

## TOWARDS INNOVATION-LED GROWTH - ECONOMIC STRATEGIES LEADING VIETNAM TO HIGHER-INCOME STATUS

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### **Abstract:**

*Vietnam has made remarkable economic advancement over the last 40 years to become a lower-middle income country with high rates of inclusive growth. The path for Vietnam from lower middle-income status to high-income status however will not be easy. Economic advancement will require a shift in focus to enhancing total factor productivity. The research supports the theory that the greatest economic gains in Vietnam can be made through technology adoption and adaptation, especially with one that encourages the adoption of new and emerging digital such as AI, robotics, platforms, the Internet of Things, AR/VR and blockchain, through education, infrastructure investment and ensuring the security of the digital networks. The creation of new technologies will gradually increase over the next phase of development alongside the development of critical legal and physical infrastructure that supports the generation and protection of new intellectual property. As Vietnam further develops, there will need to be another carefully timed switch in economic and investment strategy in order to become an innovation-led economy: one invests heavily in developing new technology, creates new industry sectors and exports knowledge-intensive products and services.*

**Keywords:** Middle-income; Total-factor-productivity; Digital; Vietnam.

**Code:** 20091801

### **1. Introduction**

Vietnam has grown rapidly and inclusively over the last 40 years, averaging 6.7% growth per year since 1986 when a new strategy towards a “Socialist-oriented market economy” was articulated in the Doi Moi reforms.

From 1986 onwards Vietnam committed to opening up to international trade, reforming land use and agricultural production, attracting high levels of foreign direct investment (FDI), reforming or selling state-owned enterprises, and growing the manufacturing base (*Breu, Dobbs, Remes, Skilling, & Kim, 2012b; OECD, 2018*).

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Public investments in infrastructure and compulsory education and healthcare have also helped lift over 40 million people out of poverty and into the middle classes. This has powered rising domestic consumption and a vibrant regional economy. Vietnam achieved lower-middle income status in 2010, and has subsequently continued to achieve high year-on-year growth rates, being second only to China in average annual growth since 2010 (*Oxford Business Group, 2017*).

Many in Vietnam are now looking forward over the next 20-25 years and considering the possible pathways available to achieve high-income status. As the experience of many middle-income countries has shown, however, the path to high-income status is far from guaranteed, with some suggesting that many countries get caught in a “middle-income trap” or sustained period of 20-40 years in middle income status (*Barbour-Lacey, 2014b*).

The rise of Vietnam to middle-income status has come at the same time as the global development of a new suite of digital technologies - artificial intelligence (AI), platforms and cloud-based services, blockchain-based systems, augmented and virtual reality (AR-VR), 3D printing and robotics and automation. The application of these technologies to industry is being described as the “Fourth Industrial Revolution” or “Industry 4.0” as they look set to drive a new wave of productivity and labour disruption across industry. In many cases these technologies offer developing nations the opportunity to enter global markets at much lower costs, democratise design and manufacturing, and provide food and materials provenance. They may also short-cut or leap-frog, existing methods of production.

Vietnam’s rapid growth and stage of development, combined with the availability of new digital tools for productivity growth (particularly total factor productivity growth), creates a powerful opportunity for rapid economic advancement if managed well.

## **2. A need to change in economic strategy, the middle income trap and the pressure to middle-income countries like Vietnam**

Vietnam has maintained high levels of GDP growth over the last decade, however productivity across Vietnam industry is stagnating. According to the Vietnam 2035 report by World Bank, in the last two decades the growth of total factor productivity, which is used to account for the majority of labour productivity growth in the 1990s, collapsed and labour productivity also declined in some sectors including construction and finance. This signals that a change in economic strategy is needed in order for Vietnam to progress to higher income status.

Historically, the strategies that have helped lift economies from low-income to lower-middle income have not been the same strategies that have successfully lifted lower middle-income countries to higher-middle income or high-income status (*Han & Wei, 2017*).

