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Contribution of Knowledge to Economic Growth: the case of Vietnam

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This paper provides evidence for the contribution of various factors to the economic growth of Vietnam during the renovation process. Quantitative analysis shows that Vietnam's economic growth depends on investment, but the efficiency of investment tends to get worse. Especially the contribution of knowledge, proxied by TFP (Total Factory Productivity), is proved to be negligible. The results give warnings on the possible slow-down of the country's economic growth if no action is taken.

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Literature review on capital and knowledge

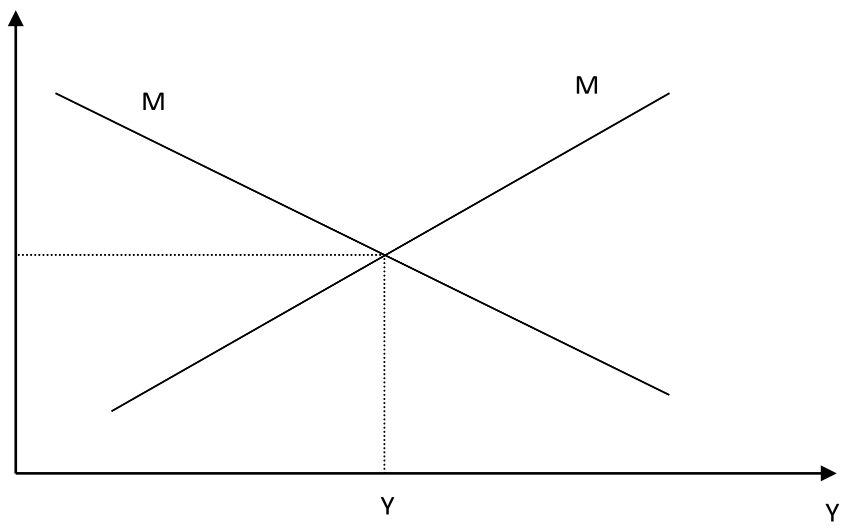
Knowledge economy is an economy where the contribution of knowledge to growth plays a dominant role. The contribution of knowledge to growth is done through two key channels, namely technological advances and human capital (skills and working techniques). By that sense, prominent studies on economic growth have so far confirmed that economic growth would cease without the support of knowledge, and in the long-run knowledge would be the only single determinant for sustaining economic growth (Sollow, 1956; Lucas, 1988; Romer, 1990;)

Researchers generally converge in two typical models of technological advances, namely conducting self-research and buying exising technologies. Developing countries are the late comers, therefore they should firtly rely on importing ready technologies, and then focus on gradually building up their own technological capacity[1]: consequently, two groups of countries are shaped, one generates and exports technologies, the other imports and copies. Importing and absorbing technologies tend to be the only way for developing countries to enhance their economies' productivity (Romer 1987, 1990). Nevertheless, in order to absorb and fully utilize external technologies, the developing countries must put much emphasis on investing in human capital (Lucas, 1988).

As a constraint, developing countries have been facing the problem of limited capital stock, and the next question is raised as whether investments in human and technologies are always good for development. Galor and Moav (2004) argue that in the early stage of development, training technology is not efficient enough while there is a shortage of capital stock due to the high marginal efficiency of capital, much higher than the efficiency of investment on human capital (education and training). The authors, in their model, show that in the early stage of development the poorer countries should not focus on human capital but on infrastructure and physical facilities. Along with the process of physical facilities' accumulation, the marginal productivity of capital (MPC) diminishes and the marginal productivity of human capital (MPH) increases, until a point where MPC is equal to and then lower than MPH (Figure 1). At such a point, the countries must switch to heavier investments on human capital.

[1] See for example: Baumol (1986), Dowrick and Nguyen (1989), Gomulka (1991), Young (1995), Lall (2000), Lau & Park (2003), Barro and Sala-i-Martin (2004)

