

The Impact of Factors of Production on Danang's Economic Growth

Tin Q. Pham¹, Thao U. P. Pham², Hai M. Nguyen³, Phe S. Ngo⁴

¹Faculty of Statistics and Informatics, University of Economics, The University of Danang (Vietnam), Danang, Vietnam, E-mail: tinpq@due.edu.vn

²Faculty of Business Administration, University of Greenwich (Vietnam), Danang, Vietnam, E-mail: thaopup@fe.edu.vn

³Faculty of Business Administration, University of Greenwich (Vietnam), Danang, Vietnam E-mail: hainm24@fe.edu.vn

⁴Planning and Finance Department, Tra Vinh University (Vietnam), E-mail: sophetvu@tvu.edu.vn

Article History

Received : 20 October 2020

Revised : 27 October 2020

Accepted : 09 November 2020

Published : 30 December 2020

Abstract: This study applies the quantitative methods to measure the influence of factors of production to economic growth in Da Nang city by using the secondary data from Danang Statistical Office during 1996 - 2019. Research results show that economic growth in Da Nang is primarily based on capital intensity. Besides, the contribution of the labour factor and the total factor productivity (TFP) to Danang's economic growth is extremely low, not commensurate with its position as a leading centre in the Middle and Central Highlands region of Vietnam.

Keywords: Economic Growth, Gross Regional Domestic Product (GRDP), Capital, Labour, Total Factor Productivity (TFP).

1. INTRODUCTION

According to the Resolution of the 9th-tenure Vietnam's National Assembly - the tenth session on November 6, 1996 "about the division and adjustment of the provincial administrative boundaries", Danang had been separated from Quang Nam province, becoming a city which was directly responsible to the central government since Jan 1st 1997. In 2003, Danang city turned into a Class-I municipality city with remarkable developments under Decision of Prime Ministry No.145/2003/QD-TTIG. After 23 years of establishment and 17 years of being recognised as a Class-

I city, Da Nang has accomplished outstanding achievements in terms of socio-economic development, urban planning and strong infrastructure initiatives throughout times. Precisely, Danang emerges as a socio-economic centre, a tourist attraction of Vietnam in general and the central region in particular. However, the economic growth in Danang has recently been slowing down as reported by the Danang Statistics Office. Danang had the lowest economic growth (6.7%) compared to other centrally-government cities in 2019. Notably, Da Nang is currently implementing the Resolution No.43-NQ/TW, that Da Nang has to maintain an annual growth rate of 12% from 2020 to gradually become one of the socio-economic centres in Asia and the driving force for the key economic regions in the Middle - Central Highlands of Vietnam in 2045, issued by the Politburo on January 24th, 2019 “towards building and developing Danang to 2030 with a vision to 2045”. Therefore, the comprehensive and systematic studies of Danang’s economic growth will be a quantitative basis for government leaders and managers at all levels to make policies and solutions to complete the Resolution No.43-NQ/TW accompanying with the sustainable development of Danang’s economy.

Over the years, several empirical research on the economic growth of Danang city, such as Bui (2008) analysed the contribution of the economic integration process to Danang’s development. Another study by Nguyen (2008) also showed evidence of the successful on Danang’s economic expansion. Later on, Tran et al. (2009) used time-series data and descriptive analysis techniques during 1996-2008 to disclose that the Danang’s average economic growth was higher than Vietnam’s, and Danang’s economic structure shifted towards increasing the proportion of Industry and Services sectors and decreasing the primary sectors including agriculture, forestry, fishery, etc. according to the general orientation of Vietnam, especially the rate of transformation economic structure in Danang was abnormally faster than Vietnam’s in general, as same as the findings of the research from Dang (2012). However, only a few papers discussed the contribution of factors of production to economic growth in Danang city. Hence, this study will apply testing and estimation techniques to logically estimate the influences of Capital, Labour factors and Total Factor Productivity (TFP) on Danang’s economic growth.

