NEW YORK ECONOMIC REVIEW

FALL 2012

VOLUME XLIII

NEW YORK STATE ECONOMICS ASSOCIATION

≻ FOUNDED 1948 ≺

New York Economic Review
Vol. 43 Fall 2012

CONTENTS

ARTICLES

Disparities In The Intensity Of Breast Cancer Treatment
Emma Bojinova……3

The Effects Of The 2008-2009 Financial Crisis On U.S. Corporate Debt Structure
Amanda E. Willsey and Dona Siregar……...16

The Rate Of Time Preference, Seat Location Choice And Student Performance In The Classroom
Wisdom Akpalu, Richard Vogel, and Xu Zhang……..……33

Sources of Employment Growth in the North Country
Kameliia Petrova……...46

Basketball Market Efficiency and the Big Dog Bias
Ladd Kochman and Randy Goodwin ……...70

Who Defaults on Their Home Mortgage?
Eric Doviak and Sean MacDonald……..…….……..75

Referees……99

Final Program (63th Annual Convention – September 23 & 24, 2011) ……100

EDITORIAL

The *New York Economic Review* is an annual journal, published in the Fall. The *Review* publishes theoretical and empirical articles, and also interpretive reviews of the literature. We also encourage short articles. The *Review's* policy is to have less than a three month turnaround time for reviewing articles for publication.

MANUSCRIPT GUIDELINES

1. Please submit three copies of a manuscript.

2. All manuscripts are to be typed, double spaced and proofread. Prepared on a IBM PC/compatible computer in Microsoft Word format, the computer disk should be submitted in addition to the three hard copies.

3. All charts and graphs *must* be reproduction quality (Microsoft Word or Excel).

4. Footnotes should appear at the end of the article under the heading of "Endnotes."

5. Citations in the text should include the author and year of publication, as found in the references, in brackets. For instance (Marshall, 1980).

6. A compilation of bibliographic entries should appear at the very end of the manuscript under the heading "References."

Manuscript submissions should be sent to the editor, William O'Dea.

Division of Economics and Business
State University of New York College at Oneonta
Oneonta, New York 13820

The NYER is cited in:

- Ulrich's International Periodicals Directory
- Cabell's Directory of Publishing Opportunities in Business and Economics

ISSN NO: 1090-5693

Disparities In The Intensity Of Breast Cancer Treatment

Emma Bojinova

Abstract

Disparities in the survival of breast cancer patients have been observed between African-American and Caucasian women in the United States. The reasons for this differential are still unclear – part of it can be attributed to differences in biology and genetics, to social, economic, and cultural factors, but also it can be due to racial discrimination. The goal of this paper is to investigate if there are racial differences in the intensity of treatment of breast cancer patients. Based on cross-sectional data from the Healthcare Cost and Utilization Project (HCUP), various specifications are used to estimate if African-Americans and other racial groups are treated less intensively in comparison with white Americans when they are admitted to hospitals in 35 states. This study provides some evidence for the presence of such disparities.

I. Introduction

Cancer has been the second leading cause of death in the United States for a number of years. Breast cancer has the highest mortality rate among females diagnosed with cancer. According to the Surveillance, Epidemiology, and End Results (SEER) Program of the National Cancer Institute the age-adjusted breast cancer incidence rate for the period 2002-2006 was 123.8 per 100,000 women per year. The breakdown by race is as follows: the incidence rate is highest for white females (127.8 per 100,000 women), followed by black females (117.7 per 100,000), Asian/Pacific Islanders (89.5 per 100,000), and Hispanics (88.3 per 100,000 women). The lowest incidence rate is recorded for American Indian/Alaska Native females (74.4 per 100,000). In contrast, black females have the highest age-adjusted mortality rate (33 per 100,000) as compared to other races for the same period. The breast cancer mortality rate is approximately 38.1 percent lower for white women (23.9 per 100,000) and between 87.5 percent and 264 percent lower for the other three racial groups mentioned above. Expenditures on diagnosis and treatment of breast cancer cases are very high. The National Cancer Institute estimates that approximately $13.9 billion is spent on breast cancer treatment every year in the United States (Cancer Trends Progress Report – 2011/2012 update).

The early detection of breast cancer is very important for a patient's survival. Mammography is especially useful for identifying breast cancer at an early stage even before physical symptoms develop. Early detection increases treatment options and thus decreases mortality. However, the decision to undergo breast cancer screening depends on whether the person has health insurance, as well as on education level and awareness of breast cancer symptoms. For instance, women who lack

*Department of Economics & Finance, Canisius College, 2001 Main St., Buffalo, NY 14208. Phone: (716) 888-2721.
E-mail: bojinove@canisius.edu

health insurance, are poor, less educated, or live without a husband tend to have the lowest mammography use due to their limited access to health care. According to the National Center for Health statistics, African-American, Hispanic, and American Indian women are more likely to be diagnosed with breast cancer at a later stage of disease development, which will affect their hospital expenditures.

Furthermore, these expenditures depend not only on the clinical status of patients, but also on the duration of stay, reason for admission, and whether this is a first admission or a re-admission to a hospital. For example, a woman in an advanced stage of breast cancer during her first admission to a hospital will undergo more diagnostic and therapeutic procedures and as a result her expenditures will be high as compared to, say, her third re-admission when she can have chemotherapy or radiation therapy only. A number of studies have shown that there is a direct relationship between length of stay and hospital charges but as the length of stay decreases expenditures decrease less than proportionately because the latter is associated with higher intensity of treatment during an early hospital stay. Also, for cancer patients it was found that the "cost of treatment may decrease with severity because of the futility of any further active intervention, while at the same time mortality rate goes up for each stage and substage" (Medstat Disease Staging Software Reference Guide, Healthcare Cost and Utilization Project 2002, p. 15). Total expenditures are a good proxy for the intensity of treatment because as mentioned above they capture the cost of treatment of the received health care which varies with the number of performed procedures at the hospital, duration of stay, reason for admission, and health status of the patient.

Racial discrimination, both individual and institutional, along with the feelings of inferiority of the minority groups, can adversely affect health. Socioeconomic status (SES) can explain part of the observed racial disparities in health (see for instance Bradley et al., 2002; Cross et al., 2002; Newman et al., 2002). However, racial differences can still be observed even after controlling for SES.

The purpose of this paper is to investigate whether there are racial disparities in the intensity of treatment of breast cancer patients, which can explain the higher mortality rate for African-Americans. Hospital expenditures recorded for an inpatient claim are used as a proxy for the intensity of treatment. Based on cross-sectional data from the Healthcare Cost and Utilization Project (HCUP) for the year 2002, different specifications are employed to estimate if black and other racial groups such as Hispanics, Asians, Native Americans, and others are treated less intensively in comparison with white Americans when they are admitted to hospitals in 35 states. The results suggest that there is some evidence for the presence of racial disparities in this particular year.

The paper is structured as follows. A brief literature review is presented in the next section followed by a description of the data. Then, the econometric models and estimation techniques are introduced. Next, the estimation results are presented. The final section provides a short discussion, summarizes the findings, and concludes.

II. Previous Literature

A lot of research has been done in explaining the differences in cancer survival rates among different socioeconomic groups. Some of the studies considered several cancer sites, whereas others concentrated on a single cancer site. A study by Kravdal (2000), based on individual register and census data for the whole Norwegian population for the period 1960-1991, investigated the social differentials in survival from twelve types of cancer (including breast cancer). The author found that excess mortality was about 15 percent lower for patients who had a post-secondary education as compared to those with compulsory schooling after controlling for age, stage at the time of diagnosis, and registered differences in tumor characteristics. Figueroa and Breen (1995) analyzed cases of breast and cervical cancer diagnosed in the period 1989-1990 in San Francisco, Detroit, and Atlanta. They found that 87 percent of the breast cancer cases were diagnosed late, when the tumor was already malignant. A significant part of the variation in diagnostic stage was explained by residence in an underclass area. The likelihood of late-stage diagnosis also increased with age and was higher for females living without a spouse. Katz and Hoffer (1994) found similar results for breast cancer patients living in Ontario, Canada. According to them factors such as knowledge, attitudes, transportation, differential physician advice, and time constraints explain why poor women have a lower likelihood of receiving screening tests.

A majority of breast cancer survival studies found evidence suggesting that the socially advantaged have better survival rates after controlling for possibly earlier detection of the disease among people from higher social classes (see for example LeMarchand et al., 1984; Bassett and Krieger, 1986; Karjalainen and Pukkala, 1990; Gordon et al., 1992; Ansell et al., 1993; Schrijvers et al., 1995).

Health insurance really matters when it comes to breast cancer screening, surgical procedures or other treatment procedures, because it affects treatment and hospital choices. Mitchell and Hadley (1997) analyzed hospital inpatient discharges of nonelderly women diagnosed with breast cancer in 1988 and 1991 for five states (CA, MD, MA, NJ, and NY). The authors found that the probability of breast-conserving surgery is 2.7 percent lower for females enrolled in HMOs, 4.8 percent lower for Medicaid and 6.6 percent lower for self-pay patients as compared to females having private insurance plans. Thorpe and Howard (2003) found substantial differences in cancer spending by insurance status based on the Medical Expenditure Panel Survey for 1996-1999. They considered five big cancer types, among which was breast cancer. Their results showed that “uninsured patients under age sixty-five spent 57 percent as much over a six-month period as privately insured patients spent on their cancer care” (p.189). They concluded that nonelderly cancer patients without health insurance have higher risk of being inadequately treated especially if they are of Hispanic origin.

A number of studies utilized data from the Healthcare Cost and Utilization Project (HCUP) to investigate racial and sex disparities in the treatment of patients diagnosed with various diseases including some types of cancer (see for instance Ball and Elixhauser, 1996; Harris et al, 1997; Andrews and Elixhauser, 2000; Shenn, 2002; Dowell et al., 2004). Andrews and Elixhauser (2000)

examined whether there is difference in the rate of receiving therapeutic procedures between Hispanic and white non-Hispanic patients based on 1993 discharge data for California, Florida, and New York (states that account for half of the Hispanic population in the United States). They used logistic regressions to estimate the likelihood of receiving a major therapeutic procedure for 63 conditions controlling for age, gender, disease severity, health insurance, income level of patient's community, and hospital characteristics. Their results showed that Hispanics were undertreated in a sense that they were less likely to receive major therapeutic procedures for 38 percent of the 63 conditions they examined and more likely for six percent of the conditions as compared to non-Hispanic whites. Dowell et al. (2004) found significant racial and sex disparities in the access to health care, lengths of stay, and types of procedures performed for Type 2 diabetes patients above 40 years of age for the period 1994-1997.

This paper also utilizes HCUP data but looks at a different cancer site (i.e. cancer of the female breast). The study also employs various estimation procedures to check for the presence of racial differences in the intensity of treatment of patients suffering from breast cancer who were admitted to a hospital in one of the thirty-five states participating in the HCUP project. The paper sheds more light in this less researched area.

III. Data Description

The source of data is the Healthcare Cost and Utilization Project for the year 2002, Agency for Healthcare Research and Quality. The nationwide inpatient sample (NIS) consists of approximately 7.85 million hospital stays from about 1,000 hospitals in the United States. It covers 35 states and is designed to approximate a twenty-percent sample of U.S. community hospitals, which allows for making inferences for the country as a whole. The advantages of using HCUP data are the availability of a large number of inpatient records, good data on health insurance and hospital characteristics, and different disease diagnoses. It should be noted that the unit of observation in this data set is an inpatient claims record, not the patient. As a result, it is possible for a patient to have more than one hospital stay in a given year and this will be considered as a different observation. The data are also censored because we observe only the individuals that go to a hospital for a treatment and file a claim.

This study focuses on breast cancer inpatient stays and restricts the HCUP sample to discharges with a principal “breast cancer” diagnosis based on ICD-9-CM codes. This reduced the sample to 22,678 observations. Observations with missing values for the variables of interest, i.e. race and total charges, were deleted. One hundred and fifty six observations for male breast cancer patients were also dropped from the sample to avoid potential unobserved gender differences with regards to treatment and disease development. Furthermore, the state of Georgia did not report the race of patients in 2002 due to confidentiality of reports. Also missing are race data for some of the other states. As a result, after deleting these observations the sample size decreased by 6,084 inpatient records.

The following variables from the NIS are used in the study: total charges (*totchg*), median household income for the patient's zip code (*zipinc*), length of stay in days (*los*), number of procedures on this record (*npr*), died during hospitalization (*died* – a dummy variable equal to one if the patient died during the hospital stay and zero otherwise), expected primary payer (*pay1*), age in years at admission (*age*), and whether the admission was elective (*elective* – also a categorical variable). The dependent variable *lntotchg* is the natural logarithm of total charges for an inpatient stay. The logarithmic transformation is used to account for possible skewness of the expenditure distribution. Two dummy variables for race, black and other race, are created. Each variable is equal to one if the patient is black or other race respectively, and zero otherwise. The indicated category is white. Hispanics, Asians, Native Americans, and others are combined into one dummy variable called *otherrace* because I am generally interested in the potential disparities between African-Americans and non-Hispanic whites. I also create categorical variables for health insurance status and median household income for the patient's zip code. The expected primary payer variables are Medicaid, Medicare, and private insurance (including HMOs and PPOs). The indicated category is other expected primary payer, which includes self-pay, charity, and the like. The median household income for a patient's zip code is not a continuous variable but instead income is reported in ranges, i.e. from $1 to $24,999, from $25,000 to $34,999, from $35,000 to $44,999, and from $45,000 or more. Thus, the following dummy variables are generated to correspond to these ranges: low income, below median income, and above median income. The indicated category is high income ($45,000 or more).

As mentioned before, hospital expenditures depend on disease severity. Variables such as disease staging and comorbidity measures developed by the Agency for Healthcare Research and Quality (AHRQ) are included to control for this relationship. I merged the national inpatient sample with HCUP severity data by a common code that is uniquely defined in both datasets. The AHRQ comorbidity measures define thirty different coexisting medical conditions, which are likely to be present prior to the hospital stay and are not directly related to the reason for hospital admission or principal diagnosis. All these comorbidity measures are defined as categorical variables (equal to one if the patient has the disease and zero otherwise). The presence of comorbidities can increase the cost of treatment, so it is important to rule out their impact on total expenditures for breast cancer patients. Disease staging criteria, developed by Medstat, define the severity for different medical diseases. They are measured on a scale from 1 to 4 with stage one being a disease with no complications; stage 2 is a disease with local complication; stage 3 corresponds to an increased disease complexity – it involves multiple sites or has systemic complications; and stage 4 is death. The staging variable (*ds_stage*) is measured on a continuous scale (has substages) to better represent the severity of a particular disease.

The summary statistics by race are presented in Table 1. White non-Hispanics seem to be a little older compared to breast cancer patients of African-American origin or belonging to other race. The length of stay in a hospital is somewhat longer for African-Americans than for other racial groups on

average (3.41 vs. 2.62 and 2.41). In addition, in this data set African-Americans have relatively higher hospital expenditures, a lower rate for elective admission, a higher mortality rate, more advanced stage of the disease at admission, and are poorer on average in comparison with whites and patients of other races.

Because hospital expenditures can be correlated with hospital characteristics, categorical variables for hospital ownership, location, region, and size were added as control variables. Such data are provided in the supplemental HCUP hospital data set, which I merged with the NIS and severity data sets. It is important to mention that the perception of a patient about the disease and the social support she receives from her family and friends can influence the timing of hospitalization and the length of stay, which indirectly affect hospital expenditures. However, they cannot be easily measured and proxies are unavailable in the HCUP data set.

