Economic Impacts of Submarine Fiber Optic Cables and Broadband Connectivity in Malaysia

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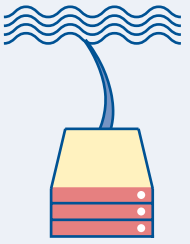
HOW DO SUBSEA CABLES GENERATE ECONOMIC IMPACT?

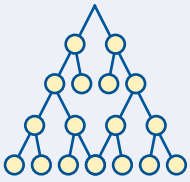
Subsea cables are the global backbone of the Internet, connecting people, businesses, and economies around the world. They connect us to the cloud, deliver streaming video, and increase efficiency and productivity for business. Subsea cables' importance is all the more apparent during the Covid19 pandemic when many of us have switched to working from home, remote learning, and online gaming and entertainment.

We studied the economic impacts from subsea cables that arrived in Malaysia several years ago to understand how they changed the economy. The results show the large impact subsea cables have had.

Subsea cables arrive



Network is built out



Internet speed increases

Price per data unit decreases

Increased data traffic competition

Consumers

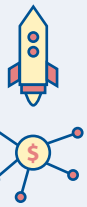
Existing consumers enjoy better speeds, increasing their consumption of digital content, products, and services.

Some consumers decide to subscribe to services for the first time

Business

Increased internet speed, quality and reliability makes doing business easier

More businesses use the cloud and e-commerce for the first time



New firms and startups emerge to serve consumers and businesses (e.g., Grab, iflix)

Growth in productivity, efficiency, and revenue for firms

Easier transition to remote work

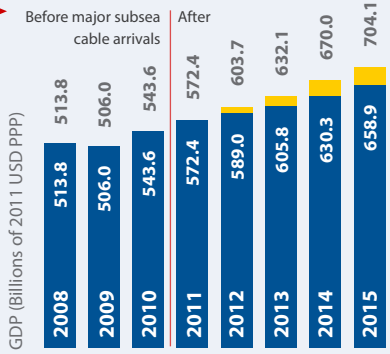
Economic Impacts

↑ Jobs ↑ GDP

The last wave of subsea cable landings led to

3.6%

increase in employment in the services sector by 2015



6.9%

increase in GDP per capita by 2015†

† Subsea cables catalyzed a 6.9% increase in GDP by 2015. This chart presents values at purchasing power parity (PPP), which accounts for changes in living standards over time. Doing so presents the most accurate picture of the impact that the connectivity improvement from subsea cables makes on people's lives. At PPP, in 2015 GDP was $704.1 million instead of $658.9 million.

For reference, in nominal terms (without any adjustments to measure living standards across time and countries), Malaysia's GDP was $301.4 billion in 2015.

Download the full report at rti.org/subsea-cables-malaysia

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1. Overview

This study explores the economic impact of the internet connectivity delivered by submarine fiber optic cables ("subsea cables") on Malaysia. Subsea cables are the global backbone of the internet, connecting people, businesses, and economies around the world (Figure 1).[1,2]

The importance of connectivity to economic growth is well-established, but rigorous studies have not been conducted for many countries.[3,4,5] This is the first such study of the impact subsea cables and international data connectivity have had on Malaysia.

Our study paired rigorous economic analysis using advanced statistical techniques with interviews with 15 Malaysian telecommunications experts. This way of approaching the study permitted us not only to acquire a nuanced view into what the data tell us, but also to acquire insights into the broader issues and trends that contextualize the role of cables and connectivity in Malaysia's economic development.

In brief, our analysis describes how Malaysia has leveraged connectivity into substantial economic growth. Focusing specifically on subsea cable landings beginning in 2009, we found that GDP per capita was 6.9% greater by 2015 than it otherwise would have been (Table 1). We also found that, although there was no change in national employment levels, there was a shift towards services. More than 400,000 service-sector jobs replaced old-economy ones.

Relative to the number of new jobs, there is much greater economic output. This means that the connectivity delivered by subsea cables has translated into impressive growth in GDP per capita mostly by facilitating modernization and enhanced productivity in the Malaysian economy.

Over the long-term (1992-2017), we found that for every 10% increase in international bandwidth consumption per internet user, there was a 0.24% increase in GDP per capita. This finding led us to consider what the impact of broadband penetration was overall. We found that every 10% increase in broadband penetration led to a 0.19% increase in GDP per capita (2001-2016). In both instances, we controlled for such important factors as economic trends, population growth, and changes in technology.

