E-commerce adoption in ASEAN: testing on individual and country-level drivers

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Abstract: E-commerce adoption is one core strategic measure of the Association of Southeast Asia Nations (ASEAN) Economic Community Blueprint 2025. However, such an effort faces great challenges due to the socio-economic heterogeneity across the member states. This paper integrates individual and country-level drivers to empirically test the model of e-commerce adoption among citizens in ASEAN. The model examines the relationships between four key drivers: demand, supply, infrastructure and regulation, on individual online purchasing behaviour. To advance, we embed and we examine the role of national trust in the model. Using data from 5,883 individuals in six ASEAN countries in 2017, the findings show, *ceteris paribus*, demand, supply, infrastructure and trust are positively associated with e-commerce adoption. This study sends a strong signal that e-commerce adoption in ASEAN can be enhanced through improvements in the institutions of each member country.

Keywords: e-commerce adoption; Association of Southeast Asia Nations; ASEAN; institutions; national trust.

Reference to this paper should be made as follows: Ayob, A.H., Yakob, N.A. and Ja'afar, R. (2021) 'E-commerce adoption in ASEAN: testing on individual and country-level drivers', *Int. J. Business Environment*, Vol. 12, No. 1, pp.18–36.

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This paper is a revised and expanded version of a paper entitled 'E-commerce adoption in ASEAN: Testing on individual and country-level drivers' presented at International Council for Small Business Conference, Paris, 8–9 April 2019.

1 Introduction

The Organization for Economic Co-operation and Development (OECD) (2011) defines e-commerce as the process of buying and selling goods or services through computer networks by methods specifically designed for the placing or receiving of orders, although it may not include payment. Although e-commerce is conceivably beneficial for the three main actors: government, enterprises and customers, the prevalence of e-commerce adoption among individuals differs greatly across countries (Martinsons, 2008). E-commerce diffusion remains uneven; a digital divide exists, and is widening, between nations (Zhu and Thatcher, 2010). Therefore, it is imperative for researchers, practitioners, and policy-makers to further explore this phenomenon to ensure that opportunities offered by e-commerce can be fully exploited by all economies.

Academic literature on e-commerce has advanced substantially in developing a framework for explaining the drivers and challenges of e-commerce growth (Agarwal and Wu, 2015). Accordingly, empirical works have fairly examined e-commerce adoption for both enterprises (Agarwal and Wu, 2015; Zhu and Thatcher, 2010) and customers (Lim and Cham, 2015; Van Slyke et al., 2010; Zhou et al., 2007). However, cross-country analysis of e-commerce adoption is rather scant. One principle barrier is a lack of initiative for integrating individual and country-level drivers to be tested in a

single model. On one hand, many studies have focused solely on the customers' attributes such as age, gender, and cognitive-psychological characteristics to explain their online shopping behaviour (Zhou et al., 2007). On the other hand, Oxley and Yeung (2001) and Martinez and Williams (2010) have merely examined country-level variables such as physical infrastructure and rule of law for predicting global e-commerce diffusion. Although these studies merit acknowledgement, they do not adequately consider both individual and country-level drivers to explain heterogeneity in the rate of e-commerce usage among customers across nations. This is a considerable deficit in knowledge, especially in the context of a particular economic bloc like the Association of Southeast Asia Nations (ASEAN), where the aim is to reduce the digital gap and disseminate the benefits of e-commerce among citizens of all member countries.

Synthesising the gap in literature, a core question that emerges is how dynamic individual and country-level factors influence the likelihood of e-commerce usage. In attempt to provide academic and practical evidence, this research empirically examines the e-commerce adoption model of ASEAN. This model was developed from the studies of three prominent institutions: the Economic Research Institute for ASEAN and East Asia, the S. Rajaratnam School of International Studies, and the Institute of Southeast Asian Studies. Accordingly, the model is recognised as a core input for the development of ASEAN Economic Community (AEC) 2025.

The model of e-commerce adoption in ASEAN emphasises on four key drivers: demand, supply, infrastructure and regulation. In general, (1) demand factors reflect the perspective of the consumers, such as the possession of payment account, (2) supply refers to the availability of electronic platforms provided by those enterprises exploiting their technological knowledge and capacity for selling products or services, (3) infrastructure captures a wide range of facilities such as the availability and quality of the internet connection, as well as a country's transportation network, and lastly, (4) regulation concerns the rules and legal framework that govern e-commerce activities, particularly the enforcement of laws pertaining to data privacy and security.

To advance the model, we embed and test the effect of (5) national trust on e-commerce adoption. Our research is guided by institutional theory that considers not only the formal institutions but also the cultural aspects from which individual behaviour acquires legitimacy (Hoffman and Ventresca, 1999; North, 1990; Scott, 1998). Also, Agarwal and Wu (2015) proposed on three macro factors: institutional environment, infrastructure, and culture, as predictors of e-commerce adoption. In other words, since online purchasing is conducted virtually and involves greater uncertainty than conventional buying (Alharbi et al., 2013), the inclination for using e-commerce among citizens is influenced by the level of trust nurtured within the society.

Specifically, our empirical approach integrates individual and country-level drivers to empirically test the relationship among demand, supply, infrastructure, regulation, and trust for explaining the propensity for online purchasing among 5,883 individuals from six ASEAN countries in 2017.