Figure 1: The investment model for capial and human capital

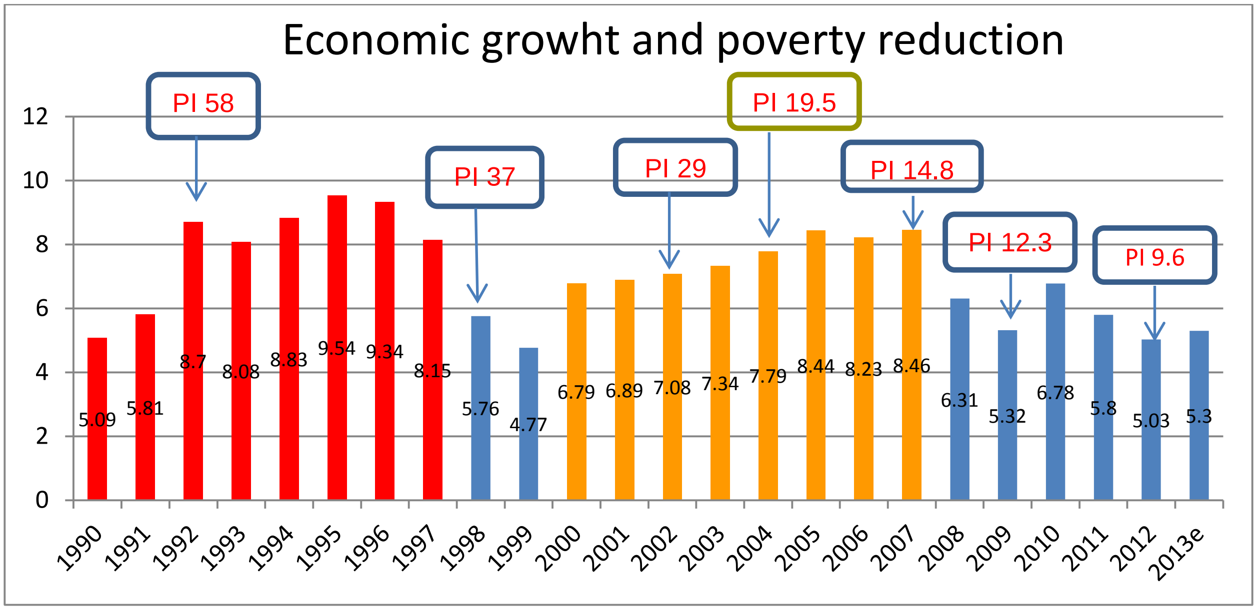


Cuong Le-Van, Tu Anh Nguyen, et al. (2010) build an overall model for countries' investment in knowledge. In this model, developing countries should initially invest mostly in capital stock, up to a certain stage of development then invest in technologies (by imports) and finally emphasize on human capital. The authors also test the model by running quantitative regressions using data from 71 developing countries excluding petroleum exporting countries documented by Barro and Lee (2000). Their results show that if a country' GDP per capita is below USD1,000 (in constant price of 2000), the country should focus on capital stock accumulation; and when the income is from USD1,000 and above, the country should invest in human capital, otherwise economic growth will slow down. Data from China, Taiwan and South Korea document the trend of increasing expenditures on human capital and R&D when the countries start their taking-off stage.

Overview of Vietnam's economy

Macroeconomic reforms and radical changes in the microeconomic institutional structure since late 1980s have substantially changed the overall socio-economic situation in Vietnam. Inflation was under control in 1989 and since then has been maintained at low levels. During 1990-1997, the average GDP growth rate was firmly kept at approximately 8% per year. However, the growth was slowing down during 1997-1999, partly due to the Asian financial crisis, and also because the reform effects were diminishing. Afterwards since 2000, the economy has gained encouragingly high growth rate, 7% per year on average during 2000-2007 (Figure 2).

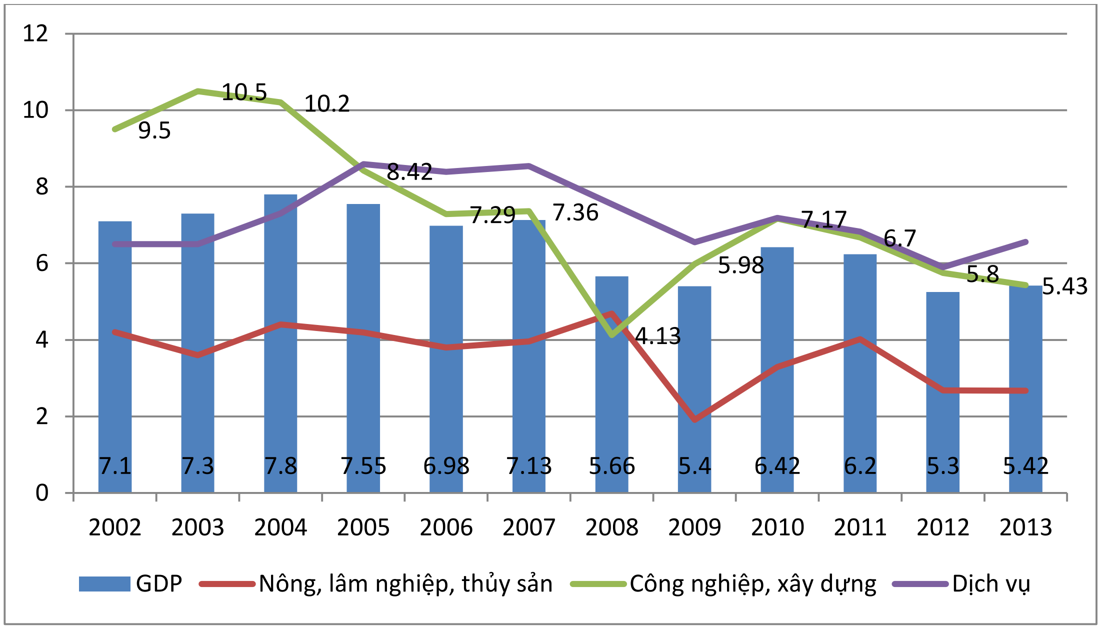
Figure 2: Overview of Vietnam's economy 1990-2013



Source: Data on growth, inflation and poverty by General Statistics Office and evaluation by IMF on Vietnam's reforms; *Note:* PI = Poverty Index.

