Taylor & Francis
Taylor & Francis Group

Check for updates

Habit formation in social media consumption: a case of political engagement

Tiong-Thye Goh[a,b], Zhuo Xin[b] and Dawei Jin[b]

[a]Victoria University of Wellington, School of information management, Wellington, New Zealand; [b]Zhongnan University of Economics and Law, School of Information and Safety Engineering, Wuhan, People's Republic of China

ABSTRACT
This study draw upon the theory of habit formation in consumption from macroeconomics to support the evidence on the existence of habit formation in social media consumption. Treating social media consumption as a form of digital good consumption and using aggregated weekly posts from the Facebook pages of a group of 12 politicians in the cabinet of Singapore, we verified through a non-separable recursive time model that social media consumption habits were developed among this group of politicians. This study further confirms the existence of reciprocity by validating habit formation in the social media consumption of citizens and followers of these politicians' posts using time aggregated data of 'likes', 'shares' and 'comments'. Further, this study shows the relationship between the strength of habit formation in social media consumption of politicians and citizens is positively correlated: the stronger the habit formation, the stronger the social capital reciprocity. Through these measurements, our analysis proved that political engagement in social media is a bi-directional habitual process and the use of a habit formation coefficient as a new parameter to measure 'reciprocal engagement' in social media provides a better understanding of the dynamic exchange between users of social media.

1. Introduction

The proliferation of social media has proven to be a powerful tool to engage citizens, build social capital and influence their decisions. Social media offers organisations and individuals the ability to communicate directly with others synchronously and asynchronously. Social media has the capability to provide different forms of communication, such as private one-to-one interaction or on-going public communication with a captive audience (Antheunis, Vanden Abeele, and Kanters 2015).

Increasingly, individual and political organisations are leveraging social media to disseminate information, encourage interaction, build loyal communities and develop social capital by engaging citizens with their propositions and opinions. For example, in New Zealand 78.68% of members of parliament adopt at least one channel of social media platform for their online political communication to cultivate youth engagement and voter support (O'Neill 2010). Political parties in Pakistan use Twitter to interact with the public, provide campaign updates and mobilise citizens during election campaigns (Ahmed and Skoric 2014). And most recently, Trump employs controlled presentation of information strategy by portraying positive self-presentation and negative other-presentation to advance his agenda via social media (Kreis 2017).

To leverage social media to be an effective and successful channel of communication, social media users must first adopt the specific system and maintain long term continued usage. Research in information systems suggests that continued use of a system goes beyond models of behavioural intention and expectation, it requires motivating behaviours that are regularly performed to become unconsciously habitual and develop into automatic routine over time (Limayem, Hirt, and Cheung 2007; Venkatesh, Thong, and Xu 2012; Wu and Kuo 2008). To show the influence of habit on future use, in their study, Limayem and Hirt (2003) adopted the Triandis model to demonstrate that habit has a direct contribution to actual use behaviour: the stronger the habit, the higher the system use. In their study, habit was measured by a self-reported circular habit construct to measure habit strength. A circular construct is a measure where the construct to be measured appears in the item statement. Most recently, Hu et al. (2018) examined the formation of social media use habits with a survey of 518 social network users. They confirmed

CONTACT Dawei Jin ✉ jindawei.cn88@gmail.com 🖂 Zhongnan University of Economics and Law, School of Information and Safety Engineering, 182 Nanhu Ave, Hongshan, Wuhan, Hubei, China

that habit formation has a direct impact on future behaviour. The habit construct used a self-reported measure which was adopted from Limayem, Hirt, and Cheung (2007). It appears that using self-reported measures of the habit construct is a common approach to assess habit strength (Hsiao, Chang, and Tang 2016; Limayem and Hirt 2003; Limayem, Hirt, and Cheung 2007; Polites and Karahanna 2012). Interestingly, within the information systems discipline, there is minimal research on how to extract habit formation measures from the social media use data. Furthermore, little is known about whether habit formation can be derived from social media consumption patterns and whether habit formation in social media consumption is reciprocated.

Therefore, this study intends to address the knowledge gap by first establishing a habit formation in social consumption model drawing upon the well-known economic theory of habit consumption theory. More specifically, our study investigates three aspects of habit formation in social consumption: users' habit formation, citizens' habit formation, and their interrelationship. To validate the theory of habit formation in social media, we will model time series social media use data with the habit formation consumption equation. In summary, this study intends to answer the following research questions:

RQ1: Do politicians exhibit habit formation in their social media consumption?

RQ2: Do citizens exhibit habit formation in their interaction with a politicians' social media site?

RQ3: Are there any relationships between the politicians' habit formation and citizens' habit formation parameters?

The rest of the paper is organised as follows. Section 2 provides a literature review about habit formation and social media consumption. Section 3 introduces the theory about habit formation in economics and puts forward empirical models. Section 4 discusses the research methodology which describes the data and variables. Section 5 summarises the analysis results. Section 6 discusses our findings' implications and limitations. Conclusion is presented in Section 7.

2. Literature review

2.1. Habit formation in economics

The concept of habit has long been acknowledged as an important characteristic of human consumption behaviour. One major distinction of habit consumption economics is that it is based on the concept of utility. For a given standard of consumption the ultimate level of utility derived depends not only on the present level of consumption, but also on how it compares to some benchmark level (Alvarez-Cuadrado, Monteiro, and Turnovsky 2004; Havranek, Rusnak, and Sokolova 2017; Kakeu and Nguimkeu 2017; Waller 1988). While habit research is very active in disciplines such as psychology and marketing, the approach taken by economics is different due to its theoretical perspective. Consumer behaviour research in marketing or psychology tends to address the cognitive aspects of habitual behaviour by conducting experiments to comprehend the cognitive decision making mechanism when consumers are faced with choices. In economics, researchers normally develop a utility model that includes external factors to explain consumer habit formation (Shu 2017). There are two aspects of the habit persistence consumption model in behavioural economics. The internal habit formation looks at how the accumulated stock of past private consumption affects the consumer's present level of utility. A rational consumer therefore considers this factor when choosing her or his optimal consumption plan. The external habit formation looks at how the accumulated level of aggregate past consumption in the overall economy affects the individual consumer's present level of utility. External habit formation is a form of intertemporal consumption externality where the individual's current decisions affect what options become available in the future. Moreover, when making an optimal decision, the consumer does not internalise external habits (Ikefuji and Mino 2009). Duesenberry (1949) believed that once a habit is formed, it is difficult to change consumption behaviour rapidly because individuals tend to get accustomed to a given 'standard of living' which they like to maintain. Habit-forming consumers favour gradual change as they dislike large and rapid changes in consumption. Hence, introducing a habit factor based on the individual's own past consumption levels into the utility function can better explain the real life consumption behaviour. This internal criterion is often referred to as characterising habit formation. Habit formation theory has proved to be useful because a large number of empirical studies have shown that the Rational Expected Life Cycle Hypothesis (RELCH), which is dominant in the theory of consumption, was unable to fully explain consumption behaviour. Based on findings from various studies, habit formation based on the individual's own past consumption levels as part of the utility function is widely accepted. For example, Meghir and Weber (1996) and Carroll, Overland, and Weil (1995) have pointed out that consumer preferences exhibit inertia so current consumption is related to past consumption. Alessie and Lusardi (1997) were able to derive a closed-form solution

for habit formation consumption under certainty equivalence and uncertainty. They showed that besides permanent income and income risk, past consumption affects current consumption. Similarly, in addition to future income changes and income risk, past saving affects future saving. A large number of studies on habit formation in economic theory have coherently showed that the motivation for habit formation is that our past activity increases the marginal utility of our current and future recurrent activities (Becker and Murphy 1988). The important point is that past consumption has an impact on current consumption. An individual's past behaviour becomes more predictive of his or her future behaviour as habits gradually develop. Besides past consumption, recent research also suggests that an individual with a larger initial stock of habituation deriving more utility from engaging in a particular consumption is more likely to continue with that behaviour (Harris and Kessler 2018). This suggests that to induce habit-forming behaviour, an upfront incentives intervention rather than spreading incentives over time is a better method to maximise habit stock (Hussam et al. 2017). In economic behavior, using past behaviour to predict future behaviour has been considered in numerous consumption contexts as habit formation theory helps explain various empirical regularities (Becker and Murphy 1988; Havranek, Rusnak, and Sokolova 2017; Pollak 1970, 1976). Most recently, habit formation has been used to discover optimal consumption of clean and dirty goods (Greiner 2018), to study the effects of climate policies and the rebound effect in climate-economy models (Safarzyńska 2018) and in household electricity consumption to study time-of-using electricity pricing subject to an in-home display that provides real-time feedback on electricity consumption and price (Martin and Rivers 2018). Interestingly, in personal hygiene, the effect of hand-washing rate increases is attributed to individuals internalising the habitual nature of hand-washing and accumulating habit stock when being monitored (Hussam et al. 2017). As illustrated here, habit formation theory is widely applied in a range of interdisciplinary research. We take this a step further by investigating habit formation in a social media context, which has not been explored, by mapping the utility of social media consumption behaviour through the well-established habit formation branch of economic theory.