This research contributes to both academics and practitioners in several ways. First, we advance the literature on those factors that influence e-commerce adoption by integrating and testing multi-level drivers in a single model. This approach not

only allows us to control for all possible individual and country factors, but also to perform a cross-country analysis. Second, we capture the comprehensive environment of the country, consisting of both formal institutions and national culture-values for examination. Third, this research focuses in the context of ASEAN member states since little research on e-commerce has been conducted outside of the west, and in particular, outside of the USA (Doern and Fey, 2006). Lastly, the findings of this study shed light on the initiatives of ASEAN to become a strong economic community where all members share the same aspiration to fully exploit the opportunities offered by e-commerce, when some are still hindered by institutional and cultural barriers.

2 E-commerce adoption as an agenda in the ASEAN Economic Community (AEC)

ASEAN was established on 8 August 1967 in Bangkok, Thailand, and currently consists of ten countries: Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, the Philippines, Singapore, Thailand, and Vietnam. There are seven goals of this regional bloc, including the acceleration of the economic growth, social progress, and cultural development in order to strengthen the foundation for a prosperous and peaceful community, through active collaboration and mutual assistance among the members.

AEC is one of three pillars comprising the ASEAN community vision. In particular, AEC Blueprint 2025 provides a broader strategic roadmap towards a highly competitive and innovative region focusing on five key areas, particularly the enhancement of connectivity and sectoral cooperation within the economic bloc. To achieve that, several measures have been planned including the advancement of e-commerce adoption among both businesses and citizens of ASEAN.

Acknowledging the potential contributions of e-commerce, ASEAN has long initiated efforts since the e-ASEAN Framework Agreement 2000 for promoting the adoption and usage of e-based business platforms and digital technology to enhance the competitiveness of the bloc. The strategic measures emphasise four aspects:

1 consumer rights and protection laws

2 legal framework for online dispute resolution

3 secure, reliable and user-friendly e-identification

4 coherent and comprehensive framework for personal data protection.

However, these efforts are hindered by the socio-economic heterogeneity among the ten member countries. The differences are observed not only in terms of economic development, but also in the cultural attributes. This issue has been seriously addressed in the initiative for ASEAN Integration and the ASEAN Equitability Development Monitor 2014 that emphasise the need to narrow the development gap, particularly in countries like Cambodia, Laos, Myanmar, and Vietnam. As such, the prevalence of e-commerce varies across all ASEAN members.

3 Critical perspectives on e-commerce adoption: individual and country-level drivers

We draw on institutional theory to argue that the eventual technological behaviour, e-commerce adoption by customers, results from both formal and informal institutional variables. According to institutional scholars, institutions provide the structure in which the behaviour of individuals and organisations occur or disappear (North, 1990). This structure is not restricted to a formal set of regulations, but includes normative (social obligations) and cognitive (collective constructions of social reality) aspects (Hoffman and Ventresca, 1999; Scott, 1998). Hence, institutions provide 'the rules of the game' through coercive, mimetic, and normative mechanisms (DiMaggio and Powell, 1983; Scott, 1998) to legitimise a particular behaviour of the participants, such as organisations and individuals.

To apply institutional theory in the context of e-commerce, more active usage among customers emerges in countries with stronger institutions and favourable culture-values that facilitate the process. For example, Martinsons (2008) has compared a mature (the USA) and developing market (China), and concluded that e-commerce adoption in the latter is hindered by low personal trust, poor contextual and informal information, and blurred boundaries between business and government.

To develop the hypotheses, we focus on four key drivers in e-commerce adoption model of ASEAN: demand, supply, infrastructure, and regulation (formal institutions), together with the national trust value (informal institution). In particular, we integrate the factors at both individual (demand) and country-level (supply, infrastructure, regulation, and trust) for explaining e-commerce usage among individuals in ASEAN. This approach bridges the gaps in existing literature mentioned earlier.

Most research has examined only demographic attributes, such as age and gender, together with personal characteristics, such as access to the internet and cognitive-psychological attributes (Sexton et al., 2002; Zhou et al., 2007). For example, the studies of Straub et al. (1997) and Lim and Cham (2015) utilised data among customers in various countries such as Indonesia, Japan, Malaysia, Switzerland, and the USA, but neglected to consider country-level variances. In fact, macro factors such as physical infrastructure and rule of law have been shown to affect e-commerce development (Martinez and Williams, 2010; Oxley and Yeung, 2001). Yet, cross-country studies by Chai and Pavlou (2004) and Van Slyke et al. (2010) did not directly test those formal institutional variables, but instead focused the influence of national culture.

3.1 Demand

The demand driver for B2C focuses on the attributes of those customers who buy products or services via the internet, i.e., those customers with the means to pay for online purchases, following the indicator of B2C e-commerce index by the United Nations Conference on Trade and Development (UNCTAD). Online purchases are very convenient because they can be made with a wide variety of payment types, and consumers can benefit from sales tax savings (Martinsons, 2008). The preferred payment method varies across countries: credit and debit card, or mobile money; depending on domestic institutions such as financial regulations and credit riskiness, as well as

consumers' personal preferences. Hence, customers must have an account at a bank or other type of financial institution, or a mobile money service, to enable them to make online purchases.

Accordingly, AEC Blueprint 2025 directs initiatives to provide a wider account ownership through the enhancement of the financing ecosystem. The measures include improved access to financial facilities and services, particularly for lower income groups. Furthermore, the AEC committee argued that consumers may decide against having an account if they feel unsecure. Thus, extra efforts should be taken to strengthen financial education programs to highlight the available technical countermeasures against threats of digital fraud, thus encouraging more people to access financial services.