The strong institutional reform during WTO-entry preparation of 2000-2007 has brought about new growth engines and incentives for the economy. High-growth economy generates demand for capital, resulting in a too quick development of the financial system. Scarce resources such as land and real eastate are under speculation while there exist no effective institutions to prevent or provide warnings about the adverse effects of such speculation on the economy as a whole. The costs of capital and other resources including land, plants and machinery have been steadily increased, making business and production activities highly expensive and risky. The economy step-by-step falls into a bubble. The consequent results include the overheating of credit system, the badly affected real estate market (due to the global economic crisis), therefore creating serious big imbalances in the economy since 2008. The period since 2008 up to date has been characterized by macroeconomic instability, slowing down growth rate which is significantly lower than many countries in the region, increasing threat of lagging behind regional nations, eroding achievements of reforms and development over the last 25 years.

Figure 3: Economic growth rates by sector (2002-2012)

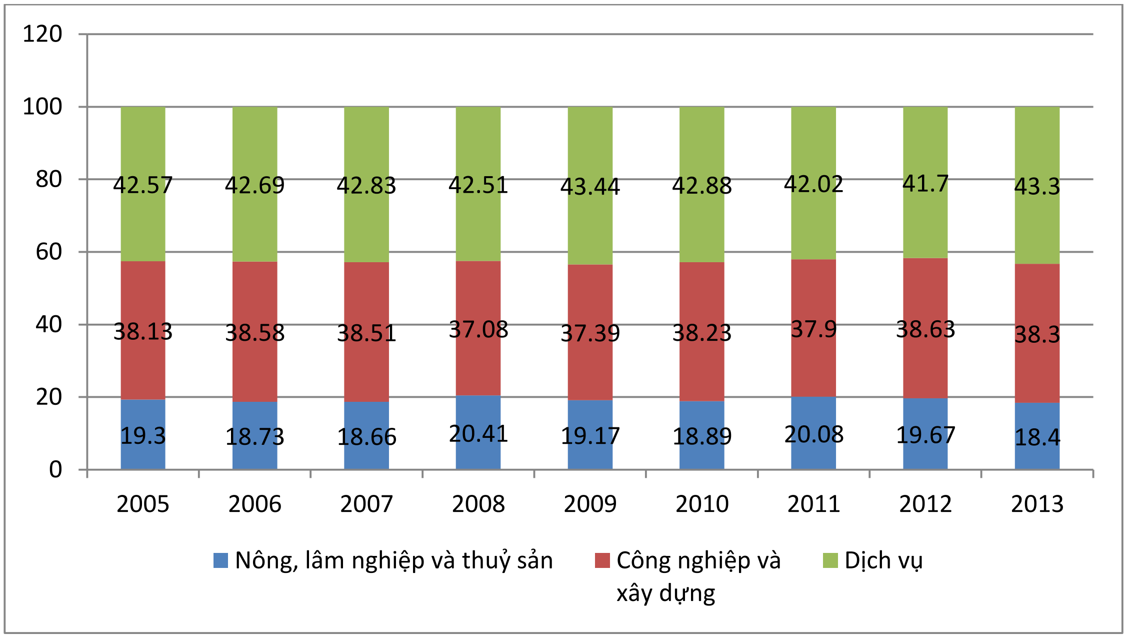


Source: GSO's Statistis Yearbooks over the years; growth rates since 2005 are by 2010 price, earlier rates by 1994 price.

Vietnam's economic growth over the last 25 years since 1989 has been led by manufacturing and service sectors. The growth rates of these two sectors are always well above that of agriculture-fishery-forestry sector (Figure 3). It is noted, however, that since 2005 the growth rate of manufacturing and construction sector has been lagged behind that of services, especially during the recession period, service sector has been still healthy and stable. The substantial decrease in growth of manufacturing and construction sector has adversely affected the overall growth of the economy and slowed down the process of economic structural change.

During the last 25 years, the contribution of agricultural sector keeps diminishing from around 40% GDP in 1990 to nearly 20% GDP in 2015 as estimated. However, the economic structure has almost no change during 2005-2013. This fact is the result of two factors: (i) growth rates of manufacturing and service sectors significantly drop while that of agriculture is negligibly affected; (ii) prices of agricultural products experience much higher increases compared to those of manufacturing and service products, therefore if considering the nominal growth rates only, agriculture-fishery-forestry sector is not lagging behind the other two sectors, leading unchanged economic structure (in current prices).