Table 1: Summary Statistics by Race

	Black			***Other Race***			***White***		
Variable	**Obs**	**Mean**	**Std. Dev.**	**Obs**	**Mean**	**Std. Dev.**	**Obs**	**Mean**	**Std. Dev.**
Age	1672	57.31	14.42	1634	56.75	14.15	12053	62.79	14.45
Length of stay (los)	1672	3.41	4.73	1634	2.62	3.80	12053	2.41	2.77
Number of procedures (npr)	1672	1.85	1.22	1634	1.91	1.26	12053	2.03	1.24
Total charges (totchg)	1672	18162.04	22945.78	1634	17930.95	18109.24	12053	15409.90	14147.13
Log of total chages (lntotchg)	1672	9.47	0.78	1634	9.51	0.73	12053	9.39	0.69
Died	1670	0.03	0.17	1633	0.02	0.14	12039	0.01	0.12
Elective	1664	0.72	0.45	1628	0.79	0.41	12025	0.84	0.37
Low income	1672	0.12	0.33	1634	0.07	0.26	12053	0.02	0.13
Below median	1672	0.28	0.45	1634	0.17	0.37	12053	0.18	0.38
Above median	1672	0.26	0.44	1634	0.21	0.41	12053	0.25	0.43
Disease stage (ds_stage)	1580	1.32	0.71	1614	1.20	0.58	10936	1.16	0.51

IV. Econometric Model and Estimation Techniques

The incurred hospital expenditures serve as a proxy for the intensity of breast cancer treatment. Using expenditures, however, should be done with caution because there may be issues with co-insurance and health insurance reimbursement to doctors for government provided insurance such as Medicaid and Medicare. In addition, there is a possibility that some of these expenditures may be due to defensive medicine. Therefore, various specifications are employed to estimate the possibility of racial disparities in the intensity of treatment of breast cancer patients controlling for health insurance status. To avoid the possibility of highly skewed expenditures or having big outliers that dramatically change the mean, I use the logarithm of expenditures as the dependent variable and estimate several model specifications via ordinary least squares (OLS). Since there can be omitted variable bias that causes heteroskedasticity, I employ the Huber-White correction to the OLS regressions. Thus, the

standard errors of the estimates will be consistent and inferences can be made. The basic model can be specified as follows:

$$\text{lntotchg} = \alpha + \beta X + \gamma Race + \theta HI + \varepsilon$$

where *X* is a vector of inpatient claims' characteristics such as age in years at admission, length of stay in the hospital, number of procedures on record, dummy variables for patient's median income, whether the person died in the hospital and whether the admission was elective. The coefficients on the race dummy variables (*black* and *otherrace*) show the difference between the respective base category and the indicated category, white female patients with breast cancer, in terms of log of total expenditures. The differences among patients with regard to their health insurance (HI) status are controlled for with three dummy variables (*Medicaid, Medicare, and Private Insurance*).

In the next specifications, I include controls for hospital characteristics such as location (urban or rural – specifications 5-7), ownership/control (public, private for profit, and private not-for-profit – specification 7), size approximated by the number of beds (small, medium, and large – specifications 6 and 7), and region (Northeast, Midwest, South, and West – specification 6). Furthermore, to take into account that expenditures depend on disease severity, I include dummy variables for disease staging and comorbidities. In addition, I expand the model by adding an interaction term between age and race to account for possible differences in hospital expenditures for women of different ethnicities at different ages. Thus, the expanded model is:

$$\text{lntotchg} = \alpha + \beta X + \gamma Race + \theta HI + \varphi Hospital + \delta Severity + \lambda(XRace) + \varepsilon$$

I also estimate the expanded model via OLS for Medicaid and Medicare claims separately, which solves the problem with having various out-of-pocket expenditures and prices for given procedures provided to patients with different types of health insurance.

Finally, I estimate quantile regression models introduced by Koenker and Bassett (1978) that focus on the median, the 25th, and 75th percentiles of hospital stays. In these regressions, the dependent variable is the number of procedures, which is a reasonable proxy for the health care and attention a patient receives when controlling for all the other variables that affect hospital stays as mentioned above (length of stay, HI, income level, disease stage, hospital characteristics, comorbidities, and race). As a result, inferences for possible racial disparities at more similar hospital stays in terms of the number of procedures can be made.

V. Estimation Results

The estimation results for the different specifications (one through seven) are provided in Table 2. The signs of the regression coefficients make sense except for the ones on race, private insurance, and elective admission in the specifications where these variables are statistically insignificant. As expected the coefficients on *npr* and *los* are positive and statistically significant at the 1 percent level

Table 2: OLS Estimation Results (Including Controls for Severity and Hospital Characteristics)

	Spec.1	Spec.2	Spec.3	Spec.4	Spec.5	Spec.6	Spec.7
Black	0.0311	-0.1851**	-0.1976**	-0.1863**	-0.2156**	-0.1805**	-0.2005
	(0.0169)	(0.0690)	(0.0692)	(0.0683)	(0.0676)	(0.0659)	(0.1209)
Other race	0.1108**	-0.1226	-0.1186	-0.1527*	-0.1658*	-0.1871**	-0.0444
	(0.0164)	(0.0673)	(0.0672)	(0.0667)	(0.0662)	(0.0628)	(0.0942)
Age	-0.0037**	-0.0049**	-0.0050**	-0.0046**	-0.0045**	-0.0046**	-0.0052**
	(0.0005)	(0.0006)	(0.0006)	(0.0005)	(0.0005)	(0.0005)	(0.0008)
Number of procedures	0.1603**	0.1614**	0.1596**	0.1522**	0.1473**	0.1420**	0.1592**
	(0.0047)	(0.0051)	(0.0051)	(0.0050)	(0.0048)	(0.0047)	(0.0073)
Length of stay	0.0963**	0.0937**	0.0932**	0.0982**	0.0983**	0.1000**	0.0996**
	(0.0043)	(0.0046)	(0.0047)	(0.0047)	(0.0047)	(0.0049)	(0.0085)
Medicare	0.0960**	0.1117**	0.1062**	0.0867**	0.0929**	0.0530*	0.0009
	(0.0268)	(0.0278)	(0.0278)	(0.0271)	(0.0269)	(0.0263)	(0.0423)
Medicaid	0.1300**	0.1419**	0.1377**	0.1142**	0.1234**	0.0378	0.0568
	(0.0305)	(0.0312)	(0.0311)	(0.0309)	(0.0305)	(0.0290)	(0.0466)
Private insurance	0.1719**	0.1827**	0.1820**	0.1559**	0.1535**	0.1123**	-0.0031
	(0.0245)	(0.0250)	(0.0249)	(0.0247)	(0.0245)	(0.0239)	(0.0395)
Low income	-0.0906**	-0.0994**	-0.1019**	-0.1130**	-0.0680*	-0.033	-0.0675
	(0.0276)	(0.0268)	(0.0268)	(0.0269)	(0.0268)	(0.0258)	(0.0399)
Below median	-0.1166**	-0.0901**	-0.0919**	-0.1013**	-0.0407**	-0.0281*	-0.0741**
	(0.0125)	(0.0134)	(0.0133)	(0.0132)	(0.0135)	(0.0135)	(0.0207)
Above median	-0.1027**	-0.1055**	-0.1070**	-0.1094**	-0.0655**	-0.0485**	-0.1139**
	(0.0113)	(0.0119)	(0.0119)	(0.0117)	(0.0117)	(0.0114)	(0.0191)
Died in hospital	-0.5872**			-0.5376**	-0.5428**	-0.5239**	-0.7114**
	(0.0596)			(0.0624)	(0.0616)	(0.0621)	(0.1011)
Elective	0.0702**			0.0628**	0.0503**	0.0466**	-0.0105
	(0.0149)			(0.0150)	(0.0148)	(0.0143)	(0.0231)
Age*black		0.0031**	0.0032**	0.0031**	0.0031**	0.0030**	0.0018
		(0.0011)	(0.0011)	(0.0011)	(0.0011)	(0.0011)	(0.0019)
Age*other race		0.0039**	0.0038**	0.0045**	0.0043**	0.0033**	0.0024
		(0.0012)	(0.0012)	(0.0011)	(0.0011)	(0.0011)	(0.0016)
Disease stage		-0.0910**	-0.0944**	-0.0403**	-0.0442**	-0.0461**	-0.0395
		(0.0137)	(0.0136)	(0.0134)	(0.0130)	(0.0131)	(0.0246)
Metastatic cancer			0.1205**				0.1277*
			(0.0413)				(0.0641)
Small hospital				-0.2715**	-0.2859**	-0.2736**	-0.1398**
				(0.0161)	(0.0161)	(0.0151)	(0.0286)
Medium hospital				-0.1033**	-0.1183**	-0.1026**	-0.0551**
				(0.0119)	(0.0118)	(0.0113)	(0.0190)
Urban hospital					0.3029**	0.3017**	0.4182**
					(0.0146)	(0.0148)	(0.0223)
Public hospital							-0.3540**
							(0.0212)
Ptivate not for profit							-0.4430**
							(0.0192)
Northeast hospital						-0.5045**	
						(0.0144)	
Midwest hospital						-0.3780**	
						(0.0144)	
South hospital						-0.383**	
						(0.0134)	
Constant	8.9391**	9.15434**	9.1574**	9.1236**	8.859**	9.248**	9.3365**
	(0.0415)	(0.0437)	(0.0442)	(0.0460)	(0.0469)	(0.0478)	(0.0769)
Observations	15300	14130	14130	14072	14072	14072	5236
R-squared	0.36	0.35	0.35	0.37	0.39	0.45	0.43

Standard errors in parentheses; * significant at 5%; ** significant at 1%

of significance showing that the log of hospital expenditures goes up as the number of procedures and length of stay increase. The estimated coefficient on *age* is negative, which is consistent with the theory that elderly patients are treated less intensively on average. The results show that patients with low, below median, and above median income levels have lower hospital expenditures as compared to those coming from high-income zip codes (all coefficients are significant at the 1 percent or 5 percent level in all specifications excluding the last two for the low income variable).

The estimated coefficients on *died* and *disease staging* are negative implying that at a more advanced stage of the disease, including dying in the hospital, the patients will not have many opportunities for treatment and as a result their expenditures will tend to be lower. *Died* is statistically significant in all specifications and *ds_stage* is significant in specifications two through six. Regression results also show that elective admissions lead to higher hospital expenditures on average. This variable is only insignificant in specification 7, which has controls for hospital ownership.

According to the estimates of the regressions, government (Medicaid or Medicare) or private insurances are associated with higher expenditures per inpatient record (excluding specification 7 for all three types of insurance and specification 6 for Medicaid) as compared to self-pay, charity, or other types of insurance. This result is plausible considering the fact that uninsured people have to pay all of their healthcare costs out-of-pocket which will affect the number of requested treatment procedures. All estimates of the health insurance variables are significant at the 1 percent level of significance in specifications 1-5 (with controls for hospital size and location). Adding control variables for hospital region and ownership affected the signs and significance of some of the estimated coefficients. In specifications 3 and 7 various comorbidity measures are included. It turns out that the five comorbidities significantly affect expenditures in specification 3 (deficiency anemias, uncomplicated diabetes, metastatic cancer, obesity, and peptic ulcer disease) and only three in specification 7 (metastatic cancer, obesity, and peptic ulcer disease).

The main variables of interest in the regressions are the race variables and the interaction terms of the race variables with age: *black, otherrace, ageblack* (age times black)*, and ageotherrace* (age times other race). The interaction terms are positive and statistically significant in specifications 1 through 6. The coefficients on the two race variables are negative and statistically significant in all but specification 7 which provides some evidence for the presence of racial differences in the intensity of breast cancer treatment of African-Americans and other races compared to white Americans.

Estimating the model for Medicare and Medicaid claims separately with all necessary controls is helpful in avoiding issues of having differences in prices for various procedures and variation in out-of-pocket expenditures that complicate the analysis. The results of the regression based on Medicare claims illustrate that age, number of procedures, length of stay, disease staging, hospital size, location, and ownership are significant predictors of hospital expenditures. Some of the income variables and comorbidities are also statistically significant. The coefficients on black and other race, as well as on the interaction terms between age and race, are not statistically significant. The same

can be said for the race variables estimated via OLS using Medicaid claims. A possible explanation for these results is that patients of different races with such insurance plans are more alike or have similar characteristics and as a result are less likely to be treated differently.

Table 3 presents the results of the three quantile regressions - the median, the 25th percentile, and the 75th percentile. The estimated coefficients on age, length of stay, and disease stage are significant at the 1 percent level in all regressions and have the expected signs. Three of the comorbidity measures (anemia, metastatic cancer, and uncomplicated diabetes) are significant at least at the 5 percent level for the different percentiles. The estimated coefficients on some of the health insurance variables (Medicare or Medicaid) and hospital characteristics (small hospital, medium hospital, and public hospital) in some of the quantile regressions are insignificant. The race variables (black and other race) are negative and statistically significant for the median, 25th, and the 75th percentiles. These results suggest that racial disparities in the intensity of treatment of breasts cancer are present for the inpatient claims in the 75th percentile (claims with high number of procedures per hospital stay or in the top 25th percentile), 50th percentile (claims with a median number of procedures), and 25th percentile (claims at the lowest 25 percent of the sample), which confirms the results found in the OLS regressions (specifications 1-7).

VI. Discussion and Conclusion

According to the SEER cancer statistics, white female Americans have the highest prevalence of breast cancer among different racial groups in the United States but African-Americans have the highest mortality rate. One possible explanation for this outcome is the difference in the socioeconomic status between the two races (see for instance Ward et al., 2008 and the published statistics by the US Census Bureau). The disparities in the educational level, income, health insurance status, marital status, and the like can affect the timing of breast cancer diagnosis and the stage of the cancer at diagnosis which in turn will have impact on the rate of survival of the patient. Another reason for the higher mortality rate of African-Americans can be due to differences in the healthcare treatment.

The goal of this paper is to investigate whether there are disparities in the intensity of breast cancer treatment of patients of different races such as white non-Hispanics, African-Americans, and others (Hispanics, Asians, and Native Americans) when they are admitted to hospitals in 35 states. Based on cross-sectional data from the Healthcare Cost and Utilization Project for year 2002, different models are estimated using ordinary least squares and quantile regressions. The estimated coefficients on the race variables are negative and statistically significant in most of the specifications providing some evidence for racial discrimination. In particular, in the majority of the specifications, African-Americans are found to be treated less intensively (or have lower log of total expenditures for treatment) than Caucasians when controlling for differences in terms of health insurance plans, hospital characteristics, disease severity and various comorbidities, as well as other patient specific

Table 3: Quantile Regressions

VARIABLES	Median	25 Percentile	75 Percentile
Age	-0.015***	-0.000***	-0.022***
	(0.002)	0.000	(0.002)
Length of stay	0.086***	0.002***	0.124***
	(0.007)	0.000	(0.007)
Black	-0.899***	-0.013***	-1.449***
	(0.278)	(0.003)	(0.289)
Other race	-0.480**	-0.017***	-0.488*
	(0.235)	(0.002)	(0.251)
Medicare	0.086	0.001	0.275**
	(0.102)	(0.001)	(0.108)
Medicaid	-0.003	0.002**	0.13
	(0.113)	(0.001)	(0.121)
Private insurance	0.302***	0.005***	0.452***
	(0.094)	(0.001)	(0.101)
Low income	-0.176*	-0.002**	-0.418***
	(0.100)	(0.001)	(0.108)
Below median	-0.182***	-0.001***	-0.276***
	(0.051)	(0.001)	(0.054)
Above median	-0.044	0	-0.160***
	(0.046)	0.000	(0.049)
Age*black	0.011**	0.000***	0.017***
	(0.004)	0.000	(0.005)
Age*other race	0.003	0.000***	0.003
	(0.004)	0.000	(0.004)
Disease stage	-0.351***	-0.497***	-0.306***
	(0.038)	0.000	(0.041)
Small hospital	-0.08	-0.002**	-0.177**
	(0.067)	(0.001)	(0.071)
Medium hospital	-0.136***	-0.001	-0.064
	(0.048)	0.000	(0.051)
Urban hospital	0.254***	0.003***	0.196***
	(0.059)	(0.001)	(0.064)
Public hospital	0.137**	0.001	0.179***
	(0.058)	(0.001)	(0.062)
Private not for profit	0.100**	0.001*	0.099**
	(0.044)	0.000	(0.047)
Elective	0.160***	0.003***	0.169***
	(0.053)	(0.001)	(0.056)
Anemia	0.477***	0.971***	0.350***
	(0.102)	(0.001)	(0.106)
Uncomplicated diabetes	-0.131**	-0.001**	-0.204***
	(0.061)	(0.001)	(0.065)
Metastatic cancer	0.911***	1.005***	0.905***
	(0.188)	(0.002)	(0.197)
Constant	2.384***	1.515***	3.420***
	(0.178)	(0.002)	(0.189)
Observations	5,239	5,239	5,239

Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

characteristics. This result is also confirmed by the quantile regression for inpatient claims in the 75th, 50th, and 25th percentiles of hospital stays in terms of number of procedures.

This study contributes to the existing literature on racial disparities in health care and more specifically focuses on breast cancer which is the cancer with the highest mortality rate for American women. Providing more evidence to prove that African-Americans and other races are treated less intensively when admitted to hospitals for breast cancer procedures can help policy makers develop strategies specifically aimed at improving the provision of health care to minority groups. More studies investigating this topic will be helpful in determining whether this undesirable outcome continues to persist or if the racial disparity gap narrows over time. A possibility for future research is to investigate this question using time-series data, as well as analyses by regions or states.

