

Nudging the financial market? A review of the nudge theory

Cynthia Weiyi Cai

Charles Sturt University Melbourne Study Group Centre, Melbourne, VIC, Australia

Abstract

A systematic review of the nudge literature and an examination of its applications across different domains reveals that: (i) a nudge, in the sense of using choice architecture to push people to choose desired results, works well; and (ii) a nudge, in the sense of pushing people to choose desired results so that people will be better off, remains questionable. In financial markets, regulators and financial intermediaries currently use nudge theory to: (i) adjust how investment choices are presented to investors; and (ii) provide information in a selective way. Besides nudging investors, it is also possible for regulators to nudge financial intermediaries towards making more ethical decisions.

Key words: Financial market; Investment decision-making; Nudge

JEL classification: G40

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1. Introduction

The 2016 US election ended with a surprising and inconclusive outcome: Hillary Clinton won the popular vote comfortably but lost the Electoral College to Donald Trump. Soon after this dramatic election, the US accused Russia of influencing voters to choose its preferred candidate, Trump, by pushing stolen information at just the right time – through disinformation and the dissemination of fake news on social media. That is, the allegation is that Russia nudged US national sentiment in Trump's favour and Russia's interests. On 6 January 2017, the US government's intelligence agencies concluded that the Russian government had interfered in the 2016 United

Please address correspondence to Cynthia Weiyi Cai via email: cynthia.pvic@gmail.com

States elections.¹ On 9 October of the same year, Richard Thaler, the father of ‘nudge theory’, was awarded the Nobel Prize in Economics for his contributions to behavioural economics. In announcing its decision, the Nobel committee explained²:

Richard Thaler’s contributions have built a bridge between the economic and psychological analyses of individual decision-making. His empirical findings and theoretical insights have been instrumental in creating the new and rapidly expanding field of behavioural economics, which has had a profound impact on many areas of economic research and policy.

So, what is nudge theory? Why would people believe the US election was nudged? And why should we care about this theory? The first formulation of the term ‘nudge’ and its associated principles was developed in cybernetics. In their 2008 book *Nudge: Improving Decisions about Health, Wealth, and Happiness*, economists Richard Thaler and Cass Sunstein brought this term to prominence. They state that due to human beings’ cognitive biases (based on psychology research), we can deliberately design how information/choices are presented to individuals, and hence influence their behaviour. That is, people can be nudged to achieve desired results. Therefore, regardless of the conclusion of US intelligence agencies, the allegation that the Kremlin could have interfered with the US election in 2016 by presenting selective information on social media has a theoretical foundation.

In our daily life, we might be nudged towards making a decision, whether we know it or not. A famous nudge example is a housefly painted onto the ceramic of a urinal that encourages its users to aim better at Schiphol Airport in Amsterdam (Thaler and Sunstein, 2008, p. 4). In recent years, the UK government led by David Cameron and the US government led by Barack Obama have favoured nudge theory in government policy-making. In 2010, the British Behavioural Insights Team (BIT), also known as the ‘Nudge Unit’ was established. In 2014, the US White House’s Social and Behavioural Science Team (SBST) was established, aiming to apply insights from social and behavioural science to policy for the benefit of the American people. In Australia, the Commonwealth and various state governments have also started exploring how the government can apply nudge theory to improve regulatory design. For example, the government of New South Wales (NSW) established a Behavioural Insights community of practice in 2012 and have successfully nudged people to pay fines and taxes on time (Easton, 2014). In 2015, the Behavioural Economics Team of the Australian Government (BETA) or

¹ Carroll, L, 2017, 17 intelligence organizations or 4? Either way, Russia conclusion still valid, *Politifact*. Available at: <https://www.politifact.com/truth-o-meter/article/2017/jul/06/17-intelligence-organizations-or-four-either-way-r/>.

² Nobelprize.org, 2017. Press release: The Prize in Economic Sciences 2017. Available at: <https://www.nobelprize.org/prizes/economic-sciences/2017/press-release/>.

‘nudge unit’ was founded, aiming to use behavioural economics to improve policy outcomes.³ In the same year, the Australian Securities and Investments Commission (ASIC) announced one ‘nudge’ study (ASIC Report 427), which aims to identify the most influential information for investors regarding investment decisions when they are reading the prospectus of hybrid securities (ASIC, 2015). At the same time, nudge theory is increasing in popularity with business leaders, public health authorities, and academia. For instance, Google is applying nudge theory in various forms to increase productivity and happiness of employees (e.g. Bock, 2015; Ebert and Freibichler, 2017). The ‘nudge unit’ in the UK applies the insights of nudge theory to improve public health prevention (Quigley, 2013). Meanwhile, as we will show in the outcome of our systematic review, the research on nudge theory rises from a single publication in 2008 to 37 publications in 2018.

The main purpose of this paper is to provide a better understanding of nudge theory by identifying the development of knowledge and gaps in related economic research. Using the HistCite™-generated bibliographic map as guidance, this paper identifies publications on nudge theory in Economics and Finance research and their interrelations, and provides a comprehensive review of literature pertaining to nudge theory. We further discuss how nudges are used in financial markets, the reasons and incentives to nudge financial markets, and associated issues.

A review of the nudge literature and an examination of applications across different domains reveals that a nudge in the sense of using choice architecture to push people to choose desired results, works well. However, whether such desired results will make people better off remains questionable. This criterion is judged by the person who is being nudged, but few studies attempt to examine the welfare outcomes of the nudged individuals. Surprisingly, there is a distinct lack of academic studies regarding nudges in financial markets. Currently, nudges are used in financial markets to: (i) adjust how investment choices are presented to investors; and (ii) provide information in a specific way. In today’s fast-growing digital world with technologies like artificial intelligence, there is enormous potential for ‘digital nudging’ to nudge large numbers of individuals simultaneously. Those who design interfaces to influence people to make investment decisions will hold significant power in the future. It is therefore necessary to further investigate this phenomenon in order to gain more insights into the role of nudges in financial markets. Regulators have already started exploring how to nudge investors to help them make better investment decisions. This paper also discusses the possibilities for regulators to nudge financial intermediaries towards making more ethical decisions. At the same time, financial intermediaries have strong incentives to nudge customers, but not always in the best interest of customers. This paper

³ BETA, 2019. Available at: <https://behaviouraleconomics.pmc.gov.au/>

concludes with a discussion of opportunities and pathways for future research on nudge theory in Economics and Finance studies.