2. LITERATURE REVIEW AND RESEARCH MODEL

2.1. Literature Review

Derived from the inputs of the manufacturing process in the economy, the shortened title book “Wealth of Nations”, published by Adam Smith in 1776, mentioned that

the origin of economic growth in any country including capital accumulation, technological advances, social factors, and institutions. Additionally, he explained that the wealth of European nations (United Kingdom), North America, and the poverty of other countries like China and Turkey in the second half of 18th century due to the difference of "Free-trading" business environment. It means that the government minimizes interferences and restrictions, and encourages free competitions to promote economic development. He also was one of the earliest pointed out the role of capital investment and technology, institutions and freedom in economic sustainability.

Following the theories of Keynes (1936) about the application of mathematical models in economic research, both Harrod (1939) - the British economist, and Domar(1939) - the American economist conducted the common research topic of economic growth, despite completely independent research. The research model was later labelled by their names as the Harrod-Domar Model, which measures the positive relationship between economic growth and capital investment in the economy, indicated that the more capital invested, the more economic development.

Solow (1956) with the study "Theory of Economic Growth" and Swan (1956) - "Economic Growth and Capital Accumulation" proposed the Neoclassical Growth model, also known as Solow - Swan model (or referred to Solow model). Beyond the agreement towards the role of Capital factor regarding the Harrod-Domar model, Solow-Swan (1956) also provided the quantitative model of the labour and technology factors impacting on economic growth. Moreover, the Solow-Swan model delivered a measurable explanation for the economic development depended on capital investment, labour and scientific and technological progress.

Furthermore, many researchers around the world exploited the Solow model to assess the effect of capital, labour and total factor production on economic advancements such as La 'baj *et al.* (2014), Dreger *et al.* (2013), Guo *et al.* (2013), and Baum *et al.* (2013). Apart from the foreign experimental research, some domestic studies are emphasising the influences of capital contribution, labour and TFP on the production outputs of the economy such as Tran (2010), Nguyen (2013); Ta and Pham (2013); Pham and Tran (2013). Yet, the TFP factor is often not calculated directly but is estimated indirectly through the estimation of contribution from both capital and labour factors to economic growth.

2.2. Research Model

The research model is developed by the Solow model (1956), which inherited from the growth theory of Adam Smith and the Harrod - Domar model to identify three

factors affecting economic development, consisting of capital investment, labour and TFP, expressed in terms of the production function (Formula (1)).

$$Y = f(A, K, L) \quad (1)$$

In which:

Y: Economic Outputs

A: Total Factor Production

K: Capital Investment in the economy

L: Total labour of the economy

Table 1: Expected Signs of the relationship between Y and K, L, TFP

<i>Explanatory variables Factor</i>	<i>Expected Relationship</i>	<i>Dependent Variable</i>
Capital Investment in the economy (K)	+	Y
Total labour of the economy (L)	+	
Total Factor Production (TFP)	+	

In the proposed research model (Formula (1)), there are three factors such as capital, labour and TFP, which affect production output in the economy. Accordingly, three research hypotheses are reflecting respectively their relationships.

- Hypothesis (H1): Total invested capital positively affects economic outputs. Capital investment is a crucial input to the economic manufacturing process. The higher capital contribution, the better production infrastructure, which in turn will boost up the outputs of the economy. As a result, the relationship between financing capital and the total economic products is positive.
- Hypothesis (H2): Labour involved in production has a positive impact on the production outputs of the economy.

Labour is also one of the indispensable factors for the production process, labour plays roles in both as the generating-output factor and as the consumer in the economy. People earn money when participating in production activities according to the method of the income distribution. Employees will spend that income to consume for their needs, thereby increasing aggregate demand in the economy according to the consumer's end-use method. This stimulates production development and increases production outputs in the economy, so the relationship between labour and the outputs is in the same direction with capital factor.

- Hypothesis (H3): TFP positively impacts on production outputs.

TFP is the synthesis of several inputs that cannot be quantified such as management, science and technology, quality of human resources, etc. TFP increase implies the enhancement of the management process, science and technology, etc., in turn, will be positively correlated with the manufacturing process of the economy and foster the economy. Consequently, TFP and economic production results are significantly associated with each other.