ENDNOTES

1. The regression results for Medicare and Medicaid are available from the author upon request.

REFERENCES

Altekruse S.F., C.L.Kosary, M. Krapcho, N. Neyman, R. Aminou, W. Waldron, J. Ruhl, N. Howlader, Z. Tatalovich, H. Cho, A. Mariotto, M.P. Eisner, D.R. Lewis, K. Cronin, H.S. Chen, E.J. Feuer, D.J. Stinchcomb, B.K. Edwards (eds). SEER Cancer Statistics Review, 1975-2007, National Cancer Institute. Bethesda, MD, http://seer.cancer.gov/csr/1975_2007/, based on November 2009 SEER data submission, posted to the SEER web site, 2010.

Andrews, R.M. and A. Elixhauser (2000) "Use of Major Therapeutic Procedures: Are Hispanics Treated Differently than Non-Hispanic Whites" *Ethnicity & Disease*, 10(3): 384-394.

Ansell, D, S. Whitrnan, R. Lipton and R. Cooper (1993) "Race, Income, and Survival from Breast Cancer at Two Public Hospitals" *Cancer*, 72(10): 2974-2978.

Ball, J.K. and A. Elixhauser (1996) "Treatment Differences between Blacks and Whites with Colorectal Cancer" *Medical Care*, 34(9): 970-984.

Bassett, M.T. and N. Krieger (1986) "Social Class and Black-White Differences in Breast Cancer Survival" *American Journal of Public Health*, 76(12): 1400-1403.

Bradley, C.J., C.W. Given, and C. Roberts (2002) "Race, Socioeconomic Status, and Breast Cancer Treatment and Survival" *Journal of the National Cancer Institute* 94: 490-496.

Cancer Trends Progress Report – 2011/2012 Update (2012), National Cancer Institute, NIH, DHHS, Bethesda, MD, August, http://progressreport.cancer.gov.

Cross, C.K., J. Harris, and A. Recht (2002) "Race, Socioeconomic Status, and Breast Carcinoma in the U.S: What have We Learned from Clinical Studies" *Cancer* 95: 1988-1999.

Dowell, M.A., B. Rozell, D. Roth, H. Delugach, P. Chaloux, and J. Dowell (2004) "Economic and Clinical Disparities in Hospitalized Patients with Type 2 Diabetes" *Journal of Nursing Scholarship*, 36(1): 66-72.

Figueroa, Janis B. and Nancy Breen (1995) “Significance of Underclass Residence on the Stage of Breast or Cervical Cancer Diagnosis” *The American Economic Review*, 85(2): 112-116.

Gordon, N.H., J.P. Crowe, J. Brumberg, and N.A. Berger (1992) “Socioeconomic Factors and Race in Breast Cancer Recurrence and Survival” *American Journal of Epidemiology,* 135(6): 609-618.

Harris, D.R., R. Andrews, and A. Elixhauser (1997) “Racial and Gender Differences in Use of Procedures for Black and White Hospitalized Adults” *Ethnicity & Disease*, 7(1): 91-105.

HCUP Databases, Healthcare Cost and Utilization Project (HCUP), 2002. Agency for Healthcare Research and Quality, Rockville, MD, www.hcup-us.ahrq.gov/databases.jsp.

Karjalainen *S.* and E. Pukkala (1990) “Social Class as a Prognostic Factor in Breast Cancer Survival” *Cancer*, 66(4): 819–826.

Katz, S.J. and T.P. Hofer (1994) **“**Socioeconomic Disparities in Preventive Care Persist Despite Universal Coverage. Breast and cervical cancer screening in Ontario and the United States**”** *The Journal of the American Medical Association*, 272(7): 530-534.

Koenker, R. and G. Bassett Jr.(1978) ”Regression Quantiles” *Econometrica*, 46 (1): 33-50.

Kravdal, Oystein (2000) “Social Inequalities in Cancer Survival” *Population Studies,* 54(1), 1-18.

LeMarchand, L., L.N. Kolonel, A. Nomura (1984) “Relationship of Ethnicity and Other Prognostic Factors to Breast Cancer Survival Patterns in Hawaii” *Journal of the National Cancer Institute*, 73:1259-65.

Medstat Disease Staging Software Reference Guide, Healhcare Cost and Utilization Project 2002, Thomson Reuters, http://www.hcup-us.ahrq.gov/db/nation/nis/DiseaseStagingV5_25ReferenceGuide.pdf

Mitchell, Jean M. and Jack Hadley (1997) “The Effect of Insurance Coverage on Breast Cancer Patients’ Treatment and Hospital Choices” *The American Economic Review*, 87(2): 448-453.

Newman, L.A., J. Mason, D. Cote, Y. Vin, K. Carolin, D. Bouwman, and G.A. Colditz (2002) “African-American Ethnicity, Socioeconomic Status, and Breast Cancer Survival: A Meta-Analysis of 14 Studies Involving over 10,000 African-American and 40,000 White American Patients with Carcinoma of the Breast” *Cancer,* 94 (11): 2844-54.

Schrijvers, C.T., J.W. Coebergh, L.H. Van der Heijden, and J.P. Mackenbach (1995) “Socioeconomic Status and Breast Cancer Survival in the Southeastern Netherlands, 1980-1989” *European Journal of Cancer*, 31A(10):1660–1664.

Shen, J.J. (2002) “Severity of Illness, Treatment Environments and Outcomes of Treating Acute Myocardial Infarction for Hispanic Americans” *Ethnicity & Disease*, 12(4):488-98.

Thorpe, Kenneth E. and David Howard (2003) “Health Insurance and Spending among Cancer Patients” *Health Affairs*, 189-198. US Census Bureau. http://www.census.gov/population/www/socdemo

Ward, E., M. Halpern, N. Schrag, V. Cokkinides, C. DeSantis, P. Bandi, R. Siegel, A. Stewart, and A. Jemal (2008) “Association of Insurance with Cancer Care Utilization and Outcomes” *CA: A Cancer Journal for Clinicians*, 58(1):9-31.

The Effects Of The 2008-2009 Financial Crisis On U.S. Corporate Debt Structure

Amanda E. Willsey* and Dona Siregar*

Abstract

This paper evaluates the relationships of liquidity, firm size, price change, asset maturity and leverage relative to debt maturity for a sample of U.S. non-financial firms. Secondarily, the objective of the research is to identify any measurable changes in firms' behavior during the 2008-2009 financial crisis with respect to their choice of debt maturity. During the period from 2002 through 2009, data from the sampled firms show significant correlations between liquidity, firm size, asset maturity, and leverage and debt maturity. That is, firms appear to consider liquidity risk when determining the maturity of liabilities. Firms also appear to make an effort to signal their value to the market as a way to reduce mispricing of securities due to information asymmetry. This research therefore provides additional support for the liquidity risk hypothesis, as well as the signaling hypothesis. During the crisis itself, changes in the variables tested did not cause firms to make notable modifications in their behavior, with two exceptions. Firms with increased leverage ratios tend to have longer debt maturity, and this association is even more significant during the crisis. In addition, firms with reduced asset maturity turned to longer-term debt. The recent financial crisis did not appear to significantly affect the other determinants of corporate debt structure. Leverage and asset maturity, however, had a greater impact on firms' decisions during the financial crisis, suggesting that changes in the economic environment affect these determinants individually, but not broadly.

Introduction

The 2008-2009 economic downturn was significant in that strains in credit markets were severe enough to warrant extreme support from the Federal Reserve Bank, propping up money markets and lending facilities, and depressing interest rates to historical lows[1].

Corporate debt structure can include debt securities of varying maturities as well as bank financing. During the financial crisis, banks were extremely reluctant to lend, and demand for lending was suppressed. Turmoil in financial markets depressed asset prices and reduced the liquidity of many securities. Though the recession reduced investment activity, financing activities for non-financial firms persisted. In this paper we investigate the changes in corporate debt structure as a result of this financial crisis.

In normal economic times, firms may make decisions for debt financing based on a series of factors. Assuming that changes in corporate debt structure can be seen as a result of the financial crisis, which factors motivated firms to initiate the observed changes? This paper will focus on the liquidity risk and signaling hypotheses, and in part, determine if either or both of these theories persist

*State University of New York at Oneonta, Oneonta, NY, 13820

during the crisis. Liquidity risk refers to the inability of firms to maintain sufficient current reserves to cover current obligations. When using short-term debt maturities to finance operations, firms are at the mercy of lenders, who may elect not to roll over the short-term debt, resulting in a cash shortage and inducing substitution into risky low-quality projects (Diamond, 1991).

The signaling hypothesis (Flannery, 1986) suggests that one motivation for firms in making debt structure decisions is to utilize the choice of debt to show investors what a firm's internally perceived value of its share price is. In essence, the firm's issuance of short-term debt maturities is an attempt to get the markets to re-price its securities, so that the prices are in line with what the firm believes its true value is.

The recent financial crisis was unfortunate. The resulting severe credit crunch in the economy left some firms with few alternative sources of external financing. However, the unexpected nature of the crisis provides insights on firms' behavior toward debt maturity decisions when external financing becomes restricted. Debt maturity is a key feature of firm financing because it will eventually determine projects that firms will accept and affect firms' continuing growth potential (Johnson, 2003). Its importance becomes even higher in the presence of an unexpected economic shock.

Moreover, understanding changes in corporate debt structure during periods of high asymmetric information is useful for investors to anticipate these shifts in order to successfully tailor their investment strategy. In addition, structure of leverage is a consideration in evaluating a firm's riskiness, which then affects the firm's credit-rating (Molina 2005). Thus, the structure of firms' debt is important not only for firms but also for investors in evaluating alternative investments and pricing debt securities in the marketplace. From firms' perspective, decisions by investors will in turn affect firms' cost of capital and investment opportunities.

Supporting previous empirical studies[2], we find that liquidity, firm size, asset maturity, and leverage are correlated to debt maturity. Our main finding is that leverage and asset maturity had a greater impact on firms' debt maturity decisions during the crisis. Firms with greater leverage tend to have longer debt maturity, and this association was even more significant during the crisis. In addition, the proportion of short-term asset maturity is negatively related to debt maturity, and this association was also more significant in the crisis. Overall, our findings indicate that during the crisis, changes in the economic environment affected determinants of debt maturity individually, but not broadly.

The remainder of this article presents a literature review in section II, our empirical hypotheses in section III, the empirical tests in Section IV, and results and implications in sections V and VI. Section VII summarizes our findings.

II. Literature Review

To begin an analysis of changes in debt structure, it is first necessary to understand what drives firms' decisions with respect to the nature and term structure of debt in general. Though varying

theories exist on this matter, the focus here is on those that can be related in some way to macroeconomic conditions.

Deesomsak et al. (2009) analyzed the effects of the 1997 Asian financial crisis on corporate debt maturity structure. Overall, they identified that there was a relationship between the economic environment and firms' decisions with regard to debt structure. In the period preceding the Asian crisis, asymmetric information problems worsened and the deterioration of balance sheets eventually led to the crisis. As market and firm-specific factors changed as a result of this crisis, firms were found to have altered their decisions with respect to the use and term structure of debt. The authors identified several documented hypotheses to explain determinants of choices of debt maturity, among which are moral hazard, signaling and liquidity risk.

The moral hazard hypothesis relates to the usage of short-term debt to reduce agency problems occurring from underinvestment, where firms turn away from low-risk investments to maximize wealth at the expense of the debt-holders. Asset substitution occurs when firms use low risk assets to engage in high-risk investments, to the detriment of bond-holders, who receive no additional compensation for the increased risk. The implication is that short-term debt may entice managers to reduce the riskiness of the firm's investments.

Diamond (1991) discusses how choices with respect to debt structure depend on the timing of cash flows from investments to meet obligations, and credit ratings. Firms with high credit ratings will be more apt to issue short-term debt and lower-rated firms will finance with longer-term bonds or bank financing. As bank financing for low quality firms is also likely to be short-term in nature, the short-term debt markets are heavily utilized by high and low grade firms. Firms using short-term debt, however, are susceptible to liquidity risk, in that there is a potential danger of being unable to refinance or roll-over short-term debt, as refinancing is under the lender's control. This is especially detrimental if cash flows are not in line with the short-term maturity. For higher quality firms, the use of short-term debt is more of an attempt to bridge the gap between periods of bull and bear markets, in essence, to time the market. Diamond's liquidity risk theory suggests that firms weigh the liquidity risk of short-term debt and may then prefer long-term debt.

This is in contrast to Flannery's model (1986) as referenced by Diamond (1991), which concludes that firms will always select short-term debt, unless it is more costly. Flannery (1986) notes that debt structure is irrelevant in the financing decision of firms operating in efficient markets when asymmetric information does not exist between firms and investors. When there is an imbalance in insider over investor information, firms use debt choices to signal to investors their true value. Short-term debt would tend to be undervalued, and therefore more costly to the firm, especially during the times when investors perceive that the value of the firm is less than its intrinsic value. Since this theory states that short-term debt is preferable unless the associated costs are higher, if the firm then issues short-term debt despite the higher costs, it is attempting to inform the market of the undervaluation. The firm's

choice of short-term debt issued in this type of scenario is what Flannery refers to as “signaling”, and is the basis of the signaling hypothesis.

Deesomsak et al. (2009) found that during the Asian financial crisis, while firms appeared to have had optimal debt maturity structures, their ability to react and adjust in the post-crisis period was constrained. Market conditions did appear to have an influence on debt structure decisions and the crisis resulted in higher awareness by managers of debt structure. The study suggests that the Asian financial crisis reduced funding costs and increased liquidity constraints, and required managers to improve the information flow to outside investors to reduce agency problems. Firms with higher leverage ratios tended to select more long-term investments, suggesting that liquidity risk was strongly considered. Firms heavily affected by the crisis were more prone to continue the use of long-term debt after the crisis subsided, to insulate themselves from liquidity risk and higher bankruptcy costs, and to maintain an adequate source of cash. This is consistent with the findings of Diamond (1991). Smaller firms with a higher level of imperfect information tended to move into short-term investments, supporting the signaling hypothesis proposed by Flannery (1986).

This study will use the concepts researched in Deesomsak et al. (2009) and further analyze the impact of the recent financial crisis on the United States non-financial corporate sector, and will assess if the results are consistent. To the extent that the findings deviate from prior research, an attempt will be made to determine the factors affecting the variance

III. Hypothesis Development

We expect to find that the liquidity risk theory explains the term structure of a firm’s debt. We believe that shortages of lending funds during the crisis were severe enough to entice firms who utilize short-term debt during normal times to prefer long-term investments during the crisis period. Further, commercial paper market activity was impaired during the crisis. This may have influenced debt decisions during the crisis. Firms were unable to issue short-term debt, even if it was preferable, because the market was illiquid.

Based upon the magnitude of the asymmetric information problem during the recession, signaling may be a valid hypothesis. We expect that firms would have made attempts to signal the markets as to their intrinsic values and thus re-price securities accordingly. Much of the information imbalance may have been perceived as a result of investor behavior that was caused by panic. Internal managers would have had better knowledge of the firm’s value, and, if signaling to the markets were beneficial, this signaling theory could be a likely factor in firms’ financing decisions. Alternatively, given that markets were so constrained, it may be difficult to determine if the hypothesis were true during the crisis.

Table 1 shows a list of variables considered, the measures for those variables, and the hypothesis against which they are being tested. These variables include liquidity (LIQ), firm size (FS), leverage

(LEV), price change (PC), and asset maturity (AM). The variables are selected based upon their relevance in supporting or refuting the liquidity risk and signaling hypotheses.

Table 1. Variables and Related Hypothesis

Variable	Abbreviation	Measurement	Hypothesis	Expected Correlation
DEBT MATURITY	DM	Total Long-term Debt/Total Liabilities		
LIQUIDITY	LIQ	Total Current Assets/Total Current Liabilities	Liquidity Risk	Negative
FIRM SIZE	FS	Natural Logarithm of Assets	Liquidity Risk/Signaling	Positive
PRICE CHANGE	PC	Annual Changes in Share Prices	Signaling	Positive
ASSET MATURITY	AM	Total Current Assets/Total Assets	Liquidity Risk	Negative
LEVERAGE	LEV	Total Liabilities/Total Equity	Liquidity Risk	Positive

Diamond's liquidity risk hypothesis suggests that firms with increasing leverage ratios tend to trade off short-term debt for longer term debt. There is expected to be a negative relationship between liquidity and debt maturity; as firms become less liquid, they may prefer to avoid the risks inherent in short-term debt and prefer longer maturities. Finally, it is believed that firms seek to match their debt maturities to cash flows. Asset maturity in this paper refers to the proportion of current assets to total assets, and when it is compared to the ratio of long-term debt to total debt (DM), firms' asset maturity is expected to be negatively related to debt maturity. This association supports the liquidity risk hypothesis.