2. Methodology: mapping nudges in economics and finance research

This review utilizes bibliographic mapping, which is an established approach for reviewing a field of research and its influential publications (Börner *et al.*, 2003; Janssen *et al.*, 2006; Janssen, 2007; Linnenluecke, 2017). Data collection and analysis are conducted following the methodological steps outlined by Janssen *et al.* (2006) and Janssen (2007). The first step is the compilation of a comprehensive data set of relevant publications and their citation records (i.e. a full record of their cited references). Next, the citation data are cleaned. The data can then be analysed and correlated using HistCite™ to map relationships between publications, and the results visualized by the software for means of communication.

2.1. Data collection and data cleaning

Publications for inclusion in this review were identified through searches within the Social Sciences Citation Index, an online academic citation database within the Clarivate Analytics Web of Science™ platform. Within this database, a search was initially conducted for publications with the term ‘nudge*’ in the title, abstract or keywords. The asterisk (*) was included as a wildcard symbol to search for variations of the term. The search identified 3800 records, and 195 records are classified as belonging to the areas of ‘behavioural science’, ‘economics’, ‘management’ or ‘business.’⁴ The 195 records were downloaded and imported into HistCite™ (version 12.03.17). The records were then cleaned manually by checking the title, abstract and keywords of each record, and, if necessary, referring to the full text of the publication to determine its suitability for inclusion in the review. For example, although the term ‘nudge’ is found in the abstract of Stark and Wang (2002), this paper is about human capital migration, not relating to nudge theory. After the data-cleaning process, five book review records and two papers were removed, leaving a total of 188 records in the data set.

2.2. Manual additions to the data set

To check whether any records were inadvertently overlooked, a cited reference search was conducted within HistCite™. Omissions can occur when a record does not meet the search criteria. In addition, restricting the search to the field of business and management may have missed contributions not classified by the Web of Science™ as belonging to this domain. Eleven

⁴ The cut-off date for this search is 18 November 2018.

additional publications were manually added to the final data set (see Table 1). With the manual additions, the final data set contains 199 records published between 2003 and 2018 (cut-off: 18 November 2018, which includes online-first articles published up to this point).

2.3. Results: citation statistics and citation map

The yearly output of research regarding the ‘nudge’ concept in the field of Economics and Finance is mapped in Figure 1. The first publication dates back to 2003. More publications emerged in 2008, followed by an exponential increase in publications. The citation map generated with HistCite™ (see Figure 2) the most highly cited publications within the data set along a timeline (left side of figure). Papers are displayed as nodes and the citation connections between them as arrows. The citation graph allows the identification of

Table 1
Manual additions to the dataset

Author (s)	Year	Title	Publication details	Reason for manual adding
Camerer	2003	Behavioral economics and the case for asymmetric paternalism	<i>University of Pennsylvania Law Review</i>	Not captured in initial search
Thaler <i>et al.</i>	2003	Libertarian paternalism	<i>American Economic Review</i>	Not captured in initial search
Sustein <i>et al.</i>	2003	Libertarian paternalism is not an oxymoron	<i>The University of Chicago Law Review</i>	Not captured in initial search
Thaler and Benartzi	2004	Save More Tomorrow™: using behavioral economics to increase employee saving	<i>Journal of Political Economy</i>	Not captured in initial search
Hausman <i>et al.</i>	2006	Ethics and economics?	<i>Economic Analysis, Moral Philosophy and Public Policy</i>	Not captured in initial search
Thaler <i>et al.</i>	2008	Nudge: improving decisions about health, wealth and happiness	Yale University Press	Book (not indexed)
Hausman	2010	Debate: to nudge or not to nudge*	<i>Journal of Political Philosophy</i>	Not captured in initial search
Thaler <i>et al.</i>	2010	Choice architecture	SSRN online	Not captured in initial search
Allcott	2011	Social norms and energy conservation	<i>Journal of Public Economics</i>	Not captured in initial search
Johnson <i>et al.</i>	2012	Beyond nudges: tools of a choice architecture	<i>Marketing Letters</i>	Not captured in initial search
White	2013	The manipulation of choice	Palgrave Macmillan	Book (not indexed)

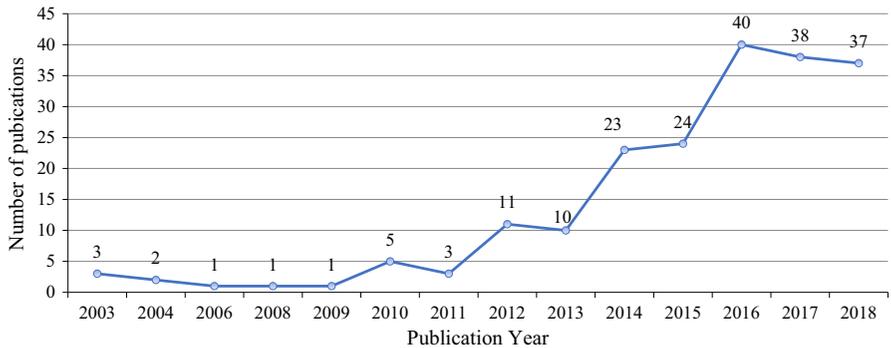


Figure 1 Publications on nudges in the business and economics field (per year). [Colour figure can be viewed at wileyonlinelibrary.com]

knowledge development and gaps in a particular field, as researchers typically cite the prior research they build upon. Corresponding citation details and citation counts for each node in Figure 2 can be found in Table 2.