Figure 4: Economic structure 2005-2013 (% GDP)



Source: GSO's Statistical Yearbook 2012 and GSO's report on Vietnam's economy 2013.

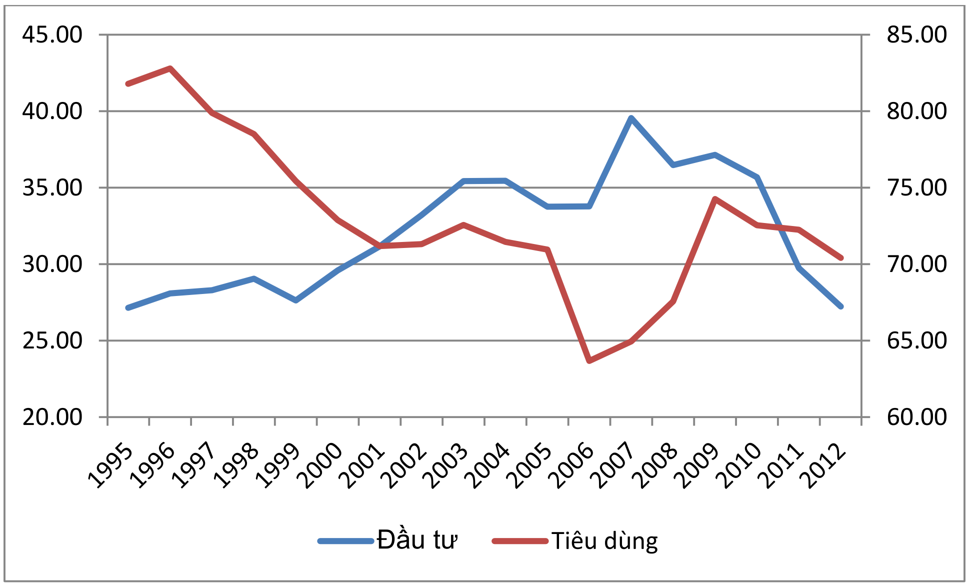
The average annual growth rate of agriculture in the past 20 years stays at approximately 4%. Hence, the industrialization of Vietnam's economy is accompanied with the steady improvement in agriculture. This allows the economy not only to sufficiently meet its demand for agricultural products, but also to stably enhance agricultural exports for the last 25 years.

The GDP per capita in 2012 (calculated in constant USD in 2005 by PPP) increased by 3.46 times compared to 1990, amounting to USD3,133. The proportion of poverty households in national standards decreased from 58% in early 1990s to 9.6% in 2012 (Figure 2). The human development index (HDI) during 1990-2012 improved by 50.55%, the highest among ASEAN-5 members: Thailand, Malaysia, Indonesia, the Philippines and Vietnam; in terms of Inquality Adjusted HDI (IHDI) in 2012, Vietnam surpassed and ranked before Indonesia and the Philippines; life expectancy in this period was also raised by nearly 10 years, from 65.6 years in 1990 to 75.4 in 2012.

Economic structure by final demand

Vietnam's economy in general depends heavily on investments. During the period 1995-2007, which was the highly growing time of Vietnam, the ratio of investment[2] in GDP kept rising, reaching its peak of nearly 40% in 2007, increased by 13 percentage points compared to 1995. However, the growth rate in this period had no surprising improvement. Along with the rise in investment ratio, the proportion of consumption in GDP kept declining during 1995-2006, dropping by 14 percentage points in the period (Figure 5). It is therefore documented that during the high-growth period, Vietnam sped up its accummuation for investments. The demand-stimulas package in 2008-2009 succeeded in pushing up immediate consumption but had no effect on promoting investments, hence when the package ended, both investment and consumption have been continuously falling down and the economy trapped in recession.

Figure 5: Investment and consumption ratios (% GDP)



Source: Annual Statistical Yearbooks.