2.2. Use behaviour in social media

Social media sites are increasing popular for engaging in social communication and making connections. Currently Facebook, YouTube and Instagram are among the top three social media worldwide with 2.2 billion, 1.8 billion and 0.8 billion users respectively as of March 31, 2018 (Kallas 2018). Undeniably, the use of social media compounded by its affordances that allow users to express and articulate opinions and disclose their online social networks has moved from a trend to becoming an integral part of almost every person's life (boyd and Ellison 2007). The prevalence of social media has encouraged researchers to investigate the relationship between user behaviour and the motivation for social media usage. In accordance with behavioural economics, motivational factors are the ingredients that transform into consumer marginal utility that drives consumption. A study by Waheed et al. (2017) investigated several motivational factors of individuals' use of social media. The social factors identified were experiencing social consciousness, attaining social presence, avoiding loneliness, getting leisure and entertainment, acquiring the feeling of connection, extending one's social network, and expressing and articulating one's opinion. Other motivational factors influencing social media usage include acquisition of information or news, building networks and relationships, and expressing online political views (Boulianne 2017), experiencing gratification, making social comparisons, continuing education and generating social capital (Alhabash, Chiang, and Huang 2014; Leiner et al. 2018; Phua, Jin, and Kim 2017; Rahman 2014). In term of political participation and expression, one of the motivations to use social media is political mobilisation when citizens are deeply frustrated with the current political system and economic conditions. Social media is used as a project management tool for coordinating political activities, including creating international connections, raising funds, and activating support (Boulianne 2017; Huang et al. 2017). A study by Hughes et al. (2012) linked personality traits such as neuroticism, extraversion, openness to experience, agreeableness, conscientiousness, sociability and need for cognition as drivers of social and informational use of social media. In addition, the internal and external factors of context, intensity and frequency of use, privacy, security and disclosure concerns, cultural and demographic differences, self-presentation, self-image and self-esteem cumulatively affect user behaviour (Waheed et al. 2017). One aspect that is important to habit consumption research is the frequency of visiting, time spent on, and the intensity of use of social media (Alhabash, Chiang, and Huang 2014; Hu et al. 2018; Leiner et al. 2018) as these determinants induce users into habitual behaviour as suggested by the habit formation theory.

Social media is a digital product with content that is consumed over networked electronic devices. Usage behaviour in social media is equivalent to a form of digital goods consumption behaviour (Bhattacharjee et al.

2011). In most cases, excessive dependency on consuming or prosuming of digital goods can affect individual wellbeing and quality of life, lower academic achievement and develop problematic behaviour (Gerhart 2017; Huang 2017; Kuss 2017; Liu, Kirschner, and Karpinski 2017; Marino et al. 2018). Hence the ability to measure and quantify the use behaviour in social media is necessary to understand how these behaviours can be altered. To model dependency behaviour, Kwon et al. (2016) used a panel dataset from Facebook and Anipang capturing information on time spent using the apps to investigate the digital vulnerabilities driven by excessive dependency on mobile social apps. They found that a form of rational addiction exists in social media consumption and concluded that users will rationally adjust consumption to optimal utility in a forward-looking way. Gan et al. (2009) combined social psychology and economic theory to investigate the formation of habits and their influence on individuals' participation behaviour in online technical support communities. They found that above a certain threshold, an individual's participation in online communities grows stronger and becomes self-reinforcing, resulting in habit formation. Kwon et al. (2014) conducted a theoretical and empirical study showing that mobile social app users' behaviour is rational and forward-looking, which is consistent with the rational addiction theory. They concluded both past and future consumption determine a user's current consumption level. Together these studies showed that social app use can be addictive and habitual, and demonstrated that in the case of addicts, they are rational in that they recognise the future consequences of their current consumption, motivating sensible consumption in order to arrive at a maximum lifetime utility choice (Kwon et al. 2016). These characteristics, when applied to political engagement in social media which differs in value propositions, utilities and intents, provide the underlying motivation for reciprocal interaction that intends to build social capital. Thus unlike other forms of digital goods, habitual use of social media for political engagement is positively linked to the degree of social capital building (Pratyush, Wei, and Abhijit 2015; Syed Ali, Wasim, and Amna 2016). Interestingly, no studies have demonstrated habit formation in social media usage for developing political engagement and building social capital. Hence, the current study intends to further our understanding of habitual consumption in such a context.

2.3. Social capital and political engagement

Social capital is a powerful concept that is applied in a wide range of academic disciplines including economics,

sociology, political science, knowledge management and information systems (Ali-Hassan 2013; Engbers, Thompson, and Slaper 2017; Kwon and Adler 2014). However due to its complexity, not only is there no agreed-upon definition that captures the entire spectrum of social capital, it is also a difficult concept to operationalise and measure precisely (Weiler and Hinz 2018). Lin (1999) defines social capital as the resources embedded in one's social networks that can be accessed or mobilised through connection to the network. Adler and Kwon (2002) and Kwon and Adler (2014) define social capital as the goodwill that is created by the strength of social relations and that can be mobilised to facilitate action for both individual and collective actors. Fukuyama (2001) defines social capital as an instantiated informal norm that promotes cooperation between individuals. What these definitions share are the social network and the interactions between individuals, and between individuals and groups in the network. These interactions are manifested by reciprocity, trust, norms and cooperation to enable the mobilisation of tangible and intangible collective assets and resources. To gain access to these assets and resources, individuals need to invest in social relationships, have the motivation to contribute and the requisite ability in order to generate social capital for any potential instrumental or expressive actions that would accumulate and reinforce each other (Kwon and Adler 2014; Lin 1999, 2008, 2017). The investment of building social relationship in a social network is a form of consumption and the different types of social capital returns such as economic, political, social and cultural gains are the drivers of consumption utilities.

Social media, political engagement and social capital are closely interrelated (Choi and Shin 2017). In general, there is a positive relationship between social media use and political engagement and the development of social capital. First social media comprise activities such as engagement with news, involvement in political discussions and participation in online or offline mobilisation efforts that can connect people to political activities, then through individual political engagement, reciprocity, trust, norms and cooperation are generated to form social capital (de Zúñiga, Barnidge, and Scherman 2017; Naseri 2017). However, not all social media have equal political significance to generate social capital, as this is contingent on the types of platforms and the types of activities (Kahne and Bowyer 2018). In a recent study Kahne and Bowyer (2018) found that friendship driven social media activity encouraged subsequent interaction in participatory politics, whereas interest driven social media activity encouraged offline political activity. A study

by Antheunis, Vanden Abeele, and Kanters (2015) on the association of Facebook and social capital and the mechanisms of users' interaction in social media concluded that directed communication and public broadcasting reinforce bonding and bridging social capital. Bridging social capital is generated inclusively when social networks are linked by individuals with diverse resources and capabilities while bonding social capital is exclusively created when strong family ties and close friends affectively support each other (Putnam 2000; Williams 2006). Hence, political consumption of social media is meant to derive the utilities of social capital and social capital is built upon the performance and resources of individuals and collectives in networks of social relationships (Bourdieu 2011; Coleman 1990; Lin 2002). For individuals, social capital enables them to access and mobilise resources embedded in social networks to realise personal goals, such as job, status or reputation (Burt 2000; Flap 1991; Paxton 2002). For collectives, social capital enables participation in groups and associations, enhancing collective goals such as participatory democracy or social development (Fishburn 1968; Kai and Brown 2000; Mcclenaghan 2000; Paxton 2002). In essence, social capital helps to foster a stronger civil society and effective political system by encouraging associative behaviour and makes political administration more responsive. Prior research on social media use showed it had a positive relationship with social capital as well as online and offline political participation (Valenzuela 2013; Zúñiga, Jung, and Valenzuela 2012). This is because social media facilitates political participation by reducing the time and economic barriers to participation and enabling interconnected political ties that expose users to more mobilising political information and afford the possibility of engaging in a range of participatory behaviours (Valenzuela 2013; Zúñiga, Barnidge, and Scherman 2017). Consequently, through social media interaction, individuals who communicate with each another frequently are more likely to participate in civic activities and stand a better chance of gaining and building interpersonal trust. Conversely, individuals who interact less often with others will not have the requisite skills and motivation to participate in community activities (Putnam 2000). Accordingly, the social connections formed through social media are particularly effective at drawing social media users into building social capital. Thus Putnam (2000) concluded that social capital encompasses both the network and its extended effect. Social capital consists of the social network and the associated norms of trust and reciprocity which need to be measured in order to quantify their strength and effectiveness. Currently there is no consensus on how

to measure social capital (Engbers, Thompson, and Slaper 2017; Weiler and Hinz 2018). One approach uses name generators to construct ego-centered social networks and to measure the level of social capital (Lin 1999). Other approach measures trust and cohesion between individuals in the social network (Glanville and Story 2018). An approach suggested by OEDC to measure social capital is to measure four conceptual components (Scrivens and Smith 2013). The personal relationships measure the structure of people's networks, the social network support measures the nature of people's personal relationships, civic engagement measures the activities and networks through which people contribute to civic and community life, and trust and cooperative norms measure shared values that underpin societal functioning. However most researchers use the self-reporting internet social capital scale (ISCS) (Williams 2006) to measure trust and reciprocity in social capital. The key characteristic of ISCS is measuring trust through the perceived bonding of online social capital and measuring reciprocity through the perceived bridging of online social capital. It is imperative that political engagement through social media must be effectively consumed by all participants to develop social capital. A recent study identified a current weakness of measuring social capital as the inability to consider temporality and causality using cross-sectional designs (Weiler and Hinz 2018). Thus in this study, we propose to measure political engagement by analysing habit formation and social capital reciprocity with auto-regressive time series data to address concerns of temporality and causality. In line with the concept of social capital reciprocity and the importance of building social capital, this study will measure reciprocity through social media responses of 'likes', 'shares' and 'comments'.