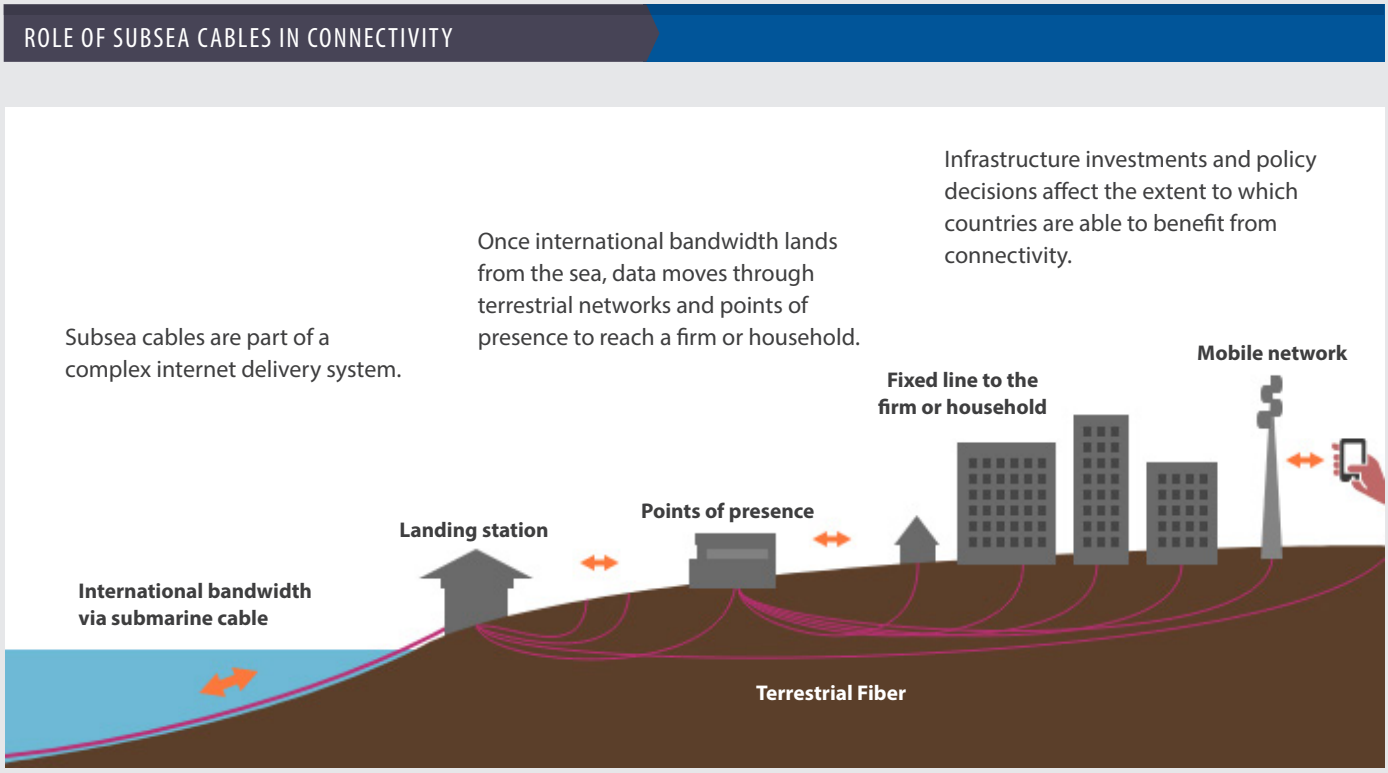
Table 1. Key Takeaways: The Economic Impact of Subsea Cables on Malaysia

INDICATOR	TIME PERIOD	MEAN VALUE
Economic growth	2011—2015	6.9% increase in GDP per capita by the end of 2015
Employment growth	2011—2015	3.6% increase in service-sector employment, which is equivalent to more than 400,000 jobs
Long-term economic growth		
• International bandwidth consumption per user	1992—2017	0.24% increase in GDP per capita for every 10% increase in international bandwidth consumption per user
• Broadband penetration	2001—2017	0.19% increase in GDP per capita for every 10% increase in broadband penetration

Source: Authors' estimates.

1 Clark, K. 2019. *Submarine Telecoms Industry Report, 7th Edition*. Submarine Telecoms Forum.
2 Brake, D. 2019. *Submarine Cables: Critical Infrastructure for Global Communications*. Information and Technology Foundation.
3 Hjort, J, Poulsen, J. 2019. The Arrival of Fast Internet and Employment in Africa. *American Economic Review*, 109(3): 1032-1079.
4 Minges, M. 2015. Exploring the Relationship between Broadband and Economic Growth. WDR 2016 Background Paper; World Bank, Washington, DC.
5 Khalil, M., Dongier, P., & Zhen-Wei Qiang, C. 2009. *Information and Communications for Development: Extending Reach and Increasing Impact*. World Bank.

Figure 1. **Role of Subsea Cables in Internet Connectivity**



2. Malaysia Country Profile

Located in Southeast Asia, Malaysia is a noncontiguous nation. Peninsular Malaysia borders Thailand and Singapore, accounting for roughly 40% of the country's total land area. The remaining 60% is on the island of Borneo and is split between Sabah and Sarawak, two of Malaysia's 13 provinces.

Kuala Lumpur, located in peninsular Malaysia in the province of Selangor, is the country's most populated city, its capital, and the economic center of the country. Roughly 7.5 million of Malaysia's 32 million people live in the greater KL area. (Table 2)

Malaysia's gross domestic product (GDP)—the most common measure of the total value of goods and services produced by a country's economy—was $365.7 billion in 2019 (in nominal terms). This equates to a GDP per capita of $11,415. Malaysia's economy has grown by at least 4% annually for the last decade. [6]

Over the past 2 decades Malaysia has transformed itself into an upper-middle income country through international trade and the growth of its manufacturing sector, which accounted for 22% of GDP.[7] Other key sectors include banking, services, oil and gas, and agriculture (especially palm oil).

According to definitions employed by the Malaysian government, the ICT sector accounted for about 6% of total GDP in 2017. (Malaysia's definition includes ICT utilization by all industries.)

About 76% of Malaysians live in urban areas which are characterized by the presence of central business districts, heavy street traffic, and high land values. The population has been growing at less than 2% per year for the last decade. Sabah and Sarawak account for about 20% of the population, but just 16.5% of GDP.

6 Department of Statistics Malaysia. 2019. Pocket Stats Quarter 3 2019.
7 Malaysian Communications and Multimedia Commission. 2017.eDataBank: Economic Indicators.

Table 2. **Key Indicators for Malaysia's Population and Economy**

INDICATOR		VALUE	YEAR
Population		31.9 million people	2019
Literacy Rate		95% of population aged 15+	2018
Primary education completion rate		94% of population aged 25+	2016
Poverty rate		0% of population below World Bank poverty line of 1.90 USD PPP/day	2015
GDP, nominal	• Total • Per capita	$365.7 billion $11,415	2019
GDP, purchasing power parity	• Total • Per capita	$681 billion 2011 USD PPP $24,574	2017
GDP, ringgit		1,237,888 million 2011 MYR	2017
Unemployment		3.4% of labor force	2018
Gini Coefficient (consumption expenditure)		0.41	2015

Sources: Penn World Table and The World Bank.

Another way to look at Malaysia's GDP is to take into consideration purchasing power parity (PPP). PPP accounts for differing price levels for comparable expenditure categories between countries. By applying PPP one can assess, both between countries and over time, real year-on-year changes and economic trends based on actual living standards.

Through the lens of PPP, Malaysia's economy is the equivalent of $681 billion with a per capita GDP of $24,574. Later, we will use the PPP method of quantifying the Malaysian economy to generate our results, enabling impacts to be interpreted directly as improvements in living standards relative to different points in the past.