3. METHODOLOGY AND DATABASE

3.1. Analysis Methods

To estimate the impact of factors of production on economic growth according to the Solow Model (Formula (1)), this study uses the Cobb-Douglas production function in Formula (2):

$$Y = AK^\alpha L^\beta \quad (2)$$

In which:

- α: The exponent reflects the contribution of the capital investment factor to the economic outputs.
- β: The exponent reflects the contribution of the labour factor to the economic outputs.

The Formula (2) is converted to the Logarithm equation as below:

$$Y = AK^\alpha L^\beta \quad (2)$$

$$\Leftrightarrow \ln(Y) = \ln(A) + \alpha \ln(K) + \beta \ln(L)$$

The differential equation of Formula (2) is applied to consider the changes over time of variables:

$$\begin{aligned} \Leftrightarrow \frac{dY}{dt} \frac{1}{Y} &= \frac{dA}{dt} \frac{1}{A} + \alpha \frac{dK}{dt} \frac{1}{K} + \beta \frac{dL}{dt} \frac{1}{L} \\ \Leftrightarrow \frac{\Delta Y}{Y} &= \frac{\Delta A}{A} + \alpha \frac{\Delta K}{K} + \beta \frac{\Delta L}{L} \\ \Leftrightarrow g(Y) &= g(A) + \alpha g(K) + \beta g(L) \\ \Leftrightarrow g(A) &= g(Y) - (\alpha g(K) + \beta g(L)) \end{aligned} \quad (3)$$

To which:

$g(Y)$: Economic growth rate.

$g(A) \approx g(\text{TFP})$: The growth rate of TFP.

$g(K)$: The growth rate of capital investment in the economy.

$g(L)$: The growth rate of labour in the economy.

The contribution levels of three factors composing capital, labour and TFP to economic growth reflect the percentages of factors devoting to economic growth respectively in the following equations:

$$\text{Contribution of capital factor} = \frac{\alpha g(K)}{g(Y)} \times 100\% \quad (4)$$

$$\text{Contribution of labour factor} = \frac{\beta g(L)}{g(Y)} \times 100\% \quad (5)$$

$$\text{Contribution of TFP factor} = \frac{g(\text{TFP})}{g(Y)} \times 100\% \quad (6)$$

The econometric model studies the impact of capital, labour and TFP on production outputs in the Formula (2) transformed into Formula (7):

$$Y = AK^\alpha L^\beta e^U$$

$$\rightarrow \ln(Y) = \ln(A) + \alpha \ln(K) + \beta \ln(L) + U \quad (7)$$

For which: U is the error that the variables in the equation (7) cannot explain.

Testing the existence and estimating the impact of the capital, labour and TFP factors on economic outputs by the econometric model is carried out with the following process:

- Relationship Testing by using F-Test with a pair of general hypotheses:
 - ✓ The null hypothesis (H_{o1}): The model (7) would not exist, implied that there is no effect of factors of production on the outputs in the economy.
 - ✓ The alternative hypothesis (H_{a1}): The model (7) does exist, implied that there are significant effects of factors of production on the outputs in the economy.
- Testing the below assumptions of the OLS regression model to check the reliability and validity of the model:
 - ✓ Assumption 1 (A1): The model has residuals (U) according to the normal distribution.

- ✓ Assumption 2 (A2): The model has the mean (Estimation) of the residuals (U) equal to 0.
- ✓ Assumption 3 (A3): The model does not have any auto-correlation.
- ✓ Assumption 4 (A4): Model does not have any multi-collinearity.
- ✓ Assumption 5 (A5): Model does have homoscedasticity.
- T-Test applying for the existing correlation of each factor on economic growth.

