DBA Africa Management Review
August 2013, Vol 3 No 2. Pp. 16-23

Capacity Utilization: The Forgotten Secret in Trading Out Poverty

X.N. Iraki, PhD.[1]

Policy makers, academics and practitioners see economic growth as the secret behind the high standards of living worldwide. The ingredients that go into economic growth are still being debated, the only reason few countries have sustained long term economic growth despite all the promises politicians and policy makers make during political campaign periods or in times of economic crisis. One of the forgotten ingredients into economic growth is capacity utilization, there is overwhelming evidence that nations and regions could do more with what they already have if they focused more on capacity utilization. Even advanced countries like USA have never had a 100 percent capacity utilization, which operations managers might argue is not always desirable. It is hypothesized that focusing on capacity utilization might be a better exit strategy out of poverty than attracting expensive investments and expanding plants. This paper attempts to unlock the potential of capacity utilization in economic growth and by extension poverty eradication. The paper while focusing on the USA will draw useful lessons for East Africa in general. Data is drawn from US economic and business official reports. To cater for economic crisis, the data is drawn to cover past crises such as the oil crisis, the Asian crisis and any other event that might have adversely affected the world or regional economies. Linear regression is used in the analysis to investigate the drivers of capacity utilization and by extension economic growth. Private investment and productivity explains growth in capacity utilization in USA.

Key words: Capacity, Poverty, Utilization, Economic growth, Trading

[1] Senior Lecturer, Department of Business Administration, School of Business, University of Nairobi, Nairobi, Kenya
- *xniraki@gmail.com*

INTRODUCTION

Economic growth has remained an area of interest for both economists and policy makers particularly in developed countries like Kenya where poverty is common. What makes the area more interesting is that fact that one countries path to growth is hard to replicate. African countries have not successfully copied the Asian countries despite that 50 years ago they were at par economically or better. This paper tries to shed more light on the paradox of growth by focusing on capacity utilization. It argues that countries can do more with what they already have. Using regression analysis, the paper tries to link capacity utilization to its other covariates to explain growth. It is assumed that higher capacity utilization leads to economic growth as idle resources are put into economic use.

LITERATURE REVIEW

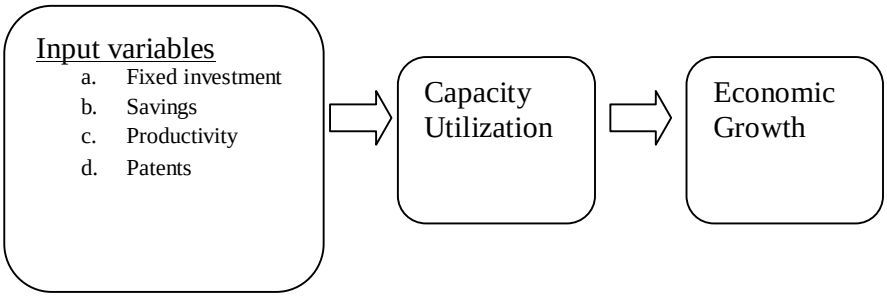
Several studies have tried to identify catalysts of economic growth. For example, Levine and Renelt (1992) indicate that the variables most closely related to growth are *trade* and *investment*; but Frankel and Romer (1999) suggested that a third factor may be at play; however, they did not identify this third factor. Crawford (2002) suggests that *three* main factors that affect growth are investment in machinery and equipments, human capital formation, and openness to trade and investment. The studies do not detail how these factors interact to foster economic growth. The current paper will follow Levine and Renelt (1992) and Crawford (2002) observations but will incorporate capacity utilization, which could be the third factor that Romer and Frankel did not suggest. By incorporating these variables into a model and analyzing it, more light can be shed into the "black box" question of economic growth.

It is envisaged that entrepreneurship (the result of Krugman's inspiration) leads to growth in efficiency, productivity and international trade (Ezeala-Harrison, 1999a). Initially, entrepreneurship leads to inventions and innovations, which lead to higher productivity (Baumol, 1968, 1986, 1990; Abdnor, 1988). The innovations and inventions lead to lowering of costs, giving the country a comparative advantage in products or services, and therefore leading to growth in exports according to the Heckscher–Ohlin theory. Such innovations increase capacity utilization. These two forces (productivity and international trade) in turn lead to growth in the economy. What is not clear is how these variables are interrelated or interact to catalyze economic growth. In this paper we propose that capacity utilization is another catalyst that could make a country grows faster. Tsoufidis and Dergiades (2006) observe that capacity utilization is one of the prominent economic variables in macroeconomic theories and policy.

