International Journal of Disaster Risk Reduction 24 (2017) 439–450

Contents lists available at ScienceDirect

International Journal of Disaster Risk Reduction

journal homepage: www.elsevier.com/locate/ijdrr

Sex, gender, and disasters: Experimental evidence on the decision to invest in resilience

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ARTICLE INFO

Keywords:
Economic resilience
Gender
Experimental economics
Disasters
Decision-making
Middle-market

ABSTRACT

Increasing sensitivity to terrorism, economic volatility, frequent and severe natural disasters, and infrastructure disruptions has intensified interest in resilience, the ability to withstand or recover from catastrophe. The growing research on disaster preparedness and recovery policies have been aggregate-level analyses focusing on communities, organizations, or the physical environments. Absent from this literature is an exploration of the role of individual decision-makers in determining the resilience strategies of firms, even though the hardiness of business is crucial to maintaining robust local, regional, and global economies. To address this, our research uses a randomized controlled experimental design to examine whether biological sex or gender diversity might lead to decision-making that improves investments in resilience to calamitous events. We study decisions related to a core resilience strategy, investment in inventories, across professional manager and student subject pools. We find that although females perceive a higher probability of a catastrophic event, male and female subjects do not make different investment decisions when faced with uncertainty and risk. Importantly, a gender construct capturing congruence with feminine personality attributes does correspond with increased resilience investment and is driven by differences between managers and students. Increased gender diversity in decision-making bodies may serve to improve economic resilience of firms and other organizations.

1. Introduction

With renewed sensitivity to threats such as terrorism attacks, deep and long-lasting recessions, frequent and severe natural disasters, and infrastructure disruptions such as blackouts and loss of clean municipal water, it is no surprise that the concept of economic resilience has become a popular focus of recent academic literature and policy discussions [44,45]. Many of the latest studies informing policy have created frameworks for evaluating vulnerability and hazard response [12,2,31,41]. Others have sought to quantify post-disaster losses, measure costs of resilience efforts, or establish baselines for appraising resilience performance [14,34,53,69]. These studies have concentrated on community or regional resilience by examining regions (e.g., metro areas or watersheds), organizations (e.g. hospitals), institutions (e.g. government policies), or infrastructure systems (e.g. power and telecommunication networks, supply chains).

Firm resilience is critical to understanding community and regional resilience. While research has attempted to quantify the effects of catastrophic events on businesses, it has largely ignored the role of decision makers within firms and their attempts to minimize potential losses. Decisions that collectively constitute the economic resilience of businesses and communities originate with individual decision-makers or with collaborations of individual decision-makers. To address this glaring gap in the literature, this paper evaluates individual-level resilience decisions and their determinants. We account for the important decision-making context of firm-level resilience decisions, namely tradeoffs inherent to resilience actions. In this paper, we evaluate the tradeoff to firms in acquiring inventories or stockpiles of production inputs, a well-established resilience tactic of firms [59,60,62]. This is an important resilience decision making context because, while market competition pressures firms to be lean, the threat of economic disruption from natural or human-made disasters necessitates contemplation of investments to reduce the adverse impacts of catastrophic events. Compared to smaller or larger firms, these tradeoffs between investments in production and resilience are likely even more acute for midsized firms, which hire one out of every three workers in the U.S. private economy [48].

Many factors potentially influence firm-level resilience investments. Our research builds on important findings that personal investment decisions often predict business investment decisions [15]. Individual vulnerability to disasters may vary based on socio-economic class, gender, age, ethnicity, and disability [47,72,74], making it likely that

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http://dx.doi.org/10.1016/j.ijdrr.2017.06.003
Received 10 November 2016; Received in revised form 1 June 2017; Accepted 3 June 2017
Available online 13 June 2017
2212-4209/

these groups would perceive disaster risk differently and/or make different resilience investment decisions. Here, we focus on the influence of sex and gender in the economic resilience decisions of firms, devoting specific attention to middle market firms. We test the degree to which sex and gender diversity leads to pro-resilient decision-making in the face of calamitous events. This question is important both to the rapidly growing literature on economic resilience and to the decision-making literature more broadly. It also has significant societal importance in terms of informing businesses, social planners and federal agencies tasked with emergency preparedness and improving the resilience of businesses and the broader community.

This research considers both biological sex and gender. Biological sex is based on physiological characteristics and is often represented by binary male/female categories [63,73]. Gender is based on biological sex characteristics and is produced through socialization as children internalize and demonstrate the different normative expectations of appearance, attitude, and behavior consistent with boys/men and girls/women [63,64,71,73]. In line with the extant literature that posits increased risk-aversion among females, we hypothesize that male and female decision makers will exhibit differences in their willingness to invest in economic resilience. We extend this further by evaluating the degree to which culturally-defined concepts of masculinity and femininity, representations of gender, drive resilience investment decision-making beyond the simple binary measure of sex.