However, the severe multi-collinearity phenomenon often encounters in the model (7) between the capital and labour factors. To deal with this problem, the assumption of the Solow Model, claimed as the “Constant Returns on Scale” Model, is also given by Pham and Tran (2013), Ta and Pham (2013), Nguyen (2014) to study the impacts of the factors of production on economic growth in Vietnam and some provinces around Vietnam. With “Model of Constant Returns on Scale”, the exponents α and β of the model (7) will be estimated according to Formula (8):

$$Y = AK^\alpha L^\beta e^U$$

$$\Leftrightarrow \text{Ln}(Y) = \text{Ln}(A) + \alpha \text{Ln}(K) + \beta \text{Ln}(L) + U$$

With

$$\beta + \alpha = 1 \Leftrightarrow \beta = 1 - \alpha$$

$$\Leftrightarrow \text{Ln}(Y) = \text{Ln}(A) + \alpha \text{Ln}(K) + (1 - \alpha) \text{Ln}(L) + U$$

$$\Leftrightarrow \text{Ln}(Y) = \text{Ln}(A) + \text{Ln}(L) - \alpha \text{Ln}(L) + \alpha \text{Ln}(K) + U$$

$$\Leftrightarrow \text{Ln}(Y) = \text{Ln}(A) + \text{Ln}(L) + \alpha(\text{Ln}(K) - \text{Ln}(L)) + U$$

$$\Leftrightarrow \text{Ln}(Y) - \text{Ln}(L) = \text{Ln}(A) + \alpha(\text{Ln}(K) - \text{Ln}(L)) + \text{Ln}(U)$$

$$\Leftrightarrow \text{Ln}(Y/L) = \text{Ln}(A) + \alpha \text{Ln}(K/L) + \text{Ln}(U) \tag{8}$$

For which:

Y/L: Average income of employees participating in the production process of the economy (Average first-time income of each worker taking part in the manufacturing process).

K/L: Average capital investment of the labour involved in the production process in the economy.

Instead of estimating α and β of the model (7), the computation of α in the equation (8) would be used, and the first pair of general hypotheses pair (H_{o1} and H_{a1}) will be replaced by the new hypothesis pair (H_{o2} and H_{a2}) to test the existence of the model (8) as below:

- ✓ The null hypothesis (H_{o2}): The model (8) would not exist, in other words, there is no effect of average capital investment on the average income of the labour in the economy.
- ✓ The alternative hypothesis (H_{a2}): The model (8) does exist, in other words, there is a statistical effect of average capital investment on the average income of the labour in the economy.

3.2. Database

The article uses secondary time-series data in the 1996-2019 period (Data for 2019 are estimated), published by Danang Statistical Office (DSO). In which, the indicator representing production outputs to analyse Danang's economic growth is Gross Regional Domestic Product (GRDP), amounted by VND billion, and Capital Investment (VND billion) is calculated at fixed prices in 2010 according to Circular No.02/2012/TT-BKHDT dated April 4th, 2012 from the Minister of Planning and Investment, about "The base year 2010 replaced the original year 1994 to calculate the statistical indices at constant-price level", in order to eliminate the effect of the price factor (inflation factor) and average labour (1000 persons).

4. DATA ANALYSIS

4.1. Estimation and Testing

Table 2: Estimation and testing of the OLS model (8)

<i>Variable</i>	<i>Coefficient</i>	<i>Std. Error</i>	<i>t-Statistic</i>	<i>Prob.</i>
C	2.639751	0.064897	40.67612	0.00
Ln(K/L)	0.447887	0.019497	22.97219	0.00
F-statistic	527.7214	Prob. (F-statistic)		0.00
Durbin-Watson stat				0.252

Data source: DSO

In Table 2, it can be seen that p-value of F-statistic is approximately 0.00 less than the significant level 5%, indicated that the null hypothesis H_{o2} could not be accepted and the alternative hypothesis H_{a2} may be correct. In other words, the model (8) exists with a confidence interval of 95%.

The statistical result of Durbin - Watson test to check the autocorrelation is 0.252, less than 1.017 (from DL - Durbin-Watson critical value table), so it violates

the 4th Assumption (A4), so autocorrelation does exist in this model. Therefore, the results of the OLS model estimation (8) is not reliable. To handle this autocorrelation, many methods could be performed, but the Generalized Least Squares (GLS) method is applied to adjust the errors based on the standard of Newey-West (1987). The GLS model is often used when the estimated results by OLS regression model fall under the phenomenon of autocorrelation or heteroscedasticity, and the estimated values of all parameters are quite similar in both regression models. However, the GLS method will re-estimate the variance to modify the input data, so the variance is different from the OLS method.