Malaysia's cable landing stations serve as access points for many of the subsea cables that connect Africa to Asia, Europe to Asia, and the Pacific Ring (Table 3). Our analysis focuses on cable landings from 2009 to 2013 to have a sufficient time period following the landings for which to quantify impacts.

Table 3. **Recent International Subsea Cable Landings for Malaysia**

CABLE	DESIGN CAPACITY (TBPS)	LOCAL LANDING STATION(S)	READY FOR SERVICE YEAR
South East Asia-Middle East-Western Europe 3 (SeaMeWe-3)	12.8	Mersing, Penang	1999
South East Asia-Middle East-Western Europe 4 (SeaMeWe-4)	12.8	Melaka	2005
Asia-America Gateway (AAG)	28.8	Mersing	2009
Asia Submarine-cable Express (ASE)	15.36	Mersing	2013
Asia Pacific Gateway (APG)	54	Kuantan	2016
Bay of Bengal Gateway (BBG)	55	Penang	2016
Asia Africa Europe (AAE-1)	80	Kuala Kurau	2017
South East Asia-Middle East-Western Europe 5 (SeaMeWe-5)	36	Melaka	2017
SEA Cable Exchange-1 (SEAX-1)	225	Mersing	2018

Sources: Telegeography's Submarine Cable Map and STF Analytics' Submarine Cable Almanac.

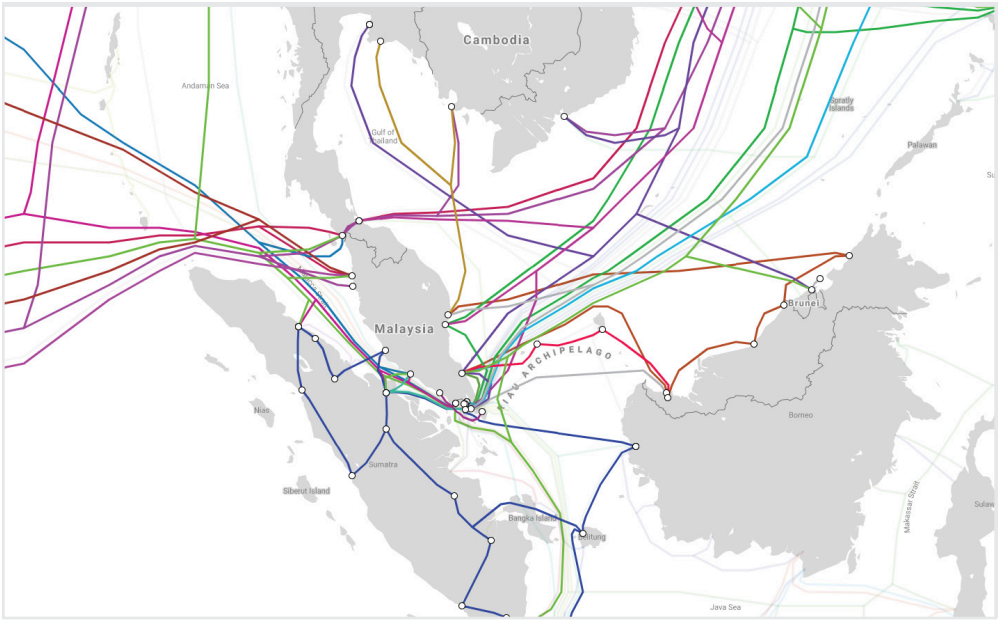


Figure 2.

Map of Subsea Cable Landings in Malaysia

Source: Telegeography's Submarine Cable Map.

3. Methodology

Our study paired rigorous econometric (statistical) analysis methods with interviews with 15 executives, government staff, and market analysts in the Malaysian internet ecosystem. This approach allowed us to contextualize our economic analysis findings using insights and perspectives from experts well-versed in Malaysia's market landscape and connectivity trends.

Because terrestrial fiber and wireless networks connect users to subsea cables' landing stations, we include them in the analysis. However, we emphasize that the impacts quantified are for the international connectivity associated with subsea cables and not domestic connectivity. Increasingly, nationally hosted internet exchanges, local content delivery networks, and data centers are bringing data resources on shore. Yet international data connectivity remains important for economic activity and competitiveness.

3.1 ECONOMETRIC ANALYSES

We employed two complementary econometric methods to quantify the impacts of subsea cables: synthetic control and simultaneous equations model. Of all available econometric methods and strategies, these two offer the most robust, reliable, and accurate way of estimating the causal effects of Malaysia's subsea cable arrivals. Both methods derive from cutting-edge statistical techniques[8,9,10] and have been used to investigate research questions similar to those posed by our analysis. [11,12]

3.1.1 Synthetic Control (SC)

SC estimates the impact of subsea cables on aggregate economic outcomes (including employment) by comparing Malaysia's actual outcomes after subsea cable arrivals to a synthetic counterfactual. We focus on the most recent cable

8 Imbens, G. W., & Wooldridge, J. M. 2009. Recent developments in the econometrics of program evaluation. *Journal of Economic Literature*, 47(1), 5-86.
9 Athey, S., Imbens, G. W. 2017. The State of Applied Econometrics: Causality and Policy Evaluation. *Journal of Economic Perspectives*, 31(2): 3-32.
10 Baum-Snow, N, Ferreira, F. 2017. Causal Inference in Urban and Regional Economics. National Bureau of Economic Research (NBER) Working Paper Series. Working Paper 20535.
11 Abadie, A., Diamond, A., Hainmueller, J. 2010. Synthetic control methods for comparative case studies: Estimating the effect of California's tobacco control program. *Journal of the American Statistical Association*, 105.490 (2010): 493-505.
12 Roller, L.H., Waverman, L. 2001. Telecommunications infrastructure and economic development: A simultaneous approach. *American Economic Review*, 91(4): 909-923.

landings because they most accurately represent current impacts.

In essence, a synthetic counterfactual is, an alternative version of Malaysia that did not experience the cable landings but for which all other prevailing macroeconomic trends continued. The counterfactual is a weighted combination of similar countries which did not receive subsea cable landings during the time period of interest.

