

5-2012

# Environmental Factors Impacting Spam: An Initial Study

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## Recommended Citation

Rao, Shashank; Wu, Jiming; Iyengar, Deepak; and Sasidharan, Sharath, "Environmental Factors Impacting Spam: An Initial Study" (2012). *MWAIS 2012 Proceedings*. 4.  
<http://aisel.aisnet.org/mwais2012/4>

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# Environmental Factors Impacting Spam: An Initial Study

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## ABSTRACT

Spam is a source of serious concern for both e-mail users and Internet Service Providers (ISP). While prior research has focused on spam content and spam filtering techniques, this study focuses on country-level, macro-environmental conditions that facilitate spamming activity. Adopting a criminological perspective, this study draws upon the deviance-based theories of rational choice and routine activities to analyze the effects of scale, economic, and judicial factors on spamming activity. Analysis of archival data obtained from international organizations suggests that spamming is influenced by scale and economic factors, but not by judicial ones. The study contributes not only to a better understanding of spamming activity but also provides a foundation for future work on other related issues such as privacy and network security.

## Keywords

Spam, privacy, security, rational choice theory, routine activities theory.

## INTRODUCTION

Spam is broadly defined as unsolicited bulk commercial e-mail sent without the consent of the recipient. Technically, an e-mail is considered to be spam if the recipient has not granted “deliberate, explicit, and still-revocable permission” for it to be delivered (Spamhaus, 2012). Spam is of serious concern to e-mail users, ISPs, and anyone connected with the Internet as it has undermined e-mail as a reliable means of communication, increased the operating costs for ISPs, and often been the precursor to criminal activities such as identity theft and fraudulent financial schemes (Symantec, 2012).

Drawing on two deviance-based theories - the routine activities theory (RAT) and the rational choice theory (RCT), this study investigates the effects of three country-level environmental factors; scale, economic, and judicial, on spamming behavior. The interplay between these theories provides a compelling basis for understanding the deviant behavior of spamming from a macro-environmental perspective.

## SCALE FACTORS

The RAT stresses the convergence in time and space of three essential elements for a crime to occur: a likely offender, a suitable target, and the absence of a capable guardian. It argues that an increase in the “active” status of a target (i.e., target availability) within a sociological system often results in more victimization of that target (Clarke and Felson, 1993; Cohen and Felson, 1979). Based off this argument, as the number of e-mail users (i.e., the availability of targets) grows, the amount of spam messages that they receive can be expected to increase correspondingly.

*P1: The number of Internet users in a country will be positively related to the level of spamming in that country.*

The RCT asserts that a decision to commit a crime is a rational decision and is affected by the perceived costs/benefits and facilitating conditions of committing the crime (Paternoster and Simpson, 1994). Spammers can easily move their operations from one ISP to another, seeking out businesses and nations with lax policy or law enforcement. In other words, it is easy for spammers who are blacklisted by one ISP to move their operations to another ISP and continue spamming anonymously. Existence of many ISPs and the ease of switching ISPs can be viewed as facilitating conditions that allows spammers to maintain their anonymity and keep on sending out spam with little fear of being blacklisted. This suggests that a link can be drawn between the number of ISPs and spamming behavior.

*P2: The number of available ISPs in a country will be positively related to the level of spamming in that country.*

**ECONOMIC DEVELOPMENT**

The extent and sophistication of marketing techniques has been recognized as an important indicator of the development of a market economy (Drucker, 1958). As a country or region enjoys economic success, its people usually benefit from a wide selection of products and services. This results in competition between product/service providers. In order to survive in this atmosphere of competition, product/service providers will use all available sales and marketing methods to reach the widest pool of prospective customers. This is easily accomplished through spam as it is a convenient and little-to-no cost marketing tool. This is also in line with the RCT in that the low costs and perceived high benefits will motivate product/service providers to indulge in spamming. Hence, it is expected that spam will be more prevalent in economically developed nations.

P3: *The economic development of a country will be positively related to the level of spamming in that country.*

**JUDICIAL FACTORS**

Several countries have well-defined anti-spamming laws in place (e.g., the CAN-SPAM Act (USA), Australian Spam Act, London Action Plan (UK)). Broadly, these laws define what kinds of spamming activities can be considered legal or illegal. According to the RAT, a guardian is critical to the prevention of a crime. The potential of legal actions by authorities can serve as a strong deterrent to offenders who might carry out deviant behaviors (Paternoster and Simpson, 1994). Hence, it can be concluded that the enactment of well-defined anti-spamming laws will contribute to a lower level of spamming.

P4: *The enactment of anti-spam laws in a country will be negatively related to the level of spamming in that country.*

Previous research also suggests that an efficient and effective judicial system is vital to the prevention of deviant behaviors (Paternoster and Simpson, 1994). This is because such a system ensures the high degree of certainty and severity of punishment crucial to the deterrence of deviant behaviors. Hence, judicial efficiency and effectiveness can substantially reduce the occurrence of the deviant behavior of spamming. A lower level of spamming activity can be expected in nations that develop and maintain an efficient and effective judicial system.

