Cover design by Cameron Taheri

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Letter from the Editor-in-Chief

The Economics Review at New York University has continued to grow and expand its reach within the NYU community by engaging readers in topics ranging from economics to politics and technology. Through this aim, we continue to provide a platform for writers and editors to hone their analytical, research and editorial skills with their published articles. Our team has cultivated an entrepreneurial environment, leading to the constant development and growth of this organization. Throughout the academic year, we have successfully enhanced our presence at NYU and online.

A common passion for economics and related subjects has fueled our on-campus collaboration and enriching debates with The Economics Honors Society and its members. By utilizing new platforms, such as LinkedIn and Twitter, we are now providing more direct and relevant content to our readers. These initiatives were further supported by our new and completely revamped website, executed by our Web Master, Abby Diette. I cannot thank her enough for making this vision come to life. I would also like to thank our Online Managing Editors, Yasmine Deswandhy and Eduard Batash, for keeping the true spirit of our organization alive by motivating, encouraging and driving our writers and editors to produce more compelling and insightful content. Last but not the least, a big thank you to our Co-Managing Editors of the Printed Publication, Cameron Taheri and Isa Alomran, who have carefully curated this publication in hopes of further sparking economic inquiry.

On a more personal note, as a senior, my engagement with The Economics Review comes to an end after four extraordinary years with this publication. Starting off as writer my freshman year, I have seen and been a part of the growth story of this organization, and I am eternally grateful to my team for making this possible! Thank you, team, for your hard work, dedication and passion. With that said, I am honored to pass on the Editor-in-Chief torch to our very own, Yasmine Deswandhy. Yasmine has proved to be an invaluable asset, and I have full faith in her to take this organization to greater heights. Thank you, once again, for the humbling opportunity to serve as the Editor-in-Chief. I have truly learned so much from such an incredible staff and hope that as a reader you see their dedication behind this publication.

Happy reading!

Sincerely,

Meghna Rangan

Letter from the Online Editors

We are delighted to present pieces from the online publication and showcase the other face of our organization. To us, this integration represents a step forward to help NYU students be heard and seen in multiple mediums. These articles, though shorter than the research papers, nonetheless are the product of the weekly dedication our staff members put forth to research, analyze, reflect, and discuss topics.

This year, our website has seen many improvements. Along with revamping the website, we have categorized our articles into six tags for ease of navigation: World, Domestic Affairs, Technology, Business, Campus and Community, and Economic Theory. We hope that doing so furthers our mission to act as an information resource to the NYU community.

In this issue, we are proud to feature five articles relating to economic, environmental and social sustainability. Firstly, Kapoor and Medina discuss abstract theories towards increasing sustainability in economic life in terms of communication, energy, transportation, and knowledge sharing. Meanwhile, Lamb analyses the hybrid economic sustainability model of Nordic countries, an article that he was able to discuss further in his feature in Denmark's largest international newspaper. Lastly, Lee and Ajjarapu present practical ways to implement sustainable solutions to these issues.

We have thoroughly enjoyed our experience as Managing Editors of the Online Publication this year. We never take for granted the opportunities to work with an outstanding staff of writers and editors and to provide students and readers with informative and interesting economic perspectives. It is with our pleasure to announce that Andrea Ferrell and Isa Alomran will take over as the new Managing Editors for the 2019-2020 Academic Year. The two have produced incredible work this past year as a Staff Writer and Staff Editor respectively and we are excited to see where they take the online publication!

Sincerely,

Yasmine Deswandhy & Eduard Batash

Editorial

A group of passionate and driven students, the Economics Review endeavors to provide all NYU students with a greater awareness of the economics at play around them. It is with great pride that I can say our Print Publication presents a truly diverse collection of student-led research. Not only do our carefully selected research papers draw ties to economics but their content pushes beyond the scope of traditional theory and ventures into unchartered territory.

Our Spring edition has an exciting and new touch that is unlike our past volumes. With the help of our Online Editors, Yasmine Deswandhy and Eduard Batash, this semester we are incorporating student articles from our Online Publication so as to complement our more theoretical academic papers with economic analyses of real-world affairs. Thank you, Yasmine and Eduard, for enriching the Print Publication and demonstrating the organization's diverse scope of work.

Moreover, we are excited to announce that the first of the two academic papers selected for our Spring edition was submitted by Richard Johnson, a student at Georgetown University. The Economics Review is excited to broaden the scope of submissions as we further expand our diverse pool of contributors and academic papers. Distinguished by its originality, Richard's paper delves into the behavior of firms with respect to their utilization of deterring agents. Jay Prasad and Christian Rodriguez deliver our second notable paper, honing in on the effects of the Dodd-Frank Act of 2010 on the banking industry's return on assets.

This volume was carefully crafted with significant aid from Isa Alomran, and so thank you, Isa, for your contributions and dedication to the Economics Review. Going forward, I am happy to announce our new Editor of the Print Publication, Rio Liu, who's consistent determination and hard work has widely contributed to the organization's success. Managing the Print Publication has been an enriching and exciting experience, and I am happy to see it carried on in good hands. With that, I would like to thank our readers for their constant dedication to the Print Publication and interest in economic inquiry.

Sincerely,

Cameron Taheri

Academic Papers

Deterring Agent Problem

By Richard Johnson

Abstract

In the absence of activity or notable threat, can we effectively attribute to—and thus measure—the experienced outcomes, the mechanisms put forth as a means for deterrence? Is it possible to have pursued a less-costly alternative having experienced similar outcomes? Using a geometric distribution to maximize the total number of trials until the first success, and the associative conjugate prior-probabilities to update our information—conditional on what has been observed—I develop a model and index that will enable firms to effectively measure the mechanisms put forth as a means for deterrence. Deterrence plays a unique role in the market in that its value is derived through its non-being-used; so long as the true value remains to be determined, there is an overestimation of its value and an underestimation of its effectiveness. In the event of an unanticipated shock between the initial-level set by the firm of the employed deterring agent, and any subsequent updating period of probabilities, firms respond by resetting the probability that an injurious attempt is made successful to the level corresponding to the trial at which the unanticipated shock occurred. This shock-correction, coupled with each updating period, allows for the true parameter of $\hat{p}$ to be derived. Thus, the deterring agent is found to be only as effective as the probability an injurious attempt is made successful.

1. Introduction

The literature on deterrence in economics has primarily been associated with the field of Law, as deterrence deals mostly with the action that ensues, beyond malevolent threats, imposed upon an uninformed party; the lack of sufficient warning of nearby danger, or the inability to anticipate imminent infractions, create an environment where an economist and a judicial official may find overlapping pathways of similar interest: to unravel the intricacies within the system of crime and punishment. Deterrence thus far has focused primarily on the responsiveness-to-crime, the probability that an individual is apprehended; the relationship between the sensitivity to crime and changes to the severity of criminal sanctions; examining the responsiveness-to-crime to labor market conditions, using positive incentives rather than punishment. In hypothesizing whether people want optimal deterrence, (Sunstein, Schkade, and Kahneman, 1999) focused on the probability of detection as being a key variable in individuals' decision to optimize deterrence. They found that changes in the probability of detection did not produce significant changes in the difference of judgments in relation to penalty levels. This suggests that the potential offender's actions remain to be determined at any given level of punishment. In lieu

of such insights, putting the firm at the forefront of decision-making, as to set the optimal level of deterrence, irrespective of the sensitivity of the potential offender, is what I will be focusing on for the remainder of this paper. My analysis will enable the firm to be a proactive agent in its implementation of deterrence strategies.

One cannot speak of deterrence in any context without referencing Thomas Schelling's enormous contribution to the field of game theory and its broad applications. In relations to strategic decision making, Schelling (1960) approached deterrence through the context of international relations, whereby a threat of massive retaliation may deter a nation from pursuing any objectives perceived as opportunistic aggression. This led to what is referred to as the problem of credible commitment: a question of how rational agents can commit themselves to costly threats and promises (which benefit the agent only in anticipation by their influence on others). Schelling shows that a player may be able to achieve commitment by staking his reputation with the other player (thus proving credibility), resulting in dependency of both recognizable contact with the opposing party, and verifiability in claims; the existence of multiple equilibria in games became essential. However, it must be noted that for credibility to be sustaining, there must be a commitment to enforcing such promises. Such as this strategy is concerned, the moment at which a threat-of-response is proven in any capacity, the mechanism put forth as a means for deterrence is compromised. The act of proving your worthiness, to instill fear of consequences to the opposing party, undermines the effectiveness of the factors related to deterrence. In other words, proving would disprove the credibility of factors related to deterrence. Credibility lies in the reinforcement of deterrence, such as the response-tactics employed by the opposing players. Credibility is no longer a necessary condition, as it renders the means by which firms employ such deterrence strategies as obsolete. My contributions to this body of work will not build per se, but approach a similar problem at a different angle. Therefore, credibility, as will be shown, is non-needed, and the optimal strategy employed by the firm will be a path more befitting to the current experiences and conditions of the market. In this paper, I identify the effectiveness and quality of the deterrence-mechanisms put forth by the firm, individual, or entity, thus allowing for an optimal level of employment. It is to the best of my knowledge that this approach has yet to have been explored.

2. Deterrence as a Strategy

Up until now, deterrence has been measured by the difference-in-difference (DID) technique, which makes use of data from treatment and control groups to extrapolate information and derive an estimate of the causal effects of a specific intervention or treatment, analyzing the changes in outcomes and observed market trends over time. So long as the desired effect is aligned with the objective, the strategies used by means for deterrence are deemed sufficient; the lack of, or less of the disturbance proves that the methodologies used are worthy of a fixed-continuation. The problem with this approach is that to deter some and not all overstates the claims of the effectiveness of such deterrence strategies; those

considered to have been "deterred" are, for the most part, immeasurable, as the information concerning the whereabouts or activity (either displaced or removed entirely) is difficult to track, leading to exaggerated claims. On a global scale, deterrence is nuanced (primarily due to its construct), but similar in principle. In Lebow and Stein's *When Does Deterrence Succeed (1990)*, four guiding principles for analyzing deterrence are first, to maintain clear communication of deterrence messages for credibility; second, to determine what motivates the adversary—opportunity, need, or a combination of the two; third, to analyze how the defender used reassurance to reduce fear and the perceived vulnerabilities of the adversary; fourth, to analyze the perceived context of the challenger and defender (p. 3, 69). In *Only in the Mind of the Enemy: Can Deterrence Effectiveness be Measured?,* Debora K. Rose proposed an indicator list that planners can use to develop appropriate priority intelligence requirements (PIR): political indicators; alliances; economic considerations; motivation; communication; military forces. While the ability to assess the effectiveness of deterrence requires greater contemplation by nations than by a firm (or even an individual for that matter), the problem of measuring deterrence remains. In the absence of activity or notable threat, can we effectively measure the mechanisms put forth as means for deterrence? For example, communication by means of disseminating the information regarding the terms and conditions, to instill fear or doubt of consequences can be effective just as it is costly. My paper seeks to shed light on this phenomenon through an economic lens and approach, by proposing not an indicator but an index to follow, such that firms, individuals or entities can optimize their deterrence strategy by employing what is identified as a deterring agent. A deterring agent is any entity, product, or agency that discourages (someone) from pursuing malicious behavior by instilling fear or doubt of the consequences; effectiveness being the desired result or effect, upon implementation and execution of a goal or strategy.

3. The Approach

Approaching the fundamental problem of deterrence through an economic lens, I ask a simple question: at what expense are firms willing to trade away their right of immunity? Right of immunity is, in other words, to abstain from market participation or any activity as to continuously avoid what is to be anticipated. To be guaranteed that one's vehicle is not removed of their possession (by coercion, order, collateral-repayment, etc.), it is imperative that such is to never to be in their possession to begin with; alternative means of transportation would be of greater interest to this individual, and ownership of a vehicle would only compromise their immunity. This fundamental principle, albeit extreme in some cases, is an absolute truth that underlies the model to be discussed, which informs of the optimal strategy to be implemented by firms. In the event of multiple threats, our model is innately flawed, and thus a very necessary assumption—which is weak at best—must be made: we cannot prevent everything from ever occurring at all times, but rather displace the area of greatest concern to a region of lesser concern. This allows us to isolate the

unanticipated events. Once the question of immunity has been addressed, the firms are to respond by employing the deterring agent at the level which corresponds to their initial probability that an injurious attempt is made successful; in doing so, the number of resources can be adjusted as conditions warrant. A series of trials is actuated, and if no attempt is made successful by the end of the trial-series, firms respond by updating their information (using conjugate prior probabilities) and reduce the level at which they employ the deterring agent. This ultimately creates an optimal strategy and index for firms to follow. Without such an index to follow, firms are never compelled to reduce employed levels, and if so, it is done unjustifiably to an arbitrary level and potentially for indefinite periods. This lack of motivation, without cause, reinforces a firm's "being stuck," lest a reversion to prior levels reflects conditions that lead to what was initially unanticipated. This brings about a falsifiable circumstance, whereby the employed deterring agent appears to be far more effective than circumstance would dictate; a false sense of security. When in fact an injurious attempt is made successful, the deterring agent is rendered ineffective and obsolete. Firms respond by increasing employed levels of the deterring agent to greater levels and once more we are stuck! This consistent strategy of employment becomes a spiraling effect continuing indefinitely as firms fail to adequately manage conditions for which they are disengaged. It will be shown that the costs incurred by employing fixed levels of the deterring agent without updating periods are far greater than what would have been had costs been minimized according to the deterring agent index.

4. Deterring Agent Model

The deterring agent mechanism is unique in that its highest bidding value can only be sustained, and thus of worth, so long as its true value remains to be determined; the maximum value derived through its demanded price is conditional on its non-being-used. The moment at which the deterring agent is actively exercised or engaged, its defined role and functioning purpose is rendered obsolete and insufficient as a means for deterrence. A very simple example of this is a firm in the retail-market wanting to maximize profits by selling deterring agents in areas where it would be least likely to be used, therefore appearing to be most effective as a means for deterrence. What must take place before this exchange can occur, however, is the circumstances which necessitate such a good. In areas with a relatively low probability that an event, which is deterrence worthy, takes place, sellers may have a difficult time appealing to their interest. This becomes problematic when sellers begin injecting fear into the market to increase sales. Doing so would encourage buyers in low-probability environments to buy such a good that will be as effective as is the probability a deterrence worthy event would occur. In knowing that the maximal value is derived in its non-being used, firms maximize profits by not selling it in areas where its true value is likely to be revealed, and conversely, selling in areas where it is most likely to remain unrevealed. As will be shown, the lowest probability yields maximal returns.