3. Theory and empirical model

3.1. Habit formation

Habit formation is addressed in a special kind of utility theory. 'It is concerned with people's preferences and judgments of preferability, worth, value, goodness or any of a number of similar concepts' (Fishburn 1968). Utility theory transforms people's choices and decisions into a numerical representation in a useful way (Fishburn 1968). If the current consumption is affected by habit, the utility function cannot be separable in time under such a condition. That is to say, the utility of current consumption is influenced by past consumption levels, and given the current level of consumption, the larger the past consumption the smaller the current

utility. Equation (1) describes the utility function.

$$u_t = uc_t - \gamma H_t \qquad (1)$$

Where u_t denotes the utility function, c_t denotes consumption, H_t refers to the habit stock where $H_t = 1 - \theta H_{t-1} + c_{t-1}$ and $0 < \theta < 1$. If $\theta = 1$, then $u_t = uc_t - \gamma c_{t-1}$ where $0 < \gamma < 1$ denotes the habit formation paramete. The utility function implies that the utility of the current consumption is related to the previous consumption. A higher value of γ indicates a smaller utility derives from current consumption to consumer.

Alessie and Lusardi (1997) derived a closed-form solution for the habit consumption and saving models under certainty equivalence. They extended the permanent income hypothesis of Caballero (1990) who considered precautionary saving preferences. According to Caballero (1990), utility function is exponential with θ the coefficient of risk aversion as shown in Equation (2):

$$u(c_t) = -\left(\frac{1}{\theta}\right)e^{-\theta c_t} \qquad (2)$$

The net consumption is defined as follows,

$$c_\tau^* = c_\tau - \gamma c_{\tau-t} \qquad (3)$$

Next, the objective function is to maximise the consumer's utility function (Equation (4)),

$$\max E_t \sum_{\tau=t}^{\infty}(1+\rho)^{t-\tau}u_\tau(c_\tau^*) \qquad (4)$$

Subject to an intertemporal budget constraint as shown in Equation (5a):

$$\sum_{\tau=t}^{\infty}(1+r)^{t-\tau}c_\tau = (1+r)A_{t-1} + \sum_{\tau=t}^{\infty}(1+r)^{\tau-t}y_\tau \quad (5a)$$

where E_t is the expectations operator, A_{t-1} is given and denotes non-human wealth, y_τ is also given and denotes non-capital income. r is the real interest rate, ρ is the rate of time preference, which is usually assumed to be fixed and r=ρ.

Next using c_τ^* instead of c_τ in Equation (5a), the intertemporal budget constraint becomes:

$$\sum_{\tau=t}^{\infty}(1+r)^{t-\tau}c_\tau^* = -rc_{t-1} + \frac{(1+r-\gamma)}{(1+r)}$$

$$\left((1+r)A_{t-1} + \sum_{\tau=t}^{\infty}(1+r)^{\tau-t}y_\tau\right) (5b)$$

According to Campbell (1986), we can assume that the intertemporal utility function is quadratic, and then we can derive a closed-form solution for consumption as

follow.

$$c_t = \frac{\gamma}{1+r}c_{t-1} + \left(1 - \frac{\gamma}{1+r}\right)Y_{pt} \qquad (6a)$$

Where

$$Y_{pt} = \frac{\gamma}{1+r}\left((1+r)A_{t-1} + \sum_{\tau=t}^{\infty}(1+r)^{t-\tau}E_t y_\tau\right) \quad (6b)$$

and Y_{pt} denotes permanent income derives from the annuity value of lifetime resources. From Equation (6a), we notice that current consumption is mainly a weighted average of past consumption and permanent income. For a stronger habit, stronger weight will be put on past consumption. When $\gamma = 0$, there is no habit formation.

3.2. Empirical model of social media consumption

In economic theory, the final purchase of goods and services by individuals constitutes consumption. Hence c_t denotes the consumption of a consumer at time t. However, in social media consumption, we adopt the number of instances of posting to measure digital good consumption. According to the habit formation consumption theory, we transform the basic model in 6(a) to describe the habit formation in social media consumption as shown in Equation (7).

$$lnC_t = \alpha_1 + \alpha_2 lnC_{t-1} + \varepsilon_t \qquad (7)$$

Where, C_t denotes social media consumption at time t and C_{t-1} is the one-period lag consumption. α_1 denotes the intercept of Equation (7). α_2 denotes the coefficient or strength of measured habit formation. ε_t is the residual term. If $\alpha_2 > 0$, then habit formation in social media consumption exists.

When politicians express their political positions, publicise their attitudes, or interpret current affairs by posting on their Facebook page, citizens can react to the posting by sharing the content, clicking on 'like' or commenting on content to express their views. This study uses the data from the politicians' posts to investigate whether 'likes', 'shares' and 'comments' exhibit habit formation. The empirical models are shown in Equations (8) to (10).

$$lnLikes_t = \beta_1 + \beta_2 lnLikes_{t-1} + \varepsilon_t \qquad (8)$$

$$lnShares_t = \gamma_1 + \gamma_2 lnShares_{t-1} + \varepsilon_t \qquad (9)$$

$$lnComments_t = \delta_1 + \delta_2 lnComments_{t-1} + \varepsilon_t \qquad (10)$$

Where, $Likes_t$ refers to the total number of 'likes' for each post. $Shares_t$ and $Comments_t$ refer to the total number of shares and comments for each post respectively.

Similarly, when $\beta_2 > 0$, $\gamma_2 > 0$ or $\delta_2 > 0$, 'likes', 'shares' and 'comments' exhibit habit formation. That is to say, citizens develop the habit of responding to the posts which is the measure of social capital reciprocity.

4. Methodology

4.1. Data collection

In this study, data were collected from the Facebook pages of 12 politicians in Singapore's Cabinet. Using multiple members from the same political party allowed us to examine whether any homogenous behavioural features exist within the same group. Data from April 2012 to June 2016 for each politician were extracted through a power query into Excel. The dataset contains a total of 15,281 postings and each posting includes data attributes such as 'post id', 'message', 'type', 'created time' and 'update time'. Because Ong Ye Kung started to post continuously from October 2, 2014, his posting data were collected from October 2014 onward. Subsequently, we used 'post id' to crawl 'shares', 'likes' and 'comments data' using Facebook Graph API. Finally, we removed records with missing values and aggregated the data by week. Overall data descriptions for each politician are shown in Table 1.

4.2. Variable descriptions

In Equation (7), the explained variable C_t. notes the total number of posts for a politician during week t. The explanatory variable C_{t-1}. the one-period lag of social media consumption which denotes the total number of posts at week t-1. We used aggregated weekly data to minimise daily fluctuation to achieve a more stable observation. To achieve statistical significance, we followed the approach of Jia, Zhang, and Li (2011) and Gan et al. (2009) by applying the logarithm to the social media consumption variables. A detailed summary of all the variables is provided in Table 2.

Table 2. Variable Descriptions.

Variable		Variable Name	Variable Description
Explained Variable	C_t.	Social Media Consumption	The number of posts for a politician in week t
	$Likes_t$.	Likes Number	The number of likes for each post in week t
	$Shares_t$.	Shares Number	The number of shares for each post in week t
	$Comments_t$.	Comments Number	The number of comments for each post in week t
Explanatory Variable	C_{t-1}.	Lagged Social Media Consumption	The number of posts for a politician in week t-1
	$Likes_{t-1}$.	Lagged Likes Number	The number of likes for each post in week t-1
	$Shares_{t-1}$.	Lagged Shares Number	The number of shares for each post in week t-1
	$Comments_{t-1}$.	Lagged Comments Number	The number of comments for each post in week t-1

5. Results

5.1. Descriptive statistics

We extracted time series data for the politicians' posts from April 2012 to June 2016 and aggregated the dataset into weekly samples which produced approximately 200 weekly records. Table 3 provides the descriptive statistical analysis for each politician. Taking the data of Lee

Table 1. Sample data details for each politician.