At certain times successful high-growth economies have implemented deliberate switches in strategy to sustain high growth. In particular, those lower-middle income countries that have successfully achieved high-income status in comparatively short periods of time have strategically switched their focus from export market development and capital accumulation to increasing total factor productivity (TFP) across all industries (Kim & Park, 2017). Through tracking the progression of economies from one income status to another, researchers at the Asian Development Bank found:

*.. the most successful middle-income country experienced faster TFP growth, and TFP growth accounted for a larger share of GDP than other middle-income economies (Kim & Park, 2017).*

A second switch in strategy is also necessary to maintain high growth as a country approaches what Acemoglu *et al.* 2006 describe as the “technological frontier”. This change occurs when the adoption of existing technologies no longer provides the sharp increases in productivity, and a country must invest heavily in the more expensive and riskier process of technological innovation and development. Traditionally doing this too early wasted resources, as state investments in innovation failed provide the anticipated returns, and spending on technology adoption provided greater efficiency gains.

Low-income countries	Middle-income countries	High-income countries
<p><b>Market development strategy</b> Export focus, investment attraction, enabling education and infrastructure, foreign direct investment, development of manufacturing. Labour-market led-growth</p>	<p><b>Investment-led strategy</b> Technology adoption, transfer and imitation across industry Total Factor Productivity -based growth</p>	<p><b>Innovation-led strategy</b> Technology development, R&amp;D and wealth from IP generation and products and services at the technological frontier. Knowledge-based growth Innovation-led growth</p>

Source: CSIRO Data 61

**Figure 1.** Different strategies for different stages of development.

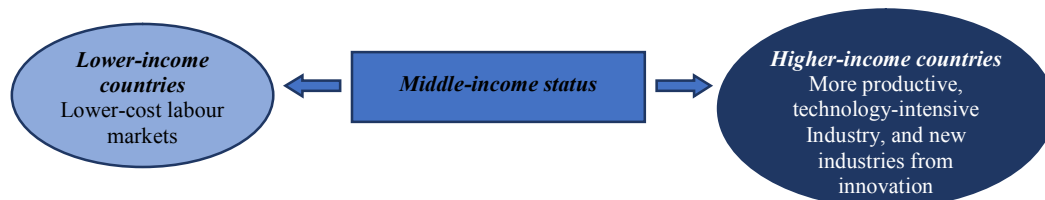
### 2.1. The middle-income squeeze

Since the *Doi Moi* reforms in 1986 many direct and indirect jobs in Vietnam have been created by a focus on exports, as seen in the increase in labour valued-added after 1995 (see Source: *World Integrated Trade Solution, 2011*

**Figure 3**). However, Vietnam’s comparative advantage for exports is mostly based on low labour costs. This has led to a focus on attracting outsourced work from more advanced economies and supplying manufactured good to large consumer markets. This work has had very little value-added, meaning there is only marginal wealth capture within the country.

When per capita income levels are low, low levels of value-added still contribute significantly to both national GDP growth and improvements in quality of life. As income levels rise however, particularly above \$5,000 per

capita, there is often a sharp deceleration in growth as the relatively unproductive labour is eventually made uncompetitive by either technology available in more advanced countries, or the flight of industry to less developed nations with lower-cost labour markets (Kim & Park, 2017).



Source: Authors created

**Figure 2.** The competitive squeeze on middle income countries

Many of Vietnam's exports have relied on supporting industries from China, including the manufacture of accessories for high-technology consumer products, garments and footwear. This makes improving Vietnam's position in global value chains difficult (Buchanan, Anwar, & Tran, 2013).



Source: World Integrated Trade Solution, 2011

**Figure 3.** Increasing labour value added of export products in Vietnam, 1995-2011.

If Vietnam is to sustain high GDP growth and improve income levels for citizens on a path to national high-income status, there will need to be a progression beyond being “input-driven”; beyond being a low cost labour market with a heavy reliance on FDI for export growth and capital accumulation. The focus will need to shift to increasing production capacity through the application of technology, and total factor productivity growth (TFP-driven growth) across all industry sectors (Kim & Park, 2017).

Estimates suggest that Vietnam will need to increase productivity - in particular total factor productivity - by 50% in the next 10 years to maintain its rapid growth (Breu, Dobbs, Remes, Skilling, & Kim, 2012a). This is high, but over the past three decades Vietnam has achieved the highest labour productivity growth rate among ASEAN countries (General Statistics Office,

2017). Since 2011, labour productivity has grown on average by 4.7% per year, with a 6% rise in 2017, achieving US\$3,987 income per worker (*General Statistics Office, 2017*).