The price (which can also be viewed as a wage or rent) of the deterring agent according to economic theory is to equate to the marginal product of its output, which is measured by the likelihood that an injurious attempt is made successful. When the price exceeds the marginal product of the deterring agent, it is evident that the true value has been revealed; this event is only to occur when an injurious attempt is made successful. Updating our information at the most opportune time is necessary because a period too soon would be unjustifiable, and a period later would be falsifiable. Thus, we update—at each discrete level—our prior at $\frac{1}{n}$, with *n* representing the optimum moment at which we run out of reason to sustain these fixed costs. Due to the output being non-tangible—notwithstanding the rights of immunity alternative to be obtained—the proxy measurement of the deterring agent's output is the sustained period by which the deterring agent's true-value has yet to be determined, or an injurious attempt is yet to be successful. In other words, how many periods, *n*, until the r^{th} success with success being defined as succeeding in the injurious attempt. Ideally, we want no success, but that would result in our rights of immunity alternative, whereby firms abstain from market participation due to the potential hazards. To model this phenomenon, we use the probability density function (PDF) of the discrete, negative binomial (NB) distribution given by,

$$P_{NB}(n) = \binom{n+r-1}{n} p^r (1-p)^n$$

To emphasize the dependence on the parameter *p*, we write as,

$$P_{NB}(n|p) = \frac{\Gamma(r+y)}{\Gamma(r)\Gamma(y+1)} p^r (1-p)^y$$

where *r* and *p* are parameters of the density function; the number of events until the r^{th} success, *p* is the probability of success in each event and y is the outcome variable. Displaying the possible outcomes, conditional on the r^{th} success and corresponding probability we have,

$$P_{NB}(y|r,p) = \begin{cases} 0 & y \leq 0 \\ \dfrac{\Gamma(r+y)p^r(1-p)^y}{\Gamma(r)\Gamma(y+1)} & y > 0 \end{cases}$$

Here we have a discrete distribution of probabilities, to make practical the adjustments of labor and capital with the current conditions experienced. Since the *NB* is a discrete distribution,

$$\sum_{y=0}^{\infty} P_{NB}(y|r,p) = \frac{\Gamma(r+y\,)p^r(1-p)^y}{\Gamma(r)\Gamma(y+1)}$$

$$= 1$$

Assuming that we have opted out of our rights of immunity alternative and now have invited the possibility that an injurious attempt can in fact occur, we want to maximize the likelihood that the event does not occur, conditional on remaining in the market. The log-likelihood function of the probability density functions shown above is,

$$l(r,p|y) = \ln\big(p_{NB}(r,p|y)\big)$$

$$= \ln\big(p_{NB}(y|r,p)\big)$$

$$= \ln(\Gamma(r+y)p^r(1-p)^y) - \ln\big(\Gamma(r)\Gamma(y+1)\big)$$

To find the maximum likelihood estimate of *r* and *p*, given $y_{1\ldots N}$, we first differentiate ∂(r,p|y_(1…N)) with respect to *p* and set it equal to 0. Maximizing the length of periods before the r^{th} success we get,

$$\frac{\partial l(r,p|y_{1\ldots N})}{\partial p} = \frac{Nr}{p} + \sum_{j=1}^{n} -\frac{y_i}{1-p} = 0$$

$$\hat{p} = \frac{Nr}{Nr + \Sigma_{i=1}^{N} y_i}$$

where $\hat{p}$ is the estimate for our probability of an injurious attempt being made successful. Applying a more stringent plan of action, we opt for keeping *r* fixed and observing mutually independent events. Thus, we now have the geometric distribution, which is a special case of the negative binomial distribution. The geometric distribution describes the number of Bernoulli trials necessary for a discrete process to change state; an estimation of the total number of trial periods before experiencing the first success—to be the first and only success. Note that the geometric distribution is memoryless; at each trial period, given that the first success has not yet occurred, the conditional probability distribution of the number of additional trials does not depend on how many failures have been observed. The model shown below is the basis of our deterring agent index and strategy,

$$P(Y_i = j \mid \gamma) = (1-\gamma)^{j-1}\gamma \quad \text{for } j = 1, 2, \ldots.$$

where Y_i is the outcome variable of experiencing j trials, conditional on the first success, γ. Similar to before, to maximize the total number of trials before experiencing the first success, we begin by taking the likelihood function,

$$L(p) = (1-\gamma)^{j_1-1}\gamma(1-\gamma)^{j_2-1}\gamma \dots (1-\gamma)^{j_n-1}\gamma = \gamma^n(1-\gamma)^{\Sigma_1^n j_i - n}$$

Taking the log, we get,

$$lnL(p) = nlnp + (\Sigma_1^n j_i - n)\ln(1-p)$$

$$\frac{d[lnL(p)]}{dp} = \frac{n}{p} - \frac{(\Sigma_1^n j_i - n)}{1-p} = 0$$

Therefore,

$$p = \frac{n}{(\Sigma_1^n j_i)}$$

So, the maximum likelihood estimator of p is:

$$\hat{p} = \frac{n}{(\Sigma_1^n j)} = \frac{1}{J}$$

We now see that so long as the value of the deterring agent remains to be determined, the marginal product of output is the probability that we experience j trials before our first success, and the corresponding wage (or rent), w_r, paid is equivalent to the likelihood of an injurious attempt being made successful. Multiplying both sides by total costs, Ω, we get,

$$\Omega(\hat{p}) = \frac{\Omega n}{(\Sigma_1^n j)} = \frac{\Omega}{J}$$

$$\Omega * MP_{output}(\hat{p}) = \Omega * w_r$$

Rearranging we get,

$$\Omega * (MP_{output}(\hat{p}) - w_r) = \begin{cases} Optimal\ Strategy & y = 0 \\ Inefficient\ Employment & y \neq 0 \end{cases}$$

where Ω is the total costs. An optimal strategy to be used by firms is one in which the marginal product of output—absent of activity—and the wage rate are equal. Measuring the output of the deterring agents cannot be estimated solely by the lack of an injurious attempt as it could very well lead to an overestimation of the effectiveness of the deterring agent's quality of output (where the wage rate exceeds

the marginal product of output), or result in the rapid reduction of the employment levels to zero (whereby the wage rate was below the marginal product of output). Any deviation from the equivalence of both the marginal product of output and wage reflects a misallocation of resources. For example, the amount of security provided during the Presidential inauguration for newly elected presidents is extraordinarily high. The probability that an unexpected breach or shock during this massive event is unknown, yet the "all-hands-on-deck" approach, utilized by every security agency and personnel reflect an extremely high probability that such an injurious attempt is to be made successful. Staff members and the like cover all possible bases around the District of Columbia, to ensure the greatest certainty that the President remains unharmed. Surely if this were true, then not having an inauguration would have been a better, more effective, alternative. Yet every newly elected President formally addresses the nation without fail, making it through the day unharmed. Applying what we now know—given that the President has over the years remained unharmed—is it possible that security personnel could have implemented a slightly less costly strategic plan that is twice as vigilant while remaining equally effective? It is very possible that security agencies and all associative parties are overspending, thus providing a false sense of security, during each inauguration. This false sense of security stems from the void of updating periods to reflect the experiences of the firm and the ever-changing conditions of the market. The decisions made by firms, given current market conditions, is the first step towards efficiently employing the deterring agent. In the event that an injurious attempt is made successful, the employed deterring agent is now rendered insufficient and obsolete, and it is evident that the firm has been overspending thus far by an amount that is equivalent to the real wage.

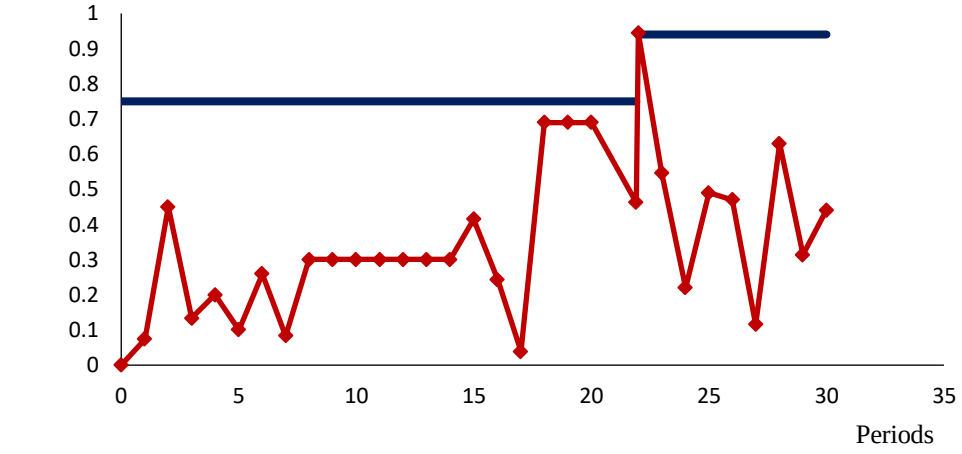
As shown, a higher price paid for the employment of the deterring agent (denoted as a real wage) corresponds with a higher-probability that an event is likely to occur. This follows economic reasoning; by participating in the market, and thus trading away all rights of immunity, while simultaneously maximizing the likelihood that an injurious attempt is not made successful, the firm is to employ the deterring agent at the level which corresponds to the probability an injurious attempt is made successful. Therefore, the effective measure of the deterring agent is such that they are only as effective, as-is the probability an injurious attempt is made successful.

This displays an essential feature of the deterring agent model that necessitates constant downward pressure when pricing the employed deterring agent, as costs at each level are only as sustainable as they are proven to be effective. As the number of trial periods (j) increases, the percentage of total costs devoted to employing deterring agents is reduced; this reflects a lower likelihood that an injurious attempt is to be made successful. Pursuing less costly alternatives and experiencing the same outcomes are signals of market efficiency. Conversely, as the total number of trial periods (j) decreases (reflecting a greater likelihood that an injurious attempt is to be made successful), a larger percentage of total costs devoted to the employed deterring agent is required and thus we find equal amounts of exposure at all levels.

5. Market Failure: Being Stuck

Without actively being engaged, the firm, using standard operating procedures, is never prompted to adjust the levels of their employed deterring agent. At these fixed levels, firms are in effect, stuck! Such fixed costs then become necessary, as they are justified by the current conditions experienced—if favorable. In other words, if what you are anticipating has yet to occur, what you have been doing must be working. Employment levels are adjusted only when an injurious attempt is made successful and what was favorable must be added to restore the levels of deterrence to further such injurious attempts from being successful in the future. Justifiable increases such as this can result in higher fixed costs to the extent that remaining in the market versus opting-out become equally attractive. This results in a market failure, whereby prices do not flexibly adjust to current market conditions without an external force acting upon them. If some catastrophic event forces fixed costs to become varied in one direction, it must be so that fixed costs also be forcibly adjusted (or varied) in the opposite direction. Below I display a random distribution of injurious attempts, all of which are unobserved and unsuccessful until surpassing the fixed levels employed by the firm.

Figure A



As shown above, the level of the employed deterring agent is left unaffected, until an injurious is made successful and yet, these are hidden costs that are not experienced and left unaccounted for. At period 22, the moment in which an injurious attempt is made successful, firms respond by heightening the level at which they employ the deterring agent. Given that nothing has occurred, and no injurious attempt has been made successful, firms will once more justify the new employment levels of the deterring agent as being most efficient. Doing less and receiving the same outcome is an implausible approach some may say. However, the moment in which something does occur, it must also be reconciled that a false sense of security was all

that has been experienced prior to the injurious event.

6. Firms Strategy

A firm's response to any unanticipated breach or shock that disrupts current operations is to draw attention towards the inefficient allocation of resources devoted to the prevention of loss, invoking a dignified, although often unwarranted, surge of resources to fill the void. That is to say, if more money were spent in the areas now found to be "underfunded", to assess the potential threat, then the unanticipated shock would have never occurred. Of course, what firms are saying is that more information (or transparent motives) of potential threats, would have enabled them to better adjust in anticipation of the injurious attempt. The current system for firm's post unanticipated shock (or post-shock), is to respond by increasing costs for an indefinite period until further decisions have been made, to allow for the subsiding of temporal-adjustments, or in some cases to be removed entirely. This brings about a volatile state that is non-conducive to the attainment of more information to optimally employ the deterring agent; suspicion is not a sufficient condition to justify increasing the costs of the employed deterring agent; to what levels should the employment levels become when it is beyond suspicion? As this fatalistic approach continues to be adopted by more firms entering the market, injurious attempts will continue to be made while the firm responds by employing deterring agents at levels predicated on mercurial-indicators and anecdotal evidence.

7. No Guarantee Clause

It must be made clear that the deterring agent index will not prevent an injurious attempt, but if successful, only suggests that we have miscalculated the probability and therefore must readjust to new conditions, now allowing firms to engage proactively and accurately assess the levels at which the deterring agent is to be employed (or reemployed). In the long-run, the level at which the deterring agent is employed serves as an unbiased estimate of its true-effectiveness, given the information provided.

Under the squared error loss function, the expected probability, p, an injurious attempt is made successful, given prior information, is as follows

$$E(p|x) = \frac{n+\alpha}{(n+\alpha)+(\beta+\Sigma_1^{\mathrm{n}}X_i-n)}$$

$$= \frac{n+\alpha}{(\alpha+\beta+\Sigma_1^{\mathrm{n}}X_i)}$$

$$= \frac{n}{\alpha+\beta+\Sigma_1^{\mathrm{n}}X_i} + \frac{\alpha}{\alpha+\beta+\Sigma_1^{\mathrm{n}}X_i}$$

$$= \frac{n}{\Sigma_1^n X_i} * \frac{\Sigma_1^n X_i}{\alpha + \beta + \Sigma_1^n X_i} + \frac{\alpha}{\alpha + \beta} * \frac{\alpha + \beta}{\alpha + \beta + \Sigma_1^n X_i}$$
$$= \hat{p}$$

As n approaches infinity (more trials being produced), less weight is placed upon the initial probability, and we become increasingly reliant on what is experienced. Using this approach to measure the effectiveness of the deterring agent, it is evident that the deterring agent could never be as effective as it once was; it is less effective than it was at fixed employment levels and more effective than it was when employment levels are varied. As the probability becomes increasingly recognizable, in the long-run, and greater updating periods are produced, we approach the true unbiased estimate of $\hat{p}$. Although, it must still be emphasized that any unwarranted updating of probabilities sooner than required is unjustifiable. Similarly, exceeding its expected updating period becomes falsifiable once the index has been implemented. It appears when executing this strategy, the employed deterring agent is as effective as could possibly be—until further notice—the end of the trial-series, or an unanticipated shock before the trial-series is complete. In the event of an unanticipated shock—having had no information prior so as to believe otherwise—it would have been impossible to have done better. In economics, this is considered to be Pareto-Optimal, or having not the ability to improve the welfare of some without harming others. To unjustifiably increase costs devoted to deterrence without sufficient information creates a distortion in the market and invokes a false sense of security, as no evidence to support this change of pace is available.

8. Optimal Solution

This brings me to my next point. If the loss is equal to the real wage of the deterring agent, would it be optimal to minimize costs to the point at which losses equal zero? In this state (as some might assert), setting the initial employment level of the deterring agent to zero should also be an efficient level of employment, as no information has been given to justify employing the deterring agent. This would enable firms to minimize costs of the employed deterring agent such that the wage is equal to zero, reflecting the probability that an injurious attempt being made successful also zero. However, this rational (and brazen) decision, is once more non-conducive to the attainment of information to assess the proper levels of employment and thus we would never have reason to increase the level of the employed deterring agent, as the deterring agent is nonexistent. Thus, setting the level at which firms employ the deterring agent at $\hat{p}$ enables the deriving of the most unbiased estimator—which could possibly be extremely small, and thus zero for practical purposes, but never truly zero. The mere existence of the firm invites the probability that an injurious attempt is made successful. If such a probability truly exists (even if extremely small) we must reconcile that an unsuccessful attempt is also possible. If unsuccessful, there lies an effective deterring agent at play.

Now that we have set our initial probability, $\hat{p}$, as being the most efficient level of the deterring agent, we must actuate a series of trial waiting-periods before the updating of $\hat{p}_1$, conditional on the information provided. The purpose of updating our estimator stems from the inability for fixed costs to naturally vary on its own, resulting in a false sense of security. By allowing for the level at which firms employ the deterring agent to vary with the probability an injurious attempt is made successful, enables both the firm and constituents of the firm to adjust accordingly. In the absence of activity or notable threat—setting $\hat{p}$ at the level which corresponds to the probability an injurious attempt is made successful—we must adjust to the new conditions of the market, such that we benefit from scale-economies by pursuing less-costly alternatives which are now available, experiencing similar outcomes whilst remaining equally effective.

We now have sufficient information to update our estimate and can develop a posterior distribution, conditional on that which has been observed. In doing so, costs are minimized at a *natural-rate*, so long as *nothing* (or $(1-\hat{p})$) remains to be observed. This natural rate ensures a steady and controlled decline in the total costs devoted to the employed deterring agent, as conditions warrant.

Updating information after j periods forces a reassessment of current operations. Having observed $j_1 \ldots j_n$ we have the conjugate prior distribution for the parameter p, given as Beta(α, β), with a pdf proportional to

$$\theta^{\alpha-1}(1-\theta)^{\beta-1} \qquad \text{for } 0 < \theta < 1$$

where α and β are the parameters specifying the length of trial periods until the j^{th} success. Wanting no injurious attempts being made successful, we use 1, as is stated for the geometric distribution. Giving the prior probability we now have,

$$\theta(1-\theta) = \hat{\theta} \qquad \text{for } 0 < \theta < 1$$

now combined with the posterior pdf becomes,

$$\hat{\theta} \times \bar{\theta}^{j}(1-\bar{\theta})^{X-j} = \hat{\theta}[\bar{\theta}(1-\bar{\theta})^{X-j}]$$

of a Beta$(\alpha + j, \beta + \Sigma x_i - j)$ distribution.

Upon completion of our first trial-series (given $\hat{\theta}_1$), in the absence of activity, we now have sufficient information to update our prior conditions and are left with a probability of $\hat{\theta}_2$. This new probability has allowed for a reduction in costs at a rate that allows firms to adjust to current market conditions in a steady and controlled fashion. This downward sloping function, as shown with $\hat{\theta}_2$, allows for a lower probability that becomes increasingly manageable over longer trial-periods; firms now experience longer trials before the next updating period. The consistent updating of probabilities not only sets the level of the employed deterring agent but also signals

how long is required before updating information, thus reducing costs at a rate reflective of current market conditions. This cycle continues indefinitely as firms expand and contract. Each subsequent updating period and new probability is more accurate than the prior having now accumulated information to support the means by which firms employ the deterring agent.