Name	Facebook Username	Designation	Total Posts	Total Number of Weeks	Start Time	End Time
Lee Hsien Loong	leehsienloong	Prime Minister	1974	225	Apr 2012	Jun 2016
Teo Chee Hean	MrTeoCheeHean	Deputy Prime Minister Coordinating Minister for National Security	1815	222	Apr 2012	Jun 2016
Khaw Boon Wan	ministerkhawboonwan	Coordinating Minister for Infrastructure Minister for Transport	1013	219	Apr 2012	Jun 2016
Yaacob Ibrahim	yaacobibrahim	Minister for Communications and Information and Minister-in-charge of Muslim Affairs	1321	212	Apr 2012	Jun 2016
Ng Eng Hen	ngenghen	Minister for Defense	886	125	Apr 2012	Jun 2016
Vivian Balakrishnan	Vivian.Balakrishnan.Sg	Minister for Foreign Affairs	1266	224	Apr 2012	Jun 2016
K Shanmugam	k.shanmusgam.page	Minister for Home Affairs Minister for Law	1201	220	Apr 2012	Jun 2016
Heng Swee Keat	hengsweekeat	Minister for Finance	680	183	Aug 2012	Jun 2016
Lawrence Wong	LawrenceWongST	Minister for National Development Second Minister for Finance	1789	226	Apr 2012	Jun 2016
Grace Fu Hai Yien	gracefu.hy	Minister for Culture, Community and Youth Leader of the House	1621	221	Apr 2012	Jun 2016
Chan Chun Sing	ChanChunSing.SG	Minister, Prime Minister's Office Government Whip	1127	212	Apr 2012	Jun 2016
Ong Ye Kung	ongyekung	Minister for Education Second Minister for Defense	588	116	Oct 2014	Jun 2016

Table 3. Summary Statistics.

Variable	Sample Size	Min	Q1	Median	Mean	Q3	Max	Sd
Lee Hsien Loong (S1)								
lnC_t.	5	0.00	1.79	2.08	2.06	2.30	3.58	0.48
$lnLikes_t$.	5	8.02	9.74	10.79	10.53	11.22	13.97	1.05
$lnShares_t$.	5	0.00	6.56	7.67	7.51	8.35	12.28	1.33
$lnComments_t$.	5	5.40	6.71	7.42	7.33	7.78	10.88	0.81
Teo Chee Hean (S2)								
lnC_t.	2	0.00	1.61	2.08	1.96	2.40	3.14	0.58
$lnLikes_t$.	2	4.16	5.91	6.78	6.91	7.95	9.52	1.28
$lnShares_t$.	2	0.00	2.71	3.69	3.66	4.84	7.18	1.47
$lnComments_t$.	2	0.00	2.71	3.33	3.41	4.18	6.48	1.07
Khaw Boon Wan (S3)								
lnC_t.	9	0.00	0.69	1.39	1.33	1.79	2.77	0.68
$lnLikes_t$.	9	1.79	4.49	5.11	5.13	5.79	8.79	1.11
$lnShares_t$.	9	0.00	2.71	3.43	3.30	3.97	7.55	1.35
$lnComments_t$.	9	0.00	2.64	3.37	3.30	4.19	6.83	1.24
Yaacob Ibrahim (S4)								
lnC_t.	2	0.00	1.10	1.70	1.58	2.20	3.05	0.77
$lnLikes_t$.	2	0.00	0.00	5.06	3.73	6.51	7.87	3.05
$lnShares_t$.	2	0.00	1.10	2.53	2.38	3.58	5.98	1.61
$lnComments_t$.	2	0.00	0.69	2.30	2.16	3.47	6.14	1.56
Ng Eng Hen (S5)								
lnC_t.	5	0.00	1.79	1.95	1.76	2.20	2.89	0.76
$lnLikes_t$.	5	0.00	6.77	8.04	7.12	8.75	11.38	2.7
$lnShares_t$.	5	0.00	4.90	6.09	5.35	6.81	10.25	2.48
$lnComments_t$.	5	0.00	3.43	4.56	4.07	5.38	7.45	1.96
Vivian Balakrishnan (S6)								
lnC_t.	4	0.00	1.10	1.61	1.51	2.08	3.05	0.72
$lnLikes_t$.	4	0.00	5.20	6.23	6.44	8.11	10.49	1.89
$lnShares_t$.	4	0.00	2.57	3.82	3.80	5.14	7.99	1.8
$lnComments_t$.	4	0.00	1.95	3.20	3.14	4.47	7.49	1.79
K Shanmugam (S7)								
lnC_t.	0	0.00	1.31	1.61	1.54	1.95	2.83	0.62
$lnLikes_t$.	0	0.00	5.92	7.33	7.03	8.45	10.89	1.83
$lnShares_t$.	0	0.69	3.62	4.84	4.80	5.95	9.25	1.61
$lnComments_t$.	0	0.00	3.20	4.37	4.24	5.48	7.66	1.62
Heng Swee Keat (S8)								
lnC_t.	3	0.00	0.69	1.10	1.09	1.61	2.83	0.71
$lnLikes_t$.	3	2.20	5.24	5.95	5.99	6.60	10.18	1.26
$lnShares_t$.	3	0.00	2.94	3.99	3.93	4.86	9.22	1.66
$lnComments_t$.	3	0.00	3.05	3.64	3.62	4.17	7.77	1.15
Lawrence Wong (S9)								
lnC_t.	6	0.00	1.79	2.08	1.99	2.20	3.22	0.41
$lnLikes_t$.	6	4.56	5.92	6.71	6.79	7.61	9.45	1.06
$lnShares_t$.	6	1.10	3.44	4.10	4.21	5.09	8.48	1.19
$lnComments_t$.	6	1.79	3.22	3.87	4.01	4.71	7.03	0.93
Grace Fu Hai Yien (S10)								
lnC_t.	1	0.00	1.39	1.95	1.79	2.30	3.22	0.69
$lnLikes_t$.	1	1.61	4.99	6.00	6.00	7.41	9.15	1.52
$lnShares_t$.	1	0.00	2.40	3.56	3.43	4.69	7.24	1.55
$lnComments_t$.	1	0.00	1.61	2.83	2.90	4.28	6.89	1.62
Chan Chun Sing (S11)								
lnC_t.	2	0.00	1.10	1.61	1.45	1.95	3.37	0.71
$lnLikes_t$.	2	1.95	5.36	6.09	6.03	6.84	9.75	1.23
$lnShares_t$.	2	0.00	2.62	3.56	3.49	4.44	7.23	1.33
$lnComments_t$.	2	0.00	3.00	3.69	3.53	4.31	6.91	1.18
Ong Ye Kung (S12)								
lnC_t.	6	0.00	1.39	1.61	1.52	1.79	3.00	0.47
$lnLikes_t$.	6	4.38	6.25	7.04	6.91	7.60	8.89	0.89
$lnShares_t$.	6	1.39	3.33	4.41	4.16	5.00	6.59	1.14
$lnComments_t$.	6	1.61	3.03	3.51	3.62	4.24	6.14	0.9

Hsien Loong for example, the average lnC_t. all samples is 2.06, which implies that this politician published approximately 8 posts every week on Facebook. The means of $lnLikes_t$. $lnShares_t$ and $lnComments_t$. are 10.53, 7.67 and 7.42, respectively. Moreover there is a difference among these variables. From Table 3, the means of $lnShares_t$. are similar to those of $lnComments_t$. and they are quite different from the means of $lnLikes_t$. for all politicians. Perhaps it is more convenient for citizens to 'like' whereas 'shares' or 'comments' take more effort.

In Table 3, 'N' denotes sample size. 'Min' and 'Max' refer to the minimum and the maximum value in the sample, respectively. 'Q1' and 'Q3' are the superior and

inferior quartiles. 'Mean' denotes the mean of the samples and 'Median' is the median value. 'Sd' is the standard deviation of the samples.

5.2 Habit formation model

This study uses R programming language from R-studio software for empirical analysis. Table 4 provides the estimation results based on regression analysis of the base model as indicated in Equation (7). As shown in Table 4, all the estimated coefficients of lnC_{t-1}. e greater than 0 and are significant at the 1% level. The more the politicians posted in the past, the more their past postings influence the number of postings in the future. In other words, politicians form habits of social media consumption consistent with the economic theory. For example, the estimated coefficient of lnC_{t-1}. r Lee Hsien Loong is 0.305 and statistically significant at the 1% level with $p < 0.01$., which means the relationship between past and present social media consumption is a significantly positive.

Tables 5–7 report the estimated coefficients and significance of Equations (8) to (10) respectively. Table 5 shows the results for 'likes': all $lnLikes_{t-1}$. are positively related to $lnLikes_t$., which means 'likes' exhibit habit formation. For example, the estimated coefficient of Teo Chee Hean for $lnLikes_{t-1}$. is 0.853 and it is strongly significant at the 1% level. This shows that after posting, citizens develop the habit of liking his posts. Tables 6 and 7 show the estimation results for 'shares' and 'comments'. They show that all the estimated coefficients of $lnshares_{t-1}$. and $lnComments_{t-1}$. are positive and statistically significant, which suggest that the past 'shares' and 'comments' influence their current behaviour. Hence 'shares' and 'comments' exhibit habit formation. After politicians post, citizens can interact with politicians by sharing their content, clicking on 'like' or commenting on the content to express their views. Habit-forming

use of 'likes', 'shares' and 'comments' imply that citizens develop a habit of engaging with the politicians' posts.