3. Developments in nudge research

3.1. The birth of nudge theory in economics

The first formulation of the term ‘nudge’ and its associated principles was developed in cybernetics. In the earliest recorded study in this discipline, a nudge was identified to be a general influencer of behaviour, regardless of its degree or scope of influence (Hausman and McPherson, 2006). In clinical psychotherapy, a nudge was further specified as an action taken towards a

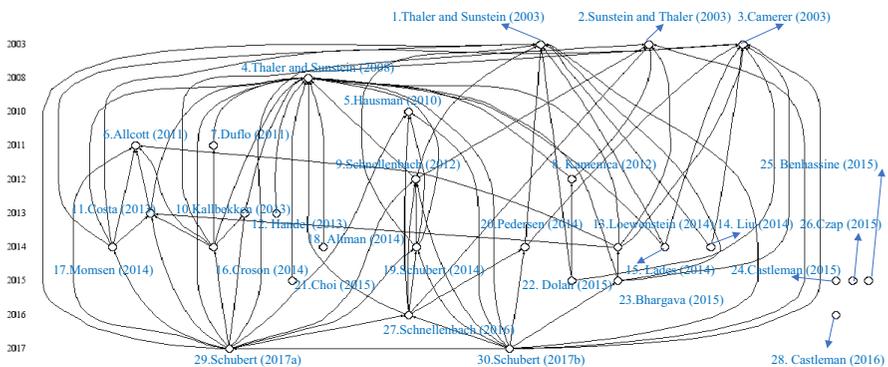


Figure 2 Citation network. The papers are displayed as nodes along a timeline. Articles are numbered based on citation numbers. The corresponding paper details are provided in Table 2. The size of the node is set as fixed for clarity. [Colour figure can be viewed at wileyonlinelibrary.com]

Table 2
List of highly cited papers in the paper citation network

Number	Citation	Publication details	LCS	GCS
1	Thaler and Sunstein (2003)	Thaler RH and C Sunstein, 2003, AM ECON REV, V93, P175	31	N/A
2	Sunstein and Thaler (2003)	Sunstein CR, 2003, U CHICAGO LAW REV, V70, P1159	27	N/A
3	Camerer (2003)	Camerer C, 2003, U PENN LAW REV, V151, P1211	28	N/A
4	Thaler and Sunstein (2008)	Thaler R, 2008, NUDGE IMPROVING DECI	93	N/A
5	Hausman (2010)	Hausman DM, 2010, J POLIT PHILOS, V18, P123	21	N/A
6	Allcott (2011)	Allcott H, 2011, J PUBLIC ECON, V95, P1082	24	N/A
7	Dufo (2011)	Dufo E, 2011, AM ECON REV, V101, P2350	6	172
8	Kamenica (2012)	Kamenica E, 2012, ANNU REV ECON, V4, P427	3	71
9	Schnellenbach (2012)	Schnellenbach J, 2012, EUR J POLIT ECON, V28, P266	8	28
10	Kallbekken and Saelen (2013)	Kallbekken S, 2013, ECON LETT, V119, P325	2	57
11	Costa (2013)	Costa DL, 2013, J EUR ECON ASSOC, V11, P680	11	102
12	Handel (2013)	Handel BR, 2013, AM ECON REV, V103, P2643	4	100
13	Loewenstein (2014)	Loewenstein G, 2014, ANNU REV ECON, V6, P391	2	28
14	Liu (2014)	Liu PJ, 2014, APPL ECON PERSPECT P, V36, P6	2	43
15	Lades (2014)	Lades LK, 2014, J ECON PSYCHOL, V41, P114	2	12
16	Croson (2014)	Croson R, 2014, ENVIRON RESOUR ECON, V58, P335	9	27
17	Mommsen (2014)	Mommsen K, 2014, ENERG POLICY, V74, P376	3	11
18	Altmann (2014)	Altmann S, 2014, EUR ECON REV, V72, P19	2	9
19	Schubert (2014)	Schubert C, 2014, J EVOL ECON, V24, P1107	3	6
20	Pedersen (2014)	Pedersen SK, 2014, B ECON RES, V66, P5147	2	6
21	Choi (2015)	Choi JJ, 2015, ANNU REV FINANC ECON, V7, P161	2	5
22	Dolan (2015)	Dolan P, 2015, J ECON PSYCHOL, V47, P1	2	31
23	Bhargava (2015)	Bhargava S, 2015, AM ECON REV, V105, P396	2	17
24	Castleman (2015)	Castleman BL, 2015, J ECON BEHAV ORGAN, V115, P144	3	31
25	Benhassine (2015)	Benhassine N, 2015, AM ECON J-ECON POLIC, V7, P86	2	28
26	Czap (2015)	Czap NV, 2015, ECOL ECON, V118, P147	2	5

(continued)

Table 2 (continued)

Number	Citation	Publication details	LCS	GCS
27	Schnellenbach (2016)	Schnellenbach J, 2016, KYKLOS, V69, P135	3	4
28	Castleman (2016)	Castleman BL, 2016, J HUM RESOUR, V51, P389	2	14
29	Schubert (2017a)	Schubert C, 2017, ECOL ECON, V132, P329	4	7
30	Schubert (2017b)	Schubert C, 2017, J I ECON, V13, P499	2	3

Cutoff at LCS ≥ 2 : a local citation score (LCS) refers to the count of citations for each publication within the data set.

Table 3
List of papers concerning nudges in financial markets

Authors	Publication year	Title	Publication details	Area
Thaler and Benartzi	2004	Save More Tomorrow TM : using behavioural economics to increase employee saving	<i>Journal of Political Economy</i>	Pension
Statman	2013	Mandatory retirement savings	<i>Financial Analysts Journal</i>	
Choi	2015	Contributions to defined contribution pension plans	<i>Annual Review of Financial Economics</i>	
Van Zyl and Van Zyl	2016	The impact of behavioural economics and finance on retirement provision	<i>South African Actuarial Journal</i>	
Nunes	2018	Participation in workplace pension schemes and the effect of provision: evidence from the United Kingdom	<i>Fiscal Studies</i>	
Handel	2013	Adverse selection and inertia in health insurance markets: when nudging hurts	<i>American Economics Review</i>	Insurance
Baicker <i>et al.</i>	2015	Behavioural hazard in health insurance	<i>Quarterly Journal of Economics</i>	
Agarwal <i>et al.</i>	2009	The age of reason: financial decisions over the life cycle and implications for regulation	<i>Brookings Papers on Economic Activity</i>	Disclosure
Agarwal <i>et al.</i>	2015	Regulating consumer financial products: evidence from credit cards	<i>Quarterly Journal of Economics</i>	
Payzan-LeNestour and Bossaerts	2015	Learning about unstable, publicly unobservable payoffs	<i>Review of Financial Studies</i>	
Gómez <i>et al.</i>	2016	Spanish regulation for labelling of financial products: a behavioural-experimental analysis	<i>Economia Politica</i>	
Tereshkiewicz	2016	Neutral third-party counselling as nudge toward safer financial products? The case of risky mortgage loan contracts	<i>Nudging – Possibilities, Limitations and Applications in European Law and Economics</i>	

targeted set of specific individuals, hence referred to as a micronudge (O'Hanlon and Wilk, 1987).