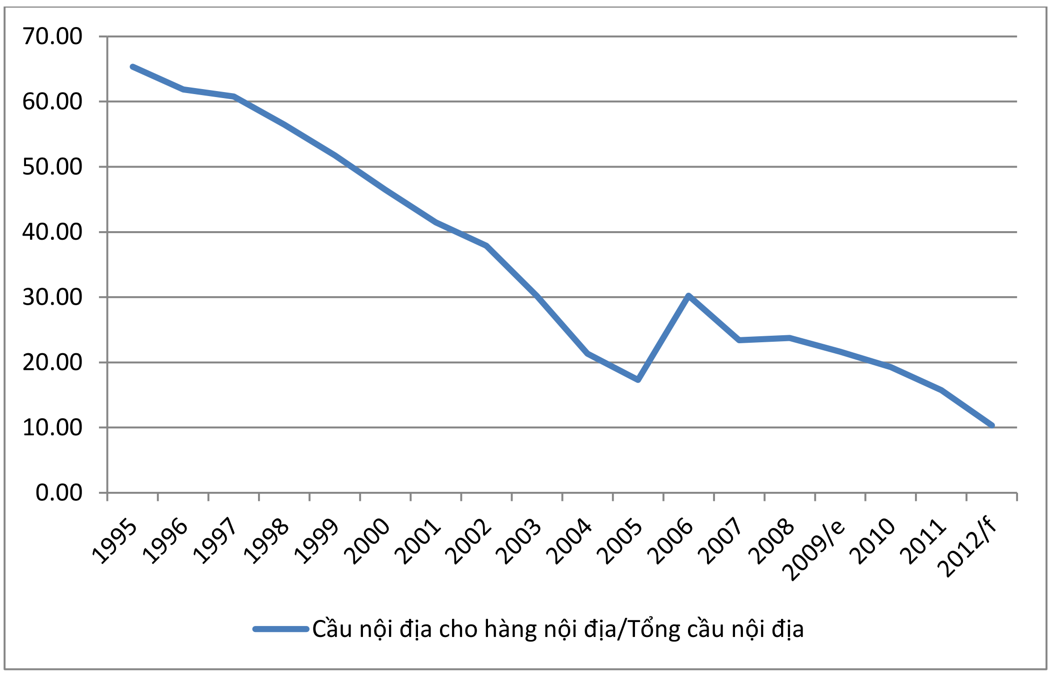
One of the key features of Vietnam's economy during the 25 years of reforms is the constant deficit in the balance of trade, in the context of highly growing exports and higher economic growth rates accompanied with larger deficits. This implies that Vietnam's economic growth heavily depends on imported inputs and technologies, consequently leading to insignificant value-added.

It is also noted that due to the large dependence on imports, the demand for domestic goods within total domestic demand keeps substantially declining, from more than 65% to approximately 10% (Figure 6). This indicates that the growth engine from domestic demand is deteriorating and thus depends

[2] Investment herein is understood as the total asset accummulation

significantly on foreign demand for exports. The economy becomes more vulnerable to external shocks and volatilities. Slowing-down exports would certainly make the economic recession worse. Among the two key engines for growth of Vietnam's economy in the recent time, namely domestic demand and exports, the engine of domestic demand has experienced serious deterioration, Vietnam is thus running with only one engine – foreign demand. This results in an implication that the demand-stimulus policies would have very limited effect because the high leakage rate to external demand makes consumption multiplier lower. Evidence on the 2009 demand-stimulus package shows that the effect of such a package almost disappeared in the afterward years: after 2009, both consumption and investment ratios in GDP strongly declined.

Figure 6: The ratio of domestic demand for domestic goods in total domestic ratio



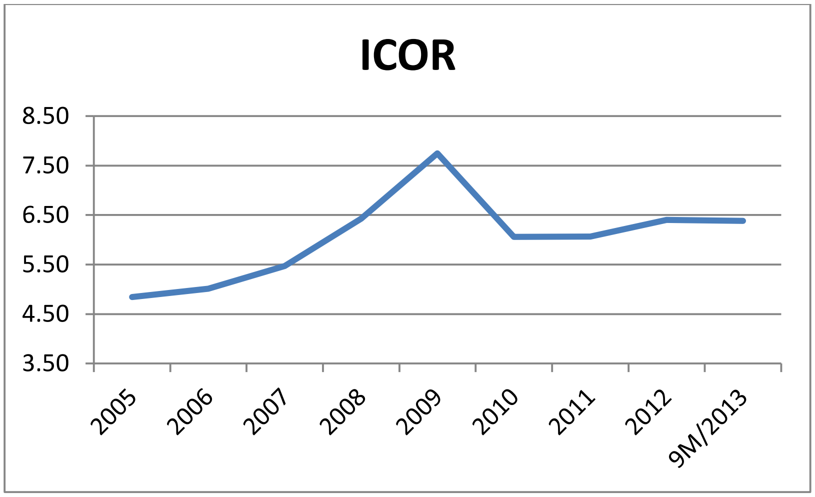
Source: Calculated by authors based on GSO data.

Contribution of production factors to economic growth

As analyzed above, Vietnam's recent economic growth depends increasingly on investments, namely capital stock and efficiency of capital usage, being revealed by Vietnam's ICOR which is greatly higher than world's standard by approximately 4 points. A low ICOR indicates insignificant contribution of technological advances to growth.

In order to identify the contribution of production factors to economic growth, there need to be data on aggregate capital stock of the economy at various points in time. However, the variable of capital stock has not ever been officially announced by both domestic and international statistics offices. Therefore in this study, we estimate the capital stock of the economy, and then build up quantitative models to identify a suitable production function for Vietnam so as to assess the impact of production factors on Vietnam's economic growth.

Figure 7: ICOR during stages of development



Source: Calculated by authors based on GSO data.