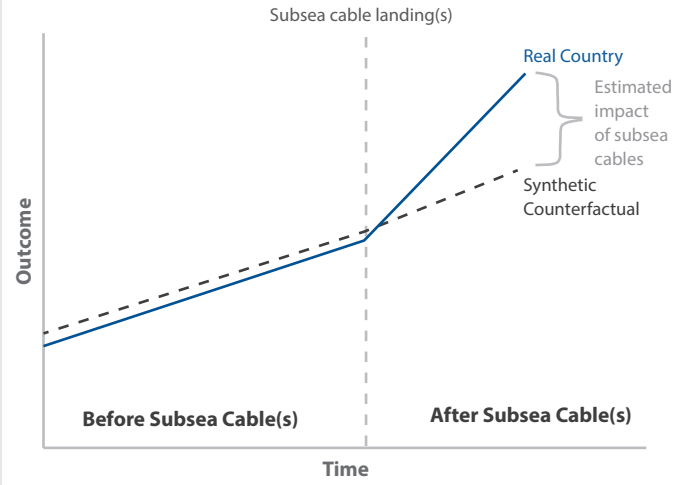
We use a weighted combination of multiple countries because the resulting counterfactual is more similar to Malaysia across a variety of important and relevant dimensions, such as GDP per capita, sectoral labor composition, and urban population, than any single comparison country alone. The construction of the counterfactual uses a completely computationally-driven matching technique that optimizes the fit of the counterfactual based on the countries' actual data. Importantly, the estimated counterfactual can be tested for its robustness and reliability, which helps quantify confidence in each set of results. See also Figure 3.

Country-level data come from the Penn World Table (PWT)[13] and the World Bank's World Development Indicators (WDI).[14] These sources provide relevant national statistics from officially recognized sources, which are then standardized using well-documented methodology. Importantly, the detailed methodology and data quality control measures used to standardize the data enable comparison across countries and over time, and thus for our application of SC to match on a variety of important macroeconomic characteristics and outcomes.

3.1.2 Simultaneous Equations Model (SEM)

SEM estimates the effect of subsea cables on GDP per capita over a long period of time by modeling national economic output and the market for broadband as a system of simultaneous equations. International bandwidth consumption and broadband penetration are highly correlated with economic growth (GDP per capita),[15] but this alone does not reveal anything about the causal relationships between either of the two broadband variables and GDP per capita.

Figure 3. Synthetic Control Technique for Analysis of Subsea Cables

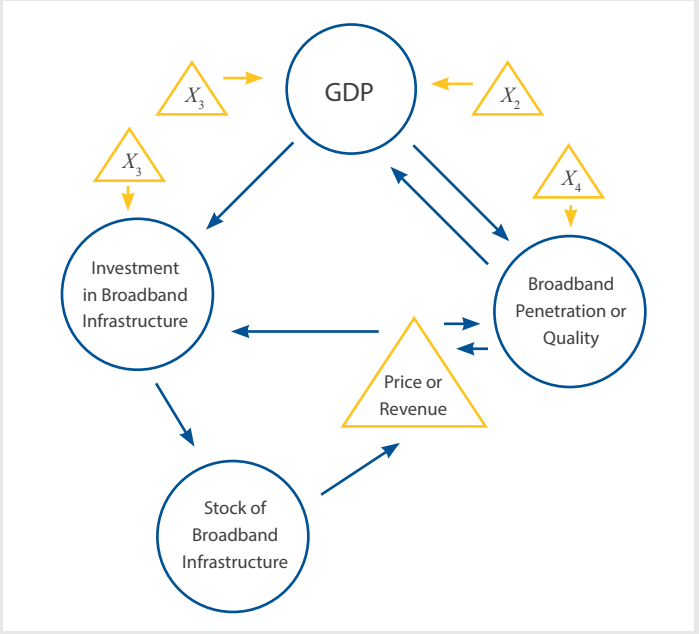


It could be that international bandwidth consumption and broadband penetration have positive effects on GDP per capita, if broadband availability and speed enable the formation of new start-ups and/or the growth of some existing businesses. Meanwhile, or alternatively, it could be true that GDP per capita has a positive effect on bandwidth consumption and broadband penetration because more resources are potentially available to invest in subsea cables and other broadband infrastructure. Moreover, it could be that neither of the two connectivity variables cause any change in GDP per capita (or vice versa), and that instead the three vary together because they are driven by other distinct variables. These complexities are illustrated in Figure 4.

Jointly estimating the system of equations representing the aggregate economy and the dynamics of supply and demand within the broadband market enables us to more accurately approximate the causal impact of subsea cables on GDP per capita. The SEM approach accounts for the mutually reinforcing relationships (potential feedback loops arising from reverse causality) as well as other key explanatory factors, thus isolating the effects of a) increases in economic growth attributable to international bandwidth and broadband penetration, and b) increases in the demand and supply of international bandwidth and broadband penetration attributable to increases in economic growth.

13 Feenstra, R. C., Inklaar, R., Timmer, M. 2015. The Next Generation of the Penn World Table. *American Economic Review*, 105(10), 3150-3182.
14 World Development Indicators, The World Bank Group, 2019.
15 The Economist Intelligence Unit. *Who dominates global data flows?* Retrieved from https://perspectives.eiu.com/an-analysis-of-underwater-internet-cables

Figure 4. Simultaneous Equations Model Schema for Analysis of Subsea Cables



The country-level data we used for SEM analysis come from the PWT, the WDI, and the International Telecommunication Union's (ITU) World Telecommunication/ICT Indicators Database.[16] These datasets are standardized to enable valid comparisons over time and thus are appropriate for use as time series variables in SEM.

The estimated effects using SC and SEM provide complementary insights due to their similarities and differences across different dimensions, as described in Table 4. By applying two econometric methods, and reviewing results in conjunction with interview data, our research sheds insight into various aspects of economic impact caused by subsea cable landings.

3.2 THEMATIC ANALYSIS OF INTERVIEWS WITH KEY STAKEHOLDERS

We interviewed 15 Malaysian broadband connectivity experts with telecommunications firms, research entities, and government agencies. Interview topics included current connectivity trends and challenges (e.g., network expansion, latency), public-sector priorities driving network expansion, role of subsea cables in the broader landscape of connectivity and internet quality, role of connectivity in economic development, and future trends and issues. So that interviewees could be open and candid, we advised that participation would be confidential, that we would not attribute responses to individuals, and that only the synthesized remarks of all interviewees would be presented in our reports.