As mentioned, most e-commerce transactions require buyers to pay using bank cards or mobile money. Nonetheless, some individuals are still sceptical about the security and reliability of online payments, and as a result, they avoid subscribing to those financial services that would otherwise allow them to buy goods and services online. Thus, demand for e-commerce is largely explained by ownership of an account with credible payment channels that are robust against potential online fraud (Oxley and Yeung, 2001). For example, in the USA, where the e-commerce market is worth over USD500 billion in 2017, the percentage of account ownership is also very high at 94% (the World Bank Global FINDEX 2014). Noticeably, the USA is one of the countries with strong customer protection laws, e.g., the Fair Credit Billing Act 1993 that grants the right of the buyer, in the case of a disputed charge, to withhold payment while the credit card company investigates the claim.

In short, we propose that e-commerce adoption is more prevalent among buyers in countries with a stronger demand, i.e., a possession of an account with financial institutions.

H1 Stronger demand is related with a higher propensity of e-commerce adoption among citizens in ASEAN.

3.2 Supply

In contrast, the supply driver for e-commerce is explained from the perspective of online retailers and the availability of secure internet servers that enable secure online transactions. This measure is also captured in the UNCTAD B2C e-commerce index. Following the observations regarding demand, customers only purchase online when they are assured that adequate safety measures are in place. Hence, e-commerce companies need to employ security protocols to address various safety issues such as safeguards for payment information and personal data protection.

According to UNCTAD, modern servers adopt encryption technology in online transactions to secure the data transfer process from unauthorised intruders. At present, the rate of secure server penetration is heterogeneous among advanced, emerging, and developing economies. Thus, we argue that more e-commerce users shall be observed in countries with a stronger supply of secure internet servers.

H2 Stronger supply is related with a higher propensity of e-commerce adoption among citizens in ASEAN.

3.3 Infrastructure

Another macro driver imperative for e-commerce is infrastructure. There are three types of infrastructure closely related to e-commerce: physical, financial, and social infrastructure (Agarwal and Wu, 2015). As financial infrastructure is partly covered by the demand side and social infrastructure will be captured by the national trust value later, the infrastructure variable here concentrates on hard physical components of information technology and telecommunication (Oxley and Yeung, 2001).

Domestic telecommunications infrastructure is defined by the quality and speed of online communications and sales in the country (Doern and Fey, 2006). Yet, at a basic level, e-commerce infrastructure merely measures the rate of internet penetration or the percentage of internet users among the population, which is adopted by UNCTAD B2C e-commerce index. Although internet infrastructure is extremely vital for online sales, service companies across countries are not equally capable of providing wider and faster internet access. In particular, service providers in more advanced economics are found more likely to make such an investment as compared to their counterparts in developing countries (de la Torre and Moxon, 2001). One possible explanation is the abundance of resources and capabilities in a more advanced economy, making the return on investment more predictable.

As a result, if internet access is unavailable or too expensive, this would limit a consumer's ability to make online purchases (Oxley and Yeung, 2001).

H3 Stronger infrastructure is related with a higher propensity of e-commerce adoption among citizens in ASEAN.

3.4 Regulation

The last driver in the e-commerce model of ASEAN is the regulatory environment of the country. As discussed earlier, online purchases expose customers to great uncertainty and risk: the seller is anonymous, the product is invisible, the payment is virtual, etc. Thus, a lack of security is often considered to be the main obstacle in adopting e-commerce, particularly when consumers are frightened by attacks on data transactions or personal accounts (Alharbi et al., 2013; Pavlou, 2003). Considering that this is a widespread impression of e-commerce, strong legal legislation and enforcement must be established to not only protect the interests of buyers, but also to disincentive hackers from fraudulent activities (Bell, 1998). In fact, if legal requirements are not adequately present, transaction costs increase and eventually impede the interest of individuals to shop online (Bell, 1998; Ndubizu and Arinze, 2002).

At the country level, laws represent a significant portion of the institutions that affect confidence in marketplace certainty (Doern and Fey, 2006); the e-commerce market will only flourish if the legal environment is secure, stable, and predictable (Zhu and Thatcher, 2010). Furthermore, the rule of law offers transparency and legal protection in online markets to drive for a global e-commerce growth (Oxley and Yeung, 2001).

Stemming from institutional theory, Martinez and Williams (2010) argued that the quality of national institutions, an open society characterised by a strong rule of law and regulation, together with political and economic stability, would foster the usage of e-commerce. However, there is still a large gap between countries in terms of awareness, understanding, knowledge, and eventual ability to deploy the robust strategies to ensure security for all parties involved in e-commerce activities.

A number of cross-country studies found that the quality of the legal environment significantly affects local e-commerce activities and revenues in a country (Ndubizu and Arinze, 2002; Oxley and Yeung, 2001). On one hand, customers in developed markets like the USA have benefited from a trustworthy regulatory system (Martinsons, 2008). They enjoy convenient and cost-effective buying options that result from low risk e-commerce that is strongly governed by a universal set of formal rules. On the other hand, consumers in developing economies are more reluctant to purchase online due to an institutional void, where there is insufficient legal protection of consumer rights afforded to them by the government (Agarwal and Wu, 2015). Hence, differences in regulation emerge as a significant predictor for explaining variances in the rate of e-commerce across countries.

H4 Stronger regulation is related with a higher propensity of e-commerce adoption among citizens in ASEAN.

3.5 Trust

While regulation captures formal institutions, trust value within the society emphasises socio-cultural or informal institutions that shape the environment that influence the prevalence of e-commerce adoption. In fact, adequate infrastructure is necessary but not sufficient for people to use e-commerce unless they have reasonable confidence in the integrity of online transactions (Oxley and Yeung, 2001).