The process through which this growth takes place is not clear despite the many attempts to explain. In this paper, we assume that growth can be facilitated through capacity utilization, making greater use of what you have from facilities to machinery and employees. It is perhaps one of the most neglected avenues through which growth can be facilitated as evidenced by the number of incomplete projects, or underutilized facilities from airports to hospitals. Even developed countries like the USA still have capacities

utilization below 100%. For curious reasons, the utilization rate in the USA is on a down ward trend since 1970s. The stream of thinking through which capacity utilization affects growth can be described below

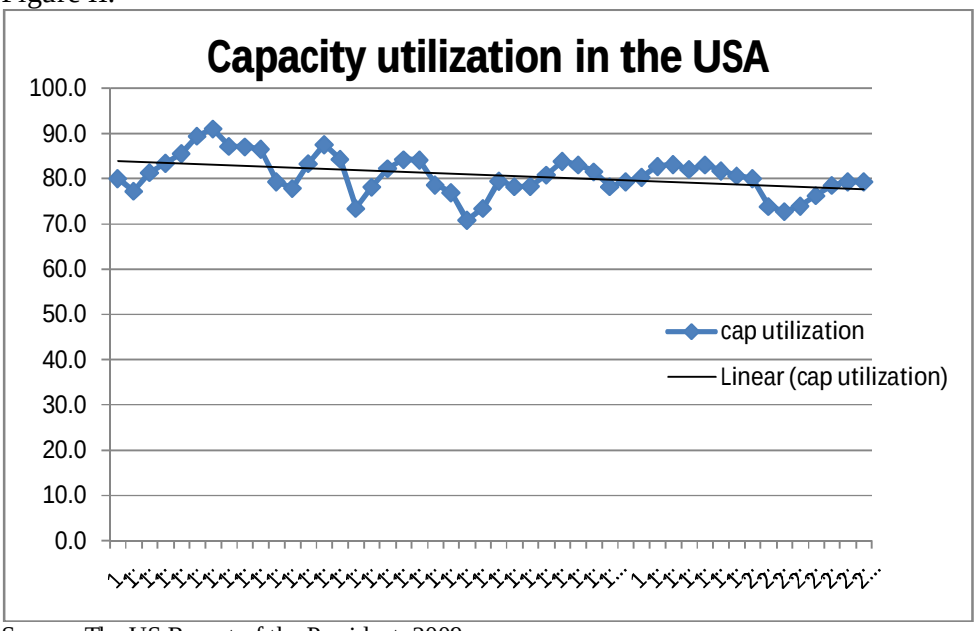
Figure I: Main Study Variables



Fixed investments increase the productive capacity of firms, the investments could be terms of factories, new technology and so on. Savings ensure future investments, while productivity ensures more can be done with the present capacity. Finally patents are a proxy for entrepreneurship or creativity in the firm; the more patents, the more chances of breakthrough technology that can increase productivity, or capacity utilization. With only about 50% of the patents getting commercialized in the USA (Sichelman, 2009), over production of patents would not be a problem

.

Figure II.



Source: The US Report of the President, 2009

This study is macro, and looks at these variables at the national level. The sample nation is the USA because of her preeminence in economic growth and as the engine of economic growth. We hope the lessons learnt can be generalized to East Africa.

The study was prompted by the general decrease in national capacity utilization in the USA in the last few decades, despite

the advances in ICT and other technologies. The general decline could be explained paradoxically by use of ICT, hence lots of capacity becoming redundant, and increased competition that has led to closure of industries and outsourcing.

The focus of this paper is to try and identify the factors influence capacity utilization in the last half century in the USA and see how we can utilize the lessons learnt in East Africa.