Table 3: Estimation and testing of the GLS model (8)

<i>Variable</i>	<i>Coefficient</i>	<i>Std. Error</i>	<i>t-Statistic</i>	<i>Prob.</i>
C	2.639	0.071950	36.68881	0.00
Ln(K/L)	0.448	0.028184	15.89147	0.00
F-statistic	527.7214	Prob. (F-statistic)		0.00

Data source: DSO

With the p-value of the F-test estimated by the GLS method is nearly 0.00, less than 0.05 – the significant level, it is possible to conclude that model (8) does exist. In particular, Table 3 shows that the first-time income of Danang employees is influenced by their average invested capital.

Table 4: Testing of Standard Normal Distribution and Residual Estimation of the model (8)

<i>Jarque-Bera</i>	<i>0.9439</i>	<i>Prob.</i>	<i>0.6237</i>
<i>Hypothesis Testing for RESID: Mean = 0.00</i>			
<i>t-statistic</i>	<i>1.38E-14</i>	<i>Prob.</i>	<i>1.000</i>

Data source: DSO

The result of the normal standard distribution test regarding the Jarque – Bera (1980) is presented in Table 4 with a p-value of 0.6237, greater than 0.05, so it may be concluded that the residuals of the model (8) are normally distributed. The p-value of the T-test (testing population mean with a certain critical value) equals 1, which is greater than 0.05, indicating that the residual mean is zero. Assumptions (A1) and (A2) are confirmed.

Likewise, the model (8) estimated and tested by the GLS method could cope with autocorrelation and heteroscedasticity problem. The regression model (8) is a single regression model (2 variables), so there is no need to test the multi-collinearity issue. Therefore, the estimated results according to GLS meet all primary assumptions. Hence, the analysis results in Table 3 guarantees the reliability to explain the effects of the independent variable on the dependent variable in the model (8).

Moreover, the intercept of the model (8) (C) exists because the p-value is 0.00, less than 0.05, so it can derive that the average intercept (TFP growth) of Danang city is quite low with 2,639%. Besides, the regression coefficient reflects that the invested capital executes to the first-time income of labour about 44.8%, and simultaneously implies the contribution of the capital factor to economic growth in Danang, assumed by the “constant returns on scale” model.

Based on the p-values corresponding to the regression coefficients of the models (8), which are all less than 0.05, it may be concluded that the research hypotheses H1 and H3 do exist with the confidence interval 95%.

In accordance with the assumption from Solow model that:

$$\alpha + \beta = 1 \Leftrightarrow \beta = 1 - \alpha \Leftrightarrow \beta = 1 - 0.448 = 0.552$$

In which:

$\alpha = 0.448$ - is the coefficient of the regression model (8).

Following the p-values of the GLS model (8) in Table 3, the capital and labour factors contribute respectively 44.8% and 55.2% to the Danang's economic growth. Thus, it concludes the existence of the second research hypothesis (H2). Therefore, the estimation results show that the signs of the regression coefficients corresponding to the factors of production are positive, so the research hypothesis H1, H2 and H3 of the model (1) may be accepted. It means that the three factors of capital, labour, and TFP have positive impacts on economic expansion in Danang city. This result is similar to the research of Tran (2008), Pham and Tran (2013), Ta and Pham (2013) for Vietnam's economic growth and Nguyen (2014) for the case of Quang Nam province and Phan (2012) in the context of Thua Thien Hue province.

4.2. Estimation of three-factor influences on Danang's economic growth

Inserting the estimation results of the regression coefficients of the capital and labour factors to the formulas (3; 4; 5 and 6) to determine the contribution of capital, labour and TFP factors to economic development in Danang city during 1996-2019.