5.3. Habit formation relationships

The empirical modelling has validated that when politicians exhibit habit formation, citizens or followers can also develop habits in their responses to posts. However, what is the relationship between politicians' and citizens' habit formation? When the habit formation parameters of politicians become larger, do citizens' parameters also increase? Currently there is no study investigating the relationship between politician and citizen habit formation parameters. However, several studies based on meta-analysis provide evidences to suggest there is a positive relationship between social media use and citizen engagement and political expression (Boulianne 2017; Skoric et al. 2016). Conversely, we would posit that there is a positive association between the habit formation parameters of politician and citizen. We extracted the habit formation parameters-- α_2, β_2, γ_2. and δ_2. explore RQ3. α_2. refers to the habit formation parameter for politicians as in Equation (7). β_2, γ_2 and δ_2. are respective habit formation parameters of 'likes', 'shares' and 'comments' for citizens as in Equations (8) to (10). We used Pearson correlation analysis to explore the relationships among α_2, β_2, γ_2 and δ_2. The correlation coefficients matrix is shown in Table 8. The correlation coefficients between α_2 and β_2, γ_2. and δ_2. are 0.651, 0.609 and 0.858, respectively and their p values are less than 0.05, which means that α_2. is strongly positively related to β_2, γ_2. and δ_2. the 5% level. We conclude that politicians' habit formation is positively related to the habit formation of citizens. From Table 8, we can also see some interesting results: for example, β_2. has a strong correlation with γ_2. and δ_2., which could indicate that citizens who like politicians' posts may share or comment on them at the same time. Since likes indicate a positive preference,

Table 4. Habit Formation of Posting by Politicians.

Variable		Sample Size	Intercept		lnC_{t-1}.		R^2
			Coefficients	Significance	Coefficients	Significance	
S1	Lee Hsien Loong	225	1.437	***	0.305	***	0.098
S2	Teo Chee Hean	222	1.168	***	0.403	***	0.159
S3	Khaw Boon Wan	219	0.928	***	0.300	***	0.086
S4	Yaacob Ibrahim	212	0.713	***	0.554	***	0.310
S5	Ng Eng Hen	125	0.434	***	0.761	***	0.603
S6	Vivian Balakrishnan	224	0.902	***	0.406	***	0.164
S7	K Shanmugam	220	1.354	***	0.118	***	0.009
S8	Heng Swee Keat	183	0.634	***	0.419	***	0.171
S9	Lawrence Wong	226	1.225	***	0.385	***	0.144
S10	Grace Fu Hai Yien	221	0.903	***	0.496	***	0.242
S11	Chan Chun Sing	212	0.945	***	0.355	***	0.124
S12	Ong Ye Kung	116	1.002	***	0.340	***	0.108

Note: One asterisk indicates significance at the 10% level; two indicate significance at the 5% level; three indicate significance at the 1% level.

Table 5. Habit Formation in 'Likes' by Citizens.

Variable		Sample Size	Intercept		$\ln Likes_{t-1}$.		R^2
			Coefficients	Significance	Coefficients	Significance	
S1	Lee Hsien Loong	225	2.293	***	0.783	***	0.616
S2	Teo Chee Hean	222	1.033	***	0.853	***	0.730
S3	Khaw Boon Wan	219	2.882	***	0.439	***	0.188
S4	Yaacob Ibrahim	212	0.169	*	0.962	***	0.930
S5	Ng Eng Hen	125	0.784	***	0.899	***	0.854
S6	Vivian Balakrishnan	224	1.877	***	0.714	***	0.533
S7	K Shanmugam	220	2.714	***	0.616	***	0.384
S8	Heng Swee Keat	183	4.454	***	0.26	***	0.060
S9	Lawrence Wong	226	1.008	***	0.853	***	0.730
S10	Grace Fu Hai Yien	221	1.333	***	0.78	***	0.604
S11	Chan Chun Sing	212	2.581	***	0.575	***	0.337
S12	Ong Ye Kung	116	2.081	***	0.701	***	0.495

Note: One asterisk indicates significance at the 10% level; two indicate significance at the 5% level; three indicate significance at the 1% level.

posts that receive many likes draw greater attention and are more likely to obtain more shares (Chang, Yu, and Lu 2015). The relationship manifests a strong social capital has been incubated and developed which may include bridging capital, capital recompense, interest sharing and exposition that contain calculated expectation on future social media engagement (Burke, Kraut, and Marlow 2011; Lee 2017).

6. Discussion

This study has shown that habit formation in Facebook does exist in the group of 12 Singapore politicians. Interestingly, habit strength measured by the regression coefficient shows that the majority of the coefficients are between 0.30 and 0.55. This may reflect the fact that in the samples, the majority of the politicians' Facebook habitual consumption behaviour is homogenous and comparable in the sense that their habits are formed through similar learned sequences of acts. They also respond automatically to similar environmental cues and engage in the same goal-triggered behaviour to establish social engagement and build social capital with fellow citizens (Triandis 1980). Two extreme cases were identified in the model. Sample S5 has the strongest

habit formation strength of 0.761 and weekly average postings of 5.8 and model $R^2 = 0.603$, while sample S7 has the weakest habit formation strength of 0.118 with an average of 4.6 weekly postings and model $R^2 = 0.009$. One can deduce from the habit formation model that both samples' posting habits are quite different, sample S7 is most likely to be posting at a fixed regular interval and least likely to be triggered by environmental cues in his posting as current postings only weakly depend on previous postings. Conversely, sample S5's postings are strongly tied to environmental cues in his responses to events and shocks such that his current weekly aggregate postings rely on past aggregate postings, according to habit formation theory. Events and shocks may be more informational and relevant to engage citizen. As a result, S5 appears to be more effective and desire in utilising social medial for political engagement to build bridging and reciprocity in social capital than S7 within the pool of participants. This observation is supported by a stronger shares habit formation coefficient which relates to bridging capital in S5 than S7. Previous studies suggest that two distinct characteristics are typical in habit formation. First, habit formation is a process of self-reinforcing in which past experience motivates individuals to develop

Table 6. Habit Formation in 'Shares' by Citizens.

Variable		Sample Size	Intercept		$\ln Shares_{t-1}$.		R^2
			Coefficients	Significance	Coefficients	Significance	
S1	Lee Hsien Loong	225	2.299	***	0.696	***	0.483
S2	Teo Chee Hean	222	0.932	***	0.749	***	0.562
S3	Khaw Boon Wan	219	2.06	***	0.378	***	0.139
S4	Yaacob Ibrahim	212	0.836	***	0.656	***	0.43
S5	Ng Eng Hen	125	1.017	***	0.82	***	0.694
S6	Vivian Balakrishnan	224	1.229	***	0.682	***	0.467
S7	K Shanmugam	220	2.082	***	0.569	***	0.326
S8	Heng Swee Keat	183	3.063	***	0.228	***	0.046
S9	Lawrence Wong	226	1.071	***	0.748	***	0.561
S10	Grace Fu Hai Yien	221	0.851	***	0.756	***	0.571
S11	Chan Chun Sing	212	1.601	***	0.544	***	0.293
S12	Ong Ye Kung	116	1.672	***	0.600	***	0.357

Note: One asterisk indicates significance at the 10% level; two indicate significance at the 5% level; three indicate significance at the 1% level.

Table 7. Habit Formation in 'Comments' by Citizens.

Variable		Sample Size	Intercept		InComments$_{t-1}$.		R^2
			Coefficients	Significance	Coefficients	Significance	
S1	Lee Hsien Loong	225	3.810	***	0.481	***	0.234
S2	Teo Chee Hean	222	1.540	***	0.549	***	0.298
S3	Khaw Boon Wan	219	2.144	***	0.347	***	0.118
S4	Yaacob Ibrahim	212	0.775	***	0.647	***	0.420
S5	Ng Eng Hen	125	0.598	***	0.863	***	0.768
S6	Vivian Balakrishnan	224	1.243	***	0.609	***	0.373
S7	K Shanmugam	220	2.864	***	0.328	***	0.106
S8	Heng Swee Keat	183	2.475	***	0.321	***	0.092
S9	Lawrence Wong	226	1.380	***	0.656	***	0.428
S10	Grace Fu Hai Yien	221	1.253	***	0.570	***	0.321
S11	Chan Chun Sing	212	2.389	***	0.328	***	0.108
S12	Ong Ye Kung	116	2.277	***	0.372	***	0.131

Note: One asterisk indicates significance at the 10% level; two indicate significance at the 5% level; three indicate significance at the 1% level.

their abilities and proficiencies to engage with activity that will enhance the current utility and experience (Moon and Sproull 2001). Second, for habitual and self-reinforcing behaviour to occur, feedback from the environment for the activated responses to be guided to conclusion is essential (Bargh and Ferguson 2000). Perhaps sample S7 has a stronger behavioural threshold such that feedback from Facebook followers had yet to critically trigger the reinforcing and goal-directed processes. In addition, there might be challenges in developing social capital through social media such as the inability to initial relevant conversation and stories, slow in response, work and time commitment (Brandtzæg et al. 2015; Burke, Kraut, and Marlow 2011).