In short, trust value in e-commerce refers to the extent to which individuals feel confident in purchasing goods online and are willing to do so (Doern and Fey, 2006). In other words, virtual purchases can only be materialised if members of the society have an adequate level of trust towards others. Trust must be present because e-commerce activities are predicated on two main issues: privacy and security. Privacy concerns an individual's right to access and control their personal information and how it is collected, used, and transferred over the internet (Boritz and No, 2011), while security means the degree to which customers believe that their personal information will not be viewed, stored, and manipulated by unauthorised parties (Flavián and Guinalíu, 2006; Pavlou, 2003).

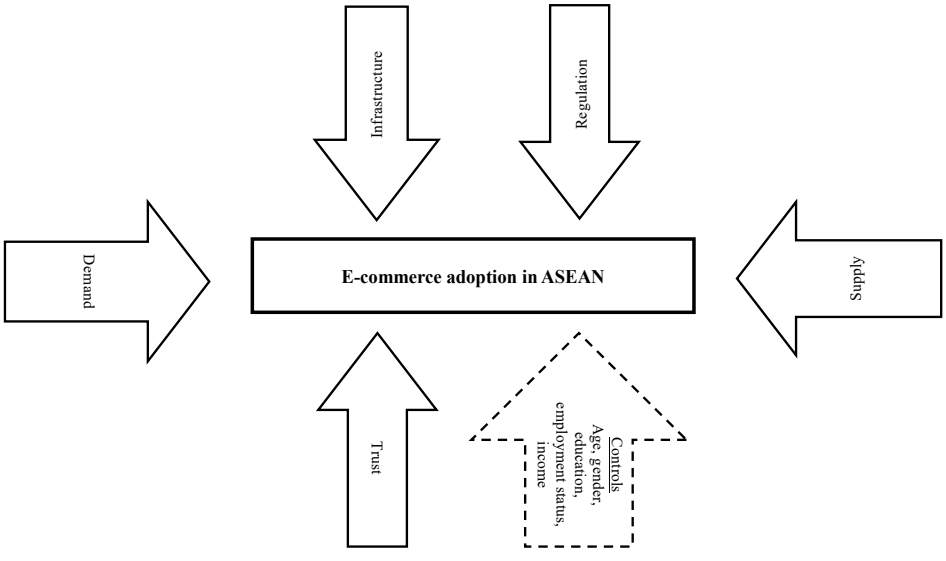
The role of trust becomes paramount because of the spatial and temporal separation between consumers and online sellers, together with the open structure of the internet that incurs greater uncertainty and risk (Pavlou, 2003). Furthermore, because of this separation, customers might have little to no interaction with sellers (San Martín et al., 2011), making it difficult for them to anticipate whether the purchased goods will be successfully delivered (McKnight et al., 2002).

At the country level, La Porta et al. (1997) and Baum et al. (2000) argue that trust value shared within the society is an important driver that contributes to the development of institutions, including the prevalence of e-commerce adoption. Thus, we suggest that the existence of strong trust would boost the spread of e-commerce in a country. On the contrary, distorted perceptions of trust will definitely hamper online sales by customers (Stewart et al., 2002).

H5 Stronger trust is related with a higher propensity of e-commerce adoption among citizens in ASEAN.

The framework of this research is presented in Figure 1.

Figure 1 Framework of study



4 Methods and data

Our initial step in constructing a robust dataset is to identify the best measures for each driver in the model. E-commerce adoption model of ASEAN does not dictate specific variables for measuring demand, supply, infrastructure and regulation. In fact, the model acknowledges that several indicators can be useful to capture each driver. Thus, we employ two methods for addressing this issue:

1 utilising similar measures as the UNCATD B2C e-commerce index

2 including other confounding variables as controls in the model.

To test our hypotheses, we acquired individual-level data from the World Bank Global FINDEX database 2017. The inclusion of data prior to that date is not possible because some of the important variables were not consistently captured. FINDEX is the world's

most comprehensive dataset funded by the Bill and Melinda Gates Foundation that studies financial inclusion in countries worldwide. For example, in 2017, data are collected through nationally representative surveys of more than 150,000 adults in over 140 economies. For other country-level variables, we gathered data from various resources: the World Bank, International Telecommunication Union (ITU), and World Values Survey (WVS).

Although FINDEX 2017 captures 10,206 observations in nine ASEAN countries (excluding Brunei), data on trust from WVS only covers six countries: Indonesia, Malaysia, the Philippines, Singapore, Thailand, and Vietnam. After merging data from all sources and dropping some incomplete inputs, the final sample for analysis consists of 5,883 individuals from six countries.

4.1 Dependent variable

The dependent variable is dichotomous, e-commerce adoption is measured at the individual-level: if respondents have personally bought things online in the past 12 months. FINDEX data in year 2014 is rather irrelevant because the question asked if respondents "… made payments on bills or bought things online using the internet." In other word, it combines the use of the internet not only for e-commerce but also other purposes.

4.2 Explanatory variables

The first driver, demand, is also binary and measured at the individual-level: if respondents have an account at a bank or another type of financial institution, or mobile money account. Ownership of any of these accounts strongly indicates the ability to pay for online transactions using a credit or debit card, or a transfer via mobile money.

Second, the supply-side driver is measured by the number of secure servers per million people, acquired from the World Bank. This measure reflects the readiness of a country to facilitate secure online transactions because encryption technology and other security protocols in secure servers are essential for safeguarding payment and personal information.