The high productivity growth has come from a low base however, and overall Vietnam's labour productivity is lower than that of other ASEAN countries, and the gap has been widening over the past ten years (*World Bank, 2017*). Productivity will need to grow strongly for Vietnam to remain competitive and keep up with its fast-developing regional neighbours.

The switch to technology-driven total factor productivity growth is not easy to do. It requires substantial investments from the state and private industry. As macro-economic stability is also crucially important in the development of high-performing economies, the key to sustained high-growth will be balancing debt with spending and tax receipts and ensuring the efficient allocation of resources to create stable and low inflation.

## **2.2. The middle-income trap - does it exist?**

“The middle income trap” is a term that was first used by Gill and Kharas (2007) in a World Bank report to vaguely describe countries that grow strongly and move from low-income to middle-income, but then their growth rate drops and they stay at middle-income status for protracted periods of time; they do not progress steadily to become high-income countries (*Gill & Kharas, 2007*).

Despite its growing popularity in the media, policy and academic papers, several analysts have challenged the term, (*Venzon, 2014*) highlighting that the probability of a country moving from middle to high income is the same moving from low to middle income - i.e. there is no unusual stagnation at middle-income status. Some countries may transition faster and some may take longer catch up to leading countries, but most will progress to higher incomes over time (*Han & Wei, 2017*).

Han and Wei (2017) analysed 94 economies using World Bank data and found that comparatively fast-growing “progressive” countries in the middle-income bracket have three determining factors (*Han & Wei, 2017*):

1. Favourable demographics;
2. A good macroeconomic environment (low debt to GDP ratios, lower political constraints and few years in crisis per decade);
3. Sound financial development (credit to private sector and initial income less than \$5,437 per capita).

Countries that did not progress comparatively quickly from middle to upper income had:

1. Unfavourable demographics (the working population group of 15-64 year olds are less than 58.5% of the total population);

2. Bad macroeconomic management (high government debt of greater than 55.9% of GDP);
3. Low levels of domestic credit to the private sector (less than 28.7% GDP).

In this analysis Vietnam fares well. There are favourable demographics - 70% of the population is between 15-64 years in 2017, and there is high and increasing domestic credit to the private sector (130.72% of GDP in 2017) and low initial income per capita (\$2,160 in 2017). However, Vietnam has high government debt, compare to its peers

Managing spending and controlling inflation will be a key constraint to advancing to higher income levels for Vietnam.

### ***2.3. Strategies for moving from middle to high income status***

A landmark study of eight of Asia's high performing economies (Japan, Taiwan, Hong Kong, South Korea, Singapore, Indonesia, Thailand and Malaysia) by the World Bank in 1994 (*Page, 1994b*) led the researchers to distil common features and four broad policy lessons for economic development and industrial transformation in the late 20<sup>th</sup> and 21<sup>st</sup> centuries, and in moving from middle to higher income status:

- (i) *Exports and industrial reform*: high performing economies push export growth to assist particular sectors in order to enhance total factor productivity (TFP). The analysis showed that export growth, and not selective assistance, did the most to enhance TFP.
- (ii) *Rapid and inclusive growth*: Highgrowth is required over a long period, including high income growth for citizens. The growth was not restricted to pockets of selected industry sectors - the growth was economy-wide and inclusive across demographic groups. High-growth Asian economies maintained low inequality co-efficient (Gini co-efficient). Tellingly, improvements in income distribution coincided with periods of rapid growth.
- (iii) *Factor accumulation, total factor productivity change - rule of law and the role of technology*: Countries that moved to high-income status had substantially higher investments and resulting assets in physical and human capital than other comparable countries. They were also unusually successful at catching up technologically - and successfully used technology investments to improve total factor productivity across industry. To do this they provided stable and reliable legal frameworks and achieved low corruption to attract investment and expand their asset base. They also invested in the education and health of their populations.
- (iv) *Macro-economic management and broad-based education strategy*: Good macro-economic management of inflation, fiscal policy, debt and foreign

debt and broad-based education policies was critical. Debt was undertaken for projects with high returns, and often utilised national or domestic savings rather than external borrowings. The size of the debt was not as distinctive in this group as the fact that it was within the nation's ability to finance it. Long-term stability in inflation and foreign debt was a feature of the high performing group.