Facebook social media consumption is a bilateral engagement process. While using Facebook, politicians receive feedback responses in the form of 'likes', 'shares' and 'comments'. From the politicians' perspective, this feedback provides an indication that followers and citizens are interested in their views and supporting their claims. According to Bargh and Ferguson (2000) feedback is essential to activate habitual responses which facilitate the development of social capital. In this study, we validated the same habit formation theory that all the different feedback mechanisms such as

Table 8. Sample Correlation Coefficients Matrix.

Variable		α_2	β_2	γ_2	δ_2
(1) α_2	Coefficients	1	0.651	0.609	0.858
	P Value		(0.030)	(0.047)	(0.001)
	Significance		**	**	***
(2) β_2	Coefficients	0.651	1	0.864	0.807
	P Value	(0.030)		(0.001)	(0.001)
	Significance	**		***	***
(3) γ_2	Coefficients	0.609	0.864	1	0.805
	P Value	(0.047)	(0.001)		(0.003)
	Significance	**	***		***
(4) δ_2	Coefficients	0.858	0.807	0.805	1
	P Value	(0.001)	(0.001)	(0.003)	
	Significance	***	***	***	

Note: One asterisk indicates significance at the 10% level; two indicate significance at the 5% level; three indicate significance at the 1% level.

"likes", "shares" and "comments" are habit forming as well. The average habit formation strength for "likes" is rather strong at 0.7, indicating the development of a strong bonding social capital between the politicians and their followers. Samples S4 and S5 have strong "likes" habit formation strength of 0.96 and 0.89 respectively which indicates strong and successful reciprocal and bonding social capital. Conversely, samples S8 and S3 have the weakest habit formation strength for "likes" of 0.26 and 0.43 respectively. This may indicate a not so successful bonding social capital. Perhaps their portfolios and their social media messages are not convincing or persuasive to their followers. For the habit formation strength of "shares", the average strength is 0.62, indicating a medium bridging social capital. The profiles of the habit formation strength for "shares" and "likes" are similar as sample S5 has the strongest habitual "shares" strength of 0.82. Both S8 and S3 have weak habitual "shares" strength of 0.22 and 0.37 respectively. Lower strength not only implies a lack of opportunity to build online bridging and bonding social capital, it may also imply the activities both online and offline do not meet the expectations of their followers and are likely to break existing social capital including trust if interventions are not implemented. Lastly the average habit formation strength for "comments" as expected has a low value of 0.51. This is because commenting requires greater effort on the part of the followers compared to shares and likes. While most politicians exhibited lower habit formation on "comments" from their followers and citizens, surprisingly sample S5's habit formation on "comments" of 0.863 remains as strong as those for "shares" and "likes". One possible explanation is the social capital of strong ties and content relevance that had already been established between sample S5 and his followers and citizens as reflected in all the strong habit formation parameters.

The relationship between politician habit formation consumption strength and the reciprocal habit

formation consumption strength is positively correlated. The more habit formation consumption by the politician (representing a more committed politician), the more the reciprocity of social capital. Hence, all the results put together provide some evidence that in order to build more successful social capital, politicians whose habit formation parameters are much lower than the mean require immediate intervention plans.

An engagement matrix is an important parameter in social media for measuring reciprocity of social capital. Basalingappa, Subhas, and Tapariya (2016) chose the number of likes on Facebook as the metric of engagement when they explored how users reacted to posts. The reason for adopting the quantity of "likes" as the metric of engagement is because it was easiest to achieve, by hitting the 'like' button. Ryan and Xenos (2011) investigated the influence of Facebook fan page characteristics, using ER, $[(PTAT - new\ fans)/Total\ Fans]*100$, as a metric to measure the engagement of fans. *PTAT*. dnotes 'People Talking About This' which measures the number of users who created a story about a page within a seven-day period. In the existing literature, most studies adopt the number or ratio of 'likes', 'shares' or 'comments' to measure engagement. While these parameters may be suitable for measuring engagement, they do not take into account shocking events and the persistent nature of behaviour. The results of this study have shown that both politicians and citizens exhibit habit formation in Facebook consumption and their habit-forming parameters are positively related. Therefore our findings can provide a more dynamic and extended Facebook habitual engagement matrix. For instance, instead of using the number of shares, likes and comments to measure engagement directly we recommend the average strength of habit formation consumption of 'likes', 'shares' and 'comments' to be used for Facebook engagement. Table 9 provides a comparison between our habitual engagement calculation and a typical engagement calculation from FanPageKama. It shows the similar results of both methods with a correlation of 0.71.

Our study has tested habit formation in consumption of Facebook, finding that it exists among this group of politicians and their followers based upon the economic theory of consumption. However, at this stage our results are based on politicians' Facebook pages. For non-political contexts such as brands, religions or celebrities and other types of social media platforms such as Twitter, Instagram or LinkedIn, the methodology described in this paper can be adopted for future investigation to draw a more conclusive comparison. While previous studies have shown that political significance depends on the affordances of the social media platforms and

Table 9. Comparison of engagement calculations.

Sample	Habitual Engagement	FanPageKama Engagement
Lee Hsien Loong	0.65	0.63%
Teo Chee Hean	0.72	0.76%
Khaw Boon Wan	0.39	0.25%
Yaacob Ibrahim	0.76	0.98%
Ng Eng He	0.86	0.98%
Vivian Balakrishnan	0.67	0.39%
K Shanmugam	0.50	0.55%
Heng Swee Keat	0.27	0.25%
Lawrence Wong	0.75	0.41%
Grace Fu Hai Yien	0.70	1.02%
Chan Chun Sing	0.48	0.29%
Ong Ye Kung	0.56	0.81%

intended activities (Kahne and Bowyer 2018; Stier et al. 2018), we expect a certain degree of similarity in the consumption habit formation because the underlying drivers of consumption motivation and utility remain unchanged. A limitation in this study is that we are unable to attribute the habit formation behaviour directly to the individual politician because we cannot verify all the postings were posted solely by the politician rather than a team of administrators. Nevertheless attributing habit formation to a Facebook page is still valid. For the habit formation in the comment response, we cannot attribute it to either positive or negative comments as the data were aggregated. Future studies can dissect the comment response and compare the strength of habit formation between positive and negative comments. Finally, while not part of the research question of this study, the relationship between politicians' online consumption habits and citizens' offline political support such as voting in general elections is worthy of attention but cannot be determined with the present data set. However, when other forms of open data sets such as voting participation rates, percentages of supporting votes, and demographic information become available, it is then possible to infer these relationships.

7. Conclusions

This paper contributes further to our understanding of the interrelationship between social media consumption, political engagement and social capital. Firstly, this paper introduces the theory of habit formation consumption from the economics discipline and extends its formulation and analysis to the digital world of social media consumption. By adapting the economic theory, it was proven that habit formation behaviour can exist beyond the economics of real good consumption and is equally valid in the digital world of social media consumption. Secondly, this paper demonstrates that the intensity with which politicians engage and interact with their citizens is determined by their past consumption and

motivated by consumption utilities. A generalisable coefficient that measures and encompasses the habit formation behaviour was computed with all the coefficients in the samples having a positive value and significant at the 1% level, consistent with the economic consumption theory. The results indicate that politicians' current posting behaviour is consistent with higher levels of past social media consumption and likely to respond to environmental shocks such as new policy announcements, breaking news or crisis events according to habit formation theory. The more a politician posted in the past, the more her or his past posting experience influences his or her aggregate present postings. Thirdly, this paper introduces a new method of measuring reciprocity in social capital, eliminating the weakness of temporality and causality in the self-reporting scale and other aggregation methods. By adopting the same habit consumption formation formulation, a generalisable parameter measuring reciprocity in social media through the processing of separate auto-regressive time series of 'likes', 'shares' and 'comments' generates parameters that are positive and statistically significant. These positive engagement parameters which measure reciprocity imply a strong bonding and bridging relationship exists between the politicians and their followers. However different habit formation strengths between politicians and followers provide the evidence that social capital effects are asymmetrical (de Zúñiga, Barnidge, and Scherman 2017). In addition, correlation analysis produces coefficients ranging from 0.6 to 0.85 showing that politicians' habit-forming is positively associated with the habit formation of citizens and followers, affirming the existence of a strong bidirectional reciprocity in social capital. In sum, the social media habit formation coefficients support effective generation of social capital among this group of politicians. Fourthly, this paper provides a new and consistent methodology applying the habit-forming parameters as a new index to measure 'habitual engagement' in social media and to evaluate the sustainability and continuity of social capital building over different event periods and among different social media platforms for different activities. Lastly, this novel interdisciplinary study further provides researchers with fresh thinking for uncovering wide-ranging new and exciting future research. For instance, while 'comments' have been shown to be habit-forming it would be interesting to know whether any differences exist between positive and negative comments. In other words, does sentiment affect habit formation? Since politicians' habit formation strength is positively correlated with the habit formation strength of 'likes', 'shares' and 'comments', how can we derive a unified model that encompasses these relationships while eliminating collinearity constraints?