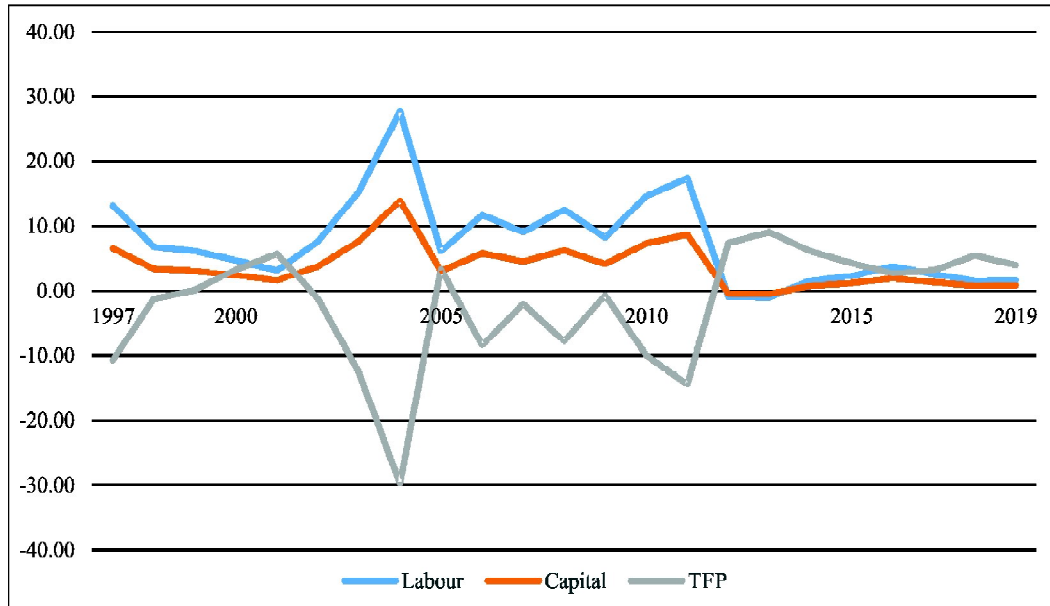
Table 5: Contribution of the Capital, Labour and TFP to Danang's Economic Growth in the 1996-2019 period

<i>Period</i>	<i>Growth Rate (%)</i>			<i>Contribution to GRDP (%)</i>		
	<i>GRDP</i>	<i>K</i>	<i>L</i>	αK	βL	<i>TFP</i>
1996-2000	9.50	17.07	2.35	7.65	1.18	0.66
2001-2005	11.18	25.45	3.75	11.40	1.88	-2.10
2006-2010	11.13	25.02	3.50	11.21	1.76	-1.83
2011-2015	8.38	7.74	2.84	3.47	1.43	3.49
2016-2019	7.48	5.34	2.67	2.39	1.34	3.75
1996-2019	9.62	16.24	3.07	7.28	1.54	0.80

Combining the data from Table 5 and Table 6 and Figure 1, it can be seen that the average economic growth in Danang in the 1996-2019 period was 9.62% with the lowest is 7.48% (2016-2019) and the highest is 11.18% (2001-2005). Contributing the most to Da Nang's economic growth in the 1996-2019 period was the invested capital factor, with an average growth rate of the capital investment amount of 16.24%, contributing to the economic growth of Danang city about 7.28%, equivalent to the approximate proportion of 75.67% in the total economic development rate in Danang. This result derives that Danang's economic growth from 1996 to 2019 is principally based on capital intensity. Ranked second is the labour factor with an average growth rate - 3.07%, contributing to Danang's economic expansion around 1.54%, accounting for 16% in total. However, the contribution of the labour factor is very stable, does not fluctuate as strongly as the financial capital factor. In addition, the TFP factor is also an ensuring highlight for the economic growth of Danang. TFP is a representative indicator with the average growing rate 0.8%, reflecting the combination of inputs of the production process, management mechanism, science and technology level, etc., stimulating the economic growth in Danang city with the lowest percentage, referred to 8.33% of the total growth rate of GRDP. Thus, it can be concluded that the contribution of TFP to economic growth is not compatible with the position of Danang.