Third, although there are many possible indicators to measure the infrastructure necessary for e-commerce, we opt to employ the most common one: the rate of internet users, retrieved from the ITU. This data is calculated based on the percentage of population in the country that actually use the internet, and not merely have access to it.

Fourth, the indicator for regulation utilised data on the Global Cybersecurity Index (GCI) score from ITU, ranging from 0 (worst) to 1 (best). GCI is a survey that measures the commitment of each country to cybersecurity in five aspects: legal, technical, organisational, capacity building, and cooperation, captured through 157 questions.

Lastly, measures on national trust are retrieved from WVS. WVS provides the largest cross-national time series data on human beliefs and values, collected among a minimum of 1,000 respondents from each country in almost 100 countries every five years. Data on trust is the percentage of the population that respond "yes" to the statement "… most people can be trusted …"

4.3 Control variables

One remedy to compensate for the potential bias caused by the selection of variables is to include other confounding measures as controls in the model. Thus, we control for individual demographic attributes: age, gender, education, employment status, and income level.

However, the inclusion of country-level controls is rather impossible due to the small number of countries involved. We attempt to include several controls such as population size and gross domestic product (GDP) as well as alternative measures of infrastructure such as logistic performance index and postal reliability index. However, all these variables are correlated almost perfectly with our explanatory variables of infrastructure and regulation, potentially causing multicollinearity. For example, population and infrastructure is correlated at –0.932 and GDP and regulation is correlated at 0.831.

Despite that, in a separate analysis, we have replaced data on infrastructure with logistic performance index and postal reliability index, similarly done by UNCTAD B2C e-commerce index. Although we do not report them here, we found that the substitution with any of these variables do not conflict with the results of this study. Therefore, our model neglects country-level controls and focus only on individual controls.

Description of all variables is presented in Table 1, and the correlations among the variables is shown in Table 2.

Table 1 Definitions of variables

Variable	*Definition*	*Source*
Dependent variable		
E-commerce adoption	Dummy, equal to 1 if respondents have personally bought things online using the internet in the past 12 months	FINDEX
Explanatory variables		
Demand	Dummy, equal to 1 if respondents have an account at a bank or another type of financial institution, or mobile money account	FINDEX
Supply (log)	Number of secure servers per million people	World Bank
Infrastructure	Percentage of internet users in the country	ITU
Regulation	Global Cybersecurity Index score, range 0 to 1	ITU
Trust	Percentage of respondents that respond “yes” to “… most people can be trusted...”	WVS
Controls		
Age	Age of respondents	FINDEX
Gender	Dummy, equal to 1 if respondent is male	FINDEX
Education	Range 1 to 3: primary, secondary and tertiary	FINDEX
Employment status	Dummy, equal to 1 if respondent is currently employed	FINDEX
Income level	Range 1 to 5: poorest to richest	FINDEX

Table 2 Descriptive statistic and correlations

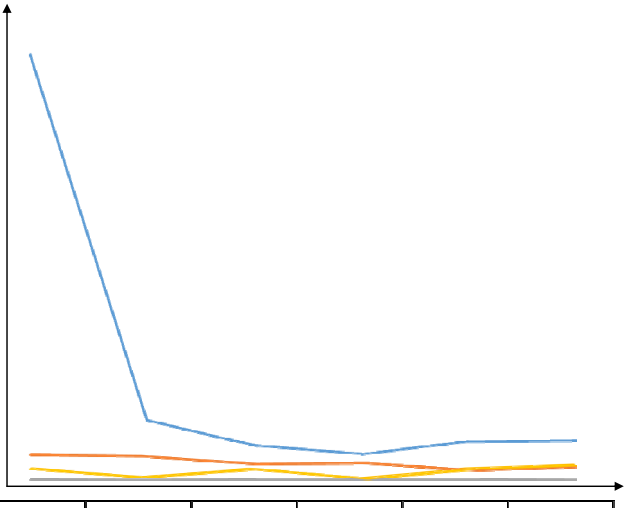
		Mean	*SD*	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*
1	Demand	0.64	0.48	1.00										
2	Supply (log)	3.23	0.87	0.38	1.00									
3	Infrastructure	58.40	18.16	0.38	0.63	1.00								
4	Regulation	0.62	0.24	0.46	0.53	0.47	1.00							
5	Trust	29.16	17.09	–0.02	0.35	–0.35	–0.46	1.00						
6	E-commerce	0.23	0.44	0.28	0.32	0.30	0.25	0.02	1.00					
7	Age	42.33	16.81	0.00	0.05	0.04	0.05	0.13	–0.25	1.00				
8	Gender	0.43	0.50	0.01	0.02	0.06	0.04	–0.05	0.00	–0.02	1.00			
9	Education	1.86	0.67	0.28	0.22	0.31	0.22	–0.17	0.37	–0.35	0.08	1.00		
10	Employment status	0.70	0.46	0.12	0.02	0.03	0.01	0.03	0.14	–0.12	0.16	0.15	1.00	
11	Income	3.10	1.43	0.15	–0.03	–0.04	–0.04	0.01	0.19	–0.11	0.03	0.29	0.13	1.00

Notes: Significant at the $p < 0.010$ level when Pearson correlations >0.03 and < –0.04.