Disclosure statement

No potential conflict of interest was reported by the authors.

Funding

References

Adler, P. S., and S.-W. Kwon. 2002. "Social Capital: Prospects for a new Concept." *Academy of Management Review* 27 (1): 17–40.

Ahmed, S., and M. M. Skoric. 2014. "*My Name is Khan: the use of Twitter in the Campaign for 2013 Pakistan General Election*." Paper presented at the system sciences (HICSS), 2014 47th Hawaii International Conference on.

Alessie, R., and A. Lusardi. 1997. "Consumption, Saving and Habit Formation." *Economics Letters* 55 (1): 103–108.

Alhabash, S., Y.-h. Chiang, and K. Huang. 2014. "MAM & U&G in Taiwan: Differences in the Uses and Gratifications of Facebook as a Function of Motivational Reactivity." *Computers in Human Behavior* 35: 423–430. doi:10.1016/j.chb.2014.03.033.

Ali-Hassan, H. 2013. "Social Capital in Management Information Systems Literature." *Journal of Information Technology Research (JITR)* 6 (4): 1–17.

Alvarez-Cuadrado, F., G. Monteiro, and S. J. Turnovsky. 2004. "Habit Formation, Catching Up with the Joneses, and Economic Growth." *Journal of Economic Growth* 9 (1): 47–80.

Antheunis, M. L., M. M. Vanden Abeele, and S. Kanters. 2015. "The Impact of Facebook use on Micro-Level Social Capital: A Synthesis." *Societies* 5 (2): 399–419.

Bargh, J. A., and M. J. Ferguson. 2000. "Beyond Behaviorism: on the Automaticity of Higher Mental Processes." *Psychological Bulletin* 126 (6): 925–945.

Basalingappa, A., M. Subhas, and R. Tapariya. 2016. "Understanding Likes on Facebook: An Exploratory Study." *Online Journal of Communication and Media Technologies* 6 (3): 234–249.

Becker, G. S., and K. M. Murphy. 1988. "A Theory of Rational Addiction." *Journal of Political Economy, 96* 96 (4): 675–700.

Bhattacharjee, S., R. D. Gopal, J. R. Marsden, and R. Sankaranarayanan. 2011. "Digital Goods and Markets: Emerging Issues and Challenges." *ACM Trans. Manage. Inf. Syst.* 2 (2): 1–14. doi:10.1145/1985347.1985349.

Boulianne, S. 2017. "Revolution in the Making? Social Media Effects Across the Globe." *Information, Communication & Society* 20 (1): 1–16. doi:10.1080/1369118X.2017.1353641.

Bourdieu, P. 2011. "The Forms of Capital.(1986)." *Cultural Theory: An Anthology* 1: 81–93.

boyd, d. m., and N. B. Ellison. 2007. "Social Network Sites: Definition, History, and Scholarship." *Journal of*

Computer-Mediated Communication 13 (1): 210–230. doi:10.1111/j.1083-6101.2007.00393.x.

Brandtzæg, P. B., I. M. Haugstveit, M. Lüders, and A. Følstad. 2015. *Participation Barriers to Youth Civic Engagement in Social Media*. Paper presented at the ICWSM.

Burke, M., R. Kraut, and C. Marlow. 2011. *Social Capital on Facebook: Differentiating Uses and Users*.

Burt, R. S. 2000. "The Network Structure Of Social Capital." *Research in Organizational Behavior* 22 (00): 345–423.

Caballero, R. J. 1990. "Consumption Puzzles and Precautionary Savings." *Journal of Monetary Economics* 25 (1): 113–136.

Campbell, J. Y. 1986. "Does Saving Anticipate Declining Labor Income? An Alternative Test of the Permanent Income Hypothesis." *Econometrica* 55 (6): 1249–1273.

Carroll, C. D., J. Overland, and D. N. Weil. 1995. "Saving and Growth with Habit Formation." *Social Science Electronic Publishing* 90 (3): 341–355.

Chang, Y.-T., H. Yu, and H.-P. Lu. 2015. "Persuasive Messages, Popularity Cohesion, and Message Diffusion in Social Media Marketing." *Journal of Business Research* 68 (4): 777–782.

Choi, D.-H., and D.-H. Shin. 2017. "A Dialectic Perspective on the Interactive Relationship Between Social Media and Civic Participation: the Moderating Role of Social Capital." *Information, Communication & Society* 20 (2): 151–166.

Coleman, J. 1990. *Foundations of Social Theory. Cambridge*. Paper presented at the International Symposium on Mobile Agents.

de Zúñiga, H. G., M. Barnidge, and A. Scherman. 2017. "Social Media Social Capital, Offline Social Capital, and Citizenship: Exploring Asymmetrical Social Capital Effects." *Political Communication* 34 (1): 44–68. doi:10.1080/10584609.2016.1227000.

Duesenberry, J. 1949. *Income, Saving, and the Theory of Consumer Behavior*. Cambridge, MA: Harvard University Press.

Engbers, T. A., M. F. Thompson, and T. F. Slaper. 2017. "Theory and Measurement in Social Capital Research." *Social Indicators Research* 132 (2): 537–558.

Fishburn, P. C. 1968. "Utility Theory." *Management Science* 14 (5): 335–378.

Flap, H. D. 1991. "Social Capital in the Reproduction of Inequality, a Review." *Blood* 115 (21): 4162–4167.

Fukuyama, F. 2001. "Social Capital, Civil Society and Development." *Third World Quarterly* 22 (1): 7–20. doi:10.1080/713701144.

Gan, L., B. Gu, S. Jarvenpaa, and G. Yang. 2009. Habit formation in online communities. *ICIs 2009 Proceedings*, 189.

Gerhart, N. 2017. "TECHNOLOGY ADDICTION: HOW SOCIAL NETWORK SITES IMPACT OUR LIVES." *Informing Science* 20: 179–194. doi:10.28945/3851.

Glanville, J. L., and W. T. Story. 2018. "Social Capital and Self-Rated Health: Clarifying the Role of Trust." *Social Science Research* 71: 98–108. doi:10.1016/j.ssresearch.2018.01.002.

Greiner, A. 2018. "Optimal Consumption of Polluting and non-Polluting Goods: The Role of Routines." *Aestimatio* 15 (16): 2–25.

Harris, M. C., and L. M. Kessler. 2018. Habit Formation and Persistence in Health Behaviors: Evidence from Stationary Exercise.

Havranek, T., M. Rusnak, and A. Sokolova. 2017. "Habit Formation in Consumption: A Meta-Analysis." *European Economic Review* 95: 142–167. doi:10.1016/j.euroecorev.2017.03.009.

Hsiao, C.-H., J.-J. Chang, and K.-Y. Tang. 2016. "Exploring the Influential Factors in Continuance Usage of Mobile Social Apps: Satisfaction, Habit, and Customer Value Perspectives." *Telematics and Informatics* 33 (2): 342–355. doi:10.1016/j.tele.2015.08.014.

Hu, T., T. F. Stafford, W. J. Kettinger, X. P. Zhang, and H. Dai. 2018. "Formation and Effect of Social Media Usage Habit." *Journal of Computer Information Systems* 58 (4): 334–343.

Huang, C. 2017. "Time Spent on Social Network Sites and Psychological Well-Being: A Meta-Analysis." *Cyberpsychology, Behavior, and Social Networking* 20 (6): 346–354.

Huang, M.-H., C.-H. Su, R. Han, and M. Weatherall. 2017. "How Does Rising Internet Usage Affect Political Participation in East Asia? Explaining Divergent Effects." *Asian Perspective* 41 (4): 527–558.

Hughes, D. J., M. Rowe, M. Batey, and A. Lee. 2012. "A Tale of two Sites: Twitter vs. Facebook and the Personality Predictors of Social Media Usage." *Computers in Human Behavior* 28 (2): 561–569.

Hussam, R., A. Rabbani, G. Reggiani, and N. Rigol. 2017. Habit formation and rational addiction: A field experiment in handwashing.

Ikefuji, M., and K. Mino. 2009. *Internal vs. External Habit Formation in a Growing Economy with Overlapping Generations*.

Jia, N., l. Zhang, and G. Li. 2011. "A Test of Habit Formation in Food Consumption with Uncertainty Rural Households: an Investigation Using Micro Panel Data." *China Economic Quaterly* 11 (4): 327–348.

Kahne, J., and B. Bowyer. 2018. "The Political Significance of Social Media Activity and Social Networks." *Political Communication* 35 (3): 1–24. doi:10.1080/10584609.2018.1426662.

Kai, A. S., and D. L. Brown. 2000. "Social Capital and Grassroots Development: The Case of Roma Self-Governance in Hungary." *Social Problems* 47 (2): 201–219.

Kakeu, J., and P. Nguimkeu. 2017. "Habit Formation and Exhaustible Resource Risk-Pricing." *Energy Economics* 64: 1–12. doi:10.1016/j.eneco.2017.03.013.

Kallas, P. 2018. Top 15 Most Popular Social Networking Sites and Apps [May 2018]. Retrieved from https://www.dreamgrow.com/top-15-most-popular-social-networking-sites/.