P5: *Judicial efficiency and effectiveness in a country will be negatively related to the level of spamming in that country.*

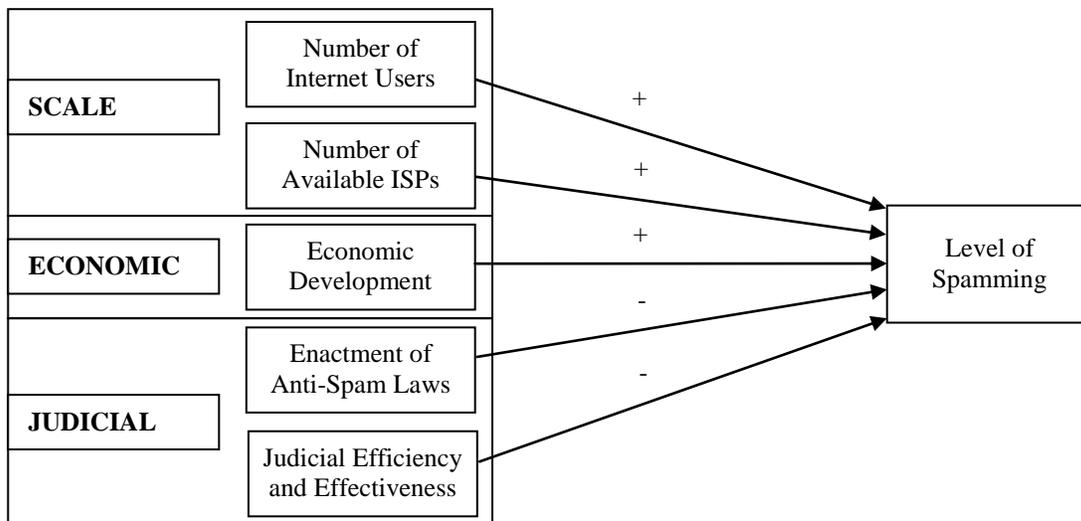


Figure 1. Research Model

**RESEARCH METHODOLOGY**

**Measures and Data Sources**

Data was collected from a variety of established archival sources. The number of internet users and the number of available ISPs in a country were obtained from the CIA World Factbook (<https://www.cia.gov/library/publications/the-world->

factbook/index.html). Economic development was measured in terms of Gross Domestic Product at Purchasing Power Parity using data provided by the World Bank (<http://siteresources.worldbank.org/DATASTATISTICS/Resources/GNIPC.pdf>). The enactment of anti-spam laws was evaluated by using the data provided by the International Telecommunications Union on two factors: (1) number of anti-spam laws and (2) the number of years since the first such law was enacted ([www.itu.int/osg/spu/spam/legislation/Background\\_Paper\\_ITU\\_Bueti\\_Survey.pdf](http://www.itu.int/osg/spu/spam/legislation/Background_Paper_ITU_Bueti_Survey.pdf)). These two factors were multiplied to get a single factor for use in the regression analysis. Judicial efficiency and effectiveness in a country was assessed by using the World Bank rule of law index (<http://info.worldbank.org/governance/wgi/index.asp>). This index ranks countries according to their judicial systems on a scale of -2.5 to 2.5, wherein a higher value indicates a more efficient and effective judicial system. The dependent variable, level of spamming, was measured in terms of numerical count of IP addresses that have been identified as a source of spam from the Spamhaus database (Spamhaus, 2012).

## PRELIMINARY DATA ANALYSIS AND RESULTS

The sample included 59 countries for which a complete set of data was available. Table 1 presents the descriptive statistics for the study variables.

	Variable	Mean	SD
1	Number of Internet Users	12,964,785	2,011,952
2	Number of Available ISPs	75.40	38.19
3	Economic Development	18,143	11,497
4	Enactment of Anti-Spam Laws	12.40	1.72
5	Judicial Efficiency and Effectiveness	0.58	0.99
6	Level of Spamming	158	73

**Table 1. Descriptive Statistics**

The research propositions were examined using ordinary least squares (OLS) multiple regression with the level of spamming as the dependent variable and the scale, economic, and judicial factors as independent variables. Initial results indicate a significant relationship ( $p < 0.01$ ) between the number of internet users and the level of spamming; hence there is support for P1. Similarly, there is a significant relationship ( $p < 0.05$ ) between the number of available ISPs and the level of spamming; hence there is support for P2. Economic development is also found to have a significant relationship ( $p < 0.05$ ) with the level of spamming; hence there is support for P3. While the enactment of anti-spam laws and judicial efficiency and effectiveness are negatively related to the level of spamming, the relationship is not significant; hence there is no support for P4 and P5.

## CONCLUSION AND FUTURE DIRECTIONS

There is initial support for the contention that scale and economic factors influence spamming activity. However, judicial factors do not seem to have an impact. A detailed analysis is being conducted, the results of which will be discussed at the conference.

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