All the economies performed particularly well in three areas - accumulation of capital, allocation of resources, and technological catch-up. This was through a combination of both market- and government-led policies.

More recent research also agrees with these findings, stating that the countries that have migrated from middle- to high-income status have had a particular focus on their economic structure, including a faster transformation from agriculture to industry, higher export orientation, lower inflation, and decreases in inequality and the age dependency ratios (*Bulman, Eden, & Nguyen, 2017*).

*Dabla-Norris et al. (2015)*, for example, summarizes that:

- In low-income countries, governments need to concentrate on strengthening economic institutions needed for market-based economic activity, reducing trade barriers, reforming agricultural and banking sectors, and improving basic education and infrastructure;
- In lower-middle-income countries, reforms in banking and agriculture, reducing barriers to foreign direct investment (FDI), increasing competition in product markets, enhancing a more dynamic service sector, improving secondary and tertiary education, and alleviating infrastructure bottlenecks should be prioritized;
- And in upper-middle-income countries, it is essential to create competitive capital markets, developing more competitive and flexible product and labour markets, fostering a highly skilled labour force, and investing in research and development of new technologies.

### **3. The role of digital technology and innovation in economic advancement**

Technology plays a crucial role in increasing multi and total factor productivity growth. The idea that innovation drives growth is, indeed, not new in the economic literature. Classical economists, such as Adam Smith and Alfred Marshall considered innovation an essential component of economic process in market-driven economies. More recently, Joseph Schumpeter and Robert Solow state that innovation is the fundamental mechanism of endogenous change that drives economic evolution and productivity growth (*Aghion Paul, 1992, 2006; Gene M. Grossman and Elhanan Helpman, 1991; Paul M. Romer, 1990*).

Total productivity growth, driven by technological intensification, is an even larger contributor to economic growth in higher income countries. Lower- and

middle-income countries have often gone through a period of “catch-up” to the technological best practices of higher income countries by applying and adopting existing technologies. Best practice and new technologies developed in other countries are adopted to improve productivity and profitability through the middle-income phase in an “investment strategy”. This often results in unsustainable high growth rates from a low base, with growth rates dropping as the country further develops. To achieve high-income status, countries need to shift from technology implementation to technology development stage.

### ***3.1. Cheaper, faster and more accessible: innovation is changing in the digital era***

The new wave of digital technology is changing the processes of innovation and technology development itself (*Guerrieri, 2012; Silja Baller, 2016*). The development of digital-enabled general purpose technologies (GPT) such as platforms, artificial intelligence (AI), big data, robotics and autonomous vehicles have nurtured the rapid evolution of new types of innovation - including autonomous innovation through self-learning algorithms. As a result, speed of innovation has accelerated, and in many cases it has also reduced in cost and accessibility.

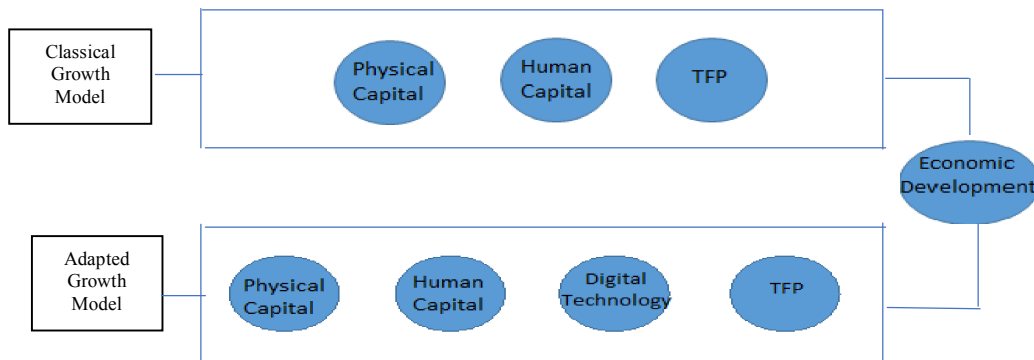
The innovation process is becoming increasingly open and globalized with citizens and consumers positioned at the centre of the process (*World Economic Forum, 2017*). Borderless innovation is now a common thanks to the increasingly power of digital platforms and open data systems. Consumers, empowered with rich information resources, are better informed and have increasing expectations for speedier, more personalized, targeted and qualified experiences (*Lauren I. Labrecque, 2013*). Businesses, thus, are pressured to innovate, extend geographical markets and use data analytics and consumer-created content to define markets.