It is thanks to two economists that this term became more widespread. In 2008, 'nudge' resurfaced in a book written by Richard Thaler and Cass Sunstein, *Nudge: Improving Decisions about Health, Wealth, and Happiness*, which brought nudge theory to prominence. In this book, Thaler and Sunstein defined a 'nudge' as follows:

A nudge, as we will use the term, is any aspect of the choice architecture that alters people's behaviour in a predictable way without forbidding any options or significantly changing their economic incentives. To count as a mere nudge, the intervention must be easy and cheap to avoid. Nudges are not mandates. Putting fruit at eye level counts as a nudge. Banning junk food does not. (p. 64)

Nudge theory is rooted in a multidisciplinary field, drawing on the work of psychologists Daniel Kahneman and Amos Tversky, whose research has changed the way psychologists (and eventually economists) think about thinking (Thaler and Sunstein, 2008, p. 23). Nudge theory involves human responses to information via two processing systems: automatic and reflective. The automatic system is highly susceptible to environmental influences while the reflective system considers explicit goals and intentions. When situations are overly complex or overwhelming for an individual's cognitive capacity, or when an individual is faced with pressures such as time constraints, the automatic processing system takes over decision-making. Automatic systems rely on judgemental heuristics, namely simple, efficient rules to make faster decisions. These rules work well under most circumstances, but they can lead to systematic deviations from logic, probability or rational choice theory. Because of the role heuristics play in decision-making, people do not always make optimal decisions and external intervention might be needed.

Drawing on insights in psychology, Thaler and Sunstein (2008) propose that people's behaviours can be changed through the alteration of different factors that may influence their perceived choices. That is, people can be nudged to achieve desired results. The authors propose the concept of 'liberal paternalism', arguing that rather than enforcing rules or employing coercion, public policy can be implemented with a softer approach that 'preserves freedom of choice but that authorizes both private and public institutions to steer people in directions that will promote their welfare.' The key instrument advanced by this approach is nudges.

Thaler and Sunstein (2008) use 'choice architecture' to describe the design of nudges to elicit certain behaviours, discussing different tools of choice architecture such as default options, namely settings or choices that apply to individuals who do not take active steps to change them (Brown and Krishna, 2004). Thaler *et al.* (2010) detail other tools of choice architecture, including default options, error expectations, feedback loops, understanding how information is mapped (as well as exploring the ways to present information

based on the structure of cognitive maps), creating incentives, and the structure of complex decisions. In the spirit of libertarian paternalism, Thaler and Sunstein (2008) apply the idea of nudges in the context of choice architecture to propose policy recommendations, thus rendering nudge theory far beyond a mere microeconomic concept. Proposed applications span different areas including finance (e.g. nudging people to increase the level of savings for their retirement), health (e.g. nudging people to change their eating behaviours to overcome obesity problems), the environment, schools and marriage.

Nudge theory proposes that the behaviour and decision-making of groups or individuals can be influenced if the information and/or choices are framed and presented differently. Individual decision-making has long been of interest to researchers in economics and business. The earliest approach in this field assumed that man is entirely rational when making decisions. For example, beginning about 300 years ago, economists began to examine the basis of consumer decision-making when making purchases, drawing on utility theory which assumes a consumer is a ‘rational economic man’ who would make choices based on the expected outcomes of his/her decisions (e.g. Richarme, 2015; Schiffman and Kanuk, 2007). Herbert Simon revised this assumption by introducing a psychological component to the decisional path, improving on the neo-classical approach (e.g. Herbert Simon’s Satisficing Theory in Simon, 1997). He argued that when individuals make decisions, their rationality is limited by the tractability of the decision problem, the cognitive limitations of their minds, and the time available to make the decision. He received the Nobel Prize in Economics for his pioneering research on the decisional process in economic organizations. In 1979, two psychologists, Daniel Kahneman and Amos Tversky, already famous for their work on judgement heuristics, published a paper in the journal *Econometrica* titled ‘Prospect theory: an analysis of decision under risk’ (Kahneman and Tversky, 1979). In an experimental setting, this paper demonstrates that people systematically violate the predictions of expected utility theory and make decisions that are influenced by cognitive failures. The works of Kahneman and Tversky on prospect theory were decisive in awarding Kahneman the Nobel Prize in Economic Sciences in 2002.⁵

The theory behind nudging is built on the work of psychologists Daniel Kahneman and Amos Tversky (see Kahneman, 1994; Kahneman *et al.*, 1997; Kahneman and Tversky, 2000; Kahneman and Frederick, 2002). However, distinct from the prospective theory that describes how people evaluate risk due to cognitive limitations, nudge theory focuses on identifying heuristics and describes methods of influencing people to think or behave regarding methodologies and strategy. Integrating human limitations into economics studies with recommendations for practice, nudge theory is a refreshing alternative that shows great promise. With low or even zero-cost interventions,

⁵ Tversky would have shared the prize had he not passed away in 1996.

human beings can be ‘nudged’ to overcome their cognitive limitations and act in their own best interests, as if they have complete information and perfect willpower and thus the cognitive abilities of the homo economicus (Mathis and Tor, 2016). *Nudge* by Thaler and Sunstein (2008) was named one of the best books of 2008 by *The Economist*. Since then, academia, politicians and industry professionals have enthusiastically evaluated and embraced this concept: Figure 1 demonstrates the rise from a single publication in 2008 to 37 publications in 2018.

3.2. *Liberal paternalism: an innovative public policy approach*

One main stream of nudge theory in the existing literature focuses on ‘liberal paternalism’ in policy-making and its applications across different domains. The concept of liberal paternalism was originally discussed in Thaler and Sunstein (2003) and further detailed in Thaler and Sunstein (2008). Thaler and Sunstein propose that a policy is ‘paternalistic’ if it ‘tries to influence choices in a way that will make choosers better off, as judged by themselves’ (Thaler and Sunstein, 2008, p. 16), while ‘libertarian’ means ‘people should be free to do what they like – and to opt out of undesirable arrangements if they want to do so’ (Thaler and Sunstein, 2008, p. 16).

