Application: 2013 Russell Ackoff Doctoral Student Fellowship
Christine L. Dobridge
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**Project Title:** How Does Regulatory Risk Affect Firms? Evidence from a Natural Experiment

**Goals of the Research:** The goal of this research project is to answer the question: "How does uncertainty about future regulatory policy affect firm outcomes including investment, cash holdings, employment, wages, and new plant creation and destruction?"

**Summary of the Project:**

In this project, I use regulatory changes under the Clean Air Act Amendments of 1990 as a natural experiment to examine the effect of regulatory risk on firm decision making. U.S. government agencies publish thousands of new regulations a year affecting U.S. businesses and the rulemaking process is long and complex. This introduces firms to a substantial amount of risk and uncertainty about the regulations they will be required to follow.

Regulatory uncertainty is often cited as a major factor restraining job creation and business investment in the U.S. currently, but there is still considerable debate on the topic. In addition, while the effect of economic uncertainty on firms’ decisions has been explored extensively in the theory literature, much less empirical research has been done. It is difficult to identify a causal relationship between uncertainty and firm outcomes, and it is also difficult to separate the effects of uncertainty about regulations from the effect of implementing the regulations themselves. I utilize a unique empirical strategy to identify the effect of increased risk on firm decisions, including investment and employment decisions, cash holdings, and capital structure. My work will contribute to a greater understanding of how firms respond to increased risk and will also contribute to the public debate on regulatory uncertainty overall.

**Detailed Description of the Methodology:**

I use a natural experiment methodology in order to test the effects of regulatory uncertainty on firm outcomes. After the Clean Air Act Amendments of 1990, industries were told at different times that they would be regulated, but not when or what the regulations would be. This introduced substantial uncertainty into the outlook for the firms to be regulated.

The specific details are as follows. Under the Act, Congress required the Environmental Protection Agency (EPA) to develop a list of pollution source categories—specific manufacturing industries—to be regulated for hazardous air pollutants. In 1991, the EPA initially listed over 600 potential sources that they were considering regulating. In the following year, they published a final list of 174 source categories to regulate. The EPA also noted they retained the right to revise the list at any time. From 1993 to 2005, the EPA added 48 new source categories to the list, and removed 24. I use being added to the list of source categories as a shock to firms that increased regulatory risk and uncertainty. Firms in an affected industry then knew they would be regulated by EPA but not when the regulations would be imposed or what the rules would look like. It took an average of eight years after source categories were
added until even the draft regulations were issued. To test the effect of increased risk, I will run the following differences-in-differences empirical specification:

\[ Y_{ijtc} = \beta \text{SourceListing}_{ijct} + \delta_{ic} + \gamma_{tc} + \epsilon_{ijct} \]

In this model, i indexes the establishment, j indexes the industry, c indexes the comparison cohort, and t indexes the quarter and year of the observation. SourceListing is a dummy variable equal to one if the firm is an industry listed as a pollution source to be regulated. The dependent variables (\(Y_{ijtc}\)) I will test are firm-level investment, cash holdings, size and capital structure as well as establishment-level employment and wages, and plant openings and plant closings.

I will also test the effect of the regulations being issued by running the following specification:

\[ Y_{ijct} = \beta \text{DraftRegPublication}_{ijct} + \delta_{ic} + \gamma_{tc} + \epsilon_{ijct}, \]

Here, DraftRegPublication is a dummy variable equal to 1 if a draft regulation was published for a given industry in a given year. After a draft regulation is published, a firm has a much clearer idea of the regulations that it will be required to follow.

**Why Funding is Being Sought:**

I am seeking funding for this project in order to be able to regularly travel to the Bureau of Labor Statistics (BLS) in Washington, D.C. to access confidential data on-site and carry out this project. The datasets I have applied for access to are the Quarterly Census of Employment and Wages and the Longitudinal Database of Establishments. These datasets contain establishment-level data on employment, wages and also on establishment openings and closings. There are no equivalent public data sources available and I must use the data on-site at the BLS headquarters.

With these data, I can test the effect of regulatory uncertainty at the individual plant level, instead of the overall firm level. This is a significant advantage—multi-product firms may operate plants in several industries, some subject to regulatory uncertainty and others not. Much of the economic theory literature suggests that firms respond to increased uncertainty by delaying investment and employment. Multi-product firms are likely only to delay investment and hiring in plants affected by regulatory uncertainty, however, not for the firm overall. With plant-level data from the BLS, I will be better able to isolate the effects of uncertainty by looking only at the affected plants. In addition, firm-level employment data are not well reported in publicly available data and wage data are not available. Using the BLS data will allow me to evaluate the employment and wage effects of an increase in regulatory risk, which I will not be able to do otherwise.

**Faculty Advisor Signature:**

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Todd Gormley, Assistant Professor of Finance