9. Unanticipated Shock: Firm Response

By now, you might have considered how firms are to react when an injurious attempt is made successful. To answer this, we first must address whether it is a rational decision by the firm, when an unanticipated shock occurs, to heighten the level at which the deterring agent is employed. Assuming this unanticipated shock was the first experienced by the firm, is it possible that this was, in fact, an isolated event? Here, given no expectations for another unanticipated shock, doing nothing must be an optimal solution. The shock has already taken place and thus if we have sufficient information to determine independent events, doing something might make us worst off. This rationale is true, however, as shown with the memory loss function, a geometric distribution can maintain a set-probability over extended periods, as successive successes are not conditional on how many failures have been experienced. If a firm experiences multiple unanticipated shocks, the question becomes how many trial periods between events are there to be, before declaring that they are in fact isolated or dependent upon one another. If declared to be isolated, fixed-continuation of employment levels of the deterring agent will support their rationale and reinforce their being stuck; this is a false sense of security. If both shocks are dependent upon one another to what new employment level should the firm set? It turns out, the unanticipated shock experienced by the firm, are signals of the now-compromised role of the deterring agent, who now has been rendered insufficient and obsolete. This signal of the firm's vulnerable state-of-being requires immediate action, thus making the firms reflexive response, a rational or natural-shock.

If an unanticipated shock occurs before any updating period, firms are to respond by setting the probabilities to correspond with the period at which the unanticipated shock occurred. This shock-correction now reflects the new conditions of the market. The closer the unanticipated shock is to the period at which probabilities are updated, the more accurate the probability was initially set. Conversely, the further the unanticipated shock is from the period at which probabilities are updated, the less accurate the probabilities. To increase the level at which the firm employs the deterring agent beyond the point which conditions-warrant, would result in wasteful spending and a false sense of security. This process is modeled graphically in Figure B below.

Figure B

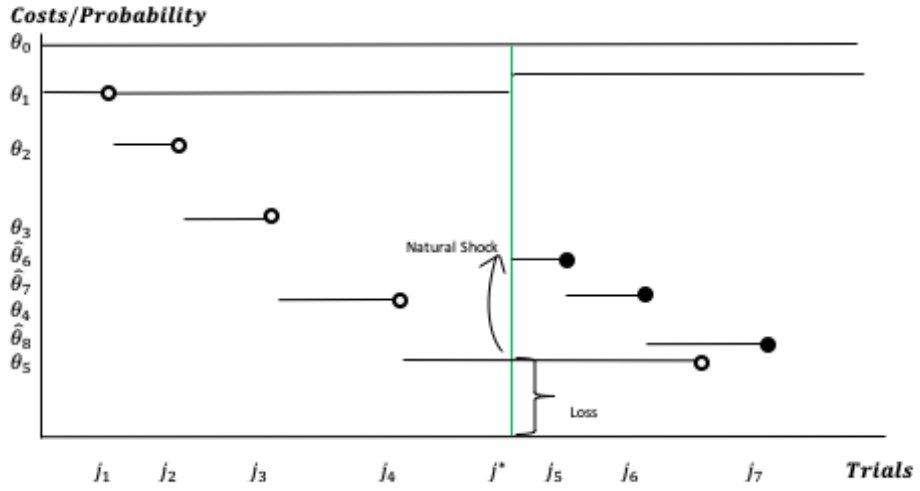


Figure B is a graphical display of the firm's employment process over j trials that a firm must undergo to optimize the level of the employed deterring agent. Beginning on the y-axis with a probability of θ_1, we see that at higher levels of employment (and thus a higher probability) it is costly to sustain such levels for an extended period of time, resulting in a trial length equal to $0{:}\,j_1$—in units set by the firm—before adjusting the estimates. As information is obtained, we adjust our estimates to reflect new conditions, now it is possible to sustain lower levels of employment at longer periods; in the absence of activity, we have no reason to maintain high costs given our evidence that similar conditions can be experienced by the firm at lower levels of employment. During the period in which the employed deterring agent is at θ_5, an unanticipated shock occurs at j^*. Here, we have our natural shock, which requires the firm to adjust the level of the employed deterring agent to the probability which corresponds to the period at which the shock took place. The employed deterring agent level goes from θ_5 to $\hat{\theta}_6$. If the firm were able to identify the period at which the unanticipated shock was to take place, then this strategy would be most optimal (and all of this would be for nothing). However, the inability to set a fixed level of the employed deterring agent at any given level of $\hat{\theta}$ requires the constant updating of the $\hat{\theta}$ estimator at a controlled, stable decline to accumulate the necessary information for a precise estimate. Therefore, it is a market failure. *Something* must occur (or be experienced) to prompt the firm to adjust employment levels, but *nothing* occurring will not prompt a reduction approach, thus we are stuck. This results in a consistent misallocation of finite resources, which creates a channel for repeat injurious attempts being made successfully.

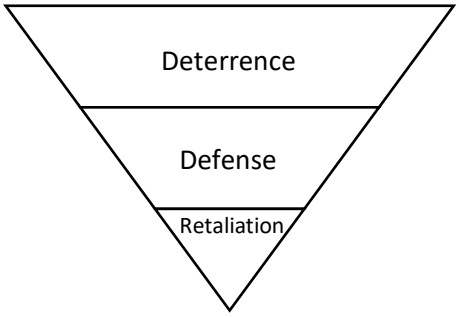
10. Optimal Path

Following the optimal strategy outlined, it is necessary to ensure that the employed levels are reflective of what conditions the firm is experiencing. Updating the probability any earlier than required (or prompted to do so) understates the magnitude of what is truly being experienced. Conversely, if the employed level of the deterring agent is updated past its updating period, it is an overstatement of the true worth, and we have a false sense of security provided. Thus, in both instances there is either understating or overstating of its usefulness. Failing to update or updating too late makes you biased towards your initial prediction, $\frac{1}{n}$. This is due to the neglect to update at the proper periods, which would require incorporation of arbitrariness (or flat-out guessing) to re-evaluate the probability of an injurious attempt being made successful.

11. Conclusion: Importance of Deterrence

The importance of deterrence as a standalone strategy—if successful—is to render all other forms of action as unnecessary. So long as the deterrence mechanism is effective, the sub-tiered strategies which reinforce the deterrence position of the firm are of no use. This can be shown by a simple inverted pyramid model below, where each section represents the percentage of total costs devoted to separate strategies.

Figure C: Sub-tiered Strategies



As shown in the inverted pyramid, larger costs devoted to an effective deterrence strategy results in fewer costs required, and thus allocated, for *defense* and *retaliation.* Conversely, less effective deterrence strategies require greater emphasis placed on defense and retaliation.

Deterrence thus far has focused primarily on the responsiveness-to-crime, the probability that an individual is apprehended; the relationship between the sensitivity-to-crime and changes to the severity of criminal sanctions; and examining the responsiveness-to-crime, to labor market conditions, using positive incentives rather than punishment. The deterrence problem has been the inability for firms (or individuals) to assess and anticipate malicious intent. Because of this, firms have

been handicapped from optimally employing and executing deterrence strategies, relying instead on second and third-tier reinforcements, defense and retaliation. This paper departs from the firm's direct engagement with the potential threat (and subsequent negotiations), and deals with deterrence as a separate strategy, to discourage (without promise) injurious attempts being made successful. Using the information accumulated, we developed a model and index that enabled firms to effectively measure the mechanisms put forth as a means for deterrence. It was shown that without this index, the current indicators firms used to set their level of deterrence created a distortion in the market, whereby a false sense of security was produced in the event of an unanticipated shock.

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The Effect of the Dodd-Frank Act on the Yearly Return on Assets for Banks

By Jay Prasad and Christian Rodriguez

Abstract

This study is geared towards examining the effects of the Dodd-Frank Wall Street Reform and Consumer Protection Act on the return on assets for banks. Using data gathered online, we input it into a model in order to achieve the optimal regression results. Our model has 21 observations and includes only banks that have more than $50 billion in AUM (Assets Under Management). Factors such as efficiency, revolving credit, commercial/ industrial loans, and more, are used in our model. Many of the factors used are ratios, so one must be careful in regards to the interpretation of the models' results. Due to the nature of this topic, the true effect of the Dodd-Frank Act will only be measurable in the future. We have also realized that there is not much literature in relation to an econometric analysis on this topic, which has led us to use many articles and piece together information. We conclude that the Dodd-Frank Act does indeed have an effect on a bank's ROA, and certain variables in the model affect it differently.

1. Introduction

The financial crisis of 2007-2008 devastated the United States. Many banks deemed 'too big to fail' inevitably collapsed and declared bankruptcy. One of the largest shocks to the financial system was the bankruptcy of Lehman Brothers Holdings on September 15th, 2008. The economic slowdown turned into turmoil—the US economy was in an out-of-control downward spiral. After the dust settled, the US followed the road to economic recovery. The government began to take preemptive measures in order to prevent financial devastation due to crises. On July 21st, 2010, President Barack Obama signed the Dodd-Frank Wall Street Reform and Consumer Protection Act into legislation. Regarded as one of the most extensive and significant financial regulatory reforms in American history, "…a sweeping overhaul of the financial regulatory system, a transformation on a scale not seen since the reforms that followed the Great Depression" (Office of the Press Secretary), the purpose of this Act was to fill the glaring cracks in our financial system that were exposed during the crisis of 2007-2008. The Dodd-Frank Act was implemented to increase financial stability, increase oversight of financial institutions, and to safely wind down any failing institution without bringing down the entire financial system. Ultimately, the accountability and consumer protection of the financial system vastly increased, and the 'too big to fail' issue was addressed.

2. Brief Literature Review

The topic of the Dodd-Frank effects on a bank's *ROA* has not been researched extensively. Due to the nature of the topic, more data will be available as time goes on, so a precise measure of the true effects of the Act will only be possible in the future. There is a very limited pool of literature that discusses an econometric analysis regarding the impact of Dodd-Frank on banks' *ROA*. Perhaps the most prevalent literature on this topic is that of Alexandra Larch, '*The Effect of Dodd-Frank on the Profitability of Community Banks: An Econometric Model'*. In this piece, the author brings to light the financial factors that affect the return on assets, return on equity, and net margin rates of 82 banks. Although the sample size is 82, only the ones considered 'commercial banks' by the author are included in the actual econometric analysis and model. By using macroeconomic indicators and profitability variables, the author concluded, "a small bank and regulations will both negatively affect profitability" (Larch, 2017, p. 3). She does admit, however, that omitted variable bias might be present in the study since many factors that affect a bank's profitability are not included in the model.

Another helpful piece of literature is written by George Turk and Philip Swicegood, titled '*Assessing the Market's Reaction to The Dodd-Frank Act'.* This article deals with the market's reaction due to the forming and signing of the Dodd-Frank Act. Turk and Swicegood (2012) used 12 major federal legislation events in order to measure the immediate effects on markets, a study done after the signing of the Dodd-Frank. They concluded that the legislative bills that were signed in order to address recent financial crises positively affected the market. The authors took this further and said, "We also find evidence that only large banks reacted to the passage of the Dodd-Frank act since they have the most at stake" (p. 576).

Martin Baily, Aaron Klein, and Justin Schardin (2017) provide an extensive look at the financial system post-Dodd-Frank in their paper, '*The Impact of the Dodd-Frank Act on Financial Stability and Economic Growth'.* This piece of writing provided much insight as Baily, Klein, and Schardin discuss the benefits and costs of the Act as well as certain aspects that could be improved and expanded on. Leverage ratios, capital requirements, capital buffers, and stress tests are a few of the qualitative measures analyzed. There is also a section in which they acknowledge that it might be too soon to measure the full effects of the Dodd-Frank, as previously mentioned. Their conclusions touch on the fact that the "financial sector is much safer today than before the crisis" (p. 43)—the issue of banks believing they are "too big to fail" is fading and consumers are much better protected nowadays compared to pre-Dodd-Frank times.

Lastly, *'Bank Capital: Lessons from the Financial Crisis',* by Asli Demirguc-Kunt, Enrica Detragiache, and Ouarda Merrouche (2010), gave much-needed context on not only market performance but how bank capital was tied to returns during the timeline of the financial crisis. In this article, variables like Tier I and Tier II capital ratios, as well as leverage and risk-adjusted ratios, are all discussed in detail. They argue that banks with limited capital and asset options would not be able to absorb

losses as well as they could have if their capital positions were not curbed. Conclusions drawn include the fact that capital differences pre-crisis had minimal effects on stock return, while during the crisis a strong capital position allowed for better stock performance (admittedly, mostly for large banks). This article, coupled with Turk's and Swicegood's piece, provided superb context in terms of market performance and bank capital pre, post, and during the financial crisis.

3. The Model

Since *ROA* can be derived in numerous ways, it was decided that having two separate models would best describe the effect the Dodd-Frank Act has on annual average *ROA* for banks with at least $50 billion in assets under management. That being said, in both empirical models, there are 21 observations being used (1996-2016). Annual data from 19 financial institutions selected to participate in this analysis are also included, and it was decided that using six variables in our model would help us:

1) Gauge the full effect of each variable on yearly average *ROA*—financial and macroeconomic data tend to be related to one another and/or move in a similar way.
2) Prevent distortion in the models' findings. Since the three major financial statements are linked to one another—meaning that any changes on the income statement will cycle into the balance sheet or cash flow statement and vice versa (Chart I) —one can argue that *ROA* and other financial metrics are related to one another. The use of more than seven variables, especially if they are all financial metrics, would warp the results.[1]

We will delve deeper into these two remarks in the data description in section (**4**). The empirical model used in this analysis is stated below—Model (1):

$$(1)\ log(ROA) = \beta_1 + \beta_2\ log\ log\ (LLtoNII) + \beta_3(PostDoddFrank) + \beta_4\ log\ log\ (Efficiency) + \beta_5\ log\ log\ (LiabilitiestoEquity) + \beta_6\ log\ log\ (TotalRevolvingCredit) + \beta_7 log(CI\_Loans)$$

3.1 Explaining Model (1)

For the empirical model employed, it was decided that having a log-log model would be best as we are interested in finding the elasticity of *ROA* relative to a percent change in our independent variables. For simplicity, we thought it would be easier to understand the coefficients if expressed as percentages. Additionally, studies conducted by banks and academics not only use elasticity to determine how consumers would respond to a change in price for their services but also to see how a bank's assets respond during economic shocks—stress tests conducted due to the

[1] The most comprehensive and visually simple illustration of the relationships between financial statements we could find (see http://accounting-simplified.com/financial/statements/links-and-relationships.html).

Dodd-Frank Act—as well as to simply see how a change in asset price affects their capital buffer. For the analyses discussed in this paper in particular, we tried using different variations of log models. However, the regression style previously mentioned seemed to have captured well-rounded results that not only make statistical sense but practical sense and theoretical sense, as well. The log-log model contains a simple set of variables that many politicians and financial executives believe to have affected the performance of financial depository institutions, in our case, a bank's *ROA*. We will begin by explaining the reasoning behind *ROA* being our dependent variable.

ROA is an indicator of the profits a company is able to generate relative to the performance of the assets held by the company. An elementary way of calculating *ROA* is by dividing net income by total assets. In our case, for simplicity, one can use the elementary *ROA* formula; however, databases like Bloomberg and Thomson One use complex algorithms to derive *ROA*, altering the algorithm depending on the industry you are analyzing. *ROA* can be used to assess how efficient a company is at using the assets available to generate profits. It is also a good metric for evaluating how well management is performing. However, one cannot assume that maximizing assets would lead to a mutual maximization of profits, and one must compare results with comparable peers, meaning that you cannot compare a large commercial bank to a much smaller community one. Specifically, in the financial industry, banks are known to have low *ROA*. This is because banks tend to be highly levered compared to other industries, so a 1 to 2% *ROA* indicates solid profits. That said, because of the recent financial crisis and the aggressive regulatory overhauls that followed, many financial institutions today believe that they are not performing at the same level they once were before the crisis. We believe that the aggressive, far-reaching, and extensive Dodd-Frank Act impacted the performance of a bank in several ways. For example, Dodd-Frank changed capital rules, all forms of lending standards, compliance, and risk management. Hence, it makes sense to use *ROA*, which is a financial metric that captures these effects.