5 Descriptive analysis

Unlike the extensive economic and monetary union like the European Union, ASEAN is less integrated bloc mainly confined to a free trade agreement. The principle barrier for integration is differences in political ideology, level of development, and socio-cultural aspects. Following the World Bank classification, all six countries in our analysis are heterogeneous in terms of level of development. Singapore is the only high-income nation, followed by Malaysia and Thailand as upper-middle-income countries, while Indonesia, the Philippines, and Vietnam are considered lower-middle economies. This can be seen in the value of country-level variables: supply, infrastructure, and regulation. As the only high-income economy, Singapore has the highest value for all these variables; 58,690, 84, 0.925, respectively. On the other hand, the Philippines has the lowest for supply at 88, Indonesia is at the bottom for infrastructure with 32, and Vietnam is the worst for regulation at 0.245. Despite that, national trust does not necessarily correspond to economic level. Vietnam is the most trustworthy nation with 51% of the population trusting each other, while Malaysia and the Philippines both lack trust in society with only 8.4% and 3.2% respectively. Figure 2 illustrates country characteristics, while Table 3 exhibits sample characteristics for the six ASEAN countries.

Figure 2 Country characteristics (see online version for colours)



	Singapore	Malaysia	Thailand	Philippines	Indonesia	Vietnam
Supply	58690	4837	580	88	1284	1335
Infrastructure	84	80	53	56	32	47
Trust	37.3	8.4	36.7	3.2	37.2	50.9
Regulation	0.925	0.893	0.684	0.594	0.424	0.245

Table 3 Sample characteristics

Country	*Description (%)*										
	n	*Gender*		*Age*		*Education*		*Employment status*		*Income*	
Singapore	996	M	43.07	M	46.96	1	17.37	Y	68.90	1	20.48
		F	56.93	SD	16.91	2	58.33	N	31.02	2	18.57
						3	24.30			3	20.38
										4	22.90
										5	17.67
Malaysia	917	M	52.02	M	36.31	1	7.20	Y	72.41	1	19.52
		F	47.98	SD	15.78	2	52.34	N	27.59	2	17.67
						3	40.46			3	18.65
										4	21.81
										5	22.35
Thailand	993	M	36.96	M	52.53	1	59.72	Y	73.72	1	19.94
		F	63.04	SD	16.34	2	32.63	N	26.28	2	20.14
						3	7.65			3	18.53
										4	19.23
										5	22.15
Philippines	998	M	43.79	M	40.5	1	29.26	Y	64.53	1	19.14
		F	56.21	SD	17.52	2	59.42	N	35.47	2	16.73
						3	11.32			3	20.34
										4	20.94
										5	22.85
Indonesia	1,000	M	39.30	M	38.28	1	34.10	Y	63.60	1	16.90
		F	60.70	SD	14.24	2	62.70	N	36.40	2	17.90
						3	3.20			3	18.80
										4	19.60
										5	26.80
Vietnam	979	M	42.80	M	42.11	1	34.01	Y	74.36	1	17.77
		F	57.20	SD	16.1	2	51.38	N	25.64	2	18.08
						3	14.61			3	18.28
										4	20.74
										5	25.13

6 Results

Prior to the estimation, we run robustness checks to ensure that there are no abnormalities in the data: common method bias (although this is less likely for the dataset compiled

from multiple sources), multicollinearity using variance inflation factors (VIF), and outliers. Thus, we are confident that our dataset is robust for analysis.

We use ordinary least squares (OLS) regression to estimate the relationship among all independent variables and the propensity of e-commerce adoption. OLS is chosen because it is a linear probability model mostly appropriate for cross-sectional data (Hutcheson, 2011). Table 4 reports the regression results. Model 1 includes the control variables. Model 2 tests only the independent variables, while model 3 runs a full model.

Table 4 Regression results

	Model 1	*Model 2*	*Model 3*
Demand		0.172***	0.078***
		(0.013)	(0.013)
Supply (log)		0.117***	0.040**
		(0.013)	(0.013)
Infrastructure		0.006***	0.005***
		(0.001)	(0.001)
Regulation		–0.357***	0.029
		(0.052)	(0.051)
Trust		–0.002**	0.003***
		(0.001)	(0.001)
Controls			
Age	–0.003***		–0.005***
	(0.000)		(0.000)
Gender	–0.037***		–0.037***
	(0.011)		(0.010)
Education	0.189***		0.112***
	(0.009)		(0.009)
Employment status	0.074***		0.059***
	(0.012)		(0.011)
Income	0.026***		0.034***
	(0.004)		(0.004)
Constant	–0.090**	–0.317***	–0.473***
	(0.027)	(0.024)	(0.031)
R^2	0.169	0.148	0.264
Adjusted R^2	0.168	0.147	0.263
F-value	238.172***	203.416***	210.834***

Notes: ***p < 0.001, **p < 0.010, *p < 0.050 and γp < 0.100 (two-tailed).

Models 2 and 3 consistently support Hypotheses 1, 2 and 3 that demand, supply and infrastructure drivers are strong and positively related with e-commerce adoption among consumers in ASEAN. Our findings are mostly consistent with prior research that e-commerce is mostly adopted amongst people who possess a bank or mobile money account mandatory for making an online payment, and those who are living in a country with strong infrastructure (Oxley and Yeung, 2001). Similarly, Järveläinen (2007) suggests customers that consider online activities including payment transactions and information sharing safe are more likely to purchase online.

Hypothesis 5 is also supported between trust and e-commerce behaviour after controlling for individual characteristics in model 3, though a negative relationship surprisingly emerges in model 2. Hence, our results hold similar findings in previous studies (Baum et al., 2000; La Porta et al., 1997) that trust provides a significant social context, equally important as formal institutions, in explaining the propensity of online shopping amongst customers.