Estimation of capital stock

In Vietnam's statistical publications, we observe data on annual accumulated assets and accumulated fixed assets. Meanwhile, World Bank's publications[3] show the annual depreciation of Vietnam's aggregate fixed assets. Based on the available data, we estimate the economy's aggregate assets as follows:

$$K_t = K_{t-1} - D_{t-1} + I_t$$

$$\delta_t = \frac{D_t}{K_t} \Rightarrow K_1 = \frac{D_0}{\delta_0} - D_0 + I_1$$

$$\delta_1 = \frac{D_1}{K_1} \Rightarrow K_2 = \frac{D_1}{\delta_1} - D_1 + I_2, \dots \qquad (1)$$

In which K_t is the capital stock at year *t* and δ_t is the unknown depreciation rate at year; D_t is the total depreciation at yeat *t* and I_t is the total known investments at year *t.* Thus, if we know δ_0 we will figure out the whole series of K_t .

We, in this paper, estimate δ_0,the depreciation rate of Vietnam's fixed assets, then estimate the aggregate fixed assets of Vietnam. The reason why we use the variable of fixed assets instead of total capital stock in general is firstly thanks to the higher reliability of available data on fixed assets. Second,

[3] Word development indicators 2013: http://data.worldbank.org/data-catalog/world-development-indicators

the depreciation of fixed assets is generally positively associated with that of total capital stock, thefore using fixed assets would not distort the results in our production function.

The average depreciation rate of South East Asian developing countries is documented by the survey in Yisheng Bu (2006) to stay around 7%. Also, McQuinn and Whelan (2007) estimate the fixed asset depreciation rate of developing countries to be approximately 6%, which is the weighted average of plant depreciation (2%) and machinery (10%). We, therefore, estimate Vietnam's average depreciation rate of fixed assets to be around 6%.

We then narrow down to find solutions for the following equation:

$$\underset{\delta_0}{Min} \sum_{t=0}^{n} (\delta_t - 0.06)^2 \qquad (2)$$

Taking the data set on fixed asset depreciation, fixed asset accumulation during 1989-2012, using Equation (1) to project all δ_t by δ_0, and then to replace those values into Equation (2), we find out δ_0 and the whole series of Vietnam's capital stock as shown in Appendix 1.

Production function

In this study, due to the limitations of time and resources, we are unable to disaggregate the variable of labor by skills and education; therefore we take the number of labor with employment to proxy the labor variable - L. The aggregate production function depicts the combination of capital stock K and labor L to generate output Y.

$$Y_t = A_t f(K_t L_t)$$

In this paper we use the aggregate production function put forward by Ravankar (1971) and Bairam (1989) which has the variable elasticity of substitution (VES) between capital and labor as follows:

$$Y_t = A_t K_t^{\alpha} L_t^{1-\alpha} e^{\beta k_t} \qquad (3)$$

In which A_t is the level of technology at time t, $k_t = \frac{K_t}{L_t}$ and β are the elasticity of substitution between capital and labor. It is noted that when $\beta = 0$ the equation (3) becomes Cobb-Douglass function.

Vietnam is undergoing through a process of developing and opening up the economy, we therefore assume that the productivity growth is mostly driven by learning-by-doing. The concept of "learning-by-doing" was firstly incorporated into a macroeconomic model by Arrow (1962), which argues that part of technical change process does not depend on the passage of time as such but develops out of experience gained within the production process itself. We accordingly assume that productivity improves thanks to both experience and technical change, thereby

$$A_t = A_0 e^{\lambda t} E_t^{\theta}$$

In which λ is the overall technical change index (or average Total Factor Productivity – TFP), E_t is the index of experience. Arrow (1962) argues that index of experience depends on the level of investment in the economy, the higher investment the better experience to gain. Thus, Arrow (1962) proposes $E_t = \sum_{i=0}^{t} I_i$ in which I_t is the annual cumulative gross investment. Other studies such as Bairam (1987) and Stokey and Lucas (1989) conclude that the index of experience relies on total cumulative output, thus suggesting $E_t = \sum_{i=0}^{t} Y_i$. In this paper, both measures are used as proxies of experience. However, we also propose that the index of experience in an economy is dependent on the ratio of capital over labor. If this ratio is higher, the capacity of gaining and accumulating experience will be greater with a stronger spill-over effect. We therefore also test the third proxy $E_t = \sum_{i=0}^{t} \frac{I_i}{L_i}$.