In the short periods, paralleling to the congresses of the Danang's Party Committee, the stimulations from factors of production to economic growth are very strong in terms of changes in the level of the contribution for each factor to economic development. The highest growth rate of Danang's economy was in 2001-2005 with 11.18% and 2006-2010 with 11.13%, principally attributed by the capital

Figure 1: Contribution of Capital, Labour and TFP to Danang's economic growth during 1996-2019



factor. These were the periods that Danang city carried out the policy of “Converting land for infrastructures” to concentrate financial resources to develop Danang with a very high average investment capital increase to 25.45% and 25.02%, contributing 11.4% (accounted for 101.96%) and 11.21% (accounted for 100.65%) to Danang's economic growth, respectively. Meanwhile, the factor TFP was assessed as a barrier to economic growth in Danang with the negative contribution of -2.10% (-18.78% in total) and -1.83% (-6.43% totally).

During the 10 years from 2001 to 2010, economic growth in Da Nang was remarkably high as can be explained by the extensive investment. It can be expressed that this was a starting period for the outstanding development of Danang when it implemented of Resolution No.33 NQ/TW “on building and developing Danang city in the era of industrialization and modernization”. That's why so many policies, as well as the reforms of Da Nang, still have been experimental and not yet aligned with the actual pace of development. However, in the period 2011-2019, Danang paid more attention to the quality of growth, reflected in the improvement of TFP's contribution to economic growth. More precisely, TFP's contribution to economic growth in Danang was 3.49% (about 41.59% totally) in 2011-2015, and especially TFP's contribution was 3.75% (amounted of 50.11% in total) during 2016-2019 -

this is the first time TFP's contribution is greater than 50% of the total economic growth. This proves that Danang's economic policy reforms, improvement of the investment environment, administrative reform, as well as the process of technological innovations have been effective to the city development. The TFP contribution research results are similar to the assessment of the Vietnam Chamber of Commerce and Industry (VCCI) on the quality of economic governance, ease of use, business-friendly environment and the efforts of administrative reform in Danang in the 2011-2019 period with the evidence base that the Provincial Competitiveness Index (PCI) of Danang was ranked nationally in the 1st place in 5 years (2011; 2013; 2014; 2015 and 2016), 2nd in 2017 and 5th in 2012 and 2018.

Table 6: Contribution Rates of the Capital, Labour and TFP to Danang's Economic Growth in the 1996-2019 period

<i>Period</i>	α_K (%)	α_L (%)	<i>TFP</i> (%)	<i>Total</i> (%)
1996-2000	80.55	12.45	7.00	100
2001-2005	101.96	16.82	-18.78	100
2006-2010	100.65	15.78	-16.43	100
2011-2015	41.37	17.03	41.59	100
2016-2019	31.99	17.90	50.11	100
1996-2019	75.67	16.00	8.33	100

5. CONCLUSION

Research results display that Da Nang's economic growth was primarily depended on capital intensity with the proportion of 75.67%, ranked 2nd as the labour factor and the lowest TFP factor (16% and 8.33%, correspondingly) during 1996-2019. In terms of periods of the Party Congress of Danang, this study also reveals that it has been successful in improving policy institutions to promote economic growth from 2011 to 2019. Hence, Danang should maintain some effective policies which have already done and currently been implementing to upswing the economy. The top government leaders and managers of the city should be patient in applying reforms because of the time lags in the accelerating process of promoting economic growth. Also, Danang should have more empirical studies considered as a logical base to identify institutional and policy issues for proposing feasible and highly effective policies in the future.

Last but not least, the limitation of this study is mostly built on the assumption of "Constant returns on scale" model. It means that the analytical results are not

highly reliable because the assumption has not been tested in this study. In consequence, the research results only leave as a quantitative proof and reference for leaders at all levels of Vietnam in general and Danang in particular in order to make executive decisions to enhance Danang's economic growth hereafter.