An implication from Flannery (1986) is that as firms' share prices decline below what insiders believe the true market value of the firm is, they will tend to issue more short-term debt, or less long-term debt, as a signal to the market. Therefore, a positive relationship between price change and long term debt maturity is anticipated. That same study suggests that small firms are more prone to the asymmetric information problem, and may therefore be more likely to issue short-term debt in an attempt to signal their true value to the market. This creates an expectation of a positive relationship between firm size and debt maturities.

IV. Data Selection

From the Compustat database, we obtained a sample of all U.S. firms listed under the category of "Super". These firms make up the S&P 1500 Super Composite Index and include S&P 500, S&P Mid-Cap and S&P Small-Cap firms. This list includes the firms we believe should have the greatest flexibility in altering their debt structure as conditions warrant. These firms are well known, publicly-traded companies and therefore we will assume that they have ready access to both long-term and short-term debt financing.

From the original sample of 1500 companies, those which had missing values for one or more years for any of the six variables were removed, as were those companies whose SIC code was either financial in nature or from the utilities sector, as these firms tend to have significantly different financial structures than the average industrial firm. Firms were also removed if they reported negative stockholder's equity and, therefore, negative leverage ratios. The final sample consists of 891 firms.

Data were obtained for these firms for a period of eight fiscal years from 2002 through 2009. As the purpose of this research is to analyze the changes before and during the crisis, the annual data were then broken down by period, using the six year period of 2002 through 2007 as the pre-crisis sample, and the two year period of 2008 through 2009 as the crisis sample.

V. Empirical Analysis

A. Descriptive Statistics

Table 2 contains summary statistics of financial attributes of firms in the sample. The mean (median) of current assets is $ 1.935 billion ($0.495 billion) prior to the crisis and increases to $2.445 billion ($0.674 billion) during the crisis period. As evidenced by the standard deviation, the amount of current assets varies widely across firms.

Turning to the total assets of the sample firms, the average of total assets is $ 7.074 billion ($1.684 billion median) in the crisis and $5.571 billion ($1.201 billion median) in the years prior to the crisis. One explanation to the large increase in average assets is that firms might have taken over underperforming or illiquid firms that are not listed in the sample during the period of financial crisis.[3] In support of the explanation that acquisition contributes to the rise in the average size of firms, we collected information about merger and acquisition activities of the sample firms from the Security Data Company (SDC) Platinum – Merger database.

The data show that 532 firms in the sample had acquired two or more target companies during the financial crisis. The transaction value of the acquisitions ranges between $33,000 and $67.29 billion with a mean of $513.23 million and a median of $69.87 million. During the crisis these firms conducted a total of 1574 acquisition transactions. Prior to the crisis, the average size of firms with acquisitions is $6.79 billion, which then increased significantly to an average of $9.11 billion during the crisis. In contrast, firms with no acquisition activities in the crisis years have average total assets of $3.49 billion in the pre-crisis period and $4.05 billion in the period of financial crisis. Moreover,

Table 2. Summary of statistics of financial values pre-crisis and during the crisis

Financial Items	Mean ($ million)	Median ($ million)	Standard Deviation ($ million)
Panel A. Pre-crisis			
Current Assets	1,934.85	495.42	4,862.35
Total Assets	5,570.82	1,201.07	15,396.05
Current Liabilities	1,340.57	243.72	3,840.62
Long-term Debt	953.27	176.46	2,591.08
Total Liabilities	3,095.10	560.65	8,628.67
Total Equity	2,475.72	587.48	7,205.47
Panel B. During Crisis			
Current Assets	2,445.34	674.75	5,853.18
Total Assets	7,074.18	1,684.34	18,602.14
Current Liabilities	1,642.34	320.24	4,623.84
Long-term Debt	1,327.37	256.18	3,395.32
Total Liabilities	4,050.53	809.46	10,778.82
Total Equity	3,023.65	768.26	8,371.24

although on average the size of firms in the sample increases, a number of companies experienced reduction in their total assets (N=84 for firms with acquisitions, N=81 for companies with no mergers or acquisitions)

We, thus, conclude that acquisition activities by larger, more established firms contribute significantly to the increase in size of sample firms during the crisis. Furthermore, we observed that many firms in our dataset hoarded their cash. This observation is consistent with survey responses reported in the study of Campello et al. (2010), who also find that constrained firms undertook deeper cuts in tech spending, employment, and capital spending in order to preserve cash. Fearing more restrictive access to external funds during the crisis, many firms even raised their cash holding level by issuing short-term or long-term debt, increasing their retained earnings and cutting dividend payments. [4] As a result of these financial decisions, total assets of some firms may increase during the period of

financial crisis – although the average increase in assets should be relatively modest compared to the rise resulting from acquisitions.

Table 2 also shows that the sample firms have mean (median) current liabilities of $1.341 billion ($0.244 billion) in the years leading up to the crisis, and $1.642 billion (0.320) during the financial crisis. An increase in the mean of long term debt (from $0.953 billion to $1.327 billion) suggests the firms step up their long term borrowing during the financial crisis, perhaps in anticipation to finance their assets. The firm's long term debt consists of debt obligations that have a maturity of more than one year. The amount of total liabilities on average increases from $3.095 billion to $4.050 billion, and a similar pattern is observed for the equity amount. The total liabilities include current liabilities, long-term debt, and other noncurrent liabilities including deferred taxes and investment tax credit.

Table 3 displays the means, median and standard deviations of debt maturity and the independent variables used for testing the debt maturity hypotheses.

Table 3. Descriptive Statistics of Debt Maturity and Independent Variables

Variable	Mean	Median	Standard Deviation
Panel A. Pre-crisis			
DEBT MATURITY	0.284	0.284	0.231
LIQUIDITY	2.571	1.974	2.235
FIRM SIZE	21.052	20.906	1.588
PRICE CHANGE	0.086	0.072	0.203
ASSET MATURITY	0.473	0.467	0.204
LEVERAGE	1.326	0.934	4.366
Panel B. During Crisis			
DEBT MATURITY	0.295	0.314	0.227
LIQUIDITY	2.499	2.062	1.728
FIRM SIZE	21.386	21.245	1.514
PRICE CHANGE	-0.108	-0.083	0.239
ASSET MATURITY	0.453	0.450	0.198
LEVERAGE	1.480	0.972	2.858

Panel A contains descriptive statistics of firms during the pre-crisis period, while panel B presents firms' descriptive statistics in the crisis period. On average, the total long-term debt over total liabilities (DM) in the crisis years is 0.295 (0.314 median), which is higher than debt maturity in the pre-crisis period (0.284). The cross sectional variation as observed by standard deviation is lower during the crisis period than in the pre-crisis period. Liquidity, defined as the ratio of total current assets over total current liabilities, averages 2.499 (2.062 median) during crisis and 2.571 (1.974 median) in the years prior to the crisis.

Turning to the price change variable, the averages of price change was -0.108 (-0.083 median) when firms faced the financial crisis, which decreased from 0.086 (0.072 median) during the pre-crisis

period. The average of asset maturity, defined as the ratio of total current assets and total assets, is 0.453 (0.450 median) during the crisis, a decline from 0.473 (0.467 median) in the pre-crisis period. Leverage, measured as total liabilities over total equity, averages 1.480 (0.972 median) and 1.326 (0.934 median) during the crisis and the pre-crisis periods, respectively.

Similar to other research that utilizes financial ratios to quantify variables, the measures of variables in this study might have changed due to exogenous factors. For example, as a result of a market downturn, accounting standards may require a firm to reduce one of its asset values, which in turn reduces the firm's total assets. Changes in financial ratios can also result from managers' attempts to move their financial ratios toward a desired target. We believe that a market-wide exogenous factor such as the recent financial crisis would have a greater impact on the financial ratios of firms and provide strong incentive for managers to restructure the firms' debt. Moreover, Wu and Ho (1996) assert that changes in financial ratios due to management strategic adjustment appear to be substantial.[5]

B. Changes in variables from pre-crisis to crisis

We then performed a paired *t*-test for each variable to validate that the means of each variable during crisis are significantly different from those in pre-crisis period using matching firm data. The null hypothesis in the paired *t*-test is that the two means of each variable are equal. The *t*-statistics show if the changes in variables tested are significant or the result of chance. Results of the paired *t*-test are shown in Table 4.

Table 4. Paired *t*-Tests to Validate Differences in Means between During Crisis and Pre-Crisis of Debt Maturity and Independent Variables

Variable	Pre-Crisis Mean	During Crisis Mean	Difference	*t*-value	*p*-value (two-tail)
DEBT MATURITY	0.284	0.295	0.011	2.22	0.027
LIQUIDITY	2.571	2.499	-0.072	-1.64	0.102
FIRM SIZE	21.05	21.386	0.336	23.42	<0.001
PRICE CHANGE	0.086	-0.108	-0.194	-38.91	<0.001
ASSET MATURITY	0.473	0.453	-0.020	-6.09	<0.001
LEVERAGE	1.326	1.480	0.154	1.67	0.096

Table 4 shows that the value of the paired *t*-test for debt maturity is 2.22 with a corresponding *p*-value of .027, suggesting that there was a reasonably significant change in the mean of debt maturity from the pre-crisis to the crisis period. Although not reported here, an OLS regression between debt maturity as the dependent variable and a dummy variable of 1 for the crisis period as the independent

variable returned identical results, and the dummy coefficient indicates that debt maturity increased by .01094 during the crisis period.

The data also reflect that liquidity decreased during the sample period, although the *t*-statistic is on the boundary of being significant. There was an increase in the average firm size during this time - validating our preliminary findings from the descriptive statistics - with a *t*-statistic of 23.42, and a *p*-value of less than 0.001. This change in firm size is significant. The *t*-tests also show that there is a statistically significant decrease in the average share price from pre-crisis to crisis. This is expected, as it is recognized that share prices declined substantially during the crisis. Asset maturity decreased over the two periods, and is also noted to be a significant change. Leverage increased during the crisis period, however the *t*-statistic was relatively small, and the corresponding *p*-value suggests that this change is significant at a 10 percent level of significance.

C. Correlations and Regression Analysis

We performed a correlation analysis of the variables tested. Table 5 reports correlations between debt maturity and the variables that determine debt maturity. Debt maturity is negatively correlated with liquidity, price changes, and asset maturity, while it is positively correlated with firm size and leverage ratio. Note that the correlations do not suggest potential multicollinearity between the various explanatory variables.

Table 5. Correlations Matrix of Debt Maturity and Variables Examined

Variable	DM	LIQ	FS	PC	AM	LEV
DEBT MATURITY	1					
LIQUIDITY	-0.139	1				
FIRM SIZE	0.244	-0.350	1			
PRICE CHANGE	-0.038	0.022	-0.099	1		
ASSET MATURITY	-0.504	0.434	-0.393	0.054	1	
LEVERAGE	0.130	-0.118	0.086	-0.030	-0.075	1

We conducted a linear regression using Ordinary Least Squares (OLS) method to evaluate the relationships between each variable and the changes in debt maturity over the entire sample period. A dummy variable of zero or one was added to each variable to test for the effect of the crisis on the dependent variable. Debt maturity is considered the dependent variable against which each additional independent variable was tested.

We include the following control variables in our regression analysis. The first variable, “Long and Short-term Interest Rate Spread,” is the spread between the long term and short term interest rate. This variable represents lenders’ willingness to provide various terms of debt instruments according to relative interest rates, which may eventually motivate firms to restructure their debt. The variable,

thus, is to account for an exogenous factor that is not under the control of managers, which may affect the decision of debt duration as suggested by Brick and Ravid (1985). They suggest that when the term structure of interest rates is not flat, the debt maturity choice has tax implications. If long-term interest rates are higher than short-term rates, in early years the firms' interest expense from issuing long-term debt is greater than the expected interest expense from rolling over short-term debt. However, in later years the interest expense of long-term debt is less. In this situation, the probability of default falls over time for long-term debt, and consequently the value of the firm's interest rate shield rises, increasing the total value of the firm. In summary, Brick and Ravid postulate that if long-term rates are higher than short-term interest rates, issuing long-term debt reduces the firm's expected tax liability and consequently increases the current firm's market value. A positive association between positive interest rate spread and debt maturity is then expected.

The short-term interest rate we use in the model is measured by the annual prime rate, and the long-term interest rate by the annual BAA corporate yield, which are reported in the Federal Reserve Board's H.15 statistical release. We use the prime rate because it is the one lending rate quoted by a majority of the major banks surveyed by the Federal Reserve and the BAA corporate yield as it is a common indicator of long-term lending interest rate for average firms.

The second factor is a set of variables: "Liquidity pre-crisis", "Asset Maturity pre-crisis", and "Leverage pre-crisis". These variables represent fixed firm characteristics prior to the crisis to account for the fact the financial ratios might have changed for exogenous reasons. Liquidity pre-crisis is calculated as the average of 2002 – 2006 annual liquidity ratio. Asset Maturity pre-crisis and Leverage pre-crisis are measured in a similar way.

The model used to conduct the analysis is as follows:

$$DM = \beta_o + \beta_1\ Dcrisis + \beta_2\ LIQ + \beta_3\ Dcrisis * LIQ + \beta_4\ FS + \beta_5\ Dcrisis * FS + \beta_6\ PC + \beta_7\ Dcrisis * PC + \beta_8\ AM + \beta_9\ Dcrisis * AM + \beta_{10}\ LEV + \beta_{11}\ Dcrisis * LEV + Control\ Variables + \varepsilon$$

Where:

DM = Debt Maturity

LIQ = Liquidity

FS = Firm Size

PC = Price Change

AM = Asset Maturity

LEV = Leverage

DCrisis = Dummy variable, (0 = Pre-Crisis, 1 = During Crisis)

Control Variables = Long and Short-term Interest Rate Spread, Fixed firm variables (Liquidity pre-crisis, Asset Maturity pre-crisis, and Leverage pre-crisis)

ε = the residual.

The OLS estimation of the model, shown in Table 6, confirms that there is a relation between four of the five independent variables and the dependent variable, debt maturity. Liquidity, firm size, asset maturity and leverage all show statistically significant *t*-statistics, with corresponding *p*-values of less than five percent. Price change does not appear to have a significant correlation with debt maturity. There is a positive and significant correlation between liquidity and debt maturity. The positive relationship between liquidity and debt maturity is contrary to our expectation of a negative relationship between these two variables. The insignificant dummy coefficient suggests that there was no significant change in this relationship during the crisis period.

Table 6. OLS Model Regression Results with Debt Maturity as the Dependent Variable using Full Sample

Table 6. OLS Model Regression Results with Debt Maturity as the Dependent Variable using Full Sample

Variable	Parameter Estimate	Standard Error	*t*- value	
Intercept	0.3517	0.0437	8.06	***
Dcrisis	-0.0930	0.0899	-1.04	
LIQUIDITY	0.0212	0.0022	9.69	***
LIQUIDITY x Dcrisis	0.0046	0.0034	1.34	
FIRM SIZE	0.0076	0.0019	3.99	***
FIRM SIZE x Dcrisis	0.0038	0.0039	0.97	
PRICE CHANGE	-0.0064	0.0136	-0.47	
PRICE CHANGE x Dcrisis	-0.0517	0.0233	-2.22	**
ASSET MATURITY	-0.4688	0.0333	-14.07	***
ASSET MATURITY x Dcrisis	-0.0598	0.0310	-1.93	*
LEVERAGE	0.0017	0.0001	2.51	**
LEVERAGE x Dcrisis	0.0058	0.0018	3.28	***
Control for				
Long and Short -term Interest Spread	0.0053	0.0014	3.76	***
Liquidity pre-crisis	-0.0010	0.0023	-4.27	***
Asset Maturity pre-crisis	-0.1197	0.0337	-3.55	***
Leverage pre-crisis	0.0122	0.0012	10.51	***
F-value	200.79***			
R-square	0.2975			
N	7128			

* ** *** represents statistical significance at the 10,5, and 1 percent level of significance, respectively.

The regression also shows a positive relationship between both firm size and leverage with respect to debt maturity. As seen with the data on liquidity, while the full period sample for firm size returns significant results, the crisis sample for this variable shows a positive, yet insignificant change, indicating that the effect of firm size on debt maturity did not change specifically during the crisis. The

significant and positive association between leverage and debt maturity became even stronger during the crisis, as noted by the significant leverage dummy coefficient. The positive correlations between firm size and leverage relative to debt maturity in the regression estimation are consistent with our hypothesis.