LLtoNII represents a bank's provision for loan losses *(LL)* divided by net interest income (*NII*). The latter is comprised of the difference between how much a bank earns on its loans and how much a bank pays out—in the form of interest—to depositors that finance these loans. On the other hand, the former is an expense on the income statement, which is made up of capital set aside to cover for loans that are considered by the bank to be uncollectible. Every year, a bank sets aside an estimated percentage of their capital to absorb expected and, in some circumstances, unexpected loan losses. This variable does an excellent job in capturing not only current and future economic conditions but also financial performance. If loan losses as a percent of net interest income increases, it indicates consumers and businesses are defaulting on their loans and affects a bank's financial performance because capital that could be used to purchase other assets is now being used to cover losses. In our case, *LLtoNII* is an effective way to measure the impact of Dodd-Frank since all lending standards changed, especially for mortgage loans, and so, banks are now expected to

own a well-diversified loan portfolio that no longer includes a substantial position in high-yield loans. Therefore, we expect this variable to have a negative influence on *ROA*.

PostDoddFrank in our model is a dummy variable. It is used to indicate the implementation of the Dodd-Frank Act. Since the Dodd-Frank Act was signed into existence on July 21, 2010, observations from 1996 to 2009 (pre-Dodd-Frank) were assigned a value of "0", whereas all observations after 2009 were assigned a value of "1". *PostDoddFrank* is also used to show whether a difference in *ROA* pre and post-Act exists. We believe that such a difference does indeed exist, however, we cannot determine whether such a difference would have a negative or positive effect, and thus our expected sign outcome is unknown.

Efficiency represents a bank's ability to turn resources into revenue. The efficiency ratio is calculated by dividing a bank's non-interest expense by its interest income. This ratio is used by Larch (2017) to measure the operational efficiency of a financial institution. By operational efficiency, we mean how much control each bank's management has over expenses, such as staff and equipment costs. Banks typically aim for a low ratio since a lower ratio indicates that the bank's revenue is growing faster than the costs tied to everyday operations. According to Sageworks, a financial information company, an acceptable efficiency ratio is usually between 50 to 55%.[2] However, due to the recent financial crisis and measures taken to curtail any such event from happening again, banks now face a substantial increase in non-interest expense, which pulls the efficiency ratio upwards. This variable is extremely important because it captures the surge in compliance cost. As a result of the Dodd-Frank Act, financial institutions were also mandated to have independent, and fully equipped risk management teams. They were also required to hire additional staff to make sure that other provisions, such as the Volcker Rule, the Lincoln Amendment, and combined prudential requirements under the supervisory stress test, are properly followed. Because of the nature of this variable and prior research, we expect to see a negative effect on *ROA*.

On the other hand, *LiabilitiestoEquity* represents the liabilities a bank has relative to its shareholder's equity. This ratio sheds light on how banks are financing their assets—it determines whether a bank is using more debt than equity, or vice versa. It is also a well-known way of comparing banks with different capital structures—not all banks engage in the same business as their peers—some are large but more regional than others. Typically, if this ratio is increasing, it is indicative that a bank is using more debt than capital provided by shareholders to purchase earning assets, which could potentially lead to a faster increase in revenues. Therefore, we expect this ratio to have a positive influence on *ROA*. However, should things go awry, shareholders are the ones who are saddled with the loss. To make matters

[2] Sageworks offers an easy, in-depth analysis of the efficiency ratio. See https://www.abrigo.com/blog/2014/09/29/does-bigger-mean-more-efficient/?sw for a discussion.

worse, if a bank does not have a comfortable capital cushion to endure any losses, then it may face insolvency. During the financial crisis, banks were not only using more debt than equity to finance certain deals, but they were also creating 'off-balance-sheet' enterprises to hide their financial position. We assume this ratio dropped substantially because:

(1) Under the Dodd-Frank Act, banks were pushed by regulators to use more capital to purchase assets, in other words, "having skin in the game".
(2) Banks were prohibited from owning risky assets, such as ownership in private equity and hedge funds.[3]

TotalRevolvingCredit represents the annual amount of outstanding credit lines extended to consumers to pay for personal expenditures, excluding loans secured by real estate. Overall, total revolving credit helps one assess the state of the credit card market. The credit card business is highly profitable, and a key component of banking operations. Intuitively, as total revolving credit increases, you could also expect a bank's revenue to increase as well, which could potentially lead to an increase in *ROA*. Many believe that the implementation of Dodd-Frank has made it much harder for revolving credit to increase year-over-year.[4] Primarily, because of the restrictions placed on banks by the Consumer Financial Protection Bureau (CFPB). According to Batkins, Milloy, and Varas (2016), the CFPB coupled with individual Dodd-Frank provisions have limited the number of financial products available to consumers, are encouraging creditors to push some of the regulatory cost to consumers, and curtailing consumer access to credit if they do not fulfill lending standards. Since total revolving credit is tied to lending, we expect this variable to have a positive influence on *ROA*.

Finally, our last variable for Model (1) is *CI_Loans*. This variable captures the total amount of loans outstanding that have been given to businesses. Businesses usually take out these short-term loans to cover working capital or to expand business operations. This variable is also similar to *TotalRevolvingCredit*—the more commercial and industrial loans given out to businesses, the higher *ROA* can potentially be. Thus, we expect to see this variable have a positive effect on *ROA*.

4. The Data

4.1 Sample Selection and Data Description

In conducting this analysis, we started by identifying banks with at least $50 billion in assets using Thomson One, a financial analytics database created by

[3] For a much more detailed discussion on this particular topic, see Klein, Baily, and Schardin (2017) pg. 35-37.

[4] Batkins, Milloy, and Varas (2016), conducted an interesting econometric analysis on the impact of the Dodd-Frank Act, using total revolving credit as the dependent variable.

Thomson Reuters. The reason being is that banks with at least $50 billion in assets are held to much stricter standards under the Dodd-Frank Act, and therefore have much more to lose as compared to smaller banks. We excluded banks that are not publicly traded due to the unavailability of public data, and we also excluded international banks that are not American—except for Mitsubishi UFJ, in which throughout its history has bought several American banks. Once a reasonable sample group was established—19 banks in total—we decided to dig deeper and look into their financial performances over 21 years (1996-2016), in order to arrive at a sample average per year. Overall, in this study, we are capturing the yearly average performance of our sample banks, as noted in Table II, III, IV, and V.

A similar approach to *ROA* was taken when calculating yearly average statistics for the independent variables: *Efficiency*, *LLtoNII*, and *LiabilitiestoEquity*. Also, similarly to *ROA*, the data was obtained from Thomson One. However, *ROA* was a given statistic, whereas the independent variables previously mentioned needed to be calculated by combining line items from a bank's income statement and balance sheet.[5] An issue that we faced with financial data while compartmentalizing it was missing values. In several cases, data for the current fiscal year was not available, and thus we extrapolated to obtain values for 2016. In other cases, data was not available for several fiscal years, and so, we were required to interpolate. For the former, we looked at banks' current SEC financial statements, such as the 10-K. However, that was not always required. A few banks had financial data with little variability, so taking a simple average did the trick. The latter, however, was a little bit more difficult, so we used three different approaches:

(1) We obtained the missing values by looking at the bank's closest peers. In other words, conducted a comparable analysis to find peers that fit both the business and financial profile of the bank with the missing data points. Some of the key characteristics that we looked for, were similar operating sectors, products and services, customers and end markets, geography, size, profitability, growth profile, and credit profile
(2) We looked at their respective historical performance and used a three-year average
(3) Like the previous technique, we noticed that a three-year average using one future and two previous years usually gave us an estimate that fell in line with the historical data trend of the bank.

As briefly mentioned in the model analysis section (**3**), all three financial statements are interlinked, which may potentially lead to a correlation problem if the financial data being used are related to each other. One particular way financial statements are linked is through 'net income'— 'net income' cycles out of the income statement and into the cash flow statement. In fact, 'net income' is the first line item

[5] For more information on how each variable was calculated, refer to the model description section, where we described the components each variable incorporates or look at table II, III, IV, and V.

in the cash flow statement. Then, it cycles out of the cash flow statement through 'ending cash balance', which is the final line item in the cash flow statement. The 'ending cash balance' is analogous to the 'cash & cash equivalents' line item on the balance sheet. As you can see, this is just one of the many ways in which the three statements are connected. You can draw similar comparisons by using different line items. Refer to Chart I—the arrows are continuously revolving around each other.

Macroeconomic and bank-related indicators, such as the *TotalRevolvingCredit* and *CI_Loans*, were obtained from the FRED economic database offered by the Federal Reserve Bank of St. Louis. Similar to the issue with financial data, we found that economic data sets, specifically for 2016, were not uploaded yet. FRED usually uploads data corresponding to the previous year. For example, data dated 01-01-2016 by FRED corresponds to 2015. As a result, to fix this issue, we implemented a similar extrapolation technique to the ones previously discussed. The only difference was that instead of purely averaging historical performance, we first solved for the annual percentage change, then averaged the results. The average annual percentage change was later used as the growth rate for 2016. An additional issue with macroeconomic indicators is that they tend to follow a common trend over time—the same can be said of financial data—so collinearity between both macroeconomics indicators and financial metrics is highly probable.

Table I: Descriptive Statistics per Variable

	No. of Observ.	Mean	Std.Dev
Full Sample			
ROA	21	1.32%	0.90%
LLtoNII	21	19.14%	22%
Efficiency	21	45.76%	12%
LiabilitiestoEquity	21	10.11	4.09
TotalRevolvingCredit (in billions)	21	815.89	144.6
CI_Loans (in billions)	21	1,284.58	387.89
PostDoddFrank*	21	--	--

*PostDoddFrank is a dummy variable

In Table I, we show summary statistics for the full sample. For the full sample *ROA*, the average was 1.32%, which is interesting since *ROA* essentially experienced a vast drop right after 2007 and slowly recovered. However, since our data mostly consists of pre-crisis data, where you see much higher returns in the earlier years, it makes sense. The standard deviation for this variable was 0.90%, which is understandable because of the structure of the data: large returns are at the end of the data set, whereas the really low returns, in some cases even negative, are located on the other half of the data set. The average *LLtoNII* is a comfortable 19.14%. Interestingly, its standard deviation was slightly higher at 22%. This may be due to the results from 2008-2010 (the financial crisis), in which we had large

percentages centered here. In some cases, *LLtoNII* surpassed 100%, meaning that banks were expecting more consumers and/or businesses to default on their loans than net interest income. Essentially, this is one of the reasons why so many banks had to be bailed out during the financial crisis. No financial institution could survive three consecutive years of profound loan losses.

The mean for *Efficiency* was 45.76%, comfortably below the 50 to 55 % threshold that is recommended. Its standard deviation was 12%. Once again, this is because the data is not widely distributed, it concentrates mainly in the post-crisis years. On the other hand, *CAR* was seemingly healthy at 13.36%, with a standard deviation of 0.95%, relatively in line with both Basel and additional prudential requirements under the Dodd-Frank Act. The mean for *LiabilitiestoEquity* was 10.11, indicating that on average liabilities were 10.11 times higher than shareholders' equity. *LiabilitiestoEquity* also has a fairly stable standard deviation at 4.09. The reason is that significant changes to a bank's capital structure occur in a span of several years. This relates to the fact that banks cannot rapidly deleverage to reduce their liabilities and assets, while simultaneously increasing capital. On the contrary, it's done slowly over time and in such a way to avoid panicking the market.

Both *CI_Loans* and *TotalRevolvingCredit* show stable summary statistics, with averages of 1,258.58 and 815.89 billion and standard deviations of 387.89 and 144.6 billion, respectively. Historically, both *CI_Loans* and *TotalRevolvingCredit* increase marginally over time, with minor hiccups during economic shocks.

Table IX shows the correlation matrix for the empirical Model (1). The results from the correlation matrix show that several of these pair-wise correlations are quite high, suggesting that there may be a collinearity problem between the independent variables of *PostDoddFrank*, *Efficiency*, *LiabilitiestoEquity, and CI_Loans*. *PostDoddFrank* and *Efficiency* seem to show the highest correlation coefficient due to similar data trends. In the initial observations, *Efficiency* remains fairly stable, indicating little variability. However, as we get closer to 2016, we begin to see *Efficiency* fluctuate much more. *PostDoddFrank* exhibits a similar trend due to its classification as a dummy variable, with no movement before the enactment of the Dodd-Frank Act. *Efficiency* and *LiabiltiestoEquity* and *LiabilitiestoEquity* and *PostDoddFrank* appear to suffer from the same correlation problem as *PostDoddFrank* and *Efficiency*.

5. Regression Results

5.1 Regression Results for Model (1)

Table X contains estimation results for the log-log model. Almost immediately, we noticed that all independent variables expressed their hypothetically expected signs, except for *CI_Loans*, which actually has a negative sign, but a significant—at the 10% level—influence on *ROA*. The unexpected sign of *CI_Loans* may be due to the strong negative relationship between *CI_Loans* and *LiabilitiestoEquity*. In fact, we looked back at the data and observed that historically,

LiabiltiestoEquity has been decreasing, whereas *CI_Loans*, has a large upward momentum. Regarding *PostDoddFrank*, we were unsure about the expected sign, so we left it as unknown. Still, we were surprised to see that *PostDoddFrank* has a positive, highly significant—at the 1% level—influence on *ROA*. This indicates that as the years of Dodd-Frank's existence increases, so will *ROA*. Nevertheless, we believe that this may be tied to lending improvements, as witnessed by the upward moving data of *CI_Loans* and *TotalRevolvingCredit*, or simply because of an improving economy. On the other hand, this positive effect could also be due to the fact that banks are adapting to the current regulatory environment. The latter happens to be highly probable because as non-interest expense increased, interest expense among banks in our sample decreased to near record lows. This proves that banks became more fiscally conservative so as to compensate for the cost of having expensive risk and compliance management staff.

For the remaining variables, our hypothetical assumptions proved to be correct. In Table X, we can see that the results for *Efficiency* demonstrate a negative, highly significant elasticity, meaning that if *Efficiency* increases by 1%, *ROA* decreases approximately by 4.41%. As previously stated, if *Efficiency* increases that indicates that either non-interest expense has gone up or interest income has declined. Although to be more specific, the former makes more sense because of the current regulatory environment. Similar to *Efficiency*, *LLtoNII* is also highly significant at the 1% level but has a much smaller elastic impact on *ROA* per percentage increase. Finally, we were surprised to see *LiabilitiestoEquity* moderately significant at the 10% level. However, as previously noted, the root of the cause might be collinearity. Overall, we believe this model has a satisfactory fit. By the looks of it, the model exhibits an F-statistic of approximately 16.40, which is higher than the F-critical value of 6.01, at 1% significance, so it's safe to say that this empirical model is significant overall. Most importantly, all independent variables are statistically significant, but on different levels of significance. Finally, we noticed that the elasticity estimators are much higher than banks' actual *ROA*, but we decided to keep this model because it captures, in an interesting way, the elastic responsiveness of regulatory change in the banking industry.

5.2 Additional Analysis of Model (1)

Another issue with this paper is that the independent variables being used, particularly in this model, exhibit symptoms of collinearity. To prove whether collinearity is present, we decided to adopt Klein's rule of thumb. We started off by finding the auxiliary regressions. This method was used to figure out which independent variables are related to each other. The results showed a troubling problem: four out of the six variables displayed R^2's that were marginally, or much larger than the threshold of .8758. However, we expected to see troublesome results like the ones mentioned above. As noted earlier in this paper, financial and economic data tend to move in a correlated manner, so it's nearly impossible to analyze the financial performance of a bank without considering economic conditions. We also

believe that, in our case, dropping a variable will cause specification bias. For instance, if we drop *Efficiency*, our model will not capture a vital component of the Dodd-Frank Act—the rise in non-interest expense. Similarly, if we drop *LiabilitiestoEquity*, we are essentially ignoring the additional prudential standards mandated by Dodd-Frank. Finally, if we drop the dummy variable *PostDoddFrank*, we are disregarding the changes to a bank's *ROA* since its formation. On the extreme side, we could attempt to find a brand-new set of variables, however, they may suffer from the same biases. Therefore, we agreed that the best approach to deal with collinearity was by leaving our data in its natural, current state.

After testing for collinearity, we then proceeded to analyze the residual variance of Model (1). The academic studies we used to guide our analysis did not include heteroscedastic findings nor mentioned it, so we had no empirical information about the heteroscedastic nature of our topic. To assess such an existence, we started by plotting the squared residuals of Model (1) against 21 observations (1996-2016). The results did not display a pattern that may indicate the existence of heteroscedasticity—no outliers, as well. To double-check our previous results, we then plotted the squared residuals against *CAR*, an independent variable. The results, once again, displayed neither outliers nor any particular pattern. Finally, we implemented White's General Heteroscedasticity Test, ultimately yielding an observations*R^2 of 6.95. Using 6 degrees of freedom, the critical chi-square values at 1, 5, and 10% significance were 16.8119, 12.5916, and 10.6446, respectively. Thus, for practical purposes, one can strongly conclude, on the basis of the White test, that there is no heteroscedasticity. As a side note, this outcome may be due to the fact that we are utilizing a log-log model, which compresses our data, reducing any pre-existing heteroscedasticity.