METHODOLOGY

Data for the main variables, capacity utilization (in percent), private investment, national savings, productivity (non farm) and patents were collected for the US from 1960-2007. Except data for patents which is got from the USA patent office, the rest of the data is from the Economic Report of the US president. For comparison purposes, all the data was converted into growth format. A regression analysis with capacity utilization as the dependent variable was run. Being an exploratory study, tests for stationarity were not done. The results follow;

Regression model used is

Capacity Utilization = f(Private investment, National Savings, Productivity, Entrepreneurship)

Patents are considered the proxy for entrepreneurship.

Therefore

$$CU = \beta_0 + \beta_1 NS + \beta_2 PR + \beta_3 EN$$

DATA

		DATA IN RAW FORM				
Year or quarter	cap utilization	Private fixed investment	Total gross saving	Productivity Business sector	Patents	
1960.	80.1	75.7	111.3	48.9	47,170	
1961.	77.3	75.2	114.3	50.6	48,368	
1962.	81.4	82.0	124.9	52.9	55,691	
1963.	83.5	88.1	133.2	55.0	45,808	
1964.	85.6	97.2	143.4	56.8	47,376	
1965.	89.5	109.0	158.5	58.8	62,857	
1966.	91.1	117.7	168.7	61.2	68,406	
1967.	87.2	118.7	170.5	62.5	65,652	
1968.	87.1	132.1	182.0	64.7	59,102	
1969.	86.6	147.3	198.3	65.0	67,557	
1970.	79.4	150.4	192.7	66.3	64,427	
1971.	77.9	169.9	208.9	69.0	78,316	
1972.	83.4	198.5	237.5	71.2	74,808	
1973.	87.6	228.6	292.0	73.4	74,139	
1974.	84.4	235.4	301.5	72.3	76,275	
1975.	73.5	236.5	297.0	74.8	71,994	
1976.	78.2	274.8	342.1	77.1	70,236	
1977.	82.3	339.0	397.5	78.5	65,269	
1978.	84.3	412.2	478.0	79.3	66,102	

1979.	84.2	474.9	536.7	79.3	48,853	
1980.	78.7	485.6	549.4	79.2	61,827	
1981.	77.0	542.6	654.7	80.8	65,770	
1982.	70.9	532.1	629.1	80.1	57,889	
1983.	73.5	570.1	609.4	83.0	56,862	
1984.	79.5	670.2	773.4	85.2	67,201	
1985.	78.3	714.4	767.5	87.1	71,661	
1986.	78.4	739.9	733.5	89.7	70,860	
1987.	80.9	757.8	796.8	90.1	82,952	
1988.	83.9	803.1	915.0	91.5	77,924	
1989.	83.1	847.3	944.7	92.4	95,539	
1990.	81.6	846.4	940.4	94.4	90,366	
1991.	78.3	803.3	964.1	95.9	96,514	
1992.	79.4	848.5	948.2	100.0	97,443	
1993.	80.4	932.5	962.4	100.4	98,344	
1994.	82.8	1,033.3	1,070.7	101.4	101,676	
1995.	83.2	1,112.9	1,184.5	101.5	101,419	
1996.	82.1	1,209.5	1,291.1	104.5	109,646	
1997.	83.1	1,317.8	1,461.1	106.5	111,984	
1998.	81.8	1,438.4	1,598.7	109.5	147,520	
1999.	80.7	1,558.8	1,674.3	112.8	153,487	
2000.	80.1	1,679.0	1,770.5	116.1	157,496	
2001.	73.9	1,646.1	1,657.6	119.1	166,038	
2002.	72.8	1,570.2	1,489.1	123.9	163,518	
2003.	74.0	1,649.8	1,459.0	128.7	169,035	
2004.	76.3	1,830.0	1,618.1	132.4	164,291	
2005.	78.6	2,042.8	1,844.2	134.8	143,806	
2006.	79.4	2,171.1	2,038.5	136.1	173,770	
2007.	79.4	2,134.0	1,956.0	138.2	157,283	

Table II: Data in Growth Format

Year or quarter			DATA IN GROWTH Format			
	cap utilization	Private investment	Savings	Productivity	Patents	
1961.	-3.49563	-0.6605	2.695418	3.476483	2.53975	
1962.	5.30401	9.042553	9.273841	4.545455	15.14018	
1963.	2.579853	7.439024	6.645316	3.969754	-17.7461	
1964.	2.51497	10.32917	7.657658	3.272727	3.422983	
1965.	4.556075	12.13992	10.52999	3.521127	32.67688	
1966.	1.787709	7.981651	6.435331	4.081633	8.827975	
1967.	-4.28101	0.849618	1.066983	2.124183	-4.02596	