Asset maturity was found to have a negative and significant coefficient during the sample period. The dummy coefficient for this variable was consistent, and the corresponding *t*-statistic and *p*-value suggest that the strength of the relationship during the crisis changed. We had expected to find a negative relationship between asset and debt maturities. The results here suggest that as the proportion of current assets to total assets decreases, debt maturity increases.

Price change is the only tested variable that appeared to have no determinable impact on debt maturity over the sample period. The coefficient for this variable is negative over the sample period, but returned an insignificant *t*-statistic and *p*-value. However, during the crisis, the variable shows a significant negative association with debt maturity. Further, the negative coefficient is inconsistent with our supposition that price change and debt maturity are positively related.

Table 7. OLS Model Regression Results with Debt Maturity as the Dependent Variable for Firms without Mergers or Acquisitions during the crisis.

Variable	Parameter Estimate	Standard Error	*t*- value	
Intercept	0.0663	0.0746	0.89	
Dcrisis	0.0732	0.1534	0.48	
LIQUIDITY	0.0218	0.0034	6.44	***
LIQUIDITY x Dcrisis	0.0003	0.0051	0.07	
FIRM SIZE	0.0210	0.0033	6.30	***
FIRM SIZE x Dcrisis	-0.0040	0.0069	-0.58	
PRICE CHANGE	-0.0112	0.0211	-0.53	
PRICE CHANGE x Dcrisis	-0.0571	0.0360	-1.59	
ASSET MATURITY	-0.4339	0.0566	-7.66	***
ASSET MATURITY x Dcrisis	-0.0927	0.0467	-1.99	**
LEVERAGE	0.0007	0.0008	0.80	
LEVERAGE x Dcrisis	0.0236	0.0050	4.74	***
Control for				
Long and Short -term Interest Spread	0.0039	0.0023	1.70	*
Liquidity pre-crisis	-0.0079	0.0038	-2.09	**
Asset Maturity pre-crisis	-0.1431	0.0573	-2.50	**
Leverage pre-crisis	0.0096	0.0014	6.98	***
F-value	98.80***			
R-square	0.3416			
N	2872			

* ** *** represents statistical significance at the 10,5, and 1 percent level of significance, respectively.

As mentioned, we found that many firms in our sample conducted acquisitions during the financial crisis. These firms may have acquired underperforming or failing companies during this time, as well as the debts – including long-term debts - of those acquired firms. This activity may lead to an increase in the debt maturities of the sample firms due to these mergers. To exclude potential effects from the acquisitions, it is relevant to analyze the relationship between debt maturity and the explanatory variables only for firms without mergers or acquisition activities. Table 7 shows that for the sample of non-acquisition firms, liquidity has a significant positive relation with debt maturity. The positive relationship is contrary to the negative association that the liquidity risk hypothesis predicts. The regression results also show that firm size is positively related to debt maturity, and asset maturity has a significant negative relationship with debt maturity.

During the crisis period, the non-acquisition firms' debt maturity is significantly influenced by two factors: asset maturity and leverage. These firms increase leverage significantly during the crisis, and the increase is significantly related to an increase in debt maturity. In other words, these firms increase their leverage by employing more long term debt. Regression analysis also shows that asset maturity has a negative and significant coefficient during the crisis, suggesting that as the proportion of short term assets to total assets decreases, debt maturity increases. In general, regression results of firms with no acquisition activities and those of full sample indicate similar variables affecting debt maturity during the crisis years.

VI. Implications

The regression shows a positive relationship between liquidity and debt maturity over the full sample period from 2002 through 2009. This is inconsistent with our hypothesis, but confirms the findings of Deemsosak et al. (2009). That research had also initially expected a negative relationship between these two variables. The positive relationship can be attributed to the possibility that firms with higher liquidity sought to avoid shortages of cash and issued debt with longer maturities. This is still supportive of the liquidity risk hypothesis, as it implies that firms do in fact consider potential liquidity problems as a motive for altering their future debt structure. During the crisis period, the relationship between liquidity and debt maturity remained unchanged, suggesting firms did not specifically consider liquidity risk as a means of selecting their debt maturity during this time.

A negative and significant correlation was also noted between asset and debt maturities. As the proportion of current assets to total assets increases, debt maturity decreases. This provides some support for the liquidity risk hypothesis. If firms carry more short-term assets, they may become more liquid, reducing their need to consider liquidity risk in determining their debt structure. Moreover, during the financial crisis, firms may switch to longer-term projects because the financial crisis removed short-term opportunities. As the financial crisis created external capital constraints, and assuming firms match the maturity of the short-term investment opportunities with short-term liabilities, investing in

short-term projects is riskier. The firm would face more pressing needs to find either renewed financing or liquidity to fulfill the debt obligations. In addition, short-term financing is costly and uncertain during the crisis, and may leave the firm with two alternatives: to default on its obligations and/or to go through bankruptcy proceedings, or to sell assets to cover the cost of maturing short-term debt. This encourages firms to borrow longer-term debt, increasing the proportion of long-term debt in the debt maturity.

The most notable determinant of debt maturity structure as noted in the regression results was leverage. This variable returned statistically significant, positive coefficients in both the full sample and crisis periods, suggesting that firms believe leverage to be an important factor to evaluate when making choices with respect to debt. This consideration became more apparent during the crisis period, where firms faced with increasing leverage ratios trended even more toward longer term debt. Our expectation that as leverage increased firms tend to trade off to longer term debt maturities was corroborated. This is highly supportive of the liquidity risk hypothesis.

We expected a positive correlation between firm size and debt maturity, and while both the full sample and dummy coefficients are positive and thus, consistent with this hypothesis, the relationship during the crisis period was not significantly different. This leads to the conclusion that while a relationship exists between firm size and debt maturity choices, the crisis did not have a significant effect on this relationship. It does appear that during normal times smaller firms trend toward shorter term debt maturities, which is consistent with the signaling hypothesis.

VII. Conclusion

Based upon our research, the data reflect that the liquidity risk hypothesis is strongly supported during the full sample period, and firms' consideration of liquidity risk changed during the financial crisis for two measures, asset maturity and leverage. The majority of the independent variables tested were shown to be significantly correlated with debt maturity, and the highly significant F-statistic reveals that these variables jointly explain changes in debt maturities. Throughout the sample period, it appears that firms did increase their debt maturities as a result of considering the risks of short-term debt, and the maturity of their assets. We initially expected that in general, the need for signaling the markets to re-price securities would be one factor in firms' debt structure decisions. We can find no support that the use of signaling increased during the crisis period, despite the increase in information asymmetry during this time.

In general, firms appear to base debt structure decisions on factors that support both the liquidity risk and signaling hypotheses. During the crisis, however, two of all determinants of debt maturity support the hypotheses. When firms experienced higher leverage ratios they appeared to make a significant change in behavior regarding their use of long-term debt. This is understandable as firms try to avoid financial distress resulting from high leverage, and one way to moderate this effect is by switching to longer-term maturity debt. In addition, when firms attempted to increase the maturity of

their assets, they turn to longer-term debt, as the liquidity risk hypothesis has predicted. The insignificant quantifiable changes in firms' behavior indicated by other determinants of debt maturity during the crisis may be representative of the magnitude and chaos of the financial crisis. Firms may have been unable to facilitate their desired debt structure decisions due to the volatility, uncertainty and limitations in the markets.[6] Alternatively, the nature of the financial crisis may have caused firms to consider additional, unique factors in making debt maturity decisions. Ideally, it would serve the purpose of this paper well to extend the sample period through 2010 in order to fully evaluate firms' behavior from the onset of the crisis until markets had returned to new normalcy.

ENDNOTES

1. Krishnamurthy (2010) provides a description of the malfunction of debt markets during the financial crisis.
2. Other studies that have examined determinants of debt maturity include Barclay and Smith (1995), Guedes and Opler (1996), and Antoniou et al. (2006).
3. We should clarify that since we require all firms in the sample to have complete financial data during the observed years of 2002 - 2009, firms that disappeared due to acquisition are not in the sample. The sample contains a consistent 891 firms in each year of observation.
4. Borrowing is possible for these firms as they may draw down their credit lines or take out new loans. (Ivashina and Scharfstein, 2010).
5. We thank the referee for highlighting factors that are not under the control of firms in relation to debt maturity structure decisions.
6. Ivashina and Scharfstein (2010) report that large borrowers faced a cut in new loans by 47 percent during the financial crisis.

REFERENCES

Antoniou, A., Gunye, Y., and Paudyal,K. 2006. The determinants of corporate debt maturity structure: evidence from France, Germany, and UK. *European Financial Management*, 12, pp. 161-194.

Barclay, M., and Smith Jr., C.W., 1995. The maturity structure of corporate debt. *Journal of Finance*, 50, pp. 609-631.

Brick, I.E., and S.A. Ravid. 1985. On the relevance of debt maturity structure. *Journal of Finance*, 40, pp. 1423-1437.

Campello, M., Graham, J.R., and Harvey, C.R. 2010. The real effect of financial constraints: Evidence from a financial crisis. *Journal of Financial Economics*, 97, pp. 470-487.

Deesomsak, R., Paudyal, K., and Pescetto, G. 2009. Debt maturity structure and the 1997 Asian financial crisis. *Journal of Multinational Financial Management*, 19, pp. 26-42.

Diamond, D.W. 1991. Debt maturity structure and liquidity risk. *Quarterly Journal of Economics*, 106, pp. 709-737.

Flannery, M.J. 1986. Asymmetric information and risky debt maturity choice. *Journal of Finance*, 41, pp. 19-37.

Guedes, J. and Opler, T. 1996. The determinants of the maturity of corporate debt issues. *Journal of Finance*, 51, pp. 1809-1833.

Ivashina, V., and Scharfstein, D. 2010. Bank lending during the financial crisis of 2008. *Journal of Financial Economics*, 97, pp. 319-338.

Johnson, Shane A. 2003. Debt maturity and the effects of growth opportunities and liquidity risk on leverage. *Review of Financial Studies*, 16, pp. 209-236.

Krishnamurthy, A. 2010. How debt markets have malfunctioned in the crisis. *Journal of Economic Perspectives*, 24, pp.3-28.

Molina, C.A. 2010. Are firms underleveraged? An examination of the effect of leverage on default probabilities. *Journal of Finance*, 60, pp. 1427-1459.

Wu, C., and Ho, S.K. 1997. Financial ratio adjustment: Industry wide effects or strategic management. *Review of Quantitative Finance and Accounting*, 9, pp.71-88.

The Rate Of Time Preference, Seat Location Choice And Student Performance In The Classroom

Wisdom Akpalu*, Richard Vogel* and Xu Zhang*

Abstract

Recent research on the impact of seat location preferences in classes on student performance has yielded conflicting and very divergent results. This study contributes to this strand of literature by controlling for additional variables that could affect student performance. Specifically, in addition to seating location preferences, we propose that student performance may be affected by the rate at which the student values present rewards as opposed to future rewards, self perceived risk aversion, absenteeism, environmental factors and other personal attributes. Using students' final numerical course grades across a sample of economics courses at Farmingdale State College we have found that innate ability measured by cumulative gpa, hours of study before examination, and age affect grades obtained based on a stochastic production function estimation. Furthermore, attendance, the number of semesters at the college, laptop usage in class, perceived risk-aversion, and residency status affect technical efficiency scores. Finally, attendance and age of the student affect seat location preferences.

Introduction

Studies on the relationship between seating location choice in a classroom and student performance have produced contrasting results. While some studies have found a positive relationship between nearness to the front row in a class and a student's grade at the end of the semester after controlling for natural and physical endowments and investments, other studies have found the opposite. This paper contributes to this line of research by investigating the determinants of grade production using a stochastic frontier production function. The argument in support of the choice of a stochastic function is based on the luck element in grades that students obtain in examinations. From the production function, we investigate the relationship between technical efficiency and factors like gender, race, age, and student major. Further, we propose and test the hypothesis that a representative student, who values leisure activities, such as texting in the class, has a higher rate of time preferences and is therefore more likely to sit at the back of the class. These types of behaviors are less likely the back of the classroom.

Several studies have employed the stochastic production function to determine students' performance in schools. For example, Cooper and Cohn (1997) used the method to investigate

*Farmingdale State College, State University of New York, Farmingdale, USA

◊The authors would like to express their gratitude to the editor and an anonymous referee for their invaluable comments. The corresponding author is Richard Vogel, School of Business, Farmingdale State College, 2350 Broadhollow Road, Farmingdale, NY 11735. Email: richard.vogel@farmingdale.edu, Telephone: 631-420-2063. Fax: 631-420-2235.

determinants of performances of schools in South Carolina and found classes taught by teachers who received merit awards show greater mathematics and reading achievement gain scores, as do classes with fewer free-lunch students. Similarly, Khan and Kiefer (2007) employed the stochastic production function to compare efficiency in performance of schools managed by non-governmental organizations, the government and the private schools in Pakistan. The "output" is test score and the inputs include student, parent, teacher, and school policy variables. Schools managed by non-governmental organizations are found to be more efficient than the others.

Recent studies focus attention on an array of factors that may affect student performance and outcomes. Studies such as those by Akpalu and Vogel (2010), Armstrong and Chang (2007) and Benedict and Hoag (2004) specifically examine the question of seat location. Akpalu and Vogel (2010) find that the principal determinants of student performance are innate ability measured by gpa, attendance and age. Their study did not find seat location to be statistically significant in predicting individual class grades, it did however find a positive and significant relationship between seating preferences and student gpa. Armstong and Chang's (2007) study focused upon the relationship between seat location and student performance on standardized computer scored exams. They did not find that seat location influenced student performance. On the other hand, Benedict and Hoag (2004) concluded that student seating preferences did affect student performance as measured by course grade. Specifically, individuals who prefer to sit near the front of the room have a higher probability of receiving As, whereas those who prefer the back have a higher probability of receiving Ds and Fs.

Other studies such as Park and Kerr (1990) evaluate other underlying factors affecting academic performance. They find that the principal factors are cumulative GPA and percentile rank on ACT/entrance exams. Attendance and students' value of the course have a positive but lesser impact on outcomes. Borg and Stranahan (2002a; 2002b) find that personality type is an important factor affecting academic performance, with introverted personality types performing better than extroverts. A number of other studies such as Arias and Walker (2004), Siegfried and Kennedy (1995), Kennedy and Siegfried (1997), and Siegfried and Walstad (1998) assess the impact of class size on student performance. While Arias and Walker's (2004) studies do find that small class size has a positive effect on student performance, the other studies suggest that class size does not matter.

A number of other studies have evaluated the relationship between attendance and student performance including Romer (1993), Cohn and Johnson (2006), and Stanca (2006). Romer (1993) finds that attendance does have a positive effect on learning. Cohn and Johnson (2006) find that performance is positively related to attendance across the whole semester. According to Stanca (2006) class attendance, effort and motivation are interrelated and it is still an open question how important attendance is to overall performance. Another factor that may affect student learning and outcomes is student employment status. One recent study by Wenz and Yu (2010) finds that the type of employment a student is engaged in does affect outcomes. Students who work to fully fund their

education had lower gpas than their counterparts, while those who work just to complement their educational experiences, i.e. to gain additional skill sets, had relatively higher gpas.

Our study contributes to this evolving body of research by examining the issue using a stochastic frontier production function. In our analysis, we examine the relationship between factors like gender, race, age, student major, and technical efficiency in grade production. Further, we examine the impact that student behaviors such as texting in the class and other more leisure oriented activities may have on grade production. The rest of this paper is organized as follows. In the next section, we present an overview of the student population group and classes that are used in the analysis. Section 3 presents the econometric model and results of our analysis. The conclusions of our analysis are presented in the final section.

Classes and Students studied

Surveys of students were conducted during the ninth to twelfth week of the fall semester of 2009 in ten different sections of economics courses. There was no prior student selection process, use of pre or post exams, standardized exam instruments or instructor imposed seating charts in any of the classes that were surveyed. These courses included three sections of Principles of Macroeconomics, four sections of Principles of Microeconomics, and one section each of Intermediate Microeconomics, Sports Economics, and Engineering Economics. With the exception of the intermediate microeconomics course, the vast majority of the students enrolled in the surveyed courses were either students satisfying general education (Social Science) requirements or business students for whom the economics courses are required as part of the Business Management and Sports Management programs. In the case of the Engineering Economics course, ninety percent of those students were engineering technology students for whom this course was a required part of their degree program. A small number of students took these courses simply as an elective outside of their primary fields.