6. Summary and Conclusions

The signing of the Dodd-Frank Wall Street Reform and Consumer Protection Act had a definite, and observable impact on a bank's *ROA.* Currently, banks believe that they are not performing as well as they once were, due to the major financial overhaul. However, today, consumers and banks both are better protected in case of another crisis. In addition, banks are a lot more efficient today than pre-Dodd-Frank times, as seen by the analysis of *LLtoNII*. We used two different models to conduct our analysis. It was decided that each model was to have 21 observations (1996-2016) and handle the annual data for a total of 19 financial institutions. Our empirical model—a log-log model—dealt with the previously explained variables of *LLtoNII, PostDoddFrank, Efficiency, TotalRevolvingCredit, and CI_Loans.* All independent variables in the first model held true to their expected signs, except for *CI_Loans*, which happened to affect *ROA* negatively. A key finding that this analysis provided was a very interesting fact about *Efficiency*. Due to the crisis of 2007-2008, a bank's non-interest expense faced a vast increase, which ultimately pulls their efficiency ratio up. This reflects the major surge in compliance costs that banks now have to face. Some of the tests we include in this paper utilize White's

General Heteroscedasticity Test as well as Klein's rule of thumb in order to test for collinearity and heteroscedasticity. We stand by our model's findings; we believe the results make both theoretical and practical sense, and that the model does a good job in showing the overall effect of the independent variables on *ROA*. Although some issues with collinearity arise, one must remember that, as stated previously, economic and financial data exhibit similar trends as well as collective relationships. Thus, it is nearly impossible to avoid the collinearity issue. If we did avoid it, the problem of specification bias would come into play. In terms of forecasting, even though we believe that one can use various models to forecast the future, the banking industry has proven to be highly dynamic. This, in turn, makes it very difficult to use model forecasting when dealing with banks. We believe that our models can be used to forecast, but because of the dynamic nature of the banking industry, the results might be less than promising. Our study explored in depth, the effects of the Dodd-Frank Act on a bank's *ROA*. Emphasis was placed on a multitude of variables, which were included in our empirical model.

Appendix

Table II: Sample Expanded Summary Statistics for *ROA* (excluding standard deviation)

		Fiscal Year Ending December					
Company	**Ticker**	**2016A**	**2015A**	**2014A**	**2013A**	**2012A**	**2011A**
JP Morgan	JPM	1.03%	0.99%	1.00%	0.92%	1.06%	1.01%
Citigroup	C	0.80%	1.12%	0.57%	0.76%	0.72%	0.98%
BofA	BAC	0.76%	0.74%	0.24%	0.48%	0.48%	0.42%
Well Fargo	WFC	1.31%	1.41%	1.54%	1.60%	1.54%	1.45%
PNC Bank	PNC	1.23%	1.28%	1.37%	1.45%	1.20%	1.34%
US Bancorp	USB	1.53%	1.53%	1.64%	1.76%	1.81%	1.73%
Capital One	COF	1.23%	1.36%	1.56%	1.48%	1.60%	1.90%
Zions Bancorporation	ZION	0.78%	0.60%	0.84%	0.92%	0.93%	1.01%
Huntington Bancshares	HBAN	0.95%	1.08%	1.15%	1.15%	1.22%	1.10%
SunTrust Banks	STI	1.05%	1.11%	1.07%	0.86%	1.23%	0.55%
Keycorp	KEY	0.81%	1.08%	1.06%	1.09%	1.09%	1.18%
BB&T	BBT	1.28%	1.21%	1.22%	1.12%	1.33%	1.08%
Regions Financial	RF	1.08%	0.96%	1.10%	1.07%	1.07%	0.02%
Fifth Third Bancorp	FITB	1.26%	1.36%	1.46%	1.55%	1.47%	1.31%
M&T Bank	MTB	1.06%	1.12%	1.31%	1.49%	1.44%	1.38%
Comerica	CMA	0.67%	0.78%	0.92%	0.88%	0.88%	0.75%
Republic First Bank	FRBK	0.34%	0.24%	0.29%	(0.28%)	0.43%	(2.51%)
New York Community Bancorp	NYCB	1.27%	1.37%	1.55%	1.61%	1.89%	1.94%
Mitsubishi UFJ	MTU	0.46%	0.45%	0.45%	0.47%	0.57%	0.38%
Avg. per year		0.99%	1.04%	1.07%	1.07%	1.16%	0.90%
Median per year		1.05%	1.11%	1.10%	1.09%	1.20%	1.08%

Just to give the reader a glimpse on how we expanded our data (1996-2016), arriving at an annual average for each individual year. The yearly average data was then used as the final testing values for our dependent variable *(ROA)*. The yearly data being used for *ROA* was obtained from Thomson One.

Table III: Sample Expanded Summary Statistics for *LLtoNII* (excluding standard deviation)

		Fiscal Year Ending December					
Company	**Ticker**	**2016A**	**2015A**	**2014A**	**2013A**	**2012A**	**2011A**
JP Morgan	JPM	11.86%	8.80%	7.19%	0.52%	7.54%	15.88%
Citigroup	C	15.24%	15.24%	14.23%	16.25%	22.40%	24.30%
BofA	BAC	7.41%	8.11%	5.69%	8.41%	20.09%	30.06%
Well Fargo	WFC	4.66%	5.39%	3.20%	5.39%	16.69%	18.47%
PNC Bank	PNC	4.44%	3.08%	3.20%	7.03%	10.24%	13.24%
US Bancorp	USB	11.44%	10.29%	11.41%	12.64%	17.52%	23.15%
Capital One	COF	21.01%	24.08%	19.87%	19.07%	26.61%	18.52%
Zions Bancorporation	ZION	(2.88%)	2.33%	(5.84%)	(5.14%)	0.82%	4.20%
Huntington Bancshares	HBAN	4.94%	5.12%	4.41%	5.28%	8.62%	10.68%
SunTrust Banks	STI	7.31%	3.46%	7.07%	11.40%	27.34%	29.87%
Keycorp	KEY	5.08%	7.07%	2.57%	5.59%	10.11%	(2.65%)
BB&T	BBT	7.62%	7.65%	4.67%	10.54%	18.05%	21.61%
Regions Financial	RF	4.54%	7.29%	2.10%	4.23%	6.45%	44.87%
Fifth Third Bancorp	FITB	8.81%	11.21%	8.80%	6.43%	8.43%	11.89%
M&T Bank	MTB	5.84%	5.98%	4.63%	6.92%	7.85%	11.30%
Comerica	CMA	4.36%	8.70%	1.63%	2.75%	4.57%	9.26%
First Republic Bank	FRBK	6.30%	1.25%	2.51%	15.13%	4.23%	53.09%
New York Community Bancorp	NYCB	(0.89%)	(3.68%)	(1.63%)	2.64%	5.43%	8.37%
Mitsubishi UFJ	MTU	4.35%	9.48%	2.10%	1.46%	4.10%	8.08%
Avg. LL, as % of NII		6.92%	7.41%	5.15%	7.19%	11.95%	18.64%
Median LL, as a % of NII		5.84%	7.29%	4.41%	6.43%	8.62%	15.88%

LLtoNII = Provision for Loan Losses / Net Interest Income*
*Net Interest Income = Interest Income - Interest Expense
The yearly data used for *LLtoNII* was obtained from Thomson One.

Table IV: Sample Expanded Summary Statistics for *Efficiency* (excluding standard deviation)

		Fiscal Year Ending December 31,					
Company	**Ticker**	**2016A**	**2015A**	**2014A**	**2013A**	**2012A**	**2011A**
JP Morgan	JPM	53.17%	55.47%	56.67%	66.51%	56.22%	52.30%
Citigroup	C	54.70%	50.17%	60.97%	52.96%	53.68%	48.81%
BofA	BAC	58.62%	61.67%	79.84%	70.04%	72.00%	66.07%
Well Fargo	WFC	55.65%	55.51%	55.49%	55.46%	54.74%	54.01%
PNC Bank	PNC	58.04%	58.16%	58.42%	57.54%	63.62%	56.74%
US Bancorp	USB	49.89%	50.85%	50.07%	48.75%	42.73%	45.40%
Capital One	COF	51.23%	51.84%	50.98%	50.88%	49.98%	51.05%
Zions Bancorporation	ZION	71.24%	72.44%	69.04%	72.24%	62.56%	61.04%
Huntington Bancshares	HBAN	62.49%	62.61%	63.69%	61.16%	60.62%	58.31%
SunTrust Banks	STI	59.29%	60.47%	64.46%	67.79%	49.54%	60.46%
Keycorp	KEY	69.68%	63.08%	63.41%	64.30%	63.23%	59.27%
BB&T	BBT	56.55%	57.32%	56.88%	55.45%	52.58%	55.74%
Regions Financial	RF	59.41%	61.91%	62.31%	62.50%	57.99%	56.47%
Fifth Third Bancorp	FITB	57.86%	56.88%	58.68%	58.02%	50.91%	51.64%
M&T Bank	MTB	55.72%	56.34%	56.59%	54.22%	53.39%	53.08%
Comerica	CMA	63.93%	65.95%	63.18%	62.68%	63.37%	64.18%
First Republic Bank	FRBK	80.94%	84.31%	83.66%	82.93%	76.52%	89.34%
New York Community Bancorp	NYCB	35.18%	32.64%	31.17%	31.52%	29.34%	28.36%
Mitsubishi UFJ	MTU	59.27%	56.48%	57.42%	57.53%	57.91%	37.32%
Avg. per year		58.57%	58.64%	60.15%	59.60%	56.37%	55.24%
Median per year		58.04%	57.32%	58.68%	58.02%	56.22%	55.74%

Efficiency = Non-interest Expense / Interest Income*
*Same as revenue
The yearly data used for Efficiency was obtained from Thomson One.

Table V: Sample Expanded Summary for *LiabilitiestoEquity (excluding standard deviation)*

		Fiscal Year Ending December					
Company	**Ticker**	**2016A**	**2015A**	**2014A**	**2013A**	**2012A**	**2011A**
JP Morgan	JPM	8.80	8.50	10.10	10.44	10.56	11.34
Citigroup	C	7.58	6.80	7.74	8.19	8.85	9.22
BofA	BAC	7.20	7.37	7.64	8.03	8.19	8.11
Well Fargo	WFC	8.67	8.26	8.15	7.95	8.02	8.36
PNC Bank	PNC	6.99	6.99	6.71	6.52	6.75	6.87
US Bancorp	USB	8.07	8.13	8.24	7.84	8.04	8.98
Capital One	COF	6.51	6.06	5.84	6.13	6.73	5.94
Zions Bancorporation	ZION	7.28	6.95	6.76	7.67	8.11	6.54
Huntington Bancshares	HBAN	8.67	9.77	9.48	8.76	8.70	9.05
SunTrust Banks	STI	7.67	7.14	7.27	7.18	7.27	7.81
Keycorp	KEY	7.95	7.85	7.91	8.02	7.67	7.95
BB&T	BBT	6.34	6.69	6.69	7.04	7.72	8.98
Regions Financial	RF	6.56	6.48	6.04	6.45	6.83	6.62
Fifth Third Bancorp	FITB	7.77	7.91	7.87	7.94	7.88	7.86
M&T Bank	MTB	6.65	6.59	6.84	6.53	7.14	7.40
Comerica	CMA	8.36	8.51	8.35	8.12	8.37	7.88
First Republic Bank	FRBK	7.95	11.70	9.77	14.29	13.09	15.09
New York Community Bancorp	NYCB	6.99	7.48	7.40	7.14	6.80	6.54
Mitsubishi UFJ	MTU	18.16	17.54	18.59	18.81	20.66	21.73
Avg. per year		8.11	8.25	8.28	8.58	8.81	9.07
Median per year		7.67	7.48	7.74	7.94	8.02	7.95

LiabilitiestoEquity = Liabilities / Shareholders' Equity
The yearly data being used for LiabilitestoEquity was obtained from Thomson One.

Table VI: Data for *PostDoddFrank*

Year	1 Post Dodd-Frank; 0 Otherwise
1996	0
1997	0
1998	0
1999	0
2000	0
2001	0
2002	0
2003	0
2004	0
2005	0
2006	0
2007	0
2008	0
2009	0
2010	1
2011	1
2012	1
2013	1
2014	1
2015	1
2016	1

Table VII: Data for *CI_Loans* (in billions)

Year	C&I Loans (in billions)
1996	815.14
1997	895.20
1998	961.67
1999	1,054.46
2000	1,067.11
2001	984.40
2002	915.79
2003	879.85
2004	980.10
2005	1,119.25
2006	1,289.48
2007	1,509.84
2008	1,412.18
2009	1,199.50
2010	1,244.52
2011	1,401.45
2012	1,525.27
2013	1,684.97
2014	1,879.78
2015	2,054.75
2016	2,101.55

Data obtained from FRED*
*Federal Reserve Bank of St. Louis

Table VIII: Data for *TotalRevolvingCredit* (in billions)

Year	TotalRevovlingCredit (in billions)
1996	521.41
1997	559.92
1998	597.07
1999	645.08
2000	705.92
2001	733.74
2002	763.07
2003	784.56
2004	814.68
2005	900.57
2006	960.54
2007	1,015.34
2008	961.75
2009	875.72
2010	836.72
2011	844.04
2012	852.76
2013	877.29
2014	913.98
2015	969.27
2016	1,000.34

Data obtained from FRED*
*Federal Reserve Bank of St. Louis

Table IX: Correlation Matrix for Model (1)

	ROA	LL to NII	POST DODD FRANK	EFFICIENCY	LIABILITIES to EQUITY	TOTAL REVOLVING CREDIT	CI_LOANS
ROA	1						
LL to NII	-0.6847	1.					
POST DODD FRANK	-0.4275	-0.2436	1				
EFFICIENCY	-0.5305	-0.1492	0.9027	1			
LIABILITIES to EQUITY	0.6570	0.0245	-0.8542	-0.8967	1		
TOTAL REVOLVING CREDIT	-0.5025	0.0202	0.4174	0.5178	-0.7450	1	
CI_LOANS	-0.4821	-0.2146	0.7739	0.7678	-0.8677	0.7463	1

Table X:

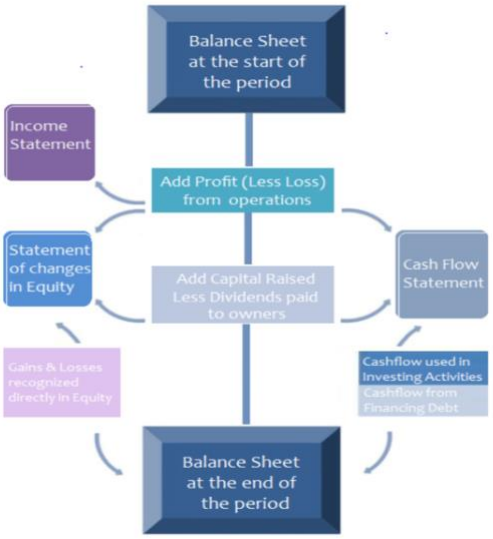
Dependent Variable: LOG(ROA)
Method: Least Squares
Date: 04/25/17 Time: 16:45
Sample: 1996 2016
Included observations: 21

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-28.15509	14.28858	-1.970461	0.0689
LOG(LLTONII)	-1.219654	0.171223	-7.123179	***0.0000
POSTDODDFRANK	3.097668	0.633914	4.886577	***0.0002
LOG(EFFICIENCY)	-4.412830	1.605175	-2.749127	**0.0157
LOG(LIABILITIESTOEQUITY)	6.781489	3.384713	2.003564	*0.0649
LOG(TOTALREVOLVINGCREDIT)	2.479952	1.109931	2.234329	**0.0423
LOG(CI_LOANS)	-2.180627	1.024209	-2.129083	*0.0515

R-squared	0.875847	Mean dependent var	-4.580499
Adjusted R-squared	0.822639	S.D. dependent var	1.085139
S.E. of regression	0.456998	Akaike info criterion	1.532926
Sum squared resid	2.923860	Schwarz criterion	1.881100
Log likelihood	-9.095723	Hannan-Quinn criter.	1.608489
F-statistic	16.46075	Durbin-Watson stat	2.554867
Prob(F-statistic)	0.000013		

*Significant at 10% **Significant at 5% ***Significant at 1%

Chart I: Relationship Between All Three Financial Statements



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Featured Articles

In the Words of Jeremy Rifkin: A Third Industrial Revolution

By Arjun Vir Kapoor

"Jeremy Rifkin theorized a new vision of how to transform the global economic dynamic in an efficient and sustainable manner."