Thus, we have the following production function:

$$Y_t = A_0 e^{\lambda t} E_t^{\theta} K_t^{\alpha} L_t^{1-\alpha} e^{\beta k_t}$$

$$\frac{Y_t}{K_t} = A_0 e^{\lambda t} E_t^{\theta} (\frac{L_t}{K_t}) e^{\beta k_t} \qquad (4)$$

Taking the natural logarithm of both sides in Equation (4), we have the regression model as follows:

$$\ln \frac{Y_t}{K_t} = \ln A_0 + \lambda t + \theta \ln E_t + (\alpha - 1) \ln k_t + \beta k_t$$

$$k_t = \frac{K_t}{L_t} \qquad (5)$$

Equation (5) is regressed with three proxies of E_t

$$E_t = \sum_{i=0}^{t} I_i \qquad (a)$$

$$E_t = \sum_{i=0}^{t} Y_i \qquad (b)$$

$$E_t = \sum_{i=0}^{t} \frac{I_i}{L_i} \qquad (c)$$

With each proxy of E_t we run the regression three times: the first with all variables in Equation (5) to test the production function of VES to see if $\beta \neq 0$ is statistically significant and $0 < \alpha < 1$. If the hypothesis of VES function is rejected, we then omit the variable βk_t and run the regression for the second time to test for the existence of overall technical change in the study period. If the hypothesis of overall technical change is insignificant statistically, we next omit the variable λt and test the last hypothesis of "learning-by-doing".

Data

We use data of labor from CEIC which is originally derived from General Statistics Office. Data of output (GDP) are adjusted at 2010 price, but applicable only to those since 2005 onward. Data of asset accumulation and depreciation are at 1994 price. In order to have a long enough series of data, we use the series of GDP at 1994 price. The difference in GDP growth between the two calculations is minor, we hence concur that 1994 priced data do not affect our regression results.

The estimated capital stock in Appendix 1 is at real terms, then adjusted to 1994 price by the adjustment factor $d_t = \frac{I_t^n}{I_t^r}$ in which I_t^n is the nominal asset accumulation, and I_t^r is the real asset accumulation. The two indices of asset accumulation are available in the 2012 database of CEIC and WDI by the World Bank.

Empirical results

The regression results presented in Appendix 2 show that the VES function is not supported and there is no evidence for overall technical change in the study period. The production function with "learning-by-doing" variable is significant when using $E_t = \sum_{i=0}^{t} \frac{I_i}{L_i}$.

The estimated coefficients $\alpha = 0,677$ and $\theta = 0,09565$ (Appendix 2) are all statistically significant at the level of 0.1%. These values are compatible with the estimated production function of developing countries where α is regularly ranging from 0.6 to 0.7. With the resulted coefficients, we are able to estimate the contribution of factors to economic growth as follows.

Table 1: Contribution of production factors to economic growth

Year	TFP	Capital	Labor	Experience
1993	0.45	2.97	0.76	3.89
1994	1.33	3.51	0.74	3.26
1995	2.29	3.84	0.73	2.73
1996	2.26	3.94	0.71	2.37
1997	1.49	4.06	0.70	2.05
1998	-1.27	4.35	0.69	1.85
1999	-1.43	4.00	0.68	1.55
2000	0.15	4.21	0.99	1.42
2001	0.18	4.42	0.96	1.33
2002	0.05	4.82	0.93	1.28
2003	0.05	5.13	0.93	1.23
2004	0.33	5.35	0.94	1.17
2005	1.00	5.40	0.93	1.11
2006	0.49	5.74	0.91	1.09
2007	-0.14	6.54	0.90	1.15
2008	-1.71	6.09	0.90	1.04
2009	-2.48	5.92	0.89	0.99
2010	-1.27	6.20	0.88	0.97
2011	-0.50	4.84	0.86	0.77
2012	-0.98	4.44	0.86	0.71

The results in Table 1 show that the contribution of labor to growth during 1993-2012 was stable and close to 1 percentage point. Capital has the greatest contribution to growth, however this contribution appears to be declining in the recent time. In the early stage of development, the role of experience was substantial. Later on, this role has been deteriorating. If there is no improvement in technology, the effect of "learning-by-doing" will shrink down to zero. The contribution of total factor productivity (TFP) is insignificant, and even negative since 2007. This implies that the overall efficiency of using both capital and labor was declining during 2007-2012.

Conclusion

Our paper is the first to provide a proper estimation of total fixed assets in the economy as a whole, and then calculate the set of data on fixed assets of Vietnam. The data are essential for other papers to do research on economic growth later on.

This study provides evidence that while Vietnam's overall economy has been increasingly depending on investments, the efficiency of investment is getting worse as Vietnam's ICOR far surpasses the world average. Our quantitative analysis documents that during the last 20 years, despite the relatively high economic growth of Vietnam, the contribution of TFP is negligible. The improvement in productivity is partly thanks to the experience factor through the process of learning-by-doing. However, the impact of "learning-by-doing" has been declining over time, therefore if there is no further improvement of TFP, the slowing down of economic growth is predictable.

With the current model of development, Vietnam's economic growth mainly relies on the capital stock accumulation. This accumulation rate is diminishing, resulting in further decline of economic growth. The economic growth drivers in Vietnam exactly follow what has been predicted in popularized growth models: diminishing capital-based growth rate; it is now the high time for Vietnam to accelerate the factor of knowledge in economic development. It is warning that the process of knowledge accumulation in Vietnam is mostly based on "learning-by-doing" rather than developing or actively utilizing update technologies to push up total factor productivity.