However, Hypothesis 4 is rejected. Model 2 shows a negative relationship between regulation and online purchase behaviour, while Model 3 shows an insignificant relationship. This findings are rather counter-intuitive, as it opposes the majority of previous research (Bell, 1998; Martinez and Williams, 2010; Ndubizu and Arinze, 2002; Zhu and Thatcher, 2010). One possible explanation is that while the government may have taken adequate measures to ensure cyber security, those efforts do not necessary reach the objective. First, the enactment of any new law may take some time to implement and enforce; until customers feel confident that their online purchases are protected, the government needs to continuously educate the public about regulations pertaining to e-commerce. Second, since online purchases are an individual decision, the existence of strong laws appears to be secondary determinant as customers rely on their own experiences, and those of their friends and family, rather than information provided by the government. Third, law experts argue that people only accept laws if they consider them to be compatible with their personal beliefs (Jackson et al., 2012; Tyler, 2006). In other words, strong regulation is important, but insufficient to dictate one's purchasing behaviour, i.e., if he or she personally prefers to buy things in traditional stores rather than online.

Lastly, in term of controls, we found that online purchasing is more common among younger, female, more educated, employed, and higher-income consumers.

7 Discussion and conclusions

In the context of e-commerce, can ASEAN economic bloc ensure equal outcomes from policies it imposes on all member countries, and does the macro environment influence individual behaviour? We endeavour to challenge most studies on e-commerce that that suggest that adoption is explained by either individual or national characteristics. Instead, we argue that e-commerce adoption results from the integration of both. Hence, online purchasing is not only influenced by who the customer is, but where the customer lives.

To provide empirical evidence, we test the e-commerce adoption model of ASEAN by examining the relationship among demand, supply, infrastructure, regulation, and trust towards the propensity to purchase online among 5,883 individuals in six countries. The findings of this research have several implications for literature and policy in e-commerce.

First, heterogeneity in institutions stand as a principle barrier to e-commerce diffusion across member countries. Although the collective mission of AEC is to ensure that all citizens have equal opportunities to utilise online businesses, adoption is limited to those who have means to pay, access to the internet and secure websites, and perceive themselves to live in a trustworthy society.

Second, we establish a conceptual link between two important, yet previously isolated, bodies of literature: e-commerce behaviour and institutions. In particular, we

found that a country's socio-culture is as important as formal institutions in explaining e-commerce behaviour. From that, we learn that initiatives encouraging people to utilise online commerce should not merely focus on tangible aspects, such as infrastructure, but should also nurture values related to virtual activity such as trust.

Third, we discover that laws protecting online security and privacy are not entirely effective in bringing confidence to users for embracing e-commerce. It is essential for governments to establish strong regulation, but the eventual decision of whether or not to buy online is driven by other more dominant factors, presumably the customer's personal experiences and those of close friends and family. In other word, what government promotes regarding internet safety is not always what the citizens really perceive or experience.

This study offers few practical implications. Following the findings that people are more likely to adopt e-commerce if they have a means to pay online and access to a secured internet connection, government should accelerates the efforts to provide adequate infrastructure especially to those who are living in rural areas. Those people are often neglected and left behind in the modern technological society. Together, although trust is not hardly nurtured in a short-term, government and the society as a whole should work progressively to improve the trustworthiness through education or public campaigns.

In summary, for policy makers, our findings suggest that the ASEAN committee should personalise strategies for each member country, instead of deploying a common plan for all. In recognising that each country faces different types of barriers to adopting e-commerce, aide and assistance can be tailored to each country's needs. Equally important, the efforts to increase e-commerce diffusion should not neglect cultural considerations while continuously focusing on the improvement of formal institutions. Finally, we suggest that the introduction of regulation of e-commerce must be comprehensively conveyed for citizens to fully understand and embrace the trend.

Despite its contributions, this research is subjected to several caveats. First, we analyse data for only six of ten ASEAN members. We must be cautious in generalising the results from this small sample into other contexts. Second, our analysis is restricted to a set of selective measures. Although we have also tested substitute variables and found no conflicting results, the choice of variables might still be an issue to some. Lastly, our analyses do not demonstrate the causality, but rather hold to a strong assumption that individual behaviour is determined by both personal and environmental aspects and not vis-a-versa. In other words, it is hard to argue that buying things online can eventually increase the level of infrastructure development in the country.

Acknowledgements

This research was funded by the National University of Malaysia, under grant DCP-2017-017/3.

References

Agarwal, J. and Wu, T. (2015) 'Factors influencing growth potential of e-commerce in emerging economies: an institution-based N-OLI framework and research propositions', *Thunderbird International Business Review*, Vol. 57, No. 3, pp.197–215.

Alharbi, I.M., Zyngier, S. and Hodkinson, C. (2013) 'Privacy by design and customers' perceived privacy and security concerns in the success of e-commerce', *Journal of Enterprise Information Management*, Vol. 26, No. 6, pp.702–718.

Baum, J., Chen, S. and Granitsas, A. (2000) 'Settling accounts', *Far Eastern Economic Review*, Vol. 163, No. 34, pp.39–41.

Bell, B.A. (1998) 'Corporate web sites and securities offerings', *New York Law Journal*, Vol. 219, No. 97, pp.5–7.

Boritz, J.E. and No, W.G. (2011) 'E-commerce and privacy: exploring what we know and opportunities for future discovery', *Journal of Information Systems*, Vol. 25, No. 2, pp.11–45.

Chai, L. and Pavlou, P.A. (2004) 'From 'ancient' to 'modern': a cross-cultural investigation of electronic commerce adoption in Greece and the United States', *Journal of Enterprise Information Management*, Vol. 17, No. 6, pp.416–423.

de la Torre, J. and Moxon, R.W. (2001) 'Introduction to the symposium e-commerce and global business: the impact of the information and communication technology revolution on the conduct of international business', *Journal of International Business Studies*, Vol. 32, No. 4, pp.617–639.