Table 4. Similarities and Differences of Econometric Analysis Strategies

IMPACT DIMENSION		SYNTHETIC CONTROL	SIMULTANEOUS EQUATIONS MODEL
Treatment	Subsea cables (explicitly)	●	
	Broadband penetration and international bandwidth (implicitly related to subsea cables)		●
Temporality	Discrete point-in-time impacts	●	
	Average impact over the long-run		●
Outcome	Employment	●	
	Economic growth	●	●
Space	Spatially-inspecific impacts (at the country-level)	●	●
Data aggregation	Macrodata on countries (national statistics)	●	●

16 World Telecommunication/ICT Indicators Database, 22nd Edition, International Telecommunication Union, 2018, https://www.itu.int/en/ITU-D/Statistics/Pages/publications/wtid.aspx.

4. Economic Impact of Subsea Cables on Malaysia

Subsea cables have caused notable economic growth in Malaysia, over both the short and the long term. We first review the impacts from landings that occurred a few years before 2014 and then look at the accumulated impact over the past couple of decades.

4.1 IMPACTS OF RECENT SUBSEA CABLE LANDINGS

We found evidence of positive effects on GDP per capita caused by subsea cable arrivals from 2011 to 2014 (e.g., Asia Submarine Cable Express) and the associated surge in international bandwidth.[17] Figure 5 shows the divergence of Malaysia from the estimated counterfactual (what would have happened had the subsea cables not arrived). The effects on GDP per capita we identified represent effects that had accumulated from these cables by 2015.

In 2015, Malaysia's actual GDP per capita was about $1,472 greater (6.9% greater) than in the counterfactual. In other words, without the surge in international bandwidth, we estimate that Malaysia's GDP per capita in 2015 would have been $21,447 rather than the actual $22,919, as shown in Table 5.[18] The cumulative impact is greatest by 2015 but is already apparent by 2012.

Subsea cables also appear to have impacts on the labor market, although the effect on total national employment are unclear. Figure 6 shows Malaysia's actual services

Table 5. Impact on GDP per Capita by 2015

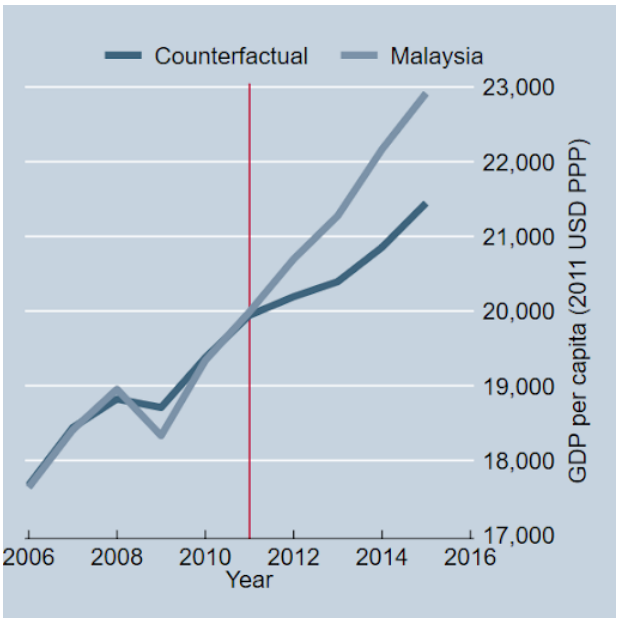
		2011	2015
2011 USD PPP	Actual	19,989	22,919
	Counterfactual	—	21,447
	Difference	—	1,472
2011 MYR	Actual	31,840	36,506
	Counterfactual	—	34,162
	Difference	—	2,344

Source: Authors' estimates.

17 We focused on this time period because there had been no major increases in bandwidth prior to 2011. Although cables landed a couple of years prior, huge increases in bandwidth consumption did not occur until about 2011.

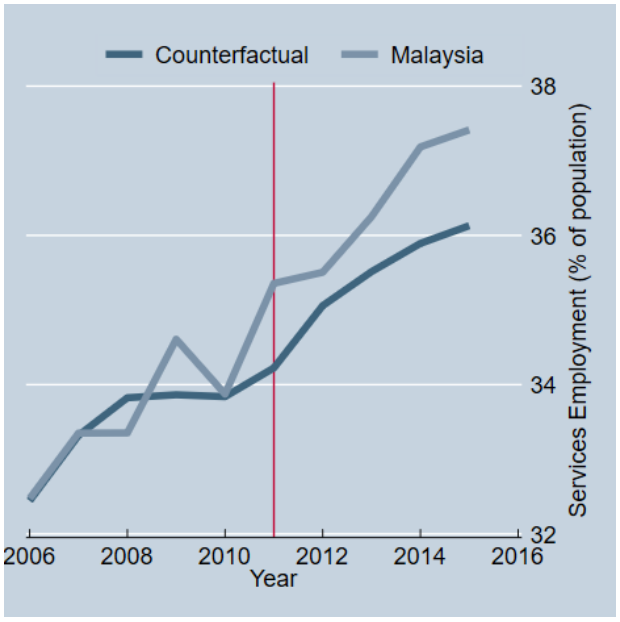
18 All U.S. dollar values are in 2011 USD PPP. All Malaysia ringgit values are in 2011 MYR.

Figure 5. Estimated Effect of Subsea Cables on GDP per Capita



Source: Authors' estimates.

Figure 6. Estimated Effect of Subsea Cables on Employment in Services



Source: Authors' estimates.

employment as a percentage of its population compared to what would have happened had subsea cables not arrived.

In 2015, Malaysia's share of the population employed in services was 37.4%, which is 3.6% greater than the synthetic counterfactual of 36.1%. In other words, without these subsea cables, we estimate that Malaysia's services employment in 2015 would have been 36.1% of the population rather than the actual 37.4%. The cumulative effect increases most notably after 2012.

Figure 7 illustrates cables' overall impact on Malaysia's GDP. Better connectivity stimulated the economy, causing it to grow much more quickly than it otherwise would have. By 2015, the annual impact on GDP was equivalent to about $45 billion (at PPP).