Economics often offers useful frameworks for public policy. Distinct from traditional approaches of enforcing rules or employing coercion, liberal paternalism claims to be a ‘soft’ approach that integrates human limitations and their consequences. In addition, according to Thaler and Sunstein, liberal paternalism may simultaneously be more effective while maintaining personal liberty when compared with traditional approaches, with the additional benefit of low or zero cost. These benefits quickly attracted politicians and academia, fuelling further research attempts to examine this new approach from different angles, evaluating whether this innovative approach is effective compared with other approaches analytically, experimentally or empirically.

Some research evaluates this innovative approach analytically. Building on models with the same set of basic arguments and assumptions that are normally used to make the case for paternalist interventions, Schnellenbach (2012) argues that paternalist interventions are redistributive policies that may benefit some individuals, but harm others. Liberal paternalism increases the stability of given social norms, which in turn need not be efficient, nor in the material self-interest of a majority of individuals. Binder (2013) also discusses the pros and cons of ‘libertarian paternalism’, concluding that as a rule, evolutionary economists should be cautious regarding this new and highly influential policy approach. However, in a comment paper on Binder (2013), Schubert (2014) argues that the model in Binder (2013) is incomplete as it neglects a constitutionally constrained form of libertarian paternalism. Therefore, most of Binder’s objections do not apply with equal force to such a refined variant of libertarian paternalism.

Besides theoretical papers, researchers examine this new approach largely experimentally and occasional empirically in specific contexts and different areas. These works primary focus on testing whether the nudge concept works. The overall research outcomes are positive; consistent with the proposed applications in Thaler and Sunstein (2008), people can be nudged to achieve desired results. For example, Pedersen *et al.* (2014) conducted an experimental study among Danish students to investigate whether demand for paternalism is related to self-control. This paper found no evidence linking self-control to attitudes towards soft paternalism (e.g., nudges). However, respondents with good self-control were significantly more favourable towards strong paternalism (e.g., restricting choices or sin taxes) than those struggling with self-control. Benhassine *et al.* (2015) implemented a large randomized experiment in Morocco, identifying an alternative libertarian paternalism programme, a ‘labelled cash transfer’ (a small cash transfer made to fathers of school-aged children in poor rural communities, not conditional on school attendance but explicitly labelled as an education support programme), sufficient to significantly increase human capital. Through a personalized text messaging experiment, nudging was also found to be cost-effective in increasing college enrolment among students who had less academic-year access to quality college counselling or information and to encourage freshmen at community colleges to refile their free application for Federal Student Aid (Castleman and Page, 2015a,b). In addition, Duflo *et al.* (2011) also provided experimental evidence in Kenya that nudging is a more effective tool to encourage farmers to use fertilizer to generate higher yields and welfare than either laissez-faire policies or heavy subsidies. In an another experimental study, Altmann and Traxler (2014) showed that dental check reminders double the numbers of patients making check-up appointments.

In addition to a soft ‘liberal paternalism’ policy approach, nudges that involve human limitations also open a new channel to address environmental issues. As discussed in a review paper, Croson and Treich (2014) provide three reasons why ‘nudges’ have been widely discussed and implemented in environmental economics studies. First, environmental economists traditionally consider models with agents with unbounded rationality, but environmental problems are difficult to solve using these traditional instruments. While purely economic solutions have been attempted, psychological biases are usually the key barrier to adoption to solve environmental problems. Accordingly, behavioural changes might prove more effective. Second, nudge interventions are low cost. Third, a more concealed reason may be a general distrust in the market system and classical economics by individuals in these positions. For instance, in an experimental study, Kallbekken and Saelen (2013) demonstrate that two ‘nudges’ (reducing plate size and providing social cues) significantly reduce the amount of food waste in hotel restaurants by around 20 percent.

Not only has nudge theory been popularised by academia, it is also highly influential in government policy-making in the UK, US and Australia. In the UK, Prime Minister David Cameron established the British Behavioural Insights Team in 2010, also known as the ‘Nudge Unit’. As advised by Thaler, this ‘nudge unit’ claims to have increased payment of £30 million a year in income tax, simply by introducing a line in their reminder letters informing the recipient that most of their neighbours had already paid (Rutter, 2015). Two years later, in Australia, the government of New South Wales (NSW) established a Behavioural Insights community of practice. Based on the nudge unit’s trials, more people in NSW are successfully being nudged to pay fines and taxes on time, with an extra US\$10 million worth of fines paid on time, saving \$80 000 in printing costs and avoiding about \$4 million in extra late payment penalties (Easton, 2014). In 2015, the Behavioural Economics Team of the Australian Government (BETA) or ‘nudge unit’ was founded. In the USA, the White House’s Social and Behavioural Science Team (SBST) was established in 2014, aiming to bring behavioural science research into the policy-making process.⁶ Nudge theory has become an increasingly popular policy tool worldwide. However, there is still ongoing debate regarding the efficacy and legitimacy of this innovative intervention approach.

3.3. Criticism of liberal paternalism: an ethical minefield?

Before the advent of nudge theory, Libertarians typically believed that people should have freedom to do as they like provided they do not break the law. On the contrary, Paternalists believe that the fortunate in society have a duty to protect the less fortunate from the consequences of their own folly. Liberal paternalism attempts to balance these two conflicting approaches. Although this innovative approach has won a lot of supporters, at the same time, ethicists have debated this approach rigorously. The two main criticisms concern: (i) whether ‘the liberal paternalism’ approach is infringing civil liberties; and (ii) whether the authorities are legitimate in their endeavour to ‘manipulate’ choices to achieve a desired outcome.

Criticism arises from whether such an approach is really providing freedom or is just a form of paternalism, as the aim of liberal paternalism is to optimize individual wellbeing, rather than providing freedom. The act of choice architecture limits such an approach to a form of coercion, thus limiting the degree of liberty. For example, Hausman (2010) argues that the entirety of the concept negates both the liberal and paternalistic intentions of the practice. Because of coercive strategies employed by choice architects, while the actual range of options is not being limited, the probability of an individual choosing any one option becomes the choice of the architect, and not of the individual. Furthermore, White (2013) hypothetically argues that an individual’s

⁶ Social and Behavioral Sciences Team, 2019, SBST, Available at: <https://sbst.gov/>.

satisfaction should be valued through liberal paternalism in order to be fully libertarian. Thus, any action that does not result in self-preservation cannot be considered to contribute to the advancement of an individual's wellbeing.