With respect to aggregate demand, Vietnam's economy increasingly depends on foreign demand for exports. The domestic demand for domestic goods accounts for only 10% of total domestic demand. This implies that the demand-stimulus policies at this moment are unnecessary and wasteful as most of the demand-stimulus packages leak out to other countries via imports. The correct direction for Vietnam is to develop both exports and supporting industries to decrease the dependence on imports, improve the balance of trade, thereby promoting the role of aggregate domestic demand on economic growth.

References

Arrow, K. (1962), "The Economic implication of learning-by-doing", *Review of Economic Studies*, Vol. 29, No. 1, pp 155-73.

Bairam, Erkin, (1989), "Learning-by-doing, Variable Elasticity of Substitution and Economic Growth in Japan, 1878-1939", *Journal of Development Studies,* 25, pp 344-353.

CEIC, Comparing economic data: https://www.ceicdata.com/

Collins, S. M., B. P. Bosworth and D. Rodrik (1996), "Economic Growth in East Asia: Accumulation versus Assimilation", *Brookings Papers on Economic Activity*, vol. 1996, No. 2, pp. 135-203.

Galor, O. and O. Moav (2004), "From Physical to Human Capital Accumulation: Inequality and the Process of Development", *The Review of Economic Studies*, Vol. 71, No. 4, pp. 1001-1026.

Golmuka, S. (1991), *The Theory of Technological Change and Economic Growth*, Routledge, London/New York.

McQuinn and Whelan "Conditional convergence and the dynamics of capital-output ratio", Journal of Economic Growth, 2007.

World Bank, World development indicators: http://data.worldbank.org/data-catalog/world-development-indicators

Revankar NS (1971), "A Class of Variable Elasticity Substitution Production Functions" *Econometrica* Vol. 39, No.1: 61-71

Stokey, N. and R. Lucas with E. Prescott (1989), “Recursive Methods in Economic Dynamics”, Harvard University Press.

Vietnam’s General Statistics Office, Annual Statistic Yearbooks.

Yisheng Bu, 2006, “Fixed capital stock depreciation in developing countries: Some evidence from firm level data” *Journal of Development Studies,* Vol.42, No 5 pages 881-901.

Dowrick, S. and D. T. Nguyen (1989), "OECD Comparative Economic Growth 1950-85," *American Economic Review*, vol.79, No. 5, pp.1010-1030.

Romer, P. (1987), "Growth Based on Increasing Returns Due to Specialization," *American Economic Review*, 77, 2 (May), 56-62.

Romer, P. (1990), "Endogenous Technological Changes," *Journal of Political Economy*, 98, 5 (October), pt II, S71-S102.

Lucas, R.E. Jr. (1988), "On the Mechanics of Economic Development," *Journal of Monetary Economics*, 22, 1 (July), pp. 3-42

Appendices

Appendix 1: Annual estimated total assets, nominal GDP, and labor

	K	L	Y
1989	107666,5174	28477	28093
1990	111491,2382	29412	41955
1991	119596,1174	30135	76707
1992	133196,9178	30856	110532
1993	156894,333	31579	140258
1994	190851,2565	32303	178534
1995	236599,4813	33031	228.892
1996	289101,369	33761	272.036
1997	349641,8323	34493	313.623
1998	420199,743	35233	361.016
1999	491934,152	35976	399.942
2000	579444,899	37075	441.646
2001	679187,7122	38180	481.295
2002	801663,6425	39276	535.762
2003	956622,2242	40404	613.443
2004	1137021,176	41579	715.307
2005	1355022,772	42775	914.001
2006	1608682,393	43980	1.061.565
2007	1953095,291	45208	1.246.769
2008	2356249,494	46461	1.616.047
2009	2821713,315	47744	1.809.149
2010	3361085,589	49049	2.157.828
2011	3929050,276	50352	2.779.880
2012	4482218,778	51699	3.245.419

Appendix 2: Regression results

Prais-Winsten AR(1) regression -- iterated estimates

```
    Source |       SS       df       MS              Number of obs =      24
-------------------------------------------          F(  2,    21) =  565.17
     Model |  .255213042     2  .127606521           Prob > F      =  0.0000
  Residual |  .004741482    21  .000225785           R-squared     =  0.8818
-------------------------------------------          Adj R-squared =  0.8800
     Total |  .259954524    23  .011302371           Root MSE      =  .01503
------------------------------------------------------------------------------
     Lyk94 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
------------------------------------------------------------------------------
     Llk94 |   .3230519   .0741206     4.36   0.000     .1689096    .4771942
    LCIl94 |   .0956484    .013615     7.03   0.000     .0673345    .1239624
     _cons |  -.4796147   .2288872    -2.10   0.048    -.9556117   -.0036178
------------------------------------------------------------------------------
       rho |   .9095269
------------------------------------------------------------------------------
```