Citizens and researchers can also use open digital platforms, data analytics, self-learning algorithms to both self-learn and innovate from almost anywhere in the world with access to internet connections and computer processing power.

As innovation is changing, there may be a need to update the approach to developing the economy toward innovation-driven growth. Traditionally, capital and labour have been the two production factors that drive growth and the impact of innovation is captured with the change of total factor productivity (TFP).

An adapted innovation-driven growth model emphasizes the importance of digital technology to economic growth. Digital technology enhances growth via various channels (i) it can increase productivity through accelerating R&D and commercialization; (ii) it improves the capacity of current physical and human capital stocks; (iii) digital technologies such as AI, autonomous vehicles, represent a new virtual force that can complement the production process.





Source: Author created.

**Figure 4.** Adapted growth model.

#### **4. Main issues for consideration for Vietnam's economic transformation**

##### ***4.1. Priority spending the key to managing economic growth to high income***

Aghion and Howitt (2018) point out that one of the main issues for developing countries when moving towards an innovation-led economy is to balance the need to invest in innovation through R&D investment, science and technology institutions and specialised education with maintaining acceptable public debt and deficits (*Levine Aghion, 2018*). The key to becoming a high performing economy through the middle-income phase, and at this point in history (at the beginning of the fourth industrial revolution) will be for Vietnam to prioritise spending and increase spending efficiency.

Vietnam's government debt stands at over 60% GDP and has been rising steadily since 2011. As a middle-income country Vietnam no longer has access to many development grants, so must increase its spending and allocation efficiency. Vietnam must become strategic and prioritise technology adoption and implementation that can cut costs and increase state revenues (*Cameron A. et al., 2019*).

##### ***4.2. Focussing on adopting technology to improve TFP is the most efficient way to maintain growth in middle income status***

Modelling from the *Vietnam's Future Digital Economy* project estimates that a scenario in which Vietnam adopts and applies digital technologies across all sectors of the economy would lead to an additional \$103 billion by 2045. The scenario where Vietnam invests in an innovation-led economy through growing the digital sector alone would only lead to an additional \$67 billion to the economy by 2045 (*Cameron A et al., 2019*).

Although this doesn't account for the investment in developing or deploying digital technologies, the greater benefit at this stage of Vietnam's economic transformation is through the *adoption* of technologies, rather than the

development of new technologies. Adopting and copying technologies from more advanced nations will provide much greater spending efficiency at Vietnam's current stage in development than pouring funds into the development of expensive new-to-world technology.

Digital technology may be changing the strategies for development through changing the accessibility for innovation.

#### ***4.3. Innovation activities verses investing too heavily in an innovation-led economy too early***

In their 2009-2010 Global Competitiveness Report the World Economic Forum the World Economic Forum also suggest that the time to switch economic strategies is dependent on income-level thresholds.

**Table 1.** Income thresholds for the different economic stages according to the World Economic Forum.

<b>Stage of development</b>	<b>GDP per capita in 2010 (in US\$)</b>
Stage 1: Factor driven	< 2,000
Transition Stage1 and Stage 2	2,000-3,000
Stage 2: Efficiency driven	3,000-9,000
Transition from Stage 2 to Stage 3	9,000-17,000
Stage 3: Innovation driven	> 17,000

*Source: WEF.*

According to the report, countries at the early stage of development compete based on their factor endowment and focus on utilizing their natural resources and cheap labor. The next stage of development, countries move to efficiency-driven stage where growth comes productivity enhancement within industries while the third stage is when countries further accelerate growth by investing innovation and generating value added through developing new technologies.

There is a distinction between innovation activities which will gradually increase over time as the country develops and the large investments in legal and physical infrastructure and R&D required to be an innovation-driven economy, which is more appropriate for countries at the later stage of development, stage 3.