As nudges are the key instrument used in the liberal paternalism approach, the inherent ethical quality of nudges has also been discussed at length in the literature. One of the main criticisms is that nudging is a euphemism for psychological manipulation, and as such whether authoritative bodies have the right to alter the decisions of individuals via such manipulations is questionable (e.g. White, 2013; Kemmerer *et al.*, 2016; Sugden, 2017). Similarly, although admitting non-manipulative paternalist policies are limited to cases with stable and homogeneous preferences, Schnellenbach (2012) argues that manipulative liberal paternalist policies collide with the common constitutional interest of citizens. This paper also argues that the paternalist perspective is not needed in a competitive market as such a market can supply many mechanisms that allow individuals to cope with problems in their decision-making processes at an individual level.

3.4. *Nudge research in financial markets*

It is worthwhile to emphasize that while researchers often discuss nudges and liberal paternalism as synonymous concepts, they are different. Liberal paternalism can be viewed as a nudge application in policymaking. There are other applications of nudge theory in different domains. Successful influential political approaches have contributed to the widespread application of nudge theory in business. One of the main contributions of Thaler and Sunstein (2008) is to inspire people to think about the use of subtle psychological 'hints' to change people's behaviours in real life, at low cost. This is a particularly attractive concept for marketers. For example, rather than fighting for brand share, nudging may be more effective in terms of creating customer's new habits. Therefore, if we are viewing financial markets as markets in which people trade for different financial arrangements (contracts), nudges can (or may have already been) used to influence the behaviours of participants in these markets.

This review of the literature reveals a surprising lack of studies on the application of nudge theory in financial markets. The work of Thaler and Sunstein (2008) mentions that nudges might affect two financial products: pensions and health insurance. Besides Thaler's work (Thaler and Benartzi, 2004), we were able to identify only another 11 papers directly relating to nudges in financial markets.⁷

⁷ Eleven papers are classified within the 'business finance' category in our search. Among these 11 papers, two papers concern management accounting (Malina and Selton, 2015; Spraakman *et al.*, 2016) and three papers address tax regulations (Anderson, 2016; Boll, 2016; Biddle *et al.*, 2018). We exclude these five papers in our discussion in this section. We further manually identify two papers that examine nudges concerning health insurance (Handel, 2013; Baicker *et al.*, 2015) and four papers concerning information presentation of financial products (Agarwal *et al.*, 2009, 2015; Gómez *et al.*, 2016; Tereszkiwicz, 2016).

Among the 12 papers, seven papers address classical ‘financial nudges’, namely pensions (five papers) and health insurance (two papers). The remaining five papers relate to information presentation (disclosure).

Thaler and Benartzi (2004) first proposed that nudging regarding pension plans is an effective way to help people save enough for retirement. Their experimental ‘Save More Tomorrow program’ reframes the decision to save: instead of reducing consumption now, the participant decides how much of a future increase in salary will be allocated to savings by default. The authors demonstrate that these changes in choice architecture significantly increase savings behaviour and generate widespread adoption of automatic saving rate escalators. The idea to nudge people to choose a better retirement pension plan has been further examined in several studies. By reviewing research on the US defined contribution pension system, Choi (2015) also shows that defaults are powerful in guiding employees’ contribution behaviours: there is a high level of inertia at the status quo for employee contribution rates and consequently, changing the default can dramatically affect contribution rates without incurring the expense of offering matches. This paper provides very strong statistical evidence to support the work of nudges in pension selection. By reviewing South Africa’s retirement schemes, Van Zyl and Van Zyl (2016) also support the effectiveness of nudges regarding pensions. Using British data covering two decades (1992–2009), Nunes (2018) evaluates the use of nudges (opt-in rate) among private sector workers who have not been offered a workplace pension plan. Meanwhile, research suggests that nudges regarding pensions are not a ‘one-size-fits-all’ approach. Using US pension data, Statman (2013) argues that nudging non-savers into retirement saving by default options are not effective because they have very low incomes, limited access to voluntary pension plans, or lack financial literacy.

Besides pension schemes, two papers examine the effectiveness of nudging in the domain of health insurance. In an analytical paper, Baicker *et al.* (2015) argue that typical overuse of health insurance might be due to a behavioural hazard, namely mistakes. They further demonstrate that in optimal co-pay formulas that incorporate such behavioural hazard, nudges can be a useful tool for calibrating the degree of behavioural hazard if we know precisely how nudges affect the error. On the contrary, by investigating the employee insurance programme of a firm, Handel (2013) provides empirical evidence that nudging employers through default options of their sponsored insurance settings can lead to an overall reduction in welfare that doubles the existing welfare loss from adverse selection.

Presenting information in a selective manner is another possible way of nudging. For example, the 2009 Credit Card Accountability Responsibility and Disclosure Act in the US requires monthly credit card statements to prominently display the cost of repaying the balance when only making minimum payments and to compare this to the cost of repaying the balance when making payments that would pay off the balance within 36 months. The

aim is to nudge consumers toward paying off a larger fraction of their balances to reduce their overall interest payments. Agarwal *et al.* (2015) empirically test the effectiveness of this nudge and find the disclosure requirements have a small but significant effect on borrowers' repayment behaviour. Tereszkievicz (2016) also advocates the neutral counselling programme as a liberal paternalism approach to nudge people to improve their mortgage loan decisions.⁸ In another paper, Payzan-LeNestour and Bossaerts (2015) perform a neo-finance experimental study, suggesting that finance practitioners can learn about unstable and unobservable payoffs in a way that approximates the Bayesian benchmark, so long as they are provided with enough information about the stochastic structure underlying the payoffs. Without such structural information (nudge), the performance of participants becomes poorer. Their results, therefore, show that nudges do need to be given for optimal learning to occur in the financial market. However, the existing literature also raises the concern that disclosing selective information to investors may also work in an undesired way. After examining financial mistakes in people's credit transactions, Agarwal *et al.* (2009) argue that nudges will probably provide little protection for older adults. When there are both benevolent nudges from government and malevolent nudges from marketers and unscrupulous relatives, older adults with low levels of financial literacy and/or significant cognitive impairment may even be nudged in the wrong direction. Similarly, in an experiment setting, Gómez *et al.* (2016) question the effectiveness of a new nudge regulation (financial product labelling) in Spain. The proposed two types of visual labels of financial products are: (1) a numerical label that rates the product from lowest risk to highest risk; and (2) a graphical label applying different colours from green (lowest risk) to red (highest risk), imitating traffic lights. Their findings suggest that these two types of labels may increase investors' risk-aversion, which in turn leads to poor investment decisions.