Great economic revolutions of the past have occurred at distinct periods of human history. These are the rare periods when new communication revolutions converge with new forms of energy and mobility. The implementation of these new communication, energy, and transportation technologies into human life over a period of time fundamentally changes the way a society manages, powers, and moves economic life.

In the 19th century, the British invented steam powered mass-producing print technology, before laying out a telegraph system soon thereafter. These two vehicles of communication converged with a cheap and efficient new energy source: coal. They then invented the steam engine and put it on rails for transportation, giving rise to a coal powered, steam driven First Industrial Revolution.

In the 20th century, we saw another communication-energy and mobility paradigm shift, primarily led by the United States. The telephone, and later, radio and TV, were the new forms of communication media that converged with a new source of energy: cheap Texas Oil. Henry Ford then put people on roads with the introduction of internal combustion engines, giving rise to a second Industrial Revolution, driven by oil, the automobile, and a mass consumer culture.

This second revolution is what led us into the 21st century, and peaked in July 2008, when oil hit $147 per barrel, and the entire global economy shut down. This downturn marked the beginning of the Great Recession, an earthquake that caused an aftershock 60 days later—the financial collapse.

Since then, many economists reason, the global economy has been in crisis. We are set to face another 20 years of declining productivity, slow growth, steep unemployment, and increasing inequality, they argue. The economic downturn is fueling growing discontent toward governing institutions and spawning extreme political and social movements around the world. And now, after 200 years of industrial activity, scientists claim that climate change is ravaging the planet, possibly taking us to the sixth mass extinction of life on Earth.

Jeremy Rifkin, an American economic and social theorist, theorized a new vision of how to transform the global economic dynamic in an efficient and sustainable manner.

Today, the Internet is converging with renewable energy sources, like solar and wind, and is becoming the communication technology to manage a distributed and collaborative green economy. According to Rifkin, the future will see people produce their own green energy and share it with each other on an "energy internet," just like we currently create and share information online. This creation of a new energy regime, loaded by buildings, partially stored in the form of hydrogen, distributed via an energy internet, and connected to plug-in zero emission transport, established the five essential pillars of a Third Industrial Revolution infrastructure. If we are able to create this new "sharing economy," which Rifkin believes will take around 40 years to frame on a global level, the economy will create a plethora of new businesses and jobs, and will usher a change in the order of human relationships. This transformation, from hierarchical to lateral power, will impact that way we conduct commerce, govern society, educate future generations, and engage in civil life, reshaping human life as we know it.

Rifkin pitched the idea of this Third Industrial Revolution to Angela Merkel, the chancellor of Germany, the strongest per capita economy in the world, who is now apparently actively trying to transform the German economy in alignment with Rifkin's vision. Chinese premier Li Keqiang, who is an economist by trade, and a fan of Rifkin's work, has along with his colleagues made the Third Industrial Revolution the core of the nation's 13th five-year plan that was announced in October of 2017.

Now, on the cusp of a new Third Industrial Revolution launching on a global scale, a new generation of scholars are beginning to mount a significant challenge to the conventional notion of the natural capitalist societies, and the role of wealth in economic processes. The result of this possible economic ideological transformation is that much of economics, as it is taught today, will become increasingly irrelevant in explaining the past, understanding the present, and forecasting the future.

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Knowledge Management: A Driver of Efficiency and Innovation

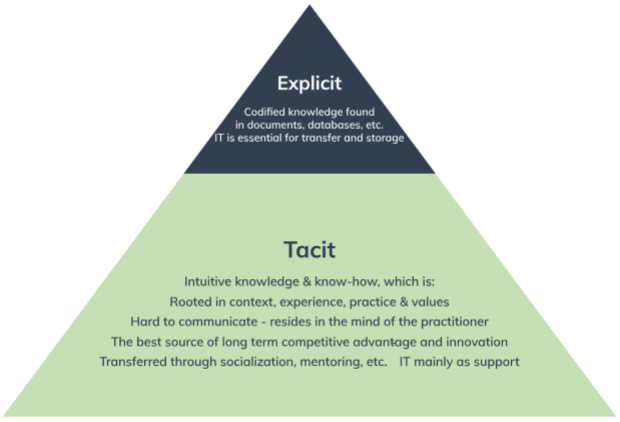
By Patricia Medina

"How do organizations capture knowledge and use it to create value?"

Successful organizations attribute their success to several factors notably their ability to identify, collect and distribute knowledge when needed. Knowledge refers to insights and expertise and is divided into three categories: explicit, tacit, and embedded. When knowledge partners with technology, it yields powerful outcomes. Technology not only produces new tangible gadgets but also helps manage knowledge and provides strategic direction. In the current digital era, an increasing number of companies worldwide are exploring how knowledge management can support efficiency and innovation in their business. For example, companies have created roles such as Chief Knowledge Officers and Chief Content Officers to manage the firm's, often untapped, knowledge assets.

What is Knowledge Management?

Knowledge management (KM) is applied in many industries and consists of a set of procedures and practices aimed at identifying relevant knowledge to create value. To accomplish its role, KM relies on various disciplines: artificial intelligence, cognitive science, and document and information tools, according to Kimiz Dalkir. In addition, knowledge is divided into three categories: explicit, tacit, and embedded.



Source: Shutterstock

Explicit knowledge is organized knowledge that can be articulated and codified. This type of knowledge is context independent, meaning its development is not related to individual experience. It is reproducible and carries lower value than other knowledge types. Explicit knowledge is easily searched, shared through technology, and stored in media (i.e. internet, books, files, sounds, and visuals). It is formalized by using words, codes, or scientific models.

Among the three types of knowledge, tacit knowledge is the most valuable source of knowledge according to most literature on the subject. This type of knowledge involves a person's know-how and expertise which have not been documented or formalized. It is usually hidden given that it is unspoken and unwritten. It is developed through personal experience and is highly subjective. As a result, it is difficult to teach and, thus, not easily reproduced. The context of experiences impacts the creation of this knowledge.

The third type of knowledge, embedded knowledge, has been less examined and exists in codes of conduct, processes, products, corporate culture, ethical principles, rules, and routines. An example is drawing lessons learned from routines.

Information vs. Knowledge, Are They the Same?

"Information is free. Knowledge is not", notes Ian Lurie, captures the difference between the two concepts. While information consists of facts, knowledge is a skill set drawn from experiences or education and practical understanding of a subject matter. In other words, information is raw data or data available as captured without being processed. Examples of raw data are user input, digital images, machine indicators, commercial transactions, and operational outputs from business processes.

Meanwhile, knowledge involves the intersection of information and the understanding of subjects that lead to valuable concepts and produce meaningful analysis. Using the concept in the graph below, imagine a person sees a traffic light turning red (information). Next, based on experience, studying the driving signals, and passing the driving test, the person realizes the context at that moment (knowledge). Then, using both, information and knowledge, the person makes the decision to stop the car (wisdom). Ultimately, information is included in knowledge.

What Does Knowledge Management Mean for Efficiency and Innovation?

Identifying, sharing, and distributing knowledge is a capability that a few companies have fully developed. Organizations embracing KM processes are more likely to have a strong commitment to improving efficiency and innovation compared to peers not involved in knowledge-related practices. As a result, the likelihood of filing more patents increases and employees acquire deeper tacit knowledge. To illustrate this pattern, one might look at the annual ranking of the top 50 U.S. patent assignees across sectors from IFI Claims Patent Services (IFI Claims)—a patent research

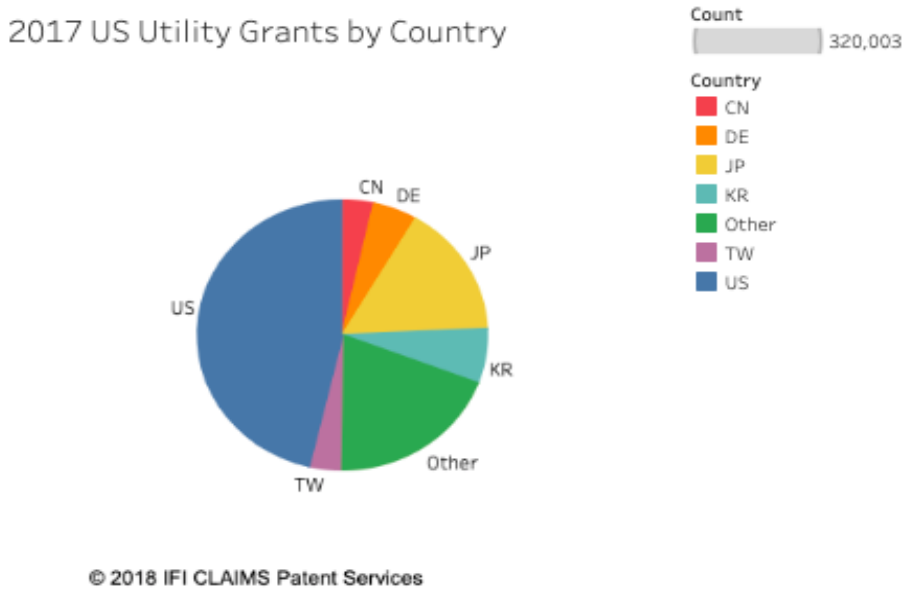
company. For example, technology company IBM had a record 9,043 patent grants in 2017 representing a strong +12% increase compared to the same period in 2016. IBM patents in 2017 reflect innovations in data management and application development, among others. The following are IFI Claims' top 20 most innovative companies for 2017 and 2016 based on the number of U.S patent grants received:

2017 Top 50 US Patent Assignees

	Company Search	2017 Grants	2016 Grants	% Change	Previous Rank	Rank Change
1	*International Business Machines Corp*	9,043	8,090	12%	1	0
2	*Samsung Electronics Co Ltd*	5,837	5,521	6%	2	0
3	*Canon KK*	3,285	3,665	-10%	3	0
4	*Intel Corp*	3,023	2,793	9%	6	2
5	*LG Electronics Inc*	2,701	2,430	11%	7	2
6	*Qualcomm Inc*	2,628	2,925	-9%	4	-2
7	*Google LLC*	2,457	2,842	-13%	5	-2
8	*Microsoft Technology Licensing LLC*	2,441	2,410	2%	8	0
9	*Taiwan Semiconductor Manufacturing Co (TSMC) Ltd*	2,425	2,288	6%	9	0
10	*Samsung Display Co Ltd*	2,273	2,025	12%	12	2
11	*Apple Inc*	2,229	2,103	6%	11	0
12	*Sony Corp*	2,135	2,184	-2%	10	-2
13	*Amazon Technologies Inc*	1,963	1,672	18%	14	1
14	*Toyota Motor Corp*	1,932	1,430	36%	20	6
15	*Ford Global Technologies LLC*	1,868	1,525	23%	19	4
16	*General Electric Co*	1,577	1,660	-4%	15	-1
17	*Toshiba Corp*	1,555	1,965	-20%	13	-4
18	*Telefonaktiebolaget LM Ericsson*	1,552	1,552	0%	18	0
19	*Fujitsu Ltd*	1,538	1,568	-2%	17	-2
20	*Huawei Technologies Co Ltd*	1,474	1,202	23%	25	5

Note: Year 2017 reflects data as of January 1, 2018 and year 2016 data as of January 1, 2017.
Source: IFI Claims

Organizations around the world are increasingly engaged in innovation and efficiency, both of which reflect KM systems. Overall, 2017 was another solid year for U.S patent grants received by organizations worldwide. The graph below shows that of the record 320,003 U.S utility grants approved in 2017, U.S corporations accounted for most of them at 46.29% followed by Japan with 15.81%.



Despite the benefits, managing a KM program may raise salient challenges: (1) weak senior management leadership and support, (2) knowledge hoarding, (3) increased costs, and (4) dysfunctional corporate culture. Knowledge hoarders gather know-how and information for personal use, thus preventing knowledge sharing. In his article, John Edwards explains that organizations may also incur economic losses arising from their limited ability to process structured or unstructured data. Structured data involves information with a high degree of organization and is easily identifiable by search engine algorithms. Meanwhile, unstructured data consists of images, text, and other content not organized in a clear method. This requires material resources to produce meaningful business intelligence. For these reasons, Thao Hua states that true cases of KM adoption have been few and far between among organizations i.e. asset management firms.

Knowledge Management in Practice

Although the application of KM is challenging, companies should consider integrating KM systems more prominently in their business strategy. The extent of dedicated resources will vary depending on a company's scale and scope of business. For example, publicly-traded companies like German-based software company SAP SE (NYSE: SAP) and U.S.-based asset manager BlackRock Inc (NYSE: BLK) are actively involved in content and knowledge-driven initiatives.

To illustrate, in July 2018, SAP announced that its SAP Preferred Success Plan clients will also have access to the SAP Learning Hub Solutions edition. Both services help clients maximize the value from their investments in cloud solutions. SAP gave

unlimited cloud resources access to five IT administrators per client. Such resources include expert-led social learning, structured learning content, and live sessions, all of which will allow SAP to share knowledge with clients and collect it from them too. SAP executives expect these solutions to further develop clients' skills, or tacit knowledge, to create future innovations. From a cost-benefit perspective, using KM can reduce costs. For example, SAP states that appropriate training of cloud software project teams, which means increasing tacit knowledge, could save clients about 10% in deployment time. These cost savings will positively contribute to clients' efficiency and budget. As a side note, SAP has a Chief Knowledge Officer overseeing product and innovation initiatives.

The benefits of using KM are also visible in the asset management industry. KM can improve the economics of new investment product offerings, data analytics, and human capital time allocation. BlackRock boosted its new product development and value-adding services by endorsing KM systems and introducing a learning culture across the firm:

First, it created the BlackRock Investment Institute (BII) in 2011. BII has two functions: a knowledge center and a liaison between its investment/research activities and clients.

Second, BII is elevating knowledge communication through technology. The firm is creating a new Global Head of Content position reporting to the Chief Marketing Officer. Existing KM and technology positions include Chief Engineer Officer and Chief Information Officer. The new role will focus on content strategy, distribution, and analytics across technology platforms, which could shape how the firm's KM systems will be used. For example, gaining first-hand knowledge of selected clients' investment processes could allow the development of tailored content for each stage of the process. This specific content can then be distributed to clients on a timely basis.

Lastly, BlackRock is advancing its known appetite for innovation and hastening the use of artificial intelligence (AI) for multiple purposes. The firm's "Tech 2020" plan involves endeavors to further integrate technology and knowledge. These efforts should contribute to higher profitability, growing asset under management, and better performing business processes—both internally and externally:

Internally, employees and the company benefit from using AI for algorithmic trading, active equities strategies, data science, and research. A few years ago, BlackRock embarked on AI-related efforts. Yet, it faced some challenges during implementation, namely employee turnover, the need for new AI skills/training, and limited AI back-office operations/infrastructure. The firm mitigated these challenges by (1) setting up programs to accelerate employee learning, (2) enhancing knowledge-sharing

platforms, and (3) acquiring or partnering with technology startups (i.e. optimization, natural language processing), according to BlackRock's Jody Kochansky. Having now developed a track record in AI, in February 2018, BlackRock created the BlackRock Lab for Artificial Intelligence and an internal Data Science Core team. These actions will respond to evolving client needs identified by the firm.

Externally, clients benefit from BlackRock's seven AI-based Sector ETFs launched in March 2018. Leveraging BlackRock's in-house expertise, the firm may create other AI-driven ETFs to include additional countries—which might be a reality in the not-too-distant future. This could translate into potential economic and brand benefits for the firm. By using AI knowledge, BlackRock is transforming its business model while broadening its iShares ETF product line.

To conclude, KM involves a formal process to identify, manage and deploy knowledge within the firm. It also involves the ability to deploy knowledge externally through client contact or product innovation. Through technology, knowledge is shared and distributed to the right people at the right time—which are key to organizational efficiency and productivity. Incorporating a KM perspective into organizational strategy helps a company plan employee training, product development, and IT investments. This can be achieved by using KM tools such as customer relationship systems and learning management systems. Ultimately, putting KM into practice has challenges; however, integrating it is beneficial for corporate competitiveness and long-term success.