#### ***4.4. The switch from technology adopter to technology developer - the innovation-based growth economy***

Previous studies on high-performing economies have found there is a point in development at which technological "catch-up" no longer provides productivity dividends to support high-growth, and the country must then

invest in the more investment-intensive role of technology creation and development. It is this technology development that will drive knowledge intensive exports, and become an innovation-based growth economy (Aizenman, Eichengreen, & Park, 2018).

Acemoglu *et al.* (2006) describe a growth model whereby firms in countries copy and adopt technologies from the world's technological frontier (where science is developing new technology through R&D), and also invest in lesser ways in innovation activities on the technological frontier. But as they approach the frontier themselves, there is higher proportionate value in investing in innovative activities for productivity growth - and less value in adopting technology through copying and imitating (Acemoglu, Aghion, & Zilibotti, 2006).

Innovation-based growth, as such, is different from other types of growth in that it includes:

- A transformation from growth driven by inputs (capital, labour, land, material) accumulation to one driven by innovation (knowledge, technology, institutions) where the role for technology is central and businesses become the primary enablers of technological innovation along with academia and the government;
- A transformation of firms with new business models and industry structure with the evolution of innovating industries and emerging ones;
- Innovation-driven growth also builds on an open economy where international knowledge stocks and resources and markets are utilized;
- Innovation-driven growth also means inclusive and sustainable growth. Digital transformation can be the solution to some of the biggest growth-related problems such as inclusive growth, pollution, urbanization, natural resource preservation, among others.

This, however, requires a strategic change in various aspects. In innovation-based growth, it helps to invest proportionately higher amounts in graduate (as opposed to school and undergraduate) education, to maximize the labour markets' flexibility and to steer the innovation system towards a greater reliance on equity financing.

For example, a flexible labour market will facilitate productivity growth to a greater degree in a developed country since leading edge innovations tend to create more job disruption than catch-up technologies. Intense investment in specialised graduate education is more productive developed countries that are closer to the technological frontier while universal primary, secondary, and good undergraduate education is more efficient spending in regards to the needs of an economy that is catching up.

It is also important to attract creative and entrepreneurial talent in an innovation-led economy. Innovative regions are generally culturally vibrant, environmentally pleasant, politically open and provide a high level of freedom of expression (Florida, 2014). This includes being able to challenge dominant thinking and authoritarianism. All of the high performing Asian economies that have become high-income over the last 70 years (Japan, South Korea, Taiwan, Singapore and Hong Kong) are now democratic (to varying degrees) and some score well on scales of freedom and political expression. They also offer lifestyle benefits in the form of attractive environments with cultural and educational opportunities.



Source: P. T. Cameron A, Atherton J, Nguyen D H, Nguyen T P, Tran S T, 2019

**Figure 5.** Strategies for advancing from income levels

Similarly, banking system development tends to enhance productivity growth in less advanced countries, while equity financing is favourable in an environment closer to the technological frontier. This is because technology development is riskier and more expensive than the adoption of technology through imitation and technology transfer. Investors in these in innovation-led environments tend to ask for a higher share of revenues, business controls and IP rights and ownership.

There is less relationship between equality indicators and innovation performance at the high-income level, however there is a strong relationship between economic progression and equality in the middle-income bracket.

In addition, expensive innovation-based development will only be worthwhile if wealth can be generated from the intellectual property developed, through licences, applications or sale of specialist goods and services. Stable and assured IP systems, and legal systems to protect and enforce IP rights have been shown to be crucial in the development of innovation-led growth (*Kim & Park, 2017*). IP products and services will also only be developed locally if there is available venture capital and R&D funding, a thriving start-up and scale-up ecosystem, and if there are the skills to successfully turn newly developed IP into business and enterprise activity.