4. Discussion: nudging financial markets?

In this section, we narrow our discussion to three main nudge issues concerning financial markets: (i) how nudges can be used in financial markets; (ii) which parties have incentives to nudge financial markets; and (iii) whether it is legitimate or effective to nudge financial markets. This discussion does not

⁸ In recent years, risky mortgage contracts such as foreign-currency indexed mortgage loans have been broadly marketed in countries like Poland and Hungary. Incorrect mortgage choices have detrimental effects on borrowers and the families. To protect borrowers making the right mortgage choice, the legislator proposes mandatory extensive disclosure of complex mortgage loans. This paper argues that as opposed to mandatory disclosure, a neutral counsellor (adviser) is more likely to use simple, non-technical language to describe complex issues and to nudge borrowers to make a better mortgage decision.

claim to resolve these issues; rather, it assesses the state of current research and provides opportunities and pathways for future research.

4.1. *How can nudges be used in financial markets?*

Thaler and Sunstein (2008) use ‘choice architecture’ to describe the design of nudges to elicit certain behaviours. Thaler *et al.* (2010) propose a range of choice architecture tools, including default options (settings or choices that apply to individuals who do not take active steps to change them), error expectations, feedback loops, understanding how information is mapped (as well as exploring ways to present information based on the structure of cognitive maps), creating incentives and the structure of complex decisions (Brown and Krishna, 2004). Johnson *et al.* (2012) divide these tools of choice architecture into two categories: structuring the choice task and describing the choice options. Tools for structuring the choice task address what to present to decision-makers. Typical examples include reducing the number of alternatives; technology and decision aids; use of defaults; focus on satisficing; limited time windows; and how task structure affects the search process. Tools for describing the choice options address how to present these options, such as partitioning options and attributes or designing attributes.

All these tools can be applied in financial markets in a variety of ways. Overall, there are two main nudge tools that can be found in financial markets. The first is to adjust how investment choices are presented to investors. For example, a classical nudge we have previously discussed is the default option in retirement savings. Another typical example involves Systematic Investment Plans (SIP) where investors make regular, equal payments into a fund and benefit from the long-term advantages of dollar-cost averaging and the convenience of saving regularly without taking any additional action. In SIPs, the default is to continue investing. The second nudge tool is to provide information in a specific way. For example, in 2015, ASIC announced a study that focuses on identifying consumer biases when assessing risks associated with hybrid securities (ASIC, 2015). The goal is to design consumer protection messages that should be included in promotional materials for hybrid securities. Furthermore, the fast growth of digital and mobile technology makes nudges more powerful on a mass scale. Recently, researchers have begun to explore the enormous potential of ‘digital nudging’. For instance, Benartzi (2017) outlines three new case studies that show how the improvement of the design of the online world can have a big impact on participants’ financial behaviours: (i) an email intervention on enrolment in a savings programme nearly doubles the programme enrolment; (ii) robo-saving apps directly and promptly encourage people to save more; and (iii) a personal capital mobile app (offering an account aggregation service that brings together all of a consumer’s financial accounts) helps people to decrease their monthly spending by 15.7 percent.

4.2. *Who has incentives to nudge financial markets?*

Payzan-LeNestour and Bossaerts (2015) conclude their paper with an important question for financial markets: ‘who has the incentives to provide investors with the nudging they need to ensure superior performance?’ The academic literature identifies ‘behavioural biases’ that cause people to misjudge important facts or to be inconsistent. Specifically, in financial markets, there are more behavioural problems due to a number of reasons. As outlined by the UK Financial Conduct Authority in its 2013 Occasional Paper No. 1, these reasons include: (i) many financial products are inherently complex compared with ordinary products; (ii) many financial products involve trade-offs between the present and the future, but due to self-control problems, people make decisions against their long-term interests; and (iii) some financial decisions such as a retirement plan or mortgage do not allow people to learn from past mistakes because these decisions are made very infrequently (Erta *et al.*, 2013). Furthermore, behavioural biases can also interact with other market failures like information asymmetries or externalities. Well documented by the literature, we know that some behavioural biases are persistent and predictable and that market forces often do not work effectively to reduce mistakes driven by such biases. In addition, the literature suggests limited improvements to decision-making from financial education as errors and biases are largely hardwired in the brain (Altman, 2012). Therefore, intervention from regulators is needed to protect investors in financial markets.

As previously discussed, governments including those of the UK, US and Australia have recently implemented nudge theory to influence people’s behaviours. For example, the ‘Nudge Unit’ of the UK Government BIT has used nudges to influence citizen behaviour in several policy areas, such as encouraging people to pay tax and/or penalties on time, encouraging people to sign up for organ donation, and encouraging savings. Nudges in domains like energy saving and organ donations are relatively uncontroversial as they are in the public interest. In comparison, nudging individuals to make better financial decisions is more debatable as the desirable outcome is more subjective and it is much harder to implement a one-size-fits-all approach. For instance, nudges are used to encourage people to save more for their future via the default option to save for retirement. Even this approach is disputable as such a strategy might not be the ‘best’ choice for young savers who are normally believed to be less risk averse as they have time to ride out the share market’s turbulence and reap the long-term benefits.