1968.	-0.11468	11.28896	6.744868	3.52	-9.97685	
1969.	-0.57405	11.50643	8.956044	0.463679	14.30578	
1970.	-8.31409	2.104549	-2.824	2	-4.63312	
1971.	-1.88917	12.96543	8.40685	4.072398	21.55773	
1972.	7.060334	16.83343	13.69076	3.188406	-4.47929	
1973.	5.035971	15.16373	22.94737	3.089888	-0.89429	
1974.	-3.65297	2.974628	3.253425	-1.49864	2.881075	
1975.	-12.9147	0.46729	-1.49254	3.457815	-5.61259	
1976.	6.394558	16.1945	15.18519	3.074866	-2.44187	
1977.	5.242967	23.36245	16.1941	1.815824	-7.07187	
1978.	2.430134	21.59292	20.25157	1.019108	1.276257	
1979.	-0.11862	15.21106	12.28033	0	-26.0945	
1980.	-6.53207	2.253106	2.366313	-0.1261	26.55722	
1981.	-2.1601	11.73806	19.16636	2.020202	6.377473	
1982.	-7.92208	-1.93513	-3.91019	-0.86634	-11.9827	
1983.	3.667137	7.141515	-3.13146	3.620474	-1.77408	
1984.	8.163265	17.55832	26.91172	2.650602	18.18262	
1985.	-1.50943	6.595046	-0.76287	2.230047	6.636806	
1986.	0.127714	3.569429	-4.42997	2.985075	-1.11776	
1987.	3.188776	2.419246	8.629857	0.445931	17.06463	
1988.	3.708282	5.977831	14.83434	1.553829	-6.06134	
1989.	-0.95352	5.503673	3.245902	0.983607	22.60536	
1990.	-1.80505	-0.10622	-0.45517	2.164502	-5.41454	
1991.	-4.04412	-5.09216	2.520204	1.588983	6.803444	
1992.	1.404853	5.626789	-1.64921	4.275287	0.962555	
1993.	1.259446	9.899823	1.497574	0.4	0.924643	
1994.	2.985075	10.80965	11.25312	0.996016	3.388107	
1995.	0.483092	7.703474	10.62856	0.098619	-0.25276	
1996.	-1.32212	8.680025	8.999578	2.955665	8.111892	
1997.	1.218027	8.954113	13.16707	1.913876	2.132317	
1998.	-1.56438	9.151616	9.417562	2.816901	31.7331	
1999.	-1.34474	8.370412	4.728842	3.013699	4.044875	
2000.	-0.74349	7.71106	5.745685	2.925532	2.611948	
2001.	-7.74032	-1.9595	-6.37673	2.583979	5.42363	
2002.	-1.4885	-4.6109	-10.1653	4.030227	-1.51772	
2003.	1.648352	5.069418	-2.02136	3.874092	3.37394	
2004.	3.108108	10.92254	10.90473	2.874903	-2.80652	
2005.	3.014417	11.62842	13.97318	1.812689	-12.4687	
2006.	1.017812	6.280595	10.53573	0.964392	20.8364	
2007.	0	-1.70881	-4.04709	1.542983	-9.48783	

RESULTS AND DISCUSSION

Table III: Regression Results

SUMMARY OUTPUT								
Regression Statistics								
Multiple R	0.716688							
R Square	0.513642							
Adjusted R Square	0.467322							
Standard Error	3.119454							
Observations	47							
ANOVA								
	Df	*SS*	*MS*	*F*	*Significance F*			
Regression	4	431.6293	107.9073	11.08903	3.14E-06			
Residual	42	408.7018	9.730995					
Total	46	840.3311						
	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	-4.49421	0.977839	-4.59606	3.91E-05	-6.46757	-2.52085	-6.46757	-2.52085
X Variable 1(Private investment)	0.266444	0.125756	**2.118741***	**0.040069**	0.012659	0.520229	0.012659	0.520229
X Variable2(savings)	0.164605	0.101569	1.620615	0.112585	-0.04037	0.36958	-0.04037	0.36958
X Variable 3(productivity)	0.663456	0.328554	**2.019319***	**0.049866**	0.000406	1.326505	0.000406	1.326505
X Variable 4(patents)	-0.00569	0.038546	-0.14759	0.883373	-0.08348	0.072099	-0.08348	0.072099