## **5. The direction of economic development: considerations going forward**

Economic development is highly multi-faceted. It is not just about growth of aggregate output, but also about the fundamental transformation of an economy, from its sectoral structure, and its demographic, social and institutional foundations. There are number of areas to be considered as an economy develops through the income stages:

- (1) *Innovation and unemployment*: As innovation or technology improves, there is job destruction as incumbent firms with old technologies are replaced by new commercial entities carving out a market share with new technologies and business models. Automation of industry, for example, will result in significant labour displacement in the job market. CISCO together with Oxford Economics suggest that the application of artificial intelligence (AI) may result in the displacement of around 14% of the labour force in Vietnam by 2028 (*CISCO, 2018*). ILO, on the other hand, expect that up to 70% of wage workers in Vietnam are at high risk of automation. This, however, may be off-set by the job creation stimulated by new firms entering the market and the induced impact of higher economic growth due to productivity change and the creation of new industries and new jobs with high value added, The net impact on the welfare of Vietnamese citizens will depend on supporting structures for change and retraining.

- (2) *Innovation and inequality*: The relationship between innovation levels and inequality is unclear. Aghion et.al (2015) found a positive correlation between the innovation growth (through patent registration) and income inequality in both the United States and India (*Philippe Aghion, 2019*). That is - increased innovation is correlated with with greater inequality - particularly at the higher levels. This contradicts work that found that low income inequality was a consistent feature of high performing and high-growth Asian economies (*Page, 1994a*). Risso and Carerra (2019) found there were a number of thresholds for both positive and negative impacts of R&D on GDP growth and inequality. Innovation investment in R&D has to be above 0.10% of GDP to obtain positive impacts on income distribution, otherwise income distribution and inequality worsens.

Income inequality is currently relatively low in Vietnam, with a 34.8% GINI coefficient in 2014. But inequality is increasing. In 2002, the Vietnam ethnic populations of Kinh earned 1.6 times more than other ethnic minorities and by 2014, the number was more than double (*Benjamin, 2017*). There has also been growth in the rich and “super rich” in the last two decades. In 2017 over 200 individuals in Vietnam were estimated to be worth US\$30 million or more (*Research, 2017*).

The digital dividend of the productivity improvement created through the application of digital technologies, can also contribute to unequal distribution of innovation benefits to different social groups or different geographical areas. A 2016 World Bank report shows that digital technologies deliver less benefits to the poor, and higher potential benefits for those who are not poor. Vietnam, just like other emerging economies, has adopted a targeted growth strategy and is developing innovation hubs attached to world-leading businesses and research institutions or universities. These are juxtaposed to the large groups of unproductive firms including those not in the informal sector. This may result in and expanding the productivity and income gap across regions.

There are, however, various examples where innovations can contribute towards inclusive growth. Firstly, social welfare can be improved through increasing the flow of more affordable and higher-quality products and services. E-health, e-education, for example, hold the potential to provide mass services to people in remote and rural areas. Secondly, digital technologies can reduce information asymmetries in many industries (and also create them in others). They may lower transaction costs and give rise to new business models such as the platform economy E-commerce that can reduce business entry costs and provide opportunities for micro-enterprises in lower income brackets.

- (3) *Innovation and green economy*: It is widely accepted that new technologies are having both positive and negative impacts on the environment. Sharing

platforms, for instance, allow people to share idle assets, better utilise goods and services. The evolution of general purpose technologies such as Internet of Things (IoT), big data analytics also offer effective solutions to manage and solve environmental problems such as climate change or ecological disorders. Technology plays a critical role in achieving the long-term balance between economic development and the natural environment. Digitally-enabled technologies such as smart grids and smart cities are believed to contribute to the transition to a more sustainable and energy efficient world. Ultimately, their impacts of many technologies rely on the purposes for which they are deployed.

There is increasing concern about the impact of digital devices on energy use. There has been an explosion in the number of internet-connected devices over the last five years, resulting sharp increases in energy demand. Andrea and Edler (2015) estimate that by 2030 ICT related industry will consume up to 21% of the total global electricity generated. In Vietnam, according to EVN annual report, to satisfy growing demand, Vietnam will need to rely on a fleet of energy generating assets with the capacity generate up to 40 gigawatts. E-waste is another area of concern. In 2016 the world, on average, generated 44.7 million metric tonnes of e-waste, with Asia generating by far largest proportion of this waste (*Baldé, 2017*).