REFERENCES

- A. Baum, C. Checherita-Westphal, and P. Rother (2013). "Debt and growth: New evidence for the euro area", *Journal of International Money Finance*, 32, 809–821.
- A. Smith (1776). *An Inquiry into the Nature and Causes of the Wealth of Nations*, McMaster University Archive for the History of Economic Thought.
- B. T. Dang (2012). "The current quality of Danang's economic growth in the period 1997-2010".
- C. Dreger and H.-E. Reimers (2013). "Does euro area membership affect the relation between GDP growth and public debt?", *Journal of Macroeconomics*, 38, 481–486.
- C. Nguyen (2014). "Evaluation of the current economic development model in Quang Nam province", *Research Journal of Economics*, 8 (435), 57–63.
- D. M. Nong (2003). Resolution No.33 NQ/TW "on building and developing Danang city in the era of industrialization and modernization".
- D. M. Nong (1996). Resolution of the 9th-tenure Vietnam's National Assembly - the 10th session "about the division and adjustment of the provincial administrative boundaries".
- E. Domar (1939). *Economic Dynamics*. New York, NY: Springer.
- H. C. Nguyen (2008). "Economic Growth in Danang city - Sustainable or unsustainable?", *Journal of Science and Technology - University of Danang, Vietnam*, 5 (28), 83–88.
- J. M. Keynes (2007). *The general theory of employment, interest and money*. England: Palgrave Macmillan.
- K. L. Phan (2012). "Evaluation of growing quality based on productivity of factors of production in Thua Thien Hue province", *Journal of Science (Hue)*, 3 (72B), 173–180.
- L. Guo and H.-B. Zhang (2013). "The analysis of affecting GDP growth factors based on EViews econometric model", 10th International Computer Conference on Wavelet Active Media Technology and Information Processing (ICCWAMTIP).
- M. Lábaj, M. Luptáèik, and E. Nežinský (2014). "Data envelopment analysis for measuring economic growth in terms of welfare beyond GDP", *Empirica*, 41 (3), 407–424.
- Minister of Planning and Investment (2012). Circular No.02/2012/TT-BKHDT on "The base year 2010 replaced the original year 1994 to calculate the statistical indices at constant-price level".
- P. T. Nguyen (2019). Resolution No.43-NQ/TW on "building and developing Danang to 2030 with a vision to 2045".

- P. T. Tran (2009). "Statistical Research in the fluctuating direction of Danang's GDP".
- Q. B. Bui (2008). "Integration and Economic Growth of Danang city", *Journal of Science and Technology - University of Danang, Vietnam*, 3 (28), 111–118.
- R. F. Harrod (1939). "An Essay in Dynamic Theory", *The Economic Journal*, vol. 49, no. 193, pp. 14–33, 1939.
- R. M. Solow (1956). "A contribution to the theory of economic growth", *Quarterly Journal of Economics*, 70 (1), 65.
- S. A. Pham and V. H. Tran (2013). "Determinants of Vietnam's economic growth in the 1986-2011 period", *Research Journal of Economics*, 2 (417), 3–10.
- T. D. Nguyen (2003). Decision of Prime Ministry No.145/2003/QĐ-TTĐ on "Danang city was turned into a Class-I municipality city".
- T. D. Tran (2010). Economic Growth of Vietnam during the 'Doimoi' period. Nation Economics University.
- T. T. Nguyen (2013). "Limitations of the quality of economic growth in Vietnam and Recommendations", *Research Journal of Economics*, 10 (425), 3–11.
- T. W. Swan (1956). "Economic growth and capital accumulation", *Econ. Rec.*, 32 (2), 334–361.
- V. A. Hoang (2013). "Impact of public investment on economic growth in the central area of Vietnam", *Research Journal of Economics*, 1 (416), 64–69.
- V. T. Ta and T. C. Pham (2013). "Applying the Solow model to assess factors influencing Vietnam's economic growth during 2001-2011", *Research Journal of Economics*, 6 (421), 12–20.
- W. K. Newey and K. D. West (1987). "A Simple, Positive Semi-Definite, Heteroskedasticity and Autocorrelation Consistent Covariance Matrix", *Econometrica*, 55 (3), 703.

To cite this article:

Tin Q. Pham, Thao U.P. Pham, Hai M. Nguyen, Phe S. Ngo. The Impact of Factors of Production on Danang's Economic Growth. *Journal of Applied Financial Econometrics*, Vol. 1, No. 2, 2020, pp. 161-175