4.2 LONG-TERM IMPACT OF BANDWIDTH CONSUMPTION AND BROADBAND PENETRATION

Over the long run, we found large positive effects of both international bandwidth consumption per user (IBWPU) and broadband penetration on GDP per capita.

Our estimates suggest that each 10% increase in Malaysia's IBWPU leads to a 0.24% increase in GDP per capita. See Table 6.

Table 6. Estimated Effect of IBWPU on GDP per Capita

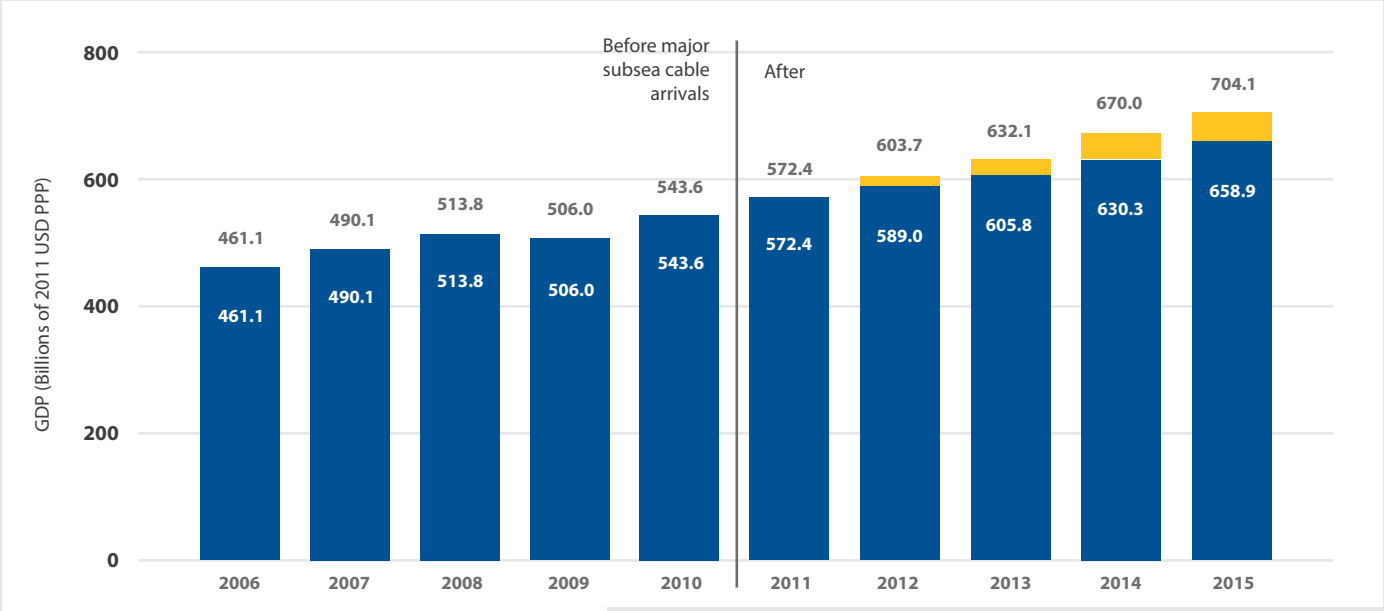
For every 10% increase in IBWPU, there has been a 0.24% increase in GDP per capita	Years: 1997 – 2017 Range of Estimate 0.04%‡ – 0.43%†

‡ p-value = 0.819 † p-value = 0.01 Source: Authors' estimates.

Figure 8 depicts Malaysia's actual GDP per capita growth over this timespan (equal to a CAGR of 3.29%) and what we estimate Malaysia's GDP per capita would have been in the absence of any change in IBWPU from 1992-2017 (equal to GDP per capita CAGR of 2.78%). Thus, international data connectivity has played a significant role in accelerating the pace of Malaysia's economic transformation.

We found similar results when looking at broadband penetration. Our results suggest that each 10% increase in

Figure 7. Estimated Effect of Subsea Cables on Malaysia's GDP at PPP

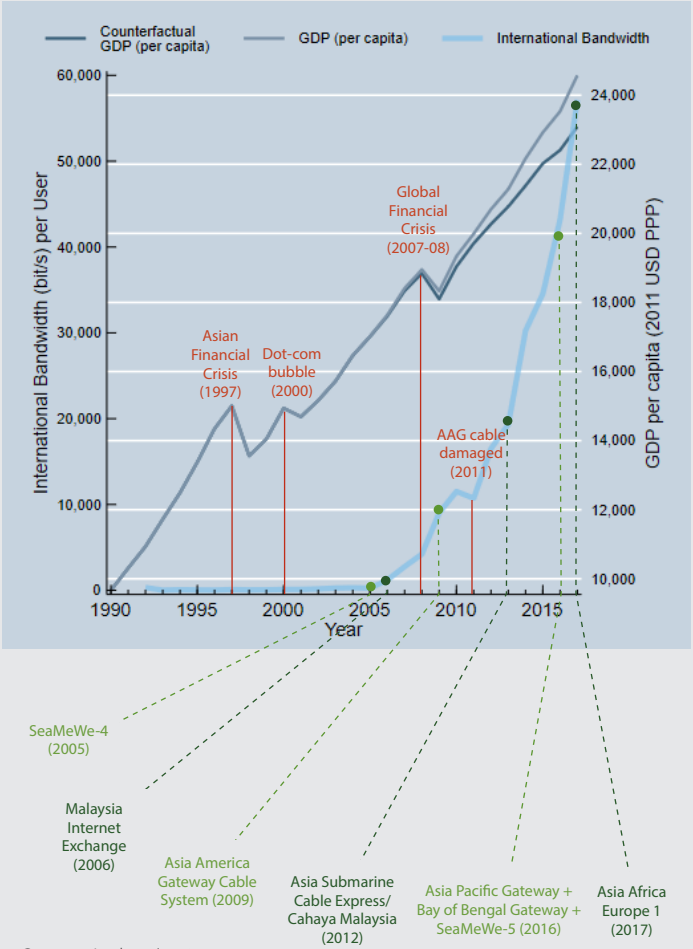


Subsea cables catalyzed a 6.9% increase in GDP by 2015. This chart presents values at purchasing power parity (PPP), which accounts for changes in living standards over time. Doing so presents the most accurate picture of the impact that the connectivity improvement from subsea cables makes on people's lives. At PPP, in 2015 GDP was $704.1 million instead of $658.9 million.