The students were given a twenty-five question survey that asked them to provide the following information: age, gender, major, on-campus resident or not, time to commute to the college, grade point average, seat location preference (front, middle or back row), employment status, average number of hours spent studying per week, and several questions related to texting in and out of class, use of a laptop computer in class, several questions related to their rate of time preference, and a question regarding risk aversion level (see Appendix 1). Each survey was coded so that the responses could be matched up with the student's final course grade and class attendance profile at the end of the semester, but individual names and other identifiers were stripped from the data insuring the individual students could no longer be identified. Only students that completed the courses and also completed the surveys were included in the analysis. The attrition rate in courses is quite low in the college and most students who drop out of courses do so well before the final examination week, and mostly for reasons of unsatisfactory performance. The course grade is made up of marks in a final test plus total marks obtained in a number of tests within the semester. Usually tests are announced ahead

of time hence high attendance rates are recorded on the day of a test. In addition, a student who misses a test for a good reason is usually given a make-up exam. Not all students that completed the surveys responded to or completed every single question. While instructors provided 230 coded observations on attendance and 219 observations on course grades, student coded responses ranged from 162 students reporting their cumulative gpa, to 223 students providing their age. It should be noted too, that each of the classes under analysis enrolled no more than 40 students.

Cumlative gpa, as Park and Kerr (1990) have demonstrated, is a good indicator of both innate intelligence and a student's pre-existing efforts in a formal educational setting. Here we use self-reported gpa. Some investigators such as Maxwell and Lopus (1994) have suggested that self-reported gpa may suffer from what has become known as the Lake Wobegon Effect (LWE), in that individuals may misreport their gpa at inflated levels. More recent study of this issue by Haley et al. (2010) finds that this effect is overstated in the literature. Their analysis indicates that even if the LWE is present in the data, any bias introduced into the analysis is relatively small and will not qualitatively affect the analysis. Thus, given the issues and problems associated with acquiring gpa from the official records, they suggest that it is completely legitimate to rely on self-reported gpa. Intuitively, this logic applies to all other self-reported data (such as number of text messages exchanged, hours studied before examination, and hours worked) used in this study. Moreover, since the student is neither rewarded nor punished for disclosing this information we have no reason to believe the data is over or under inflated.

Attendance as reported by the instructors is the overall percentage of classes attended by the student during the semester. This is then converted into a dichotomous variable equal to 1 if the student had an attendance record of ninety percent or more, and '0' otherwise. The ninety percent is chosen upon examining the distribution of the data and experimenting with several values. Presumably, greater class attendance leads to better overall performance, though some of the studies discussed previously do not fully support this thesis. Some questions on the survey, such as those regarding age and the number of semesters students have been enrolled at Farmingdale capture various aspects of life experience and acquired skills relevant to education.

A number of variables collected capture various aspects of the students' work and study habits, their level of engagement with the courses they are taking, and general attributes and attitudes that they may hold. These variables include their employment status, whether and how much they may text in class, and their rate of time preference (questions related to whether the student would take a $1000 cash card now, or if they would be willing to wait for a card that provides them with $1050 four months in the future), and their degree of risk aversion.

Theoretical framework for the analysis

We hypothesize that the student's final course grade depends upon his/her seat location preference in class and other attributes (i.e., A), e.g. innate ability. These attributes may include personal and environmental characteristics that affect efficient utilization of other grade production inputs. Assume that the distance from any seat in the class to the professor's desk is measurable on a continuous scale. Normalizing the distance to the farthest seat to the instructor's desk as one, let $x_i \leq 1$ be the seat preference of student i in a particular class. Let the score obtained depend on the average number of hours that the student studies for the course (i.e., s). Student i's grade production function is

$$g = g\ (x, s, A\ \text{, with}\quad g_x \leq 0,\ g_s \geq 0,\ g_{ss} < 0,\ g_{sx} < 0 \text{ and } \quad g_{xx} \geq 0 \qquad (1)$$

where $g_x \leq 0$ is the marginal grade productivity with respect to the normalized distance from the professor's desk. In addition, we have hypothesized that this marginal productivity is non-increasing in increased distance from the desk and that the attributes include the age of the student, his/her cumulative GPA, class attendance rate, self perceived risk aversion, whether the student lives on campus or not, the student's rate of time preference, and the number of years the student has spent in the college.

The student's seat location function arises through a utility maximization process. Assuming the returns to college education are positive (see for example Card 1999 or Katz and Murphy 1992), we postulate that the student derives utility indirectly from the score that he/she obtains in a course. We further hypothesize that students sitting in the rear of the class are more likely to engage in leisure activities, such as texting, sleeping or reading literature that is unrelated to the topic under discussion. As a result, the in-class leisure depends on $1-x_i$. Using equation (1), the corresponding utility function for the student is

$$u = u\ (g\ (x, s, A\ ), l) \qquad (2)$$

where $l = l(1-x) = 1-x$, is the distance to the rear of the classroom. Suppose the individual has a fixed amount of time that he or she can allocate to working (k) and studying (s). If the time endowment is normalized to one, then $k = 1-s$. Let the marginal opportunity cost of the time spent on studying be fixed at w. If the individual derives utility from income obtained from working then we can re-specify the utility function as

$$u = u\ (g\ (x, s, A\ ), l, w(1-s)) \qquad (3)$$

Maximizing equation (3) with respect to x and s gives

$$\frac{\partial u}{\partial x} = u_g.g_x + u_l.l_x = 0 \Rightarrow g_x = u_l/u_g = mrs_{l,g} \qquad (4)$$

$$\frac{\partial u}{\partial s} = u_g.g_s - u_s = 0 \Rightarrow g_s = \ u_s/u_g \ = mrs_{s,g} \tag{5}$$

From equation (4), the student will chose a seating position for which, in equilibrium, the marginal gain in grade will equate his/her marginal rate of substitution (*MRS*) between in-class leisure in class and his/her grade. Equation (5) indicates that, in equilibrium, the student will equate his/her marginal gain in the score to the marginal rate of substitution between the proportion of time allocated to studies and the score/grade.

From equation (4), we can derive the comparative statics of x with respect to the composite index A. Thus

$$u_{gg}g_xg_A \ dA - \ u_{gl}.g_x - u_{gg}.g_x^2 - u_g.g_{xx} - u_{ll} + u_{lg}g_x \ dx = 0$$

$$\frac{dx}{dA} = \frac{u_{gg}g_xg_A}{2u_{gl}.g_x - u_{gg}.g_x^2 - u_g.g_{xx} - u_{ll}} \leq 0 \tag{6}$$

From equation (6), given that an attribute improves scores, a student with such an attribute is more likely to sit in the front row relative to the rear row. This is empirically tested.

Estimation of the empirical model

For any given combination of inputs, the Stochastic Frontier Production Function (SFPF) assumes the realized production (say test scores) of an economic unit (say a student) is bounded above by the sum of a parametric function of known inputs each associated with unknown parameters, and a random error corresponding to measurement error of the level of production or other factors (Battese and Coelli, 1993). Thus, the greater the amount by which the realized production falls short of this stochastic frontier production, the greater the level of technical inefficiency. Given the variables of interest, we specify the stochastic production function as:

$$g_i = f(x_i, s_i, \mathbf{A})Exp(v_i - u_i), \tag{7}$$

where v_i is a normally distributed error term (i.e., $v_i \sim N(\mu, \sigma^2)$) and u_i is a one sided error with a positive mean and variance (Aigner, Lovell and Schmidt 1977; Kumbhakar and Tsionis 2006; Lothgren 1997). Note that from equation (7), technical efficiency is measured as

$$\theta_i = \frac{g_i}{f(x_i, s_i, \mathbf{A})Exp(v_i)} = Exp(-u_i).$$

Thus, a hundred percent efficiency score indicates performance on the frontier (i.e., best performance possible, given the available inputs) and zero percent, on the other hand, indicates weakest performance. The stochastic frontier production function has also been employed (e.g. by Cooper and Cohn 1997) to investigate determinants of achievement gains of the South Carolina educational system.

To estimate equation (7), questionnaires were administered to 230 students taking principles of economics, intermediate macroeconomics, sports economics and engineering economics. The descriptive statistics of the data collected are presented in Table 1. A typical classroom in the college is rectangular in shape with no rising-stairs and has a capacity of 40 seats arranged in 6 columns and 7 rows (with 2 seats missing in two of the columns). A class normally has one entrance which is situated at the front corner of the class. Students sitting at the first two rows are designated as "sitting in front", those in the last two rows are considered "sitting at the back" and the rest are classified as "sitting in the middle".[1] The mean percentage score of the students is 79.23 percent and the mean cumulative GPA is above 3.0. On the average, each student has spent about 3 semesters at the college and takes approximately 14 credits during the semester. Furthermore, 39 percent of the students sit in front. From our sample, 8.5 percent use laptops in class, very few (4 percent) perceive themselves as risk averse, 9 percent live on campus, and approximately half (44 percent) have relatively higher rate of time preferences (i.e., prefer rewards now to the future). Our sample has more females (59 percent) than males (41 percent) and less than 8 percent were unemployed or did not work. Of the number employed, more than a third work fulltime. Furthermore, the average age is approximately 22 years, with relatively low standard deviation of 5.4 implying the individuals ages are close to the mean.[2]

Table 1. Descriptive Statistics of variables used in the regressions

Variables	**# of obs**	**Mean**	**SD**
Grade	219	79.23	14.94
Present at all classes (=1, 0 otherwise)	230	0.257	0.438
No. of semesters in FSC	218	2.975	2.176
Cumulative GPA at FSC	162	3.046	0.576
Total # of semester credits	222	13.856	2.682
Use laptop in class (=1, 0 otherwise)	223	0.085	0.421
Perceived self as risk-averse(=1, 0 otherwise)	199	0.040	0.197
Sit in front(=1, 0 otherwise)	196	0.388	0.488
Age of student	222	21.599	5.436
No. of hours the student study before exam	197	3.022	4.220
Student live on campus(=1, 0 otherwise)	223	0.094	0.293
Student has higher rate of time preference(=1, 0 otherwise)	216	0.444	0.498

Table 2 has the results of the estimated stochastic production function of the scores. The R-squared indicates that about 30 percent of the variability of the dependent variable is explained by the explanatory variables, which is quite high for survey data (see e.g., Stanca, 2006; and Cohn and

Johnson, 2006). Also the Wald Chi-square statistics (Prob> F = 0.00) indicates that the line is a good fit. Moreover, the likelihood ratio test strongly confirms that the level of technical efficiency varies

Table 2. Stochastic Frontier Production Function of Marks Obtained for Spring 2010 Semester

Variable	**Coefficient**
log(Cumulative GPA at FSC)	**0.025** (3.77e-06)***
log(Age of student)	**-0.003** (5.7e-08)***
log(No. of hours the student study before exam)	**0.006** (1.02e-07)***
Constant	**0.993** (1.23e-05)***
σ_{μ}^2	-2.668 (0.121)***
σ_v^2	-38.483 (285.308)
Lambda ($\lambda = \sigma_u / \sigma_v$)	5.98e+07 (0.059)
Mean Efficiency	0.82
Wald Chi-square (3) = 1.00e+10 (**Prob > 0.00**)	
Likelihood-ratio test: $H_0 : \sigma_{\mu} = 0$, Chi-square = 44.22 (**Prob> 0.000**)	

Standard errors in parentheses. ** significant at 5%; *** significant at 1%.

across the scores hence the stochastic frontier estimation is desirable. The variables that are statistically significant in explaining the scores are the Cumulative GPA, the number of hours a student studies before taking the examination, and the age of the student. All three explanatory variables were significant at the 1 percent level. The proxy for innate ability (i.e., CGPA) and the hours of study have a positive impact on scores, while older students have lower scores, on average. From the elasticity coefficients, a 10 percent increase in the CGPA or hours of study before exams, on the average, increases the score mark by 0.25 percent and 0.06 percent, respectively.[3] This implies that, all other things being equal, innate ability as well as the effort students invest in studies are both important in determining the overall course grade. Secondly, relatively younger students performed better than older ones with a corresponding elasticity coefficient of -0.003. It is noteworthy that although the coefficients are statistically significant, the impacts of the corresponding variables on scores are very small. Interestingly, the mean efficiency score is 0.82, which is very high, indicating the performance of most students is at the frontier. Thus, the students on the average have the capacity to increase their performance by 18 percent.

Furthermore, we explore the determinants of technical efficiency among the students. Thus, we regressed the technical efficiency scores on several variables. The results are reported in Table 3. From the results, the R-Square indicates that about 22 percent of the variability of the technical

efficiency is accounted for by the explanatory variables. Contrary to our expectation, students who were present at all classes performed worse than students who missed some classes. Specifically, on

Table 3. Determinants of Technical efficiency in total marks scored for Spring 2010 Semester

Variables	**Coefficients**	**Elasticity**
Present at all classes (=1, 0 otherwise)	**-0.153** (0.075)**	-0.169
No. of semesters in FSC	**-0.019** (0.005)***	-0.074
Total No. of semester credits	-0.0008 (0.003)	
Use laptop in class (=1, 0 otherwise)	**-0.082** (0.024)***	-0.006
Perceived self as risk-averse(=1, 0 otherwise)	**-0.117** (0.040)***	-0.008
Seat in front(=1, 0therwise)	0.015 (0.020)	
Student live on campus(=1, 0 otherwise)	**-0.001** (0.0004)***	-0.001
Student has higher rate of time preference(=1, 0 otherwise)	**0.032** (0.019)*	0.019
Constant	**1.012** (0.080)***	
Observations	**112**	
R-squared	**0.22**	

* significant at 10%; ** significant at 5%; *** significant at 1%. Robust standard errors in parentheses

average, being present at all classes lowered the efficiency score by 17 percent. Thus students who attend all classes, on the average, have 17 percent lower scores than their counterparts who skip some classes. This finding contrasts those of previous studies (see e.g., Moore, 2006). Secondly, students with more semesters at the college had lower efficiency scores, with a corresponding elasticity of -0.07. This finding possibly stems from the increasing number of hours that students at the college work on average as they spend more semesters in the college. The correlation between working fulltime and the number of semesters spent at the college is positive (0.39) and statistically significant at the 1 percent level. Thirdly, students who use laptops in class or live on campus had lower efficiency scores. A plausible explanation is that the laptops are used for leisure activities such as checking email and browsing sites unrelated to the lectures. Unfortunately, this could not be verified from our data since we did not ask the students to indicate the activities the laptops were used for while in class. The negative relationship between multi-tasking and performing in class has also been found by Ellis et al. (2010). It is also possible that students who live on campus spend a lot more time socializing than studying for examinations. Furthermore, it is interesting that the students who perceived themselves as being risk averse performed worse than risk-loving students; and those who are more uncertain about the future (or value benefits today more than the same benefits in the future) perform relatively closer to their frontier, on the average. Most importantly, seat location preference does not explain efficiency scores. In the following regression we explore the determinants of the

decision to sit in front and the results are presented in Table 4. We found that older students are more likely to sit in front, and a 10 percent increase in age will increase the probability that a student sits in front by 13.7 percent on the average. Moreover, a 10 percent increase in class attendance, on the average, increases the probability that a student will sit in front by 33 percent.

Table 4. Logit regression for the Choice of Front Seat

Variables	**Coefficient**	**Elasticity**
Class attendance rate	**5.567**	**3.306**
	(2.074)***	
Cumulative GPA at FSC	0.165	
	(0.376)	
Total No. of semester credits	0.096	
	(0.061)	
Perceived self as risk-averse(=1, 0 otherwise)	-0.228	
	(0.817)	
Age of student	**0.094**	**1.367**
	(0.032)***	
Student has higher rate of time preference(=1, 0 otherwise)	0.626	
	(0.410)	
Constant	-9.937	
	(2.827)***	
Observations	123	
Pseudo R-squared	0.10	

* significant at 10%; ** significant at 5%; *** significant at 1%. Robust standard errors in parentheses.

Conclusions

This study sought to investigate the determinants of student performance in Economics employing a stochastic frontier production function. We found that scores or grades obtained were positively affected by both innate ability and effort invested by the student. However, older students performed worse than their younger counterparts. The mean efficiency score was very high (82 percent). Regarding the determinants of technical efficiency, students who were present at all classes, had spent more semesters at the college, used laptops in class, perceived themselves as risk-averse or lived on campus had lower technical efficiency scores. On the other hand, students who were more uncertain about the future (or valued benefits today more than same benefits in the future) perform relatively closer to their frontier, on the average. Seat location was not statistically significant in the technical efficiency estimation. A separate Logit analysis of seating preferences indicated a positive relationship with attendance and age.

