Investment and Growth[1]

Investment spending makes a direct contribution to economic activity because investment is one of the components of total expenditure in an economy, GDP equals personal consumption plus investment plus government expenditures plus net exports (i.e.: GDP=C+I+G+(X-M)). These expenditures reflect the total level of demand in the economy. Unlike other expenditures, such as personal expenditure on restaurant meals, capital expenditures are doubly important because capital is one of the factors of production (capital and labour) that directly determine the economy's productive capacity or aggregate supply. While in the short run, fluctuations in demand determine the level of GDP, over the long run, it is the growth in the economy's ability to supply output that determines the speed at which an economy can grow. Consequently, growth theories and the associated empirical work focus on the supply side of the economy.

Over the past 20 years there has been an explosion of theoretical and empirical research that examines the relationship between investment, productivity and long-term economic growth. This research has two basic schools of thought: the neoclassical model as first described by Solow (1956 and 1957) and new growth theory (also know as endogenous growth theory) articulated by Romer (1986, 1987 and 1990), Lucas (1988) and Grossman and Helpman (1991).

The neoclassical model originally focused on investment in tangible assets, and the resulting accumulation of physical assets to help explain economic growth. Recently the concept of investment has been broadened from private investment in tangible assets to include human capital, research and development expenditures and investment in public infrastructure. While emphasizing a broader view of investment, this literature remains in the neoclassical tradition where benefits of investment are internal in the form of enhanced productivity or higher wages. New growth theory moves away from the neoclassical model and explores alternate productivity channels through which investment affects growth. This school attaches greater significance to certain types of investment that create externalities and generate an additional productivity boost through production spillovers or the associated diffusion of technology.[2]

Both models share similarities concerning the central importance of investment and capital accumulation to economic growth, but differences between these models have important implications for the impact of investment on productivity and economic growth. The empirical literature also shows this duality.

Some researchers have extended the neoclassical model by incorporating a broader concept of investment and by improving the measures of investment and capital accumulation used in the empirical research, for example, Jorgenson and Stiroh (2000), Oliner and Sichel (2000) and Jorgenson (2004) among others. According to recent estimates, asset accumulation and labour growth now explain more than 80% of economic growth, with the accumulation in tangible assets the most important factor. Jorgenson (2004) found that *"investment in tangible assets is the most important source of economic growth in the G7 nations. The contribution of capital input exceeds that of productivity for all countries for all periods."*

Other researchers have concentrated on elements of new growth theory to try to explain technological progress, productivity and long-term economic growth. There are three branches of new growth theory that emphasise different drivers of long-term productivity and economic

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[1] This discussion is an abbreviated version of the investment and growth section of "Asset-based Financing, Investment and Economic Growth", C4SE for CFLA (2004). www.cfla-acfl.ca/files/public/CFLA-Final_Economic_Report-PDF-Dec04.pdf

[2] Stiroh (2000), "Investment and Productivity Growth: A Survey from the Neoclassical and New Growth Perspectives". Industry Canada. p. 1.

growth: machinery and equipment, human capital, and research and development. Some propose hybrid models whereby two or more of these drivers are needed to boost productivity.

The empirical research has found a strong link between investment in general and machinery and equipment investment in particular with economic growth—De Long and Summers (1991, 1992, 1993 and 1994), De Long (1991), McGrattan (1998), Sala-i-Martin (1997), Hoover and Perez (2004), and Abdi (2004) among others. These results are suggestive that machinery and equipment investment has a central role to play in long-term economic growth, possibly because technological change is embodied in recent vintages of capital.

In a series of studies, De Long and Summers explored the relationship between machinery and equipment investment, long-term economic growth and productivity to see if there were positive spillovers from machinery and equipment (M&E) investment. They concluded that the return to society of equipment investment is large and exceeds the private return. They found that increasing the M&E investment share by one percentage point could increase long-run productivity growth by 0.2 to 0.3 percentage points. De Long (1991) replicated the analysis for industrialized nations for a period in excess of 100 years—1870 to 1979—and found similar results, with a one percentage point rise in M&E investment share leading to a 0.7 percentage point rise in GDP per capita.

A number of studies use Canadian data as part of their cross country analysis, which generally support the findings of De Long and Summers. Abdi (2004) showed that there is a strong relationship between M&E investment, economic and total factor productivity growth. He used panel data on 20 Canadian manufacturing industries over the period from 1961 to 1997, and time series data from 1961 to 2000 for the entire manufacturing sector in his analysis. He found the elasticity of output with respect to M&E capital stock of 0.67, and non-M&E capital stock of 0.24, both of which are well above their share of national income. This suggests that M&E and non-M&E investment could be complements, and not substitutes. It was also found that both M&E and non-M&E investment positively affect TFP levels. A doubling of M&E investment could raise TFP levels by about 20% and doubling non-M&E investment could raise TFP levels by almost 23%.

Most other researchers that examined Canada did not differentiate between M&E and non-M&E investment, but their results seem to support the view that there are positive spillovers from investment onto productivity and growth. Li (2002) finds that the aggregate physical capital investment rate is positive, with a 1% rise in the investment rate leading to a 0.2% rise in long-term growth, but the results are not particularly robust. Sargent and James (1997) estimated the effect of physical capital on output growth in Canada over the period from 1947 to 1995. They found estimates for the elasticity of output with respect to capital were in the range 0.61–0.88, which is well above capital’s share of national income.

Economic research has found that business investment and the accumulation of physical capital is a significant source of economic and labour productivity growth over the medium term in the neo-classical tradition. And machinery and equipment investment has been found to be directly or indirectly associated with the key drivers of knowledge in the economy as advocated by new growth theories and by the evidence.

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