For reference, in nominal terms (without any adjustments to measure living standards across time and countries), Malaysia's GDP was $301.4 billion in 2015.

Source: Authors' estimates.

Figure 8. Actual v. Counterfactual GDP per Capita based on Estimated Effect of IBWPU



Source: Authors' estimates.

broadband penetration led to a 0.19% increase in Malaysia's GDP per capita.[19] See Table 7.

Figure 9 depicts Malaysia's actual GDP per capita growth over this timespan (equal to a CAGR of 3.27%) and what we estimate Malaysia's GDP per capita would have been in the absence of any change in broadband penetration from 2001-2017 (equal to a GDP per capita CAGR of 2.47%).

The findings from the econometric analyses lead us to conclude that subsea cables have caused significant productivity increases in Malaysia. Impacts on GDP per capita found using both econometric approaches are complemented by the evidence indicating increases in Malaysia's services

Table 7. Analysis of the Effect of Broadband Penetration on GDP per Capita

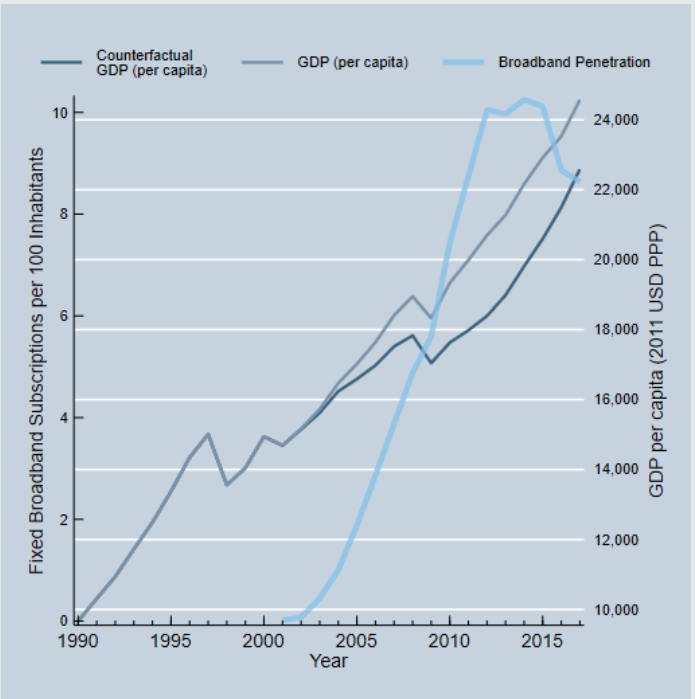
For every 10% increase in broadband penetration, there has been a 0.19% increase in GDP per capita	Years: 2001 – 2017 Range of Estimate 0.04%‡ – 0.43%†

‡ p-value = 0.819 † p-value = 0.01 Source: Authors' estimates.

employment but no impact on total national employment. Thus, relative to the number of new jobs, there is much greater economic output as a result of subsea cable arrivals.

The evidence suggests that subsea cables have driven impressive growth in GDP per capita mostly by facilitating modernization and enhanced productivity in the Malaysian economy. It is possible that the same economic dynamism enabled by subsea cables that has driven growth may also help to create and preserve jobs in the long run.

Figure 9. Actual v. Counterfactual GDP per Capita based on Estimated Effect of Broadband Penetration



Source: Authors' estimates.

19 These estimates describe the average effect of past changes in broadband penetration in Malaysia on per capita GDP but are not necessarily predictions of the effects of future changes, which will be determined in part by future circumstances of the country.

5. Stakeholder Perspectives on Connectivity

Experts interviewed for this work concurred with our quantitative analysis findings that Malaysia has been successful in leveraging increases in international data connectivity for economic growth and that this as well as broadband access, speed, and quality is a priority for the country's economic development strategy. A recent World Bank report on Malaysia's digital economy reinforces these assessments.[20]

Most experts called our attention to the National Fiberisation and Connectivity Plan (NFCP), a strategy led by the Malaysian Communications and Multimedia Commission for meeting specific connectivity targets (e.g., speed, coverage) by 2023, as evidence of the seriousness Malaysia places on data connectivity for its economic and social development goals.[21] Mobile wireless is especially important, with uptake currently at more than 130 subscriptions per 100 people (Table 8).

Subsea cables have played a role in economic development by affecting the cost, speed, and quality of services. Experts were clear that past landings have led to increases in bandwidth consumption and decreases in costs. However, they also suspect that the network connecting landing stations, fiber, and points of presence could be more robust and cost efficient if there were a greater degree of competition.

Given the national priority placed on connectivity for economic growth, most experts believe that boosting competition is important for driving network expansion and lowering costs. A more competitive market will generate incentives for Malaysia's commercial operators to serve the majority of communities and allow the universal service provision to focus on isolated communities where the network economics are especially prohibitive.

This section organizes interviewees' remarks into three subsections: network expansion, uptake proposition, and economic development and social empowerment. The focus is on sharing key themes concerning the terrestrial fiber network that speak to the ability of Malaysian citizens and businesses to maximize the value they derive from the connectivity delivered by subsea cables.

5.1 NETWORK EXPANSION

The majority of Malaysia's terrestrial fiber network is owned and operated by Telekom Malaysia (TM). Although there are other players, most of these operate networks that are more limited in scale or operate using bandwidth leased from TM on a wholesale basis. Those that do own and operate their own networks, such as TIME, focus on specific types of developments or on select geographies where their projects can be profitable.

Interviewees are quick to point out that the current market landscape is the way it is because TM was once the government-owned operator with a national mandate. They also note that even after privatization in 1990, TM shouldered much of Malaysia's network construction and investment. Building a fixed-line network in Malaysia can be challenging because of topography and dense vegetation.

