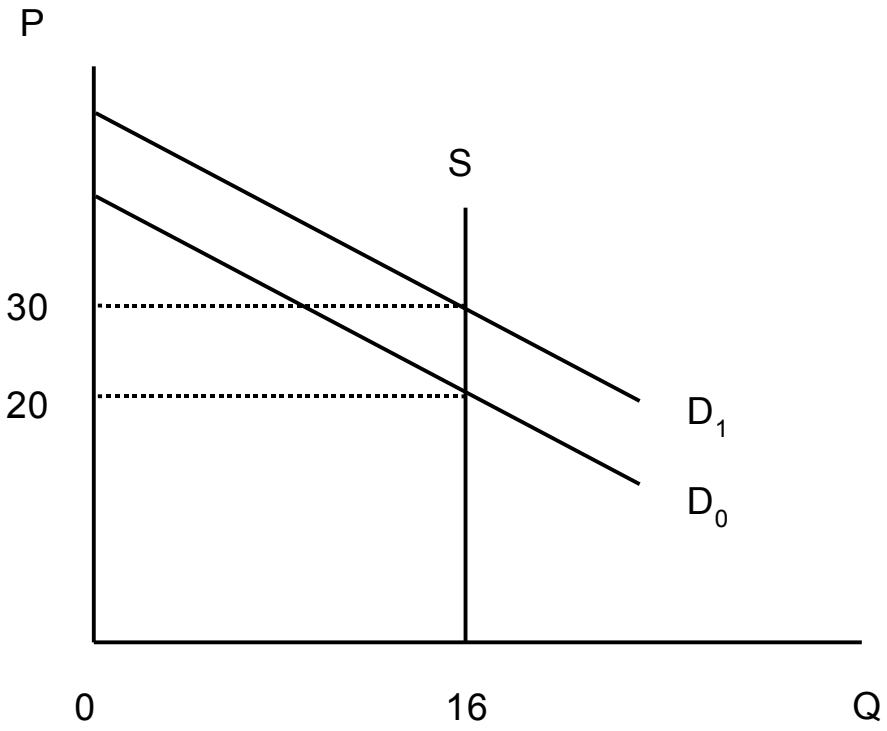
Investment spending is not constant. Variations in investment spending are thought to be the cause or at least one of the links in business cycles, hence their importance. So what causes variability? The same factors we have been already discussing variability of sale, profits and expectations, durability of capital stock, and irregularity of innovation, cause variability of investment spending.

Effect of Investment Expenditures on Aggregate Supply

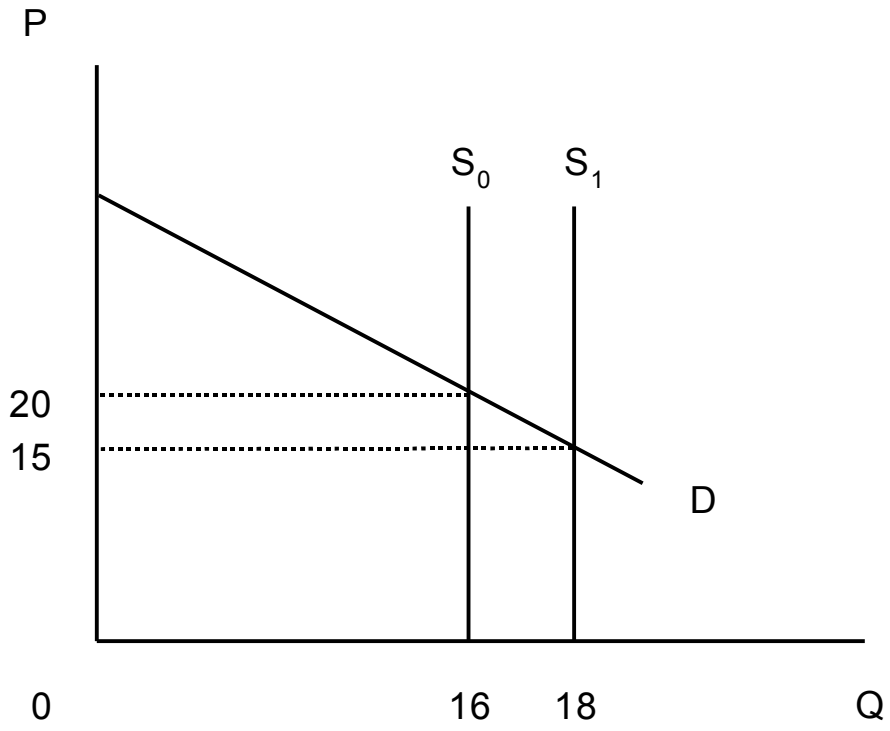
Investment has both a short run and a long run effect. In the short run, as investment spending increases, so does national income as it is a component of national income. Employment increases as workers are hired to construct capital assets. Workers are paid income which increases aggregate demand. In the long run, the new capital goods are used to manufacture consumer goods or deliver consumer services, thus increasing aggregate supply (the more we have to consume, the higher our standard of living).

Investment Supply and Demand: A Microeconomic Perspective

Let's examine investment from a microeconomics perspective looking the market for capital assets. Every market has elements of supply and demand, investment/capital goods is no exception. There is a supply and demand for capital goods. What determines this supply and demand of capital goods? The key here is profits. Firms acquire assets to accomplish one goal, to make a profit. This means that capital assets should return profits. If they do not,that is a good clue that there is an oversupply situation. Increasing supply does not increase demand. This is not a field of dreams, build it, and they will come. There can be too much investment. Let's consider an example of office building space.



From the figure, on the demand line, D_0, above at an annual rent of $20 per square foot (SF), 16 million square feet of office space is demanded and supplied. In contrast to consumer markets, where supply is upward sloping at an angle, capital asset demand is a vertical line. In this case, the supply of office space is fixed. It does not vary due to a change in price. That is because the 16 million SF cannot be removed from the market nor can it be increased in the short term. Consequently, slight changes in demand have a significant impact on the price. Please note that most renters sign annual leases, so there is no adjustment in the rent until the time at which the lease expires.



Let's say that there is a surge of new office space construction, and that an additional 2 million SF becomes available. Rent drops to $15/SF with an additional 2 million SF occupied. At the current price of $20, there will be an excess supply of 2 million SF or 12.5% vacancy rate.

Recall that once office space is constructed, it cannot decrease easily if demand fails to materialize. Price adjustment is not instantaneous, as rents are locked in until leases expire. Consequently, excess supply hangs around for years.

Capital good markets often have this characteristic. Problematic for real estate is the extensive use of mortgages to finance construction. Market rent levels of $16/SF may not support the debt service. In this case the original mortgagors go broke and banks take over the property. If a bank has many loans on office property and the whole office space industry is overbuilt, the bank may encounter solvency problems if it experiences a high rate of bad loans. Consequently, a certain amount of price stickiness prevails in real estate markets for a period of time.

Another way of viewing it is to remember the demand is due to benefit. That is, we buy goods for the benefits they give us. The same also occurs for capital goods. Firms buy capital goods for the net benefit it provides to them. Net benefit is the revenue the capital asset provides minus its cost. The more net benefit the asset provides, the more firms want to acquire it. Net benefit increases if either the revenue generated by the asset increases or the cost associated with its acquisition and operation decreases.