DiMaggio, P.J. and Powell, W.W. (1983) 'The iron cage revisited: Institutional isomorphism and collective rationality in organizational fields', *American Sociological Review*, Vol. 48, No. 2, pp.147–160.

Doern, R.R. and Fey, C.F. (2006) 'E-commerce developments and strategies for value creation: the case of Russia', *Journal of World Business*, Vol. 41, No. 4, pp.315–327.

Flavián, C. and Guinalíu, M. (2006) 'Consumer trust, perceived security and privacy policy: three basic elements of loyalty to a web site', *Industrial Management & Data Systems*, Vol. 106, No. 5, pp.601–620.

Hoffman, A.J. and Ventresca, M.J. (1999) 'The institutional framing of policy debates: economics versus the environment', *American Behavioral Scientist*, Vol. 42, No. 8, pp.1368–1392.

Hutcheson, G.D. (2011) 'Ordinary least-squares regression', in Moutinho, L. and Hutcheson, G.D. (Eds.): *The SAGE Dictionary of Quantitative Management Research*, pp.224–228, SAGE Publications Ltd., London.

Jackson, J., Bradford, B., Hough, M., Myhill, A., Quinton, P. and Tyler, T.R. (2012) 'Why do people comply with the law? Legitimacy and the influence of legal institutions', *British Journal of Criminology*, Vol. 52, No. 6, pp.1051–1071.

Järveläinen, J. (2007) 'Online purchase intentions: an empirical testing of a multiple-theory model', *Journal of Organizational Computing and Electronic Commerce*, Vol. 17, No. 1, pp.53–74.

La Porta, R., Lopez-de-Silanes, F., Shleifer, A. and Vishny, R. (1997) 'Legal determinants of external finance', *The Journal of Finance*, Vol. 52, No. 3, pp.1131–1150.

Lim, Y.M. and Cham, T.H. (2015) 'A profile of the internet shoppers: evidence from nine countries', *Telematics and Informatics*, Vol. 32, No. 2, pp.344–354.

Martinez, C.A. and Williams, C. (2010) 'National institutions, entrepreneurship and global ICT adoption: a cross-country test of competing theories', *Journal of Electronic Commerce Research*, Vol. 11, No. 1, pp.73–91.

Martinsons, M.G. (2008) 'Relationship-based e-commerce: theory and evidence from China', *Information Systems Journal*, Vol. 18, No. 4, pp.331–356.

McKnight, D.H., Choudhury, V. and Kacmar, C. (2002) 'The impact of initial consumer trust on intentions to transact with a web site: a trust building model', *The Journal of Strategic Information Systems*, Vol. 11, Nos. 3–4, pp.297–323.

Ndubizu, G. and Arinze, B. (2002) 'Legal determinants of the global spread of e-commerce', *International Journal of Information Management*, Vol. 22, No. 3, pp.181–194.

North, D. (1990) *Institutions, Institutional Change and Economic Performance*, Cambridge University Press, Cambridge.

Organization for Economic Co-operation and Development (OECD) (2011) *OECD Guide to Measuring the Information Society 2011*, Organisation for Economic Co-operation and Development.

Oxley, J.E. and Yeung, B. (2001) 'E-commerce readiness: Institutional environment and international competitiveness', *Journal of International Business Studies*, Vol. 32, No. 4, pp.705–723.

Pavlou, P.A. (2003) 'Consumer acceptance of electronic commerce: Integrating trust and risk with the technology acceptance model', *International Journal of Electronic Commerce*, Vol. 7, No. 3, pp.101–134.

San Martín, S., Camarero, C. and San José, R. (2011) 'Dual effect of perceived risk on cross-national e-commerce', *Internet Research*, Vol. 21, No. 1, pp.46–66.

Scott, W.R. (1998) *Organizations: Rational, Natural, and Open Systems*, Prentice Hall, Upper Saddle River, NJ.

Sexton, R.S., Johnson, R.A. and Hignite, M.A. (2002) 'Predicting internet/e-commerce use', *Internet Research*, Vol. 12, No. 5, pp.402–410.

Stewart, D.W., Pavlou, P.A. and Ward, S. (2002) 'Media influences on marketing communications', in Bryant, J. and Zillmann, D. (Eds.): *Media Effects: Advances in Theory and Research*, Rev. ed., pp.353–396, Erlbaum, Hillsdale, NJ.

Straub, D., Keil, M. and Brenner, W. (1997) 'Testing the technology acceptance model across cultures: a three country study', *Information & Management*, Vol. 33, No. 1, pp.1–11.

Tyler, T.R. (2006) *Why People Obey the Law*, Princeton University Press, Princeton.

Van Slyke, C., Lou, H., Belanger, F. and Sridhar, V. (2010) 'The influence of culture on consumer-oriented electronic commerce adoption', *Journal of Electronic Commerce Research*, Vol. 11, No. 1, pp.30–40.

Zhou, L., Dai, L. and Zhang, D. (2007) 'Online shopping acceptance model – a critical survey of consumer factors in online shopping', *Journal of Electronic Commerce Research*, Vol. 8, No. 1, pp.41–62.

Zhu, L. and Thatcher, S. (2010) 'National information ecology: a new institutional economics perspective on global e-commerce adoption', *Journal of Electronic Commerce Research*, Vol. 11, No. 1, pp.53–72.