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Nordic Countries are Neither Socialist nor Paradise

By Ethan Lamb

"While certain achievements of Nordic countries undeniably demonstrate success, a further examination reveals that the prosperity attained in this region is largely attributable to Nordic culture and free market policies, and has very little to do with socialistic initiatives."

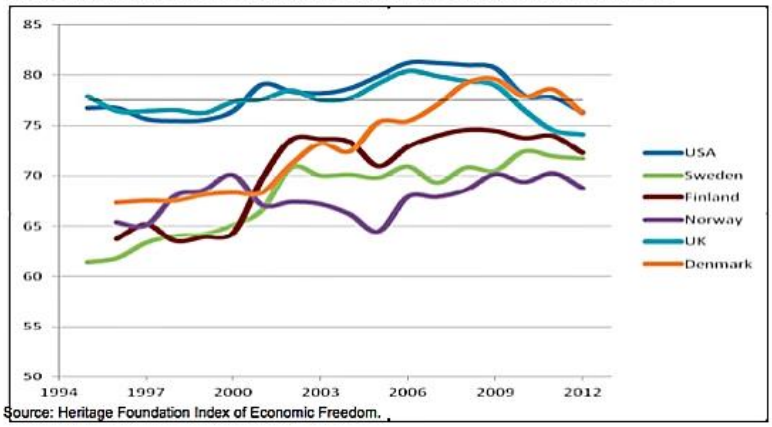
The broad debate between free markets and socialism has been gaining relevance in American political discourse. A popular talking point is Nordic countries, which are often considered the exemplar of socialist policies being implemented correctly. While certain achievements of Nordic countries undeniably demonstrate success, a further examination reveals that the prosperity attained in this region is largely attributable to Nordic culture and free market policies, and has very little to do with socialistic initiatives.

An honest analysis of Nordic political systems shows that these countries are not socialist, no matter how the term is defined. In fact, after frequently being extolled by Sen. Bernie Sanders as a paradigm for socialism, Danish Prime Minister Lars Lokke Rasmussen responded, "I would like to make one thing clear. Denmark is far from a socialist planned economy. Denmark is a market economy." Furthermore, the Heritage foundation in partnership with the Wall Street Journal formulates an Index of Economic Freedom, which measures trade freedom, business freedom, investment freedom, and property rights. According to the Index of Economic Freedom, Denmark is the 12th most economically free country in the world, only one spot behind the United States. Contrary to popular belief, the Nordic system can largely be explained as a group of free-market economies with high taxes and expansive welfare states, with certain industries such as healthcare being centralized.

The impetus for socialism in America is often undergirded by a certain set of circumstances, the most common being health outcomes and income equality. The contention of many self-proclaimed socialists is that if the United States were to become socialist, health outcomes would improve and the distribution of income would be more equal because these outcomes happened in Nordic countries. However, further scrutiny shows that the laudable health outcomes predate the Nordic countries' move to a more socialist-redistributive political system. In Debunking

Utopia, analyst Nima Sanandaji underscores this notion by pointing out

Figure 9: Heritage Foundation Index of Economic Freedom, annual overall score



Source: Heritage Foundation Index of Economic Freedom.

that "When Nordic countries had similarly sized public sectors as the United States (1960), Swedes lived 3.2 years longer than Americans, while Norwegians lived 3.8 years longer. Today the difference has shrunk to 2.9 years in Sweden and 2.6 years in Norway." A similar trend occurred when comparing infant mortality rates. In other words, there is another factor(s) responsible for these impressive statistics. Moreover, according to the OECD Better Life Index, Switzerland, a culturally and economically conservative country, has a higher living standard than all of the Nordic countries.

It should also be noted that the Czech Republic and Slovenia are rated more income-equal than all of the Nordic countries despite having lower and relatively flat taxes. This trend is not necessarily a critique of the political systems in the Nordic countries. It's merely a suggestion that Nordic policies do not explain the entire story and have a much weaker causal impact than is generally understood.

To understand the success behind the Nordic countries, it's important to recognize the unique culture that made such economic growth possible. German sociologist Max Weber noted that "Protestant countries in northern Europe tended to have higher living standards, better academic institutions, and more well-functioning societies than countries in other parts of Europe," and attributes a large part of that success to a protestant work ethic. Moreover, Swedish Scholar Assar Lindbeck posits the strong work ethic in the Scandinavian culture is due to the "hostile environment of preindustrial Scandinavia," which required farms to work exceedingly hard to yield a profit. Furthermore, economist Tino Sanandaji explains that "Scandinavia was likely the most egalitarian part of Europe even before the modern era. For example, it was the only major part of Western Europe that never developed full-scale feudalism and never reduced its farmers to serfdom." Contrary to the prevailing narrative, Scandinavian societies were some of the first societies to embrace free-

market principles such as property rights. In fact, even before Adam Smith, a Finnish priest and member of Sweden's Parliament named Anders Chydenius articulated the necessity of free trade and free markets in fostering economic prosperity.

Such values, including personal responsibility, work ethic, and social trust are uniquely present in the Nordic culture. For example, Nordic countries are at the top of the charts for coffee consumption per person. Finland (12.3 kg), Norway (9.7 kg), Denmark (8.7 kg), and Sweden (7.3%) noticeably surpass the average American's coffee consumption of 4.2 kg. Perhaps more telling, Nordic countries account for three out of the top four spots in Europe in terms of share of workers "totally committed to their employer." Sweden (65%), Norway (63%), and Denmark (53%) significantly outrank their southern European counterparts in France (41%), Italy (39%), and Portugal (28%). Moreover, the aforementioned income-equality rankings heavily correspond with high levels of homogeneity. What these can partially display is that public trust in institutions, social cohesion, and unity are integral characteristics in forming a functional society. The importance of such oft-overlooked metrics and cultural components explains at least some of the disparity in performance levels between Nordic countries and countries that implement Nordic policies. The latter tend to achieve underwhelming results.

SHARE OF WORKERS IN EUROPE "TOTALLY COMMITTED TO THEIR EMPLOYER"

COUNTRY	PERCENT
POLAND	65
SWEDEN	65
NORWAY	63
DENMARK	53
NETHERLANDS	47
SWITZERLAND	46
LUXEMBOURG	45
IRELAND	44
BELGIUM	43
GERMANY	43
UNITED KINGDOM	42
FRANCE	41
ITALY	39
PORTUGAL	28

Some of the previously discussed cultural traits become much more apparent when juxtaposing the performance of Nordic Americans with average Americans as well as Nordics in Europe. For instance, the GDP per capita of all Americans ($52,592) is lower than that of Norway ($65,685), and marginally higher than those of Denmark ($45,597), Sweden ($45,067), and Finland ($40,832). However, when looking at the

GDP per capita for Danish Americans ($70,925), Swedish Americans ($68,897), Norwegian Americans (67,385), and Finish Americans ($64,774), Nordic Americans conspicuously outperform their relatives in their home country. Further adhering to this phenomenon, the high school graduation rate of Swedish Americans (96.6%), Danish Americans (96.5%), Finnish Americans (96.4%), and Norwegian Americans (96.3%) is markedly higher than those of all Americans (86.3%), and their relatives in Norway (81.7%), Sweden (79.6%), Finland (78%), and (75.1%). Economists Geranda Notten and Chris de Neubourg provide further evidence by pointing out that, while the absolute poverty level is higher in America (11%), the poverty rates in Denmark (6.7%) and Sweden (9.3%) are higher than the poverty rates of Danish Americans (4.1%) and Swedish Americans (5.1%). This like-for-like comparison more closely resembles a fixed-effects modeling econometric analysis and indicates that the success of these Nordic countries could very well be in spite of the policies implemented in these countries.

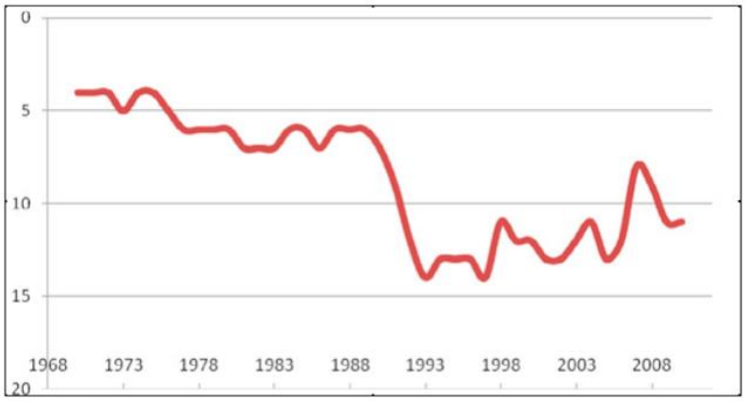
Historical Outlook

Nordic countries are indisputably some of the most prosperous countries in the world. However, it is important to understand the policies responsible for generating their robust economic growth. As Nima Sanandaji notes in Debunking Utopia, Sweden averaged 2% growth per year from 1870-1936, the highest of any western nation, while pursuing pro-market policies. While the Swedish Social Democratic Party was able to gradually expand the welfare state and raise taxes from 1936-1970, their average growth rate was 2.9%, around the western European average. However, between 1970-1991, Sweden, unlike any other Nordic Country, pursued a quasi-Socialist system, manifesting in the enacted policies such as "employer funds," in which the private ownership of firms would gradually be transferred to labor union. Sanandaji points out that this trial of socialism coincided with a growth rate of 1.4%, the second lowest in western Europe at the time. In fact, The Economist explains that "In a period from 1870 to 1970 the Nordic countries were among the world's fastest growing countries, thanks to a series of pro-business reforms such as establishment of banks and the privatization of forests. But in the 1970s and 1980s the undisciplined growth of government caused the reforms to run into the sands."

After this underwhelming period, Sweden enacted reforms that tightened up their welfare programs and reduced their taxation levels. These reforms increased the growth rate to 1.8%, near the top of western Europe. The strength of the economies in these various time periods are well explained when comparing how Sweden's employment level responded to the Great Depression with how it responded to the crisis in the 1990s. While both periods brought turmoil, Sweden's quasi-socialist economy reacted demonstrably worse to the crisis in the 1990s, as the charts below indicate. Moreover, the expansion of the public sector starting in the 1970s significantly stifled growth in the private sector job market. In short, Sweden's wealth was built from decades of free-market policies, and severely undercut by the growth

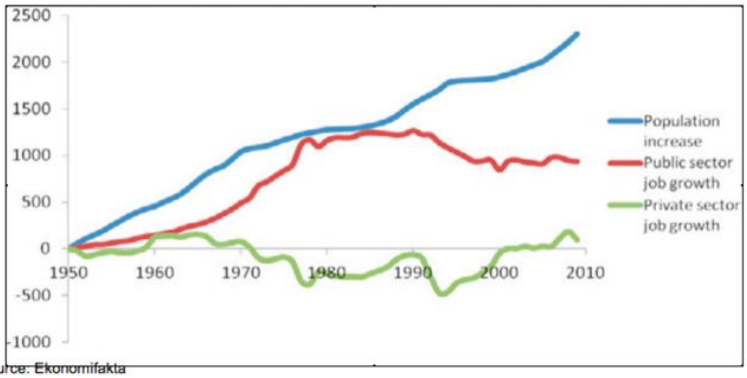
of the public sector and redistributionism. While the Nordic countries have done much to curtail such pernicious policies, they are still facing the consequences of a rapid expansion of the public sector and increased taxation

Figure 1: Sweden's ranking amongst OECD countries



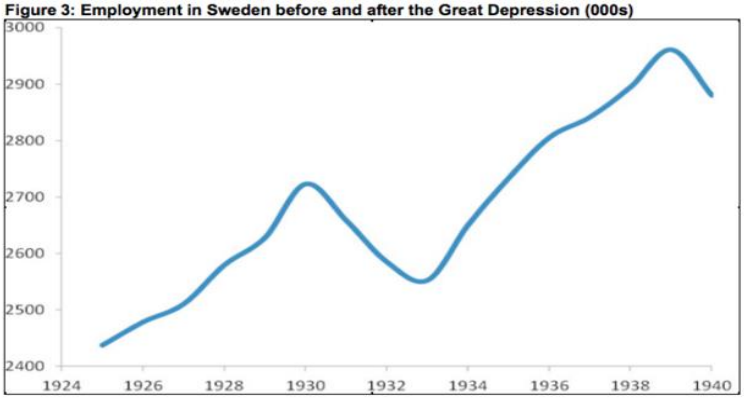
Source: Ekonomifakt

Figure 2: Increase in population, public sector jobs and private sector jobs (thousands)



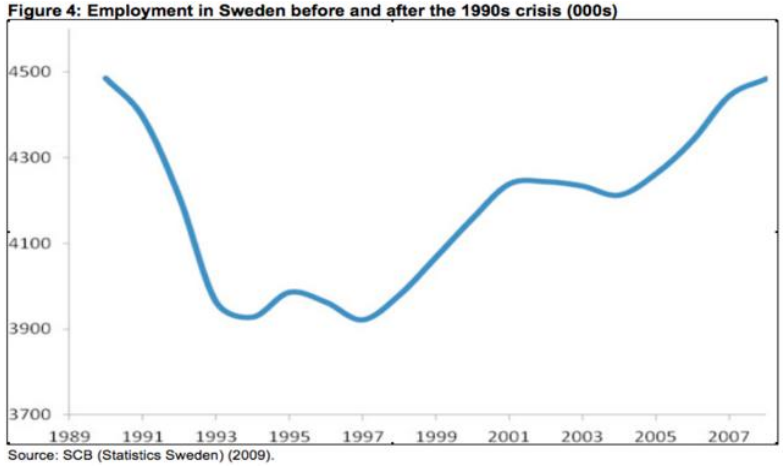
Source: Ekonomifakta

Figure 3: Employment in Sweden before and after the Great Depression (000s)



Source: Krantz (1997)

Figure 4: Employment in Sweden before and after the 1990s crisis (000s)



Source: SCB (Statistics Sweden) (2009).

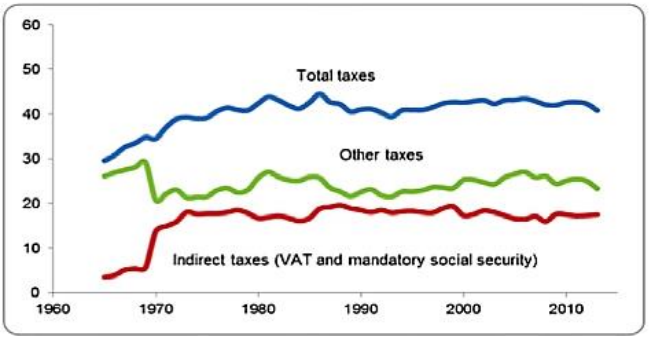
Taxes

Today, while the Nordic countries have largely worked on reforms including reduced unemployment benefits and lower tax rates, their welfare programs and taxation levels are still significantly larger than that of America. According to Danish researcher Henrik Jacobsen Keven, "The top marginal tax rates are about 60-70 percent in the Scandinavian countries as opposed to only 43% in the United States." However, these high tax rates are not uniquely imposed on the high-income earners. The Tax Foundation notes, "The top marginal tax rate of 60 percent in Denmark applies to all income over 1.2 times the average income in Denmark. From the American perspective, this means that all income over $60,000 (1.2 times the average income of about $50,000 in the United States) would be taxed at 60 percent." In fact, American tax rates are demonstrably more progressive than in Nordic countries. Such high tax rates have been shown to discourage investment and output. In an extensive economic study conducted by Mathias Trabandt and Harald Uhlig, motivated in part by the Laffer curve model, higher taxes in both Denmark and Sweden actually decrease the revenues from taxes.

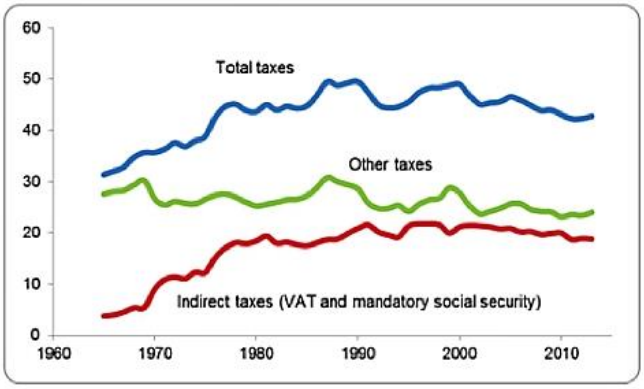
Furthermore, the taxation levels in Nordic countries are often underestimated due to hidden taxes. For example, the "employer fee" is effectively a tax on labor. Nima Sanandaji delineates this clearly in an example of a worker in Sweden. He explains, "somebody receives a wage of 10,000 kronor in Sweden, the employer has to pay additionally around 10,000 kronor to the government. Half of this is a tax on labor and the other half is the employer's fee. On their pay stubs, people see that their official wage is around 15,000 kronor, out of which 5,000 have been paid in taxes. The other 5,000 kronor, which has been paid to the tax authority, is often not even included on the pay stub. Thus, many ordinary citizens think the tax on labor is a third of their income (5,000 kronor out of 15,000) rather than the actual rate of half their income (10,000 kronor out of 20,000)." Such hidden taxes are replete in the Nordic

countries and actively deceive their citizens. On average, Swedes believe their average tax rate is close to 40%, when in actuality the number has been found to be much closer to 60%.