To examine these hypotheses, we utilize controlled experiments with a subject pool of professional middle market firm managers. We replicate the same experiments with undergraduate experimental economics subject pool students and report results of both. The direct and indirect losses due to disaster-related supply chain interruptions are an increasing concern for businesses [19], so the experimental design takes an explicitly narrow focus on one core resilience strategy of firms, investments in inventories. Inventories, which can bear sizeable costs in the short-run, can shield firms from costly business disruption when faced with critical supply chain curtailments. Such business interruptions can be several orders of magnitude larger in terms of economic disruption than the property damage of calamitous events. The interconnectedness of supply chains, trade and financial markets mean that local disaster-induced disruptions can produce effects that ripple through regional and global economies [19]. Our experimental design allows us to evaluate the effects of sex and gender on the decision to invest in resilience, as well as differences in experience levels (managers vs. students). We also conduct extensive post-experiment survey assessments of our subjects that provide critical information in understanding determinants of resilience decision-making.

This research makes a number of important contributions to the resilience and risk literature. First, our focus on middle market firms fills a notable gap in the resilience literature. Mid-sized firms are a critical component of labor economies and global supply chains [33,48], but their resilience to disasters has remained under studied. Second, this study accounts for risk in a unique way, by incorporating the inherent priors of experimental subjects and by designing a strategy neutral game. Third, by using an experimental approach using both student subjects and actual manager subjects, we are able to help reconcile the conflicting findings from previous research regarding the relationships between gender and risk. Risk and resilience studies have tended to focus on student subjects. We overcome the limitations of this approach by using a sample of middle market firm managers representing of all industries and comparing the decisions of students with professionals accustomed to making these types of decisions. Fourth, the existing risk literature relies on the use of biological sex as the operationalization of gender, most typically examining only firms in the financial sector of the economy [66]. Following Meier-Pesti & Penz [46], who introduced masculinity and femininity into the financial risk-taking research, we suspect that some of the conflicting male/female results produced in the risk literature are due to limitations of operationalizing gender as an M/F checkbox. By incorporating both sex (M/F) and gender (socially constructed masculinity/femininity), we are able to more holistically assess the factors influencing resilience investment decisions.

The overall findings of these experiments support the conclusion that gender diversity, that is diversity of feminine and masculine personalities, may lead to greater investments in resilience. Under conditions of uncertainty, male and female decision makers hold different perceptions of the likelihood of a catastrophic event that may lead to increased investments in resilience as more women are included in those decisions. Femininity is also positively correlated with perceptions of increased disaster likelihood. Further, regardless of biological sex, individuals reporting high congruence with femininity traits may also be more likely to direct resources toward resilience. We discuss these results and their implications after reviewing the risk, decision-making, and economic resilience literature, describing the experimental design and reporting the study findings.

1.1. Gender, decision-making and resilience

Middle market firms, defined here as those with annual revenues between $10 million and $1 billion, are an ideal sample to use to examine the relationship between decision-making, gender, and resilience. These firms account for approximately one-third of the US private economy in dollar terms [48], making employment in these firms vital for state and local economies. Despite their prevalence and economic importance, these firms are particularly vulnerable to catastrophic events. Relative to smaller firms, they have greater capacity to insulate themselves to disasters. However, relative to larger firms, they often lack the necessary resources and expertise to fully recover from or prepare for disaster. Middle market firms are also less likely to acquire government assistance.

Prior to the mid-1990s, middle market firms had not focused on disaster planning, but an increase in both the frequency of catastrophic events and investment in costly data centers have prompted change [54]. Purchasing business interruption insurance, designing alternate methods of communication with key customers and suppliers, and rewriting contracts to include provisions for emergency space or equipment, were some actions firms began pursuing. Each represents methods of passive (preventative) resilience [54]. Among the middle market firms, fewer than ten percent are women-owned or woman-run. This lack of gender diversity may have important implications for economic resilience.

Only a small literature explicitly examines how gender might affect decisions regarding economic resilience. For example, Danes, et al. [18] found that female-owned firms that accepted federal disaster assistance (a form of active resilience) achieved enhanced resiliency when compared to male-owned firms. Female-owners also maintained greater firm resiliency via social capital. Danes, et al. [18] posit that relatively higher risk aversion and support-seeking tendencies of females and their deeper commitment to permanent employees may explain these outcomes.

The effects of gender composition on resilience decision-making may manifest itself in a number of important ways. Our focus on the role of gender and the growing literature on economic resilience informs and is informed by two main areas of prior research: the literature on gender and risk and the literature on gender and decision-making. Notably, the extant empirical literature has operationalized gender in terms of dichotomous biological sex rather than on masculine or feminine attributes. However, because gender is socially and culturally constructed, individuals (regardless of their biological sex) will vary in their adoption of masculine/feminine traits and behaviors depending on their socialization. By ignoring these social and cultural gender constructs, the empirical literature relying only on a biological sex measure becomes dependent on sorting into particular industries or roles within a firm. Such sorting would lead to inconsistent findings regarding the role of gender, which is what we report below. Next, we review the literature that informs our hypotheses.