ENDNOTES

1. The question on the survey asks students to identify where they normally sit in class. Since none of the classes surveyed employed any type of enforced seating chart or scheme, students were free to choose from all available seats at any point during the semester. Applying the concept of revealed preference to students responses suggests that a student's indicated seat location is a good indicator of their specific preference to be in the front, middle or back of the room.
2. The following are additional statistics from the data. On the average, 29 percent of the students consider themselves risk loving; 67 percentage are neutral and only 4 percent are risk averse. The mean individual discount rate obtained through the experiment is 9.6 percent, which is much higher than average official lending rates at the commercial banks. Furthermore, the average number of text messages sent out by the students within the semester is approximately 9 while the maximum messages sent out are approximately 13.
3. Note that since letter grades are based on numerical scores, a small change in such a score could results in a change in a grade level.

REFERENCES

Aigner, D., Lovell, C. A. K., and Schmidt, P. 1977. "Formulation and estimation of stochastic frontier production function models." *Journal of Econometrics* 6: 21-37.

Akpalu, W. and Vogel, R. 2010. "Student performance in the economics classroom." *Academy of Economics and Finance Journal* 1: 61-67.

Arias, J. J. and Walker, D. M.. 2004. "Additional evidence on the relationship between class size and student performance." *Journal of Economics Education* (Fall): 311-329.

Armstrong, N. and Chang, Shu-Mei. 2007. "Location, location, location: does seat location affect performance in large classes." *Journal of College Science Teaching* 37(2): 54- 58.

Battese G. E., and Coelli, T. J. 1993. *A stochastic frontier production function incorporating a model for technical inefficiency effect*, Department of Econometrics, University of New England Armidale, NSW, Australia

Benedict, M. E. and Hoag, J. 2004. "Seating location in large lectures: are seating preferences or location related to course performance?" *Journal of Economics Education* (Summer): 215- 231.

Borg, M. O. and Stranahan, H. A. 2002a. "Personality type and student performance in upper-level economics courses: The importance of race and gender." *Journal of Economics Education* (Winter): 3- 14.

Borg, M. O. and Stranahan, H. A.. 2002b. "The effect of gender and race on student performance in principles of economics: the importance of personality type." *Applied Economics* 34: 589-598.

Card, D. 1999. "The causal effect of education on earnings." In *Handbook of Labor Economics*, vol. 3A, edited by David Card and Orley Ashenfelter, Amsterdam; New York and Oxford: Elsevier Science, North-Holland.

Cohn, E. and Johnson, E. 2006. “Class attendance and performance in principles of economics.” *Education Economics* 14(2): 211-233.

Cooper, S. T. and Cohn, E. 1997. “The estimation of a frontier production function for the South Carolina educational process.” *Economics of Education Review,* 16(3): 313-327.

Ellis, Y., Daniels, B. W. and Jauregui, A. 2010. “The effect of multitasking on the grade performance of business students,” *Research in Higher Education Journal*, 8:1-10.

Haley, M. R., Johson, M. F. and McGee, M. K. 2010. “A framework for reconsidering the Lake Wobegon Effect.” *Journal of Economic Education* 41(2): 95-109.

Katz, L. and Murphy, K. 1992.“Changes in Relative Wages, 1963-1987: Supply and Demand Factors.” *Quarterly Journal of Economics* 107: 35-78.

Kennedy, P. E. and Siegfried, J. 1997. “Class size and achievement in introductory economics: Evidence from the TUCE III data.” *Economics of Education Review* 16 (4): 385-94.

Khan, S. R. and Kiefer, D. 2007. “Educational production functions for rural Pakistan: a comparative institutional analysis.” *Education Economics*, 15(3): 327–342.

Kumbhakar, S. C. and Tsionas, E. G. 2006. “Estimation of stochastic frontier production functions with input-oriented technical efficiency.” *Journal of Econometrics* 133: 71-96.

Lothgren, M. 1997. “Generalized stochastic frontier production models.” *Economics Letters* 57: 255-259.

Maxwell, N. L., and Lopus, J. S. 1994. “The Lake Wobegon effect in student self-reported data.” *American Economic Review. Papers and Proceedings* 84(2): 201-05.

Moore, R. 2006.” The importance of admissions scores and attendance to first-year performance.” *Journal of The First-Year Experience & Students in Transition*, 18(1): 105-125.

Park, K. H. and Kerr, P. M. 1990. “Determinants of academic performance: A multinomial logit approach.” *Journal of Economics Education* (Spring): 101-111.

Romer, D. 1993. “Do students go to class? Should they?” *Journal of Economic Perspectives* 7: 167-174.

Siegfried, J. and Kennedy, P. E.. 1995. “Does pedagogy vary with class size in introductory economics?” *American Economic Review. Papers and Proceedings* 82(2): 347-51.

Siegfried, J. J., and Walstad, W. B. 1998. “Research on teaching college economics.” In W. B. Walstad and P. Saunders, eds.. *Teaching undergraduate economics: A handbook for instructors*, 141-66. New York: Irwin/McGraw-Hill.

Stanca, L. 2006. “The effects of attendance on academic performance: panel data evidence for introductory microeconomics.” *Journal of Economics Education* (Summer): 251- 266.

Wenz, M. and Yu, W.-C. 2010. “Term-time employment and the academic performance of undergraduates. *Journal of Education Finance* 35(4): 358-373.

Acknowledgement

The authors would like to acknowledge participants of conference sessions at the New York State Economics Association meeting in the Fall of 2010, and from the Farmingdale State College Applied Economics Seminars during 2010-11 academic year where previous versions of this paper were presented.

Appendix 1: Survey Instrument

	Survey Questions
1.	What is your age (please indicate in years)?
2.	What is your major at Farmingdale State College?
3.	Do you live on campus?
4.	If you do not live on campus, how much time does it take you to commute to class?
5.	Are you currently taking a math class?
6.	If yes to the preceding question, what is the course?
7.	What is the highest level mathematics course that you have ever taken?
8.	If you intend to have a minor, what will it be?
9.	How many semesters have you been enrolled at FSC?
10.	Is FSC your first college?
11.	What was your high school GPA?
12.	What is your college cumulative GPA?
13.	Have you ever received or sent a text message in this class?
14.	How many text messages, on the average do you send our or receive when you are in this class?
15.	What is the highest number of text messages that you have sent out or received in this class?
16.	Are you employed fulltime or part-time?
17.	How many credits are you taking this semester?
18.	How many hours on the average do you study before taking each test in this course?
19.	If the course does not require an in-class test, how many hours on the average do you spend on major assignments for the course?
20.	Please indicate the position of your seat (i.e. where you normally sit in class) from the front row (front, middle, or back)
21.	Do you use a laptop computer in class?
22.	What is the maximum number of hours you studied before taking a test in the course?
23.	Suppose that FSC wants to implement two scholarship schemes, **A** or **B** to supplement students' expenses on food, textbooks, etc. on campus. The two schemes cost the same amount of money. Which of the following would you vote for? **Scheme A** would provide you with a $1000 Cash Card that could be used to buy such items on campus this month (please note that the card does not expire) **Scheme B** would provide you once with a $1050 Cash Card that could be used to buy such items on campus next semester (i.e. in 4 months time, and note that the card does not expire.
24.	If you are to quote a value for Alternative B that will make you exactly as happy as choosing alternative A, what value will that be?
25.	Do you consider yourself to be risk loving, risk neutral, or a risk averse person?

Sources of Employment Growth in the North Country

Kameliia Petrova*

Abstract

This study looks at employment changes in the North Country region (Franklin, Essex, Clinton, Jefferson, Lewis and Saint Lawrence counties) during the period 1990 - 2007 using the National Establishments Time Series, decomposes the sources of employment changes and, in the process, identifies the main sources of employment growth. The study was supported financially by the New York State Department of Labor.

1. Introduction

The North Country has a clear vision about future economic development. Most of it has to do with the efforts of local administrations and the business community to improve the entrepreneurial climate. It has become clear that one of the main channels for success in the area is developing and locating resources for local business to encourage their successful growth and development. Support from local and state government in developing different programs such as tax relief and participation programs has had a great impact on the local business climate.

The North Country economy has been based mostly on local businesses. There are a few big employers, but the main focus has been developing local entrepreneurial talent. Local communities, at the county level, have made a great effort to provide the necessary help and support for both new and existing businesses during challenging times. Eight of the fifty-two NY State Enterprise zones are in the North Country. However, little is known about the past area trends in employment dynamics and sources of employment growth, as well as their use as indicators for the local economic condition.

Employment change can be described as a dynamic process with two main outcomes: job creation and job destruction. Job creation, or employment growth, results from the birth of new businesses, growth of existing businesses and relocation of businesses to a particular area or region. In a similar manner, job destruction, or employment decline, results from death and contraction of existing businesses and relocation of existing businesses out of an area or region. The process of employment change can also be decomposed into three separate net effects: net effect of birth and death of businesses, expansion and contraction of businesses, and relocation of businesses in and out of the region.

This study of the employment changes in the North Country region during the period 1990 – 2007 was accomplished using a newly available and unique data set – the National Establishments Time Series (NETS). In the study, I provide a decomposition of the sources of employment changes

*Associate Professor, Department of Economics and Finance, SUNY Plattsburgh, 101 Broad Street, Plattsburgh, NY 12901, Email: kpetr001@plattsburgh.edu, Tel: 518-564-4187, Fax: 518-564-4215

and, in the process, identify the main sources of employment growth. The results of the study suggest that the two main sources of job creation are business establishment births and expansion of existing establishments. At the same time, deaths and contraction of existing establishments cause most of the job destruction in the region. The net effects of both business expansions and contractions and business births and deaths contribute positively to employment growth in some periods, and negatively in others. The net effect of business establishments moving into and out of the region is almost zero. Most establishments move within the region. New jobs are mainly created as a result of births of new business establishments rather than the expansion of existing ones. Deaths of new businesses account for a little over one half of the job destruction in the region. With the exception of Agriculture, Forestry, Fishing and Hunting, the North Country Region falls well short of the average statewide wages for all industries. Most of the job creation has been in industries that have relatively low average wages, while most of the job loss has been in industries with higher wages. During the period under review, deaths of companies totaled 47,525, while births totaled 6,635.

The rest of the paper is organized as follows. Section two provides a description of the NETS data used in the study. Section three follows with a decomposition of the sources of employment growth in the North Country. Section four continues with a decomposition of the sources of employment growth across industry. Finally, section five presents conclusions and policy implications that can be drawn from the research.

2. Overview of the North Country Economy

In 2007 the North Country region, made up of Clinton, Essex, Franklin, Lewis, Jefferson, and St. Lawrence Counties, accounted for 1.5 percent of New York State's private sector employment[1]. The average wages in the region were 50 percent lower than the state's private sector wages. Clinton, Jefferson, and St. Lawrence counties accounted for 76 percent of the region's private sector employment. Franklin and Jefferson counties were in the top half of the 62 New York State counties in employment growth from 2004 to 2007. Their employment growth (5.7 and 7.4 percent respectively) exceeded the state's employment growth rate of 3.9 percent.

The North Country region has a slightly smaller share of retirement age workers (18 percent) than the state average across all industries (20 percent). The region's share of retirement age workers in Financial Services, Information, Natural Resources and Mining, Retail Trade, and Other Services industries is higher than the statewide average.

From the 56 reportable, non-confidential, 3-digit North American Industry Classification System (NAICS) industry sectors, 28 met at least one of the three competitiveness criteria defined by the Bureau of Labor Statistics: location quotient, relative average wage and differential employment growth rate[2]. The total employment in these 28 industries accounts for 48 percent of the private employment in the North Country region for 2007. While no industries met all three competitive criteria, 5 industries met two of the criteria. The employment concentration in Forestry and Logging is more

than 18 times the concentration of the state as a whole. Animal Production, Primary Metal Manufacturing and Paper Manufacturing all exceed the state concentration. Forestry and Logging is the only industry sector with a relative wage higher (3 percent higher) than the corresponding state wage.

Of the 28 competitive industries in the North Country region 11 were projected to have positive employment growth between 2007 and 2016. The highest projected employment growth is in Forestry and Logging, which is the top most competitive sector in the area. Other sectors with high projected employment growth are Support Activities for Agriculture and Forestry, Support Activities for Transportation, Animal Production, Crop Production and Wood Product Manufacturing. Sectors that have traditionally been strongly represented in the region, such as Accommodation and Paper Manufacturing are projected to experience employment decline by 2016. The industries with the highest projected employment decline are Publishing Industries and Heavy and Civil Engineering.

3. Data: The National Establishment Time-Series Database

3.1 Overview

The data set used in the study is the National Establishment Time Series (NETS). The NETS is a longitudinal data created by Walls & Associates from the original Dun & Bradstreet (D&B) cross-section files of the Data Universal Numbering System (DUNS) marketing information. The D&B files collection is an on-going effort to capture every business establishment in the United States in each year. The main target of this data collection is the business community. A set of indicators, such as D&B Ratings and PayDex scores, are calculated providing a useful tool in the process of decision-making.

The files with marketing information are assembled through the collection of data from many different sources: telephone calls, court filings, newspapers and electronic news, payment information, company filings and reports, government registries, licensing data, public utilities, the US Secretaries of State and the US Postal Service. Using DUNS, D&B assigns a 9-digit identification sequence to every establishment in the data. Since 1990 the DUNS has been adopted by many government agencies in the US and has become internationally recognized.

This study uses an extract from the NETS covering all business establishments that were located in the North Country (Franklin, Essex, Clinton, Jefferson, Lewis and Saint Lawrence counties) between 1990 and 2007 and their headquarters, regardless of the location.

The unit of observation is a business establishment, which is defined as an entity or business at a single physical location. It is often the case that firms own more than one establishment that might be located in different geographical areas and operate in different industries. The NETS data indicate whether an establishment is a stand-alone firm or a branch of a multi-establishment firm. Most of the establishments, however, are stand-alone firms.

The following variables have been used in the study: current establishment location (zip codes including the 4-digit extension); Federal Information Processing Standard (FIPS) county codes in each year; type of location (single location, headquarters, branch) in each year; employment in each year; SIC/NAICS codes at the 8-digit level in each year; if the establishment moved, the year of movement, origin zip code, origin city, origin state, destination zip code, destination city, destination state.

3.2 Advantages of the NETS

The NETS has several beneficial characteristics, one of which is that the data cover the whole universe of establishments. Over the period 1990-2007, the database includes annual information on 15 to 20 thousand establishments in the North Country providing about 500 to 600 thousand jobs. A total of 40,264 establishments are covered in the 1990-2007 North Country extract from the NETS. Characteristically, the North Country is populated with a small number of large establishments and a significant number of small establishments.

There was a change in the data collection process in 1991. After a federal court ruling that allowed regional Bell companies to sell information collected by them, D&B expanded its database by using the telephone directory to identify businesses. Neumark et al. (2005, 2006 & 2008) report that this change resulted in a significant increase in the number of establishments and jobs at the NETS, and that for the period after 1991 the data sets reported considerably more very small establishments compared to other data sources. Even though Neumark et al. (2005, 2006 & 2008) chose to drop the 1990-1991 data, for the purpose of my analysis I have included these two years. A comparison of data from the 1990-1991 period and the rest of the data show that there is no significant difference in terms of the number of establishments observed.

One additional property of the NETS is that the database provides complete information on business relocation. As Neumark et al. (2005, 2006 & 2008) note, other data sources have been used in studies of employment dynamics. Some of the most popular among researchers are the Census of Manufacturers, the Longitudinal Research Database, and the Unemployment Insurance Data. There are also some newer data sets based on Census and Bureau of Labor Statistics data. The NETS database, however, tracks business address changes and identifies business moves over time within the entire country.

3.3 Relocations, Births, and Deaths

In recording the relocation of an establishment that existed previously versus a new establishment, the DUNS number plays a significant role. DUNS numbers are unique and never recycled. If one establishment closes, its DUNS number is stored under “inactive” or “out of business.” The same DUNS number can be reassigned only if the establishment reopens. Every time there is an update of the establishments’ database, D&B contacts the last recorded address, or headquarters in case an establishment is a part of a multi-unit firm. If a new establishment has been founded and

investigation shows that there is no previous record, a new DUNS number is assigned. This systematic procedure allows for differentiation between relocations, birth, and deaths.

An establishment that relocates is identified by street address and zip code changes from one year to another. The data include both establishments that moved to the North Country and establishments that moved out of the North Country. There are two limitations on the information that can be extracted from this form of relocation (Newmark, 2006). The first limitation refers to the difference between moving out and branching out. Moving out occurs when a company located in the North Country moves out of the area. This company will be in the NETS. However, when a company located in the North Country decides to open an establishment outside the North Country area, a process called branching out, this new establishment will not be registered in the data. The main presumption is that opening a new establishment in the North Country area has a different cost than opening the same establishment outside of the area.