Vietnam is committed to working towards sustainable development and has taken action to incorporate sustainable development goals into national socio-economic development strategies. However, sustainable development action within Vietnam is undeveloped and requires a comprehensive and integrated approach from the government at all levels. Examining ways in which Vietnam businesses work with government to profit from and build new businesses by reducing waste, creating energy efficiencies and positively changing the environment through digital innovation may steer the benefits of the technologies of the 4<sup>th</sup> Industrial Revolution towards creating longer term sustainability for Vietnam's people, environment and economy.

## **6. A roadmap for Vietnam's Future Digital Economy**

A roadmap developed for the *Vietnam's Future Digital Economy Project* recommends that while Vietnam is in the lower-middle and middle-income and investment phase, government spending focuses on broad enabling infrastructure such as digital networks and secure and sustainable energy supplies as a priority (*P. T. Cameron A, Atherton J, Nguyen D H, Nguyen T P, Tran S T, 2019*). This infrastructure will provide nation-wide capacity for technology adoption and use, as well avenues for immediate repayment of debt through new income. Security of the digital networks is listed as the second priority on the roadmap. This would be obtained through adopting and

developing cyber security capacity and expertise from more advanced economies.

Investing in broad-based digital skills - through schools, colleges, and possibly education platforms - will unlock much of the productivity from the investment in broadband and other networks and facilitate equitable change. Modernising government through digital innovation will both provide work, skills development and investment in the Vietnamese digital sector, and create immediate efficiencies and cost-reduction in government service delivery. IP developed for modern government services that utilise AI, block chain, robotics and platforms, can be further commercialised for commercial goods and services for export.

The final steps in the roadmap signal the switch to the innovation-led economy that would advance Vietnam to high-income status. These include broad regulatory reforms and investment in actions to build the R&D and a national innovation network - including the creation of a reliable patents and IP registration processes and protections. This would support technology start-ups and allow for wealth generation through knowledge-based exports.

The digital and tech start-up sector is being seen as an avenue for Vietnam to sustain high growth rates beyond the lower-middle income state and progress to high income status (*Barbour-Lacey, 2014a; VNS, 2017*). Young, agile and firms with highly trained entrepreneurs found in global start-up communities are crucial to developing an innovation-led economy. These will also move the country beyond the technology-adoption phase (what Acemoglu *et al.* 2006 describe as an 'investment strategy' - or one based on large investment in technology adoption in older and established firms).

At this point, attracting entrepreneurs and digital creatives will require the development of cultures of political openness and freedom of expression - possibly through the reform of Vietnam's political system. It will also require the development of urban and other environments that are healthy and culturally attractive to the global creative classes.

## **7. Conclusion**

Vietnam has made remarkable economic advancement over the last 40 years to become a lower-middle income country with high rates of inclusive growth. The path for Vietnam from lower middle-income status to high income status however is not guaranteed and will not be easy. Vietnam is currently a predominately low-cost labour market for manufacturing and agriculture with relatively high government debt to GDP, and decreased avenues for future finance. This means that government spending to embrace the incredible productivity-enhancing digital technologies now driving fourth industrial revolution will need to be carefully managed and prioritised.



Now that Vietnam has reached middle-income status, economic advancement will require a shift in focus to enhancing total factor productivity across all industries. This will involve a change in economic strategy and investment; one that encourages the *adoption and adaption* of digital and other technologies through education, infrastructure investment and ensuring the security of the networks. The focus on industrial productivity through the adoption and adaptation of existing technologies will provide the greatest gains, rather than large investments in the creation of new-to-the-world technologies. Innovation activities in these technologies can steadily increase alongside the development of legal and physical infrastructure that supports its development.

As Vietnam further develops, there will need to be another carefully timed switch in economic and investment strategy in order to become an innovation-led economy: one invests heavily to develop new technology, creates new industry sectors and exports knowledge-intensive products and services. This will potentially see Vietnam join the other high performing Asian economies at the technological frontier. Making this switch too early however risks inefficient spending and taking risks in innovation ventures that may not provide dividends.

The beginning of the first switch in strategy to focus on total factor productivity enhancement can be seen in Vietnam's embrace of Industry 4.0 policies and actions, and the plans to roll out 5G networks ahead of many other countries. The roadmap contained in the *Vietnam's Future Digital Economy* project outlines how further prudent investment in both hard and soft infrastructure can build on those actions and policies to both improve productivity and lead the way to an innovation-led economy over the next 25 years./.

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