Besides the government, it is also debatable whether and how financial intermediaries can employ ‘nudge’ tactics to influence their clients. The intention of ‘nudging’ people is to help them make better choices; the rationale is that this intervention is necessary due to innate cognitive bias. In effect, ‘nudging’ is stating ‘we know best’. This good intention aptly describes the role of financial advisers, as they use their professional knowledge, skills and experiences to

advise the client that ‘this is the direction you should go’. The implication of nudge theory in this scenario is that financial advisors can further ‘nudge’ the client by presenting their recommended advice in such a way that the client is more likely to follow it. Nevertheless, there is an almost inviolable rule of personal finance: a decision that is better for an investor might lead to lower income for financial intermediates/advisors. Payzan-LeNestour and Bossaerts (2015) provide one example of such a dilemma in hedge funds, wherein the average historic performance is emphasized in most hedge funding marketing material, ignoring the fact that many hedge funds perform differentially across two regimes: in upturns, return correlation with the market as a whole is low; in downturns, however, it is high. This example might be viewed as an ‘anti-nudge’ phenomenon in the financial market: information that may deter investors’ choices is wilfully omitted. In Australia, the Banking Royal Commission was established on 14 December 2017 to inquire into and report on misconduct in the banking, superannuation and financial services industry.⁹ The interim report submitted on 28 September 2018 found that financial advisers had failed to comply with the best interests of customers in 75 percent of advice files reviewed. This report concluded there was an ‘inherent’ conflict of interest arising from banks providing personal financial advice to retail clients while also selling them financial products. In the context of lending, this report also described cases in which consumers were ‘nudged’: ‘The customer’s “needs” are formed by reference to what the entity has to sell. And often it is the entity’s representative that tells the customer what he or she “needs”.’ It seems that given the current aggressive sales-driven culture, bankers also have incentives to nudge investors, but not always for the best interests of investors.

4.3. Concerns of nudging financial markets: future research avenues

At the core of behavioural economics is the idea that we are not always rational beings. Our decisions are driven by a range of subconscious factors (desires, habits, social norms) and these factors are consistent, predictable and can be understood. The key principle of nudge theory is leveraging subconscious drivers (such as framing, loss aversion and reciprocity) and making a certain behaviour easier than an alternative path. When nudges are introduced, thus allowing other bodies to interfere in the decision-making process, this phenomenon essentially impinges on the free will of a person to make autonomous choices. Therefore, the intention of nudging must be good, such that a nudged behaviour is better for the person who is being nudged. Who can judge whether nudges make individuals better off? Thaler and Sunstein (2008) state explicitly in their opening chapter that their recommendations for nudging are designed to ‘make choosers better off, as judged by themselves’ (p. 5). This

⁹ Royal Commission. Available at: <https://financialservices.royalcommission.gov.au/Pages/default.aspx>

criterion is therefore not judged by the policy-maker, social planner, or ‘choice architect’ who implements the nudge; it is judged by the person who is being nudged. Our review reveals that a nudge in the sense of using choice architecture to push people to choose desired results works well. However, whether such a nudge will make people better off remains questionable. For instance, the nudge might successfully encourage people to save more, but this might also mean they spend less on their children’s educations or preventative medicine. While this criterion is theoretically judged by the person who is being nudged, very few studies attempt to examine the welfare outcomes of the nudged individuals. This might be due to the difficulties in measuring the wellbeing of individuals in specific contexts, and this is a highly recommended area for future research. In the context of financial markets, for example, if the government attempts to use the ‘soft power’ of nudging to influence investors’ investment decisions, research on identifying investors’ best interests should be the starting point. Meanwhile, the cost and benefits of nudges, compared with other government interventions such as rules or no intervention, should also be assessed.

Meanwhile, nudges are used not only as regulation intervention tools but are also increasingly being implemented in business. Companies like Amazon and the tech giants (e.g. Google, Apple, Microsoft and IBM) have started to look at what motivates human behaviour, incorporating data-driven and personalised nudge marketing. When you talk to Alexa, invented and designed by Amazon Echo, ‘she’ knows your preferences and will answer your questions to deliver the best customer experiences. You might be ‘nudged’ by Alexa without being aware of it. Similarly, in financial markets, artificial intelligence robots are beginning to conduct financial market trading and to provide financial advice. A serious concern is that we cannot tell how the complex algorithms are designed in these black boxes and how these robots are ‘trained’ using machine learning. Investors might be ‘nudged’ in a way that they don’t like. In today’s fast-growing digital world, there is a huge opportunity to use the scale of digital interactions and capabilities for mass-personalisation to nudge large numbers of people simultaneously. With technologies like machine learning becoming more sophisticated, there is huge power in the hands of people who design interfaces to influence people to make one decision or another. If we view ‘nudges’ as merely a technique to influence people’s behaviours, it may be used either for good or for bad. Therefore, another urgent question for governments, business leaders and academia is where is the line drawn between influence and manipulation? As a nudge is used to help people overcome their heuristic(s), we might argue the desired results we nudge people to achieve should be the result people would choose themselves, without such heuristic(s). Two main issues remain to be addressed by future research regarding assessment of the legitimacy of a nudge, namely how can we: (i) identify the threshold of such a nudge; and (ii) determine the result of an individual’s internal heuristics?

The interim report of the Royal Commission indicates that mortgage lenders and financial advisers prefer ‘pursuit of profit’ to all else. The report observes that for bank lenders: ‘compliance appeared to have been relegated to a cost of doing business’. Regarding financial advisers, the commissioner highlights the inaction of corporate regulators such as ASIC in reining in this bad behaviour, criticizing the Financial Planning Association and the Association of Financial Advisers by saying: ‘neither plays any significant role in maintaining or enforcing proper standards of conduct by financial advisers.’ If the current enforcement does not work effectively, can financial regulators also use the ‘soft power’ to nudge financial intermediaries such as bankers to influence their behaviours to make more ethical decisions in the market? If so, how? This is another interesting area for both regulators and academia to explore.

5. Conclusion

Nudge theory inspires people to think about the use of subtle psychological ‘hints’ to change people’s behaviours, at low cost. This ground-breaking phenomenon can be used to both inform and drive future methodologies and strategies. In the coming years, we may see new and innovative ways to apply nudge theory in different domains, either for better or worse. This poses new challenges and opportunities for regulators, industry professionals and academia. It is of the utmost importance that research keeps pace with this developing phenomenon in order to ensure that nudges are used with good intention to improve the wellbeing of the individuals that are nudged. More cross-disciplinary studies (involving technologies such as IT, economics such as Finance, and social sciences such as Psychology) are necessary to address these challenges.

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