*Significant at 5 per cent

The regression model shows that the main predictors of capacity utilization are private investment, and productivity. That may not be surprising; productivity leads to greater use of the available resources, what increase in capacity utilization is all about. Private investment is another significant variable as shown by the values of t-statistic. Individuals or private sectors are probably better in utilizing capacity than public sector. The insignificance of savings can be explained by the fact that the savings are used in investment. The insignificance of patents is however surprising, but may be the dividends of patents eventually showing up through increased productivity. The fact that only a small percentage of patents are commercialized could be another explanation. For European commission (2006) indicates that only 5 per cent patents in 8 countries are used to form new companies.

In East Africa, it seems despite all the advances in economic theories; we must still develop the old fashioned way, through perspiration, to quote Krugman (1994). We must save and invest in new technologies that increase capacity utilization which can be translated into economic growth and poverty reduction. However, the model explains only 51.4% of the growth in capacity utilization. In East Africa, culture, history and policies that do not focus on productivity as evidenced by corruption and rent seeking could explain the difference in variation. The legal system may be a factor as

suggested by Felthoven (2002). We recommend that the East African countries should in addition to implementing the suggested policies, avail data on capacity utilization through the national statistical centers.

Future directions

Further research to incorporate Chow's test and investigate the effects of structural breaks such as the oil crisis or the end of the cold war could be pursued. The data should further be tested for stationarity and if the test fails, a first difference equation is used. Problems with linear regression such as serial correlation and heteroskasdacity should be investigated. The same study could incorporate panel data from a sample of countries. Significantly data on capacity utilization for the East African countries was not available, yet that could give us great insights into our own economies.

References

Abdnor, James, "The Spirit of Enterprise," *Journal of Small Business Management*, January 1988.

Baumol, W. J., "Entrepreneurship in Economic Theory," *American Economic Review* 58 (2), May 1968.

Baumol, W. J., "Entrepreneurship and a Century of Growth," *Journal of Business Venturing*, Spring 1986.

Baumol, W, J., "Entrepreneurship: Productive, Unproductive, and Destructive," *Journal of Political Economy*, 98 (5) 1990: 893-901.

Council of Economic Advisers, *The Economic Report of the President*," Washington. D.C: US Government Printer, 2009.

Crawford, Allan, "Trends in Productivity Growth," *Bank of Canada Review*, Spring 2002.

Ezeala-Harrison, F., *Theory and Policy of International Competitiveness*, Westport, CT: Praeger, 1999.

European Commission, "Study on evaluating the knowledge economy what are patents actually worth? The value of patents for today's economy and society," 2006

Federal Reserve Bank Release, Industrial production and Capacity Utilization, October 16, 2009.

Felthoven, R. (2002), "Effects of American Fisheries Act on Capacity Utilization, and Technical Efficiency," *Marine Resources Economics*, Vol. 17.

Frankel, Jeffrey and Romer D., "Does Trade Cause Growth?" *American Economic Review*, June 1999: 379-399.

Krugman, Paul, "The Myth of Asia's Miracle," *Foreign Affairs*, 73 (6), Nov/Dec 1994.

Levine, Ross and Renelt, D., "A Sensitivity Analysis of Cross Country Growth Regressions," *American Economic Review*, 82 (4) September 1992: 942-63.

Sichelman, Ted M., (2009), Commercializing Patents. *Stanford Law Review*, Forthcoming; UC Berkeley Public Law Research Paper No. 1395558. Available at SSRN: http://ssrn.com/abstract=1395558

Svensson, R., (2007), "Commercialization of Patents and External Financing During the R&D Phase," Research Institute of Industrial Economics (IFN), P.O. Box 55665, SE-10215 Stockholm, Sweden.

Tsoulfidis, L and Dergiades, T., (2006), "The Inflation –Capacity Utilization Conundrum; Evidence from Canadian Economy," *Applied Econometrics and International Development*, Vol 6, No2.

US Patent and Trade Office (2009), http://www.uspto.gov/