Hidden and visible taxes in Norway (percentage of GDP)



Hidden and visible taxes in Sweden (percentage of GDP)



In conclusion, the Nordic countries have not stumbled upon some magic formula to circumvent basic economic principles. When constructing policy, it is important to identify and evaluable intangible factors such as culture. The Nordic countries do not have socialist economies, and it is even worth noting that their expansive public sector and high taxes have been far from perfect. With all of this in mind, Bernie Sanders and the ever-growing Democratic Socialist movement in America ought to demonstrate how their policy proposals would yield successful results instead of blindly citing the Nordic model, which is highly misleading and obscures a much-needed debate.

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Renewables in the United States

By Jae Seung Lee

"What's the impact of the United States' exit from the climate agreement and its new energy policies?"

On June 1, 2017, US President Donald Trump announced the US's exit from the Paris Climate Agreement, an agreement signed within the United Nations Framework Convention on Climate Change ("UNFCCC") to mitigate greenhouse gas. Even though there has been no other withdrawal, the United States' exit raised concern among the signatories. Kyoto Protocol, the predecessor adopted in 1997 to stabilize temperature and cut emissions, failed to bring major carbon emitters to the table for a binding climate treaty. It was a landmark accomplishment of global efforts to reduce carbon emission. However, the protocol lost its power following the withdrawals of countries with most carbon emissions due to 'economic' reasons. Because of the similarities between the two treaties, the US's exit may trigger other developed nations' exit.

Furthermore, in stark contrast to the current global trend of fighting climate change, the current US government plans to continue to ease the relevant regulations. The Clean Power Plan ("CPP"), proposed by the Environmental Protection Agency ("EPA") under the previous administration to meet targets of the Paris Agreement, has been stalled by the current administration's effort to revamp the coal mining industry. The CPP's proactive measure, which enforces utilities to build new renewables, has been met with fierce opposition from the coal industry. Scott Pruitt, the former administrator of the EPA, argued potential benefits of its repeal amount to 33 billion dollars. While many believe these rollbacks have come at an alarming speed, given that the earliest possible effective date of the exit is November 2020, the impact of these new policies may not be substantial in short term.

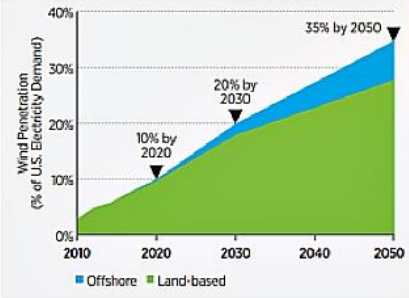
The current administration's actions are not without opponents, however. On the day of the US's official withdrawal, a bipartisan coalition of governors formed the United States Climate Alliance, a forum where states committed to reducing greenhouse emissions can work together to uphold the principles of the Paris Agreement. Most of the states, except some coal-heavy states in the Midwest and Deep South, are likely to meet or exceed emissions requirement for the CPP unless there are price hikes of natural gas, which makes oil more attractive. State-level legislation calling for more renewable energy, cheaper natural gas, and improvements in solar/wind utilities will encourage more green investment.

To add to the issue, in December 2017, President Trump signed a new bill, the Tax Cuts and Jobs Act. Cutting the corporate tax rate from 35% to 21%, the new tax law boosted after-tax profits by reducing the tax liabilities of all companies. While many companies gain from this cut, it will cause damage to the renewables market because of its unique investment structure: tax equity.

Improving efficiency and profitability contributed to the growth of the renewable energy market; in the U.S., this is largely due to tax equity financing. Tax Equity investors passively own renewable projects and gain federal and state income tax benefits with a small return of cash flow. Moreover, these investors are distinct from other equity investors because they cannot be involved in project level management except for downside cases. Flip structure, as its name suggests, enables them to take active control when the project underperforms.

There are two available tax credits: Investment Tax Credit ("ITC") and Production Tax Credit ("PTC"). ITC is an upfront tax credit against the capital expense used to build a project, and PTC, popular for wind projects, is a tax credit based on the amount of electricity the project produces. Both became less attractive to investors after the tax cut because companies now have fewer tax liabilities. Also, PTC is scheduled for phase-out in 2021. Consequently, the tax reform will be a significant blow to renewable projects' sponsors looking to raise capital.

The *Study Scenario* consists of 10% wind generation by 2020, 20% by 2030, and 35% by 2050 compared against the *Baseline Scenario*.



Cumulative Wind Capacity (GW)		2013	2020	2030	2050
Baseline Scenario	Land-based	61			
Central Study Scenario	Land-based	61	110	202	318
	Offshore	0	3	22	86
	Total	**61**	**113**	**224**	**404**

Note: Wind capacities reported here are modeled outcomes based on the *Study Scenario* percentage wind trajectory. Results assume central technology performance characteristics. Better wind plant performance would result in fewer megawatts required to achieve the specified wind percentage, while lower plant performance would require more megawatts.

Wind may take a hit from decreasing tax credits, yet, there seems to be a new promising sign of growth through offshore wind. Due to their location in the ocean, the construction cost of offshore turbines was initially very expensive; that said, the price has decreased substantially over the last decade, and they generate more electricity compared to onshore wind turbines due to higher wind speed. Hence, offshore wind farms are becoming more and more attractive.

Relative to the history of offshore wind energy production in Europe, the United States is almost two decades behind. Such a large gap stems from different financing schemes; European policies such as the Feed-in Tariff and Contract for Difference induce more investment by minimizing risk exposure, a limited amount of tax equity discourages investors in the US. In 2018, Europe installed 2.6 GW of new offshore wind capacity, of which 85% is attributed to the United Kingdom and Germany. Europe now has 105 offshore wind farms with 18.5 GW capacity. In contrast, the first U.S. commercial offshore wind farm, Block Island Wind Farm near Rhode Island, is only 30 MW and began operating three years ago.

However, starting with new legislation in Northeastern states, the U.S. has been slowly gaining momentum. In 2016, Charlie Baker, a Republican governor of Massachusetts, signed an energy law that requires utilities to procure 1.6 GW from offshore wind farms in the next 10 years. The construction of 1.6 GW projects is estimated to generate a total of $1.4 billion to $2.1 billion. Anticipating similar economic benefits, other states, including New York and New Jersey, have joined the fray.

The Bureau of Ocean Energy Management ("BOEM"), an agency within the U.S. Department of the Interior, is supportive of these new projects. BOEM has successfully executed lease sales in New England, Virginia, Maryland, New Jersey, New York, and North Carolina since the inception of its renewable energy programs. The Department of Energy has also projected continued growth in this sector: 3 GW, 22 GW and 86 GW for 2020, 2030 and 2050, respectively.

Apart from its impressive track record in renewables, the United States is a leading natural gas producer. Natural gas supplies one-third of domestic primary energy and is a primary heating fuel for half of US households. Due to soaring demand of the international market, the U.S. is building more Liquefied Natural Gas ("LNG") export terminals. With more LNG terminals built in Louisiana, Texas, Maryland, and Georgia, the country will double its export capacity by the end of 2019. This will make the U.S. one of the three largest LNG exporters. Its vast deposit of shale gas and rapidly increasing export capacity prompted more competition among global competitors: Qatar and Australia. Uncertainty due to China's 10% tariff on U.S. LNG caused a delay of investments in the facilities; however, global demand of LNG is projected to increase consistently, and other major LNG importers such as Japan and South Korea will continue to purchase U.S. LNG to appease the U.S. during its trade wars.

Hydraulic fracturing ("Fracking") largely contributed to a dramatic increase in gas production. Fracking has cut energy production cost, thereby offering lower energy prices. Recent roll-back of its strict regulations will boost the production even more. As natural gas only produces 50 - 60% less carbon monoxide than coal when it is

burned at an energy plant, it is considered to be a decent alternative for coal and petroleum. As a result, its share of the domestic energy mix has increased rapidly, and it is the largest among the mix as of today.

Despite its advantages, the natural gas industry prompted environmental concerns. The most controversial one is fracking. It made the resource accessible and secured a significant amount of energy, but it uses an excessive amount of water, may trigger earthquakes, and poses risks of leaking chemicals into drinking water or air. Some energy researchers argue that the carbon footprint of liquefying the gas and transporting it with pipelines and vessels may be bigger than the one of coal. Natural gas is indeed a stable source of energy that relatively emits less carbon, but it remains a fossil fuel nonetheless.

Incentive-driven corporations pursue profit maximization. In a Wood Mackenzie study, rates of return of conventional energy projects are found to be much higher than those of recent renewable projects. Oil explorations' IRR is 8 to 15%, and North American onshore production's return is on average 33%. These are much higher than the returns of renewables, which are 5% and 7% in wind and solar respectively in a developed country. At least for now, it seems reasonable for large energy conglomerates to pursue what they have been doing well.

Quantifying positive and negative externalities in the energy industry is very difficult. Like fracking, revolutionary methods of using resources can create another problem. Natural gas is deemed to be a bridge fuel from carbon-intensive petroleum to eco-friendly energy, but it is also blamed for detaining transitions to renewables. Tax credits, which guarantee revenue to make renewables' long-term contracts attractive, thereby reducing carbon emissions, can phase out anytime soon if Congress does not approve its extension. Ironically, technological innovations and environmental policies put the industry on the horns of a dilemma. Conflicts between interest groups hinder society from realizing greater initiative of improving the environment and producing sustainable energy. It is now more than ever for policymakers to consider not only economic benefits but also health and welfare for future generations.

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Student Loans: The Next Big Economic Bubble?

By Chitanya Ajjarapu

"A chronic increase in the costs of education suggest another bubble has formed."

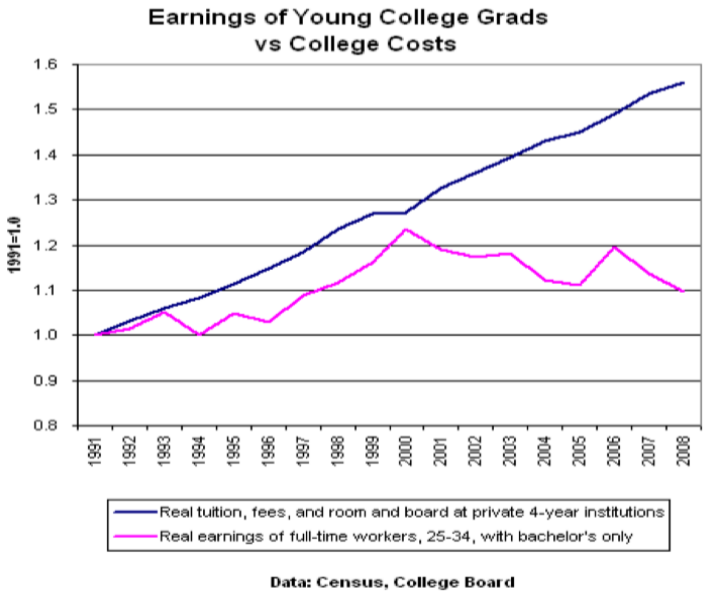
It's been more than a decade since the great recession of 2008 rattled our financial markets and economy, and when we are asked what caused the recession or the factors that lead up to it, one answer remains infamous: the housing bubble. Long story made incredibly short, the housing bubble refers to a very fast paced and large increase in the value of houses. A trend that continued until 2006. The bubble "popped" when these housing prices fell back down back to their regular values. The crash then occurred because so many financial flows were connected to the prices of housing. As economist Alan Blinder describes it, a bubble is a "large and long-lasting deviation from an asset's fundamental value." Because of the subjective nature of the description, many economists have trouble identifying bubbles in foresight, and can only recognize one after it pops. However, with the housing bubble still relatively fresh in our minds, many are trying to identify and curb bubbles before too many factors rely on it and they pop. Many are starting to speculate that a new bubble that is existing in our times is student loans.

First, to be recognized as a bubble, at least in Blinder's eyes, the asset's change in value needs to be able to be defined within the three criteria: large, long-lasting, and deviation from the fundamental value. Let's start with large: using 1940 as a reference point, the yearly tuition to attend the private university Yale, one of the highest ranked universities in the world, would have cost $450 per year, adjusting with inflation to about $8,200 in current times. This is a far cry from the $53,000 it costs each year to attend Yale today, more than five times the previous amount. It's been nearly 80 years since the blissful days of cheaper education, and the price arguably had to rise as consumer tastes changed and started to view education as inelastic and necessary, but whether or not this warrants a five times increase is up for debate, which moves into the next question, what is the fundamental value of an education?

It's hard to put a price on the fundamental value of an asset, especially if that asset is education. With all assets, a "fundamental value" requires looking at the historical costs of the asset, the yields it procured, and people's rapidly changing views on it. If we take a different approach and value the education based on what the students give up, the opportunity cost of the education, we can ask what the fundamental value of

an education should be. In addition to the tuition that students have to pay, they also give up the opportunity to work for four years instead of going to college. Such work averages out to $35,256 per year. Combining this with the average cost of tuition $34,740 gives a bachelor's degree an economic cost of about $280,000 over the four years. Therefore, theoretically speaking, the value for bachelor's education has to exceed this cost in order to have some kind of return on investment, and it definitely does. A bachelor's degree can't expire, and is capable of pulling an average of around $60,000 per year, meaning that on paper such a degree is paid off in 5 years. An unfortunate truth that is looming over all of us is that the sacrifices made are a lot more complex than this.

Experts suggest that nowadays 8 million students are defaulting their federal loans. The balance for the whole nation has reached $2 trillion, and a lot of that money won't get paid back. The pressure that is put on such students is immense. While in the housing bubble, sleazy mortgage lenders were enticing financially illiterate families to buy houses they couldn't afford and then selling them off up the derivative chain to investors, now it is the government that is holding on to the loans, and a multitude of factors pushing students to take the loans. When these loans are defaulted, student credit scores are butchered, and many will find trouble being able to finance cars and houses. Sacrifices that definitely deviate from what the fundamental idea of an education should be. The last point is also equally as hard to define: long-lasting.



Source: US Department of Labor Wage and Hour Division

What year should we use as a reference point? At what point did the price of education stop reflecting the real value that comes along with it and start riding the

psychological euphoria that causes a rise to bubbles in the first place? These are all questions that are easier to answer about a bubble once it has popped and its damages have spilled over onto the economy, but that hasn't happened yet, and might not happen for a long time. Till then, we can only use historical data to see how much prices have risen over the years.

Indeed, even viewing the prices relative to more contemporary times, the fact that price is greatly deviating from the financial returns is staggering.

You may be asking yourself, will the student loan bubble give rise to problems the same way the housing bubble did? Luckily, the silver lining to the incredibly large and dark cloud is that it "probably won't". The key difference between the two bubbles is who the beneficiary to these assets are. In the housing bubble, unscrupulous practices and incentives drew in crowds with minimal regulation and responsibility allowing them to run amok and collectively leave a razed economy in its wake. The federal government holds student loans, with a sole, inherently altruistic purpose of providing educations to those who cannot front the money themselves. Furthermore, the loans are not being packaged and sold off the same way mortgages were, and the fact that it is in the hands of the government gives it an implicit insurance that defaults of such loans won't financially ruin colleges and universities across the nation. Our economy can sleep easy at night knowing this fact, but what about our metaphorical homeowners; the students who borrowed so much and fearfully may get so little?

A key factor in the housing crisis was that when the housing value fell below their mortgage, even prime homeowners walked out and chose to default. This is much harder to do regarding student educations. Can a student walk away from all the work they put into their education already? Can they decide that an education is simply not worth the financial costs anymore, and walk away from their degree. These are questions that are simply too hard to answer, and are questions that many of us hope not to have to answer in the future. A bitter truth that is becoming realized is that the costs to keep oneself educated is growing increasingly steep, but it is as Barack Obama once said, "You think education is expensive? Wait till you see how much ignorance costs."

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