Kreis, R. 2017. "The "Tweet Politics" of President Trump." *Journal of Language and Politics* 16 (4): 607–618. doi:10.1075/jlp.17032.kre.

Kuss, D. 2017. "Mobile Phone Addiction: Evidence From Empirical Research." *European Psychiatry* 41: S26–S27. doi:10.1016/j.eurpsy.2017.01.137.

Kwon, S.-W., and P. S. Adler. 2014. "Social Capital: Maturation of a Field of Research." *Academy of Management Review* 39 (4): 412–422.

Kwon, H., H. So, S. P. Han, and W. Oh. 2014. "*Nature or Nurture? An Analysis of Rational Addiction to Mobile Social Applications*." Paper presented at the thirty fifth international conference on information systems (ICIS), Auckland.

Kwon, H. E., H. So, S. P. Han, and W. Oh. 2016. "Excessive Dependence on Mobile Social Apps: A Rational Addiction Perspective." *Information Systems Research* 27 (4): 919–939.

Lee, J. 2017. "Social Capital Expectation and Usage of Social Media: the Moderating Role of Social Capital Susceptibility." *Behaviour & Information Technology* 36 (10): 1067–1080. doi:10.1080/0144929X.2017.1344730.

Leiner, D. J., L. Kobilke, C. Rueß, and H.-B. Brosius. 2018. "Functional Domains of Social Media Platforms: Structuring the Uses of Facebook to Better Understand its Gratifications." *Computers in Human Behavior* 83: 194–203. doi:10.1016/j.chb.2018.01.042.

Limayem, M., and S. G. Hirt. 2003. "Force of Habit and Information Systems Usage: Theory and Initial Validation." *Journal of the Association for Information Systems* 4 (1): 65–97.

Limayem, M., S. G. Hirt, and C. M. K. Cheung. 2007. "How Habit Limits the Predictive Power of Intention: The Case of Information Systems Continuance." *MIS Quarterly* 31 (4): 705–737.

Lin, N. 1999. "Building a Network Theory of Social Capital'." *Connections* 22 (1): 28–51.

Lin, N. 2002. *Social Capital: A Theory of Social Structure and Action.* Vol. 19. Cambridge: Cambridge University Press.

Lin, N. 2008. "A Network Theory of Social Capital." In *The Handbook of Social Capital*, edited by D. Castiglione, J. W. Van Deth, and G. Wolleb, 50–69. Oxford: Oxford University Press.

Lin, N. 2017. "Building a Network Theory of Social Capital." In *Social Capital*, 3–28. London: Routledge.

Liu, D., P. A. Kirschner, and A. C. Karpinski. 2017. "A Meta-Analysis of the Relationship of Academic Performance and Social Network Site use among Adolescents and Young Adults." *Computers in Human Behavior* 77: 148–157.

Marino, C., G. Gini, A. Vieno, and M. M. Spada. 2018. "The Associations Between Problematic Facebook use, Psychological Distress and Well-Being among Adolescents and Young Adults: A Systematic Review and Meta-Analysis." *Journal of Affective Disorders* 226: 274–281.

Martin, S., and N. Rivers. 2018. "Information Provision, Market Incentives, and Household Electricity Consumption: Evidence From a Large-Scale Field Deployment." *Journal of the Association of Environmental and Resource Economists* 5 (1): 207–231. doi:10.1086/694036.

Mcclenaghan, P. 2000. "Social Capital: Exploring the Theoretical Foundations of Community Development Education." *British Educational Research Journal* 26 (5): 565–582.

Meghir, C., and G. Weber. 1996. "Intertemporal Nonseparability or Borrowing Restrictions? A Disaggregate Analysis Using a U.S. Consumption Panel." *Econometrica* 64 (5): 1151–1181.

Moon, J. Y., and L. Sproull. 2001. Turning Love into Money: How some firms may profit from voluntary electronic customer communities. *Unpublished manuscript.*

Naseri, S. 2017. "Online Social Network Sites and Social Capital: A Case of Facebook." *International Journal of Applied Sociology* 7 (1): 13–19.

O'Neill, B. 2010. *New Zealand politicians' use of social media applications: A political social capital perspective.*

Paxton, P. 2002. "Social Capital and Democracy: An Interdependent Relationship." *American Sociological Review* 67 (2): 254–277.

Phua, J., S. V. Jin, and J. J. Kim. 2017. "Uses and Gratifications of Social Networking Sites for Bridging and Bonding Social Capital: A Comparison of Facebook, Twitter, Instagram, and Snapchat." *Computers in Human Behavior* 72: 115–122.

Polites, G. L., and E. Karahanna. 2012. "Shackled to the Status quo: The Inhibiting Effects of Incumbent System Habit, Switching Costs, and Inertia on new System Acceptance." *MIS Quarterly* 36 (1): 21–42.

Pollak, R. A. 1970. "Habit Formation and Dynamic Demand Functions." *Journal of Political Economy* 78 (4): 745–763.

Pollak, R. A. 1976. "Habit Formation and Long-run Utility Functions ★." *Journal of Economic Theory* 13 (2): 272–297.

Pratyush, B., Z. Wei, and C. Abhijit. 2015. "Better Knowledge with Social Media? Exploring the Roles of Social Capital and Organizational Knowledge Management." *Journal of Knowledge Management* 19 (3): 456–475. doi:10.1108/JKM-11-2014-0467.

Putnam, R. D. 2000. *Bowling Alone: The Collapse and Revival of American Community.* New York: Simon and Schuster.

Rahman, N. 2014. "The Usage and Online Behavior of Social Networking Sites among International Students in New Zealand." *The Journal of Social Media in Society* 3 (2): 65–81.

Ryan, T., and S. Xenos. 2011. "Who Uses Facebook? An Investigation Into the Relationship Between the Big Five, Shyness, Narcissism, Loneliness, and Facebook Usage." *Computers in Human Behavior* 27 (5): 1658–1664.

Safarzyńska, K. 2018. "Integrating Behavioural Economics Into Climate-Economy Models: Some Policy Lessons." *Climate Policy* 18 (4): 485–498.

Scrivens, K., and C. Smith. 2013. Four Interpretations of Social Capital. doi:10.1787/5jzbcx010wmt-en

Shu, S. B. 2017. "Commentary: Incorporating Memory Processes Into the Modeling of Habits." *Journal of the Association for Consumer Research* 2 (3): 306–308.

Skoric, M. M., Q. Zhu, D. Goh, and N. Pang. 2016. "Social Media and Citizen Engagement: A Meta-Analytic Review." *New Media & Society* 18 (9): 1817–1839. doi:10.1177/1461444815616221.

Stier, S., A. Bleier, H. Lietz, and M. Strohmaier. 2018. "Election Campaigning on Social Media: Politicians, Audiences, and the Mediation of Political Communication on Facebook and Twitter." *Political Communication* 35 (1): 50–74. doi:10.1080/10584609.2017.1334728.

Syed Ali, R., Q. Wasim, and U. Amna. 2016. "Facebook Is a Source of Social Capital Building Among University Students: Evidence From a Developing Country." *Journal of Educational Computing Research* 55 (3): 295–322. doi:10.1177/0735633116667357.

Triandis, H. C. 1980. "Values, Attitudes, and Interpersonal Behavior." *Nebraska Symposium on Motivation Nebraska Symposium on Motivation* 27: 195–259.

Valenzuela, S. 2013. "Unpacking the Use of Social Media for Protest Behavior The Roles of Information, Opinion Expression, and Activism." *American Behavioral Scientist* 57 (7): 920–942.

Venkatesh, V., J. Y. Thong, and X. Xu. 2012. Consumer acceptance and use of information technology: extending the unified theory of acceptance and use of technology.

Waheed, H., M. Anjum, M. Rehman, and A. Khawaja. 2017. "Investigation of User Behavior on Social Networking Sites." *Plos One* 12 (2): 1–19.

Waller, Jr W. T. 1988. "The Concept of Habit in Economic Analysis." *Journal of Economic Issues* 22 (1): 113–126.

Weiler, M., and O. Hinz. 2018. "Without Each Other, we Have Nothing: A State-of-the-art Analysis on how to Operationalize Social Capital." *Review of Managerial Science* 12 (483): 1–33.

Williams, D. 2006. "On and off The'Net: Scales for Social Capital in an Online era." *Journal of Computer-Mediated Communication* 11 (2): 593–628.

Wu, M.-C., and F.-Y. Kuo. 2008. "An Empirical Investigation of Habitual Usage and Past Usage on Technology Acceptance Evaluations and Continuance Intention." *ACM Sigmis Database* 39 (4): 48–73.

Zúñiga, H. G. D., M. Barnidge, and A. Scherman. 2017. "Social Media Social Capital, Offline Social Capital, and Citizenship: Exploring Asymmetrical Social Capital Effects." *Political Communication* 34 (1): 1–25.

Zúñiga, H. G. D., N. Jung, and S. Valenzuela. 2012. "Social Media Use for News and Individuals' Social Capital, Civic Engagement and Political Participation." *Journal of Computer-Mediated Communication* 17 (3): 319–336.