Going forward, given the national priority placed on connectivity for economic growth, most experts believe that increasing supplier diversity will be important for driving network expansion and further lowering costs. A

Table 8. Key ICT Indicators

INDICATOR	UNITS	YEAR
Electrification	100% of population with access to electricity	2017
Internet users	80% of population	2017
Fixed broadband subscribers	8.55 subscriptions per 100 inhabitants	2018
Fixed Broadband Speed	1 megabits per second	2017
Fixed Broadband Monthly Subscription Charge	8.57 2011 USD PPP	2017
Mobile Cellular Subscribers	135 subscriptions per 100 inhabitants	2018
Mobile Download Speed	19 megabits per second	2020
Mobile Broadband Prepaid Subscription Charge	0.90 2011 USD PPP per 500 megabits	2017

Source: International Telecommunication Union and Ookla Speedtest.

20 World Bank. 2018. *Malaysia's Digital Economy: A New Driver of Development*. Washington, DC: World Bank
21 Malaysian Communications and Multimedia Commission. National Fiberisation and Connectivity Plan. Available at https://www.nfcp.my/.

more dynamic market will generate incentives for Malaysia's commercial operators to expand and thereby allow the universal service provision to focus on isolated communities where the network economics are particularly prohibitive. A recent World Bank report on Malaysia's digital economy reinforces these assessments.[22]

Stakeholders also believe it is important that Sabah and Sarawak have their own international subsea cable landing. At present, traffic originating from or bound for these two provinces is routed through KL (like most Malaysian web traffic). Better routing would positively affect latency and cost and therefore uptake and overall economic competitiveness for Malaysia's two most underdeveloped provinces.

Malaysia's internet ecosystem is growing more robust, with three major internet exchanges, growth in content distribution networks, growth in ISPs, and large data center projects. Historically, Malaysian ISPs have been creative in routing their traffic to minimize costs. As the ecosystem matures, however, the concern is that the market landscape could inadvertently hamper progress towards Malaysia's digital economy goals.

5.2 UPTAKE PROPOSITION: AFFORDABILITY, QUALITY OF SERVICE, AND CONTENT

Mobile wireless services are the principal means of getting online. Mobile coverage is strong, with 96% of the population covered by 2G networks, roughly 95% by 3G, and 93% by 4G. For years, the emphasis was on ensuring that people had access, with access being the intersection between network availability and affordability. Affordability remains a focus, but the laser focus on availability is shifting more towards quality. Analysts in government and industry now assess such measures as quality, speed, and robustness of service.

There is a small but growing fixed-line consumer market. In 2018, there were about nine wired broadband subscriptions in Malaysia per 100 inhabitants. But this number is likely to grow, particularly as demand for bandwidth-hungry consumer services like streaming and gaming grow in popularity, interviewees note. The NFCP, hopes to achieve an average speed of 30 Mbps to 98% of the population and an average speed of 500 Mbps for all state capitals and high-impact areas.

5.3 ECONOMIC DEVELOPMENT AND SOCIAL EMPOWERMENT

The 2019 Shared Prosperity Vision 2030 emphasizes just how important Malaysia views connectivity for both social cohesion and economic growth.[23] Top of mind for interviewees was the emphasis on economic competitiveness and the digital economy. Herein there are two broad themes: the urban/rural digital divide and the Fourth Industrial Revolution (4IR).

More robust networks and literacy in the digital economy are essential in all areas, not just those cities where Malaysia's network is most capable. Interviewees noted that Malaysia has hundreds of thousands of small businesses across the country. Poorer network quality in rural or less densely populated areas could mean that businesses may fail to adapt to the economic transformation occurring elsewhere, undermining their long-term competitiveness. E-commerce, mobile payment acceptance, and cloud services are affected by network quality.

Furthermore, companies make site selection and business decisions based in part on connectivity. If the connectivity is not available, it would likely have impacts on willingness to adopt new technologies, invest, or expand operations. Subsea cables can deliver the international connectivity, but domestic terrestrial networks are critical infrastructure that bring it to users. Not addressing the divide between urban and rural connectivity could amplify pressure on Malaysia's cities should the population migrate in even greater numbers towards those areas with better connectivity and therefore economic opportunities.

Experts note that the 4IR heightens the importance of connectivity. It describes a work of interconnected devices and systems, a whole new generation of technologies much of which may not be conceived yet. Artificial intelligence, internet of things, and the next generation of online education, augmented realities, and gaming have substantial computing and data demands. These applications also require robust connectivity and consume substantial bandwidth. The whole of Malaysia must have fast, affordable connections and the ability to connect people and devices seamlessly with global and domestic data resources.

22 World Bank. 2018. Malaysia's Digital Economy: A New Driver of Development. Washington, DC: World Bank.
23 Prime Minister's Office of Malaysia. 2019. Shared Prosperity Vision 2030. Available at https://www.pmo.gov.my/2019/10/shared-prosperity-vision-2030-2/.

6. Conclusion

Subsea cables have had a significant impact on Malaysia's economy, increasing GDP per capita by 6.9% between 2011 and 2015 and increasing job opportunities in services by 3.6% from the most recent cable landings.

Over the long-term, for every 10% increase in IBWPU there has been a 0.24% increase in GDP per capita. (If one studies broadband penetration instead of IBWPU, the result is 0.19% for every 10% increase.) Clearly, Malaysia has been successful in leveraging connectivity into economic growth.

Numerous factors play a role in determining if future subsea cable landings will have similar impacts to those discussed above. Important factors include improvements to the technology, Malaysia's future terrestrial broadband infrastructure, changes in the skills of the labor force, as well as policy changes. From a geographic standpoint, areas of Malaysia that remain underconnected long-term may be left behind as connected areas further develop.

The evidence of impact on overall growth in Malaysia from subsea cables is overwhelmingly positive so far; however, effects likely vary for specific demographics of the population and types of firms. As more of Malaysia's economy shifts towards industries leveraging cutting-edge technology like subsea cables, highly educated and skilled segments of the labor force may be relatively better poised to take advantage of the technology. This, in turn, could contribute to widened disparities in socioeconomic outcomes across certain demographics if left unaddressed. Policies that expand geographic access and improve access through pricing while maintaining broadband quality, such as market regulation to increase competition among service providers, would likely further amplify subsea cables' impact on overall growth while mitigating the emergence of inequities.

Economic Impacts of Fiber Optic Subsea Cables and Broadband Connectivity in Malaysia

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