

Philadelphia, February 8th 2010

**To: The Wharton Risk and Decision Processes Center.
The Ackoff Doctoral Student Fellowship program.**

From: Santiago Gallino. PhD Student Operations and Information Management Department
Research Proposal

1. Project title and descriptive summary

Project Title:

Does Inventory Have Psychic Effects? A Test Using Extreme Weather for Exogenous Variation

Descriptive summary:

This study concerns how consumers decide on their demand based on observed inventory levels. To execute this empirical study, we use extreme weather to measure exogenous variations in inventory levels. Therefore, in a number of areas--consumer decision-making, psychology, and environmental conditions--this study fits with the scope of the Fellowship program.

When manager deal with products where the amount of inventory is under their direct control, predicting demand fluctuations and managing inventory levels becomes essential to retail operations. However, when making decisions concerning inventory management the question arises as to how inventory affects sales arises. This relevant question has received relatively limited attention in the literature. There is, of course, the simple availability effect. But we are interested in testing if the assumption of a static demand function holds even when inventory changes are not related to marketing actions. The presence of such a demand effect can have interesting implications for inventory levels decisions.

Many retailers and researchers believe that inventory has psychic effects: inventory affects demand beyond just being present or absent; the amount of inventory seen by a customer also affects her demand.

There are conflicting views about whether psychic effects increases demand ("billboard effect) or decreases it ("scarcity effect"). To estimate psychic effects, we plan to study retailers distribution centers (DCs) and see how an exogenous increase in the movement of inventory from these DCs to retailers' stores affect sales at those stores. We plan to show that an exogenous event occurs when the National Weather Service Forecast Office issues driving-risk alerts at those DC locations. Then we will use this exogenous shock to test the direction of the psychic effect on the consumers demand.

One of the interesting aspects of our research approach is that it will enable us to test a relevant hypothesis that underlies on a vast analytical literature related to inventory policies. We will pick the

phenomenon already described, collect relevant data, test the hypotheses and finally discuss acceptance or rejection of the hypotheses.

We plan to first obtain relevant data from different sources namely: extreme weather conditions, inventory levels in warehouses and sales records. Then we will work on the data applying econometric tools to be able to have a conclusion on the existing hypothesis.

In this empirical work, we use extreme weather conditions as an instrument for evaluating inventory variations with respect to an exogenous cause. We will analyze the relation between the resulting inventories availability and actual demand in the area where these events had impacted. We will outline the implications of the research outcomes to current inventory policies definitions.

With our work we try to obtain a deeper understanding and find empirical evidence of the relation between inventory and demand. Doing this we are sure that we will make a significant contribution to better understanding risk, uncertainty and consumer behavior in the retail industry. Retailers will be able to reconsider their assumptions between inventory position and demand and hopefully then improve their results.

Because of the relevance of the question we are working we expect to have a significant impact with our work. Presenting and discussing our result with academics, managers and students that are involved in the different activities organized by the Wharton Risk and Decision Processes Center will definitively be a main objective of this project. We are also interest to share and discuss the results with academics at a conference and finally being able to reach a broader audience with Knowledge@Wharton.

2. Name of primary faculty member with whom the student is working:

Marshall L. Fisher.

Professor of Operations and Information Management.

Richard Lai

Assistant Professor of Operations and Information Management.

3. Detailed budget describing the anticipated expenses

In this empirical work, we use exogenously bad weather as an instrument for inventory. Our method requires us to obtain data on weather conditions at retailers' distribution centers (DC). This effort is mostly manual (e.g., tallying up each retailer's DC) and moderately expensive (e.g., purchasing weather data at the MSA level). Weather data at coarsest geographic granularity is freely available but would be not be accurate for our study. We also feel that it is important to obtain first-hand accounts (and data, if possible) from 1 or 2 retailers, so as to ground the research closer to the phenomenon. Finally presenting this paper at a conference to discuss result will definitively be relevant to the project

Estimates:

Acquiring weather data	\$1100
Data cleansing	\$900 (\$10/hr x 90 hrs)
Conference fees and travel:	\$700x2
Books, photocopying, etc:	\$300