The second limitation has to do with the type of relocation. The NETS data follow only physical relocations. There are, however, other types of relocations. If a job position is moved to another location of the same firm, this type of relocation will be observed as a decrease in employment in the first location and increase of employment in the second. Also, when activities from different locations are consolidated and moved to a single location, this change will be observed as an expansion of one establishment and closing of another.

3.4 Data Assessment

The NETS data had been thoroughly examined in Neumark et al. (2005) studying employment change in California. They provide a detailed investigation of the quality, reliability and potential limitations of the data, concluding that the NETS are a reliable source of information about the process of employment change.

4. Employment Dynamics in North Country Region

The following information presents the decomposition of the sources of employment change and growth in the North Country: births and deaths, expansion and contraction, and relocation (in and out of the region).

4.1 Decomposition of the Sources of Employment Growth

Table 1 presents decomposition of the sources of employment growth over overlapping three-year periods for 1990-2007. The table consists of three panels. Panel A, Employment change, provides the starting employment, ending employment and the overall change for each period. Panel B, Gross flows, shows the number of jobs created by birth, expansion and move in of establishment, and number of jobs lost due to death, contraction and move out of establishments. Panel C, Employment change, details decomposition of the process of employment change into three net flows. This

Table 1. Decomposition of Employment Growth in the North Country Area, 1990-2007

	'90-'93	'91-'94	'92-'95	'93-'96	'94-'97	'95-'98	'96-'99	'97-'00	'98-'01	'99-'02	'00-'03	'01-'04	'02-'05	'03-'06	'04-'07
A. Employment change															
Starting Employment	166,674	165,690	166,297	178,832	174,749	181,887	179,868	181,305	182,611	183,888	188,931	195,331	203,481	197,759	196,018
Ending Employment	178,832	174,749	181,887	179,868	181,305	182,611	183,888	188,931	195,331	203,481	197,759	196,018	192,138	189,511	189,143
Change	12,158	9,059	15,590	1,036	6,556	724	4,020	7,626	12,720	19,593	8,828	687	(11,343)	(8,248)	(6,875)
B. Gross flows															
Job creation															
Birth	29,617	30,179	35,095	22,464	29,376	25,812	24,505	20,092	21,944	28,551	26,371	21,720	15,663	16,335	15,894
Expansion	11,772	16,924	12,359	14,101	13,962	14,084	18,111	21,680	22,905	20,183	19,149	21,101	23,089	22,580	19,135
Move in	1,121	1,894	1,449	1,359	1,270	1,686	1,770	1,818	1,465	1,488	1,511	1,767	2,252	2,546	2,508
Job destruction															
Death	16,420	20,160	18,934	20,560	20,520	22,822	22,411	20,473	18,512	17,952	24,230	26,503	29,965	25,014	23,334
Contraction	11,855	17,715	12,361	14,895	15,895	16,464	16,530	14,134	13,330	10,992	12,098	15,375	19,987	22,376	19,110
Move out	2,077	2,063	2,018	1,433	1,637	1,572	1,425	1,357	1,752	1,685	1,875	2,023	2,395	2,319	1,968
C. Net flows															
Employment change =	12,158	9,059	15,590	1,036	6,556	724	4,020	7,626	12,720	19,593	8,828	687	(11,343)	(8,248)	(6,875)
(birth–death)	13,197	10,019	16,161	1,904	8,856	2,990	2,094	(381)	3,432	10,599	2,141	(4,783)	(14,302)	(8,679)	(7,440)
+ (expansion - contraction)	(83)	(791)	(2)	(794)	(1,933)	(2,380)	1,581	7,546	9,575	9,191	7,051	5,726	3,102	204	25
+ (move in-move out)	(956)	(169)	(569)	(74)	(367)	114	345	461	(287)	(197)	(364)	(256)	(143)	227	540

decomposition is done for periods of three years, instead of annually. Because of imputations and rounding (Walls & Associates, 2003), the NETS data are less reliable for shorter periods of time. Thus, changes shown over a three-year period are preferable to annual ones.

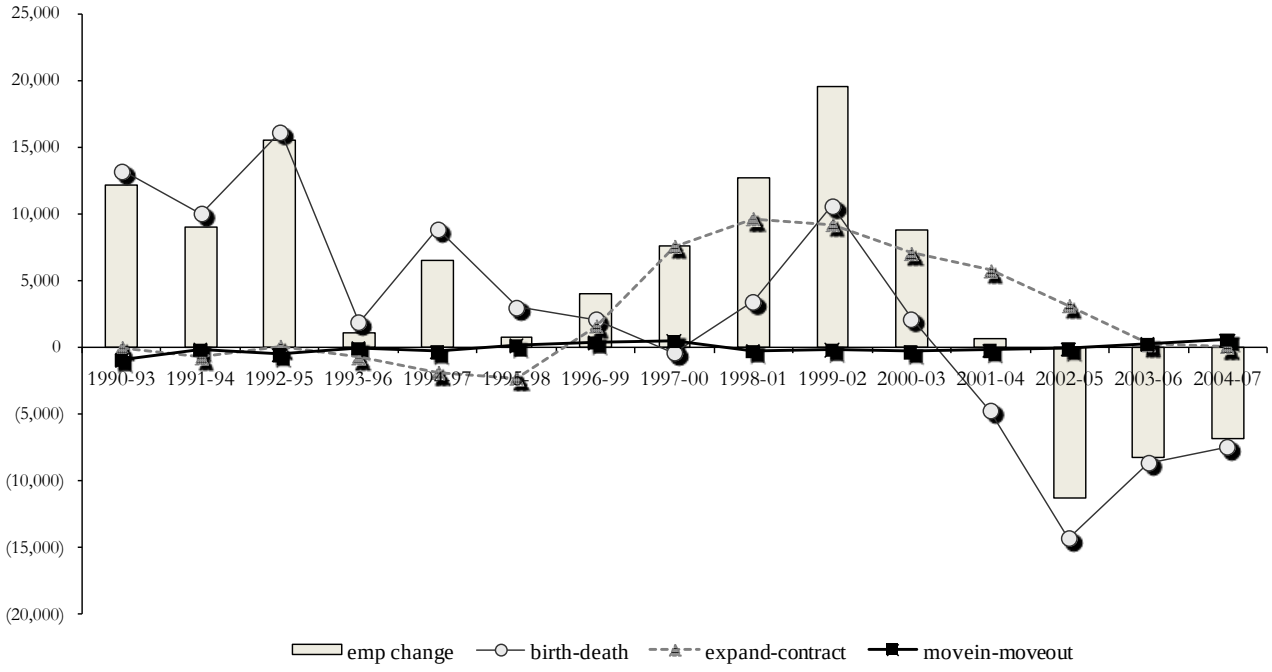
Table 1 show that the net effect of business expansions and contractions is positive for some periods and negative for others. This process follows the business cycle to some degree. In periods of high economic growth, more new establishments, and respectively jobs, are created than are closed down and jobs lost. The opposite happens during recession and times of slow economic growth when many business owners close down, thus relatively more establishments, and jobs, are lost. For example, with the exception of 1997-2000 when 381 jobs were lost, the net effect of expansion and contraction is positive all the way until 2001-2004 when 4,783 are cut, followed by three more periods of an equivalently high number of job losses. These periods follow the recession of 2001-2002, as officially defined by the National Bureau of Economic Research. This can also be seen in Figure 1.

In a similar manner, births and deaths of establishments affect the overall employment change positively for some years and negatively for others. One would expect there to be mostly a positive effect since the establishments that survive are more likely to be the ones that grow and not the ones that contract. What is interesting, however, is that in the case of the North Country region, the net effects of expansions and contractions are negative until 1996-1999. The negative effect is relatively small for the first four periods. For example, 83 jobs are cut due to birth-death for the 1990-1993 period and only 2 jobs for the 1992-1995 period. At the same time, the cuts amount to 1,933 jobs in the 1994-1997 period and 2,380 jobs in the 1995-1998 period respectively. For all periods after that, the region experiences a positive net effect of birth and deaths. The strongest is the effect for the 1998-2001 period and the 1999-2002 period with over nine thousand jobs created.

Finally, the net effects of relocations in and out of the region are insignificant, as can be seen from both Table 1 and Figure 1. Relocation of establishments in the region contributes about 2 percent of job creation, relative to births and expansions. At the same time relocation of establishments out of the region contributes about 7 percent of the total job destruction relative to deaths and contractions. As can be seen from the bottom row of Table 1 the net effect of relocations amounts to an average of 200 jobs a year. This, compared to the net effect of birth and deaths and expansions and contractions, is 15 to 20 times less in magnitude of the effect. It is easy to see that birth and deaths and expansions and contractions are the main processes contributing to the employment dynamics in the North Country.

Figures 2.1 and 2.2 present the relative importance of the different factors of job creation and destruction. Figure 2.1 shows that birth of new establishments is the main source of job creation for almost all of the periods included. Only after 2002 is there a small change in this order as expansions slightly outweigh births. One can see clearly from the figures that the number of jobs created by relocation of establishments into the region is extremely small throughout the whole period. The side panel of Figure 2.1 shows the distribution of job creation across the three different sources. Births

Figure 1. Net Employment Changes Due to Different Business Dynamics
North Country Region, 1990-2007



contributed an overwhelming 70 percent of the total job creation, while expansions contribute 28 percent, and relocations only 2 percent.

Figure 2.2 shows the distribution of the source of job destruction. In each period, the death of business establishments is the main source of job destruction, accounting for 54 percent of the job loss for the period observed. Contractions account for 39 percent and relocations out of the region only 7 percent.

4.2 Effect of Relocations

Tables 2A and 2B[3] show relocations in and out of the region by number of establishments and number of jobs respectively. The results indicate that some establishments left the North Country, resulting in job losses, and some moved in the area, bringing new jobs. As can be seen from the last column in Table 2A, the net loss/gain from relocations as a percentage of the total number of establishments in the area is very small. The worst years, when the number of establishments leaving the area is the highest, are 2003, 2004, & 2005 with 124, 135 and 105 establishments respectively. This amounts on average, to 0.006 percent of the total number of establishments in the region. At the same time, the

worst net effect has been observed in 2000 and 2007, when the total net loss of number of establishments was 18 and 12 respectively. The loss reported for the period 2003-2005 has been

Job Creation and Destruction

North Country Region, 1990-2007

Figure 2.1

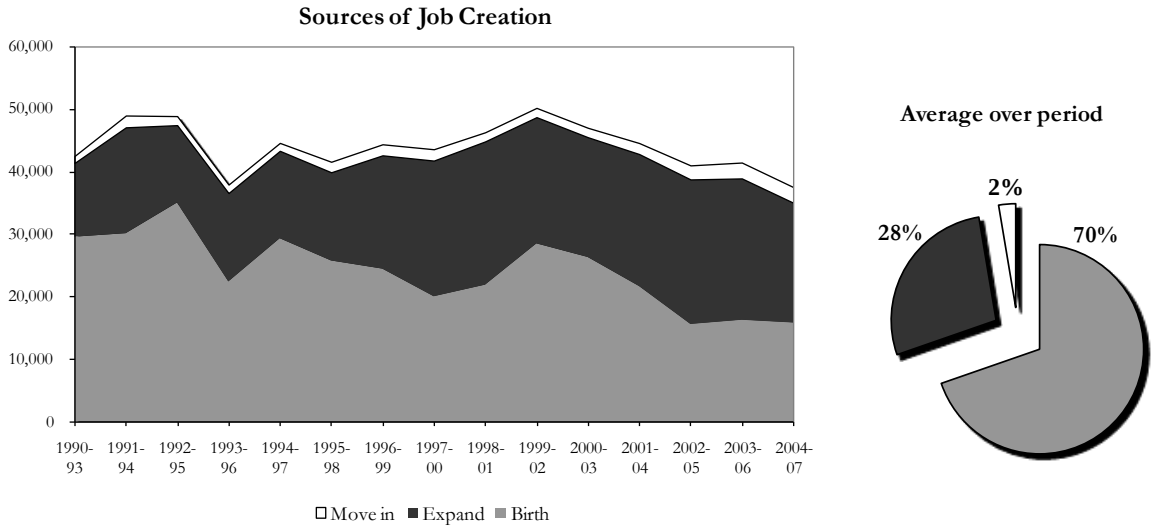
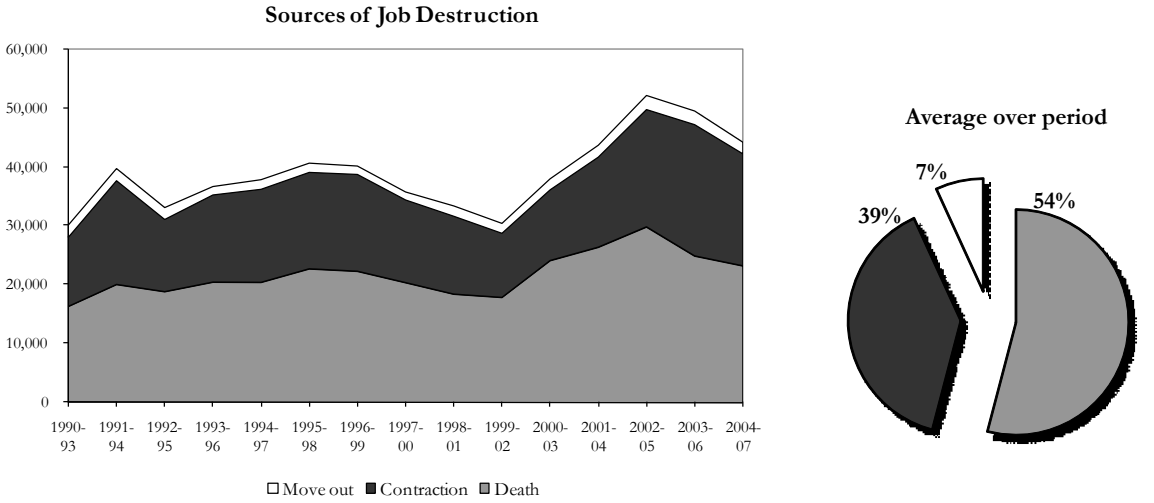


Figure 2.2



offset by equally high number of establishments moving in the area. In terms of number of jobs lost, the worst year was 1992 when 1,364 jobs were lost due to businesses leaving the North Country. The best year for the region was 2004, with 1,049 new jobs created by businesses relocating to the region.

Table 2 Business Relocation and Its Effect on Employment in the North Country, 1990-2007

A. By number of establishments

	Moved in	Moved out	Net effect	Total number of	Net loss, % of
1990	58	47	11	15,531	0.071
1991	40	37	3	15,876	0.019
1992	46	42	4	17,142	0.023
1993	46	46	-	16,983	-
1994	47	51	(4)	18,223	(0.022)
1995	69	77	(8)	18,505	(0.043)
1996	76	80	(4)	19,071	(0.021)
1997	58	58	-	19,138	-
1998	66	60	6	19,186	0.031
1999	60	54	6	19,260	0.031
2000	56	74	(18)	19,474	(0.092)
2001	78	82	(4)	20,752	(0.019)
2002	93	91	2	21,293	0.009
2003	116	124	(8)	21,193	(0.038)
2004	137	135	2	21,205	0.009
2005	107	105	2	21,603	0.009
2006	80	83	(3)	21,377	(0.014)
2007	82	94	(12)	21,816	(0.055)

B. By number of jobs

	Moved in	Moved out	Net effect	Total number of jobs	Net loss, % of
1990	752	319	433	165,690	0.260
1991	369	394	(25)	166,297	(0.015)
1992	773	1,364	(591)	178,832	(0.356)
1993	307	305	2	174,633	0.001
1994	279	349	(70)	181,767	(0.040)
1995	684	779	(95)	179,878	(0.052)
1996	723	509	214	181,040	0.119
1997	363	284	79	182,335	0.044
1998	732	632	100	183,652	0.055
1999	370	441	(71)	188,631	(0.039)
2000	386	679	(293)	194,898	(0.155)
2001	755	565	190	203,137	0.098
2002	626	631	(5)	197,294	(0.002)
2003	871	827	44	195,298	0.022
2004	1,049	937	112	191,560	0.057
2005	588	555	33	188,821	0.017
2006	410	476	(66)	188,461	(0.035)
2007	251	353	(102)	184,772	(0.054)

Tables reporting relocations by number of establishments and number of jobs for each county are available on request from the author. Clinton County lost the highest number of establishments among all counties in the region. Seventy eight establishments left in 2003 and 2004, which resulted in a loss of more than 600 jobs over the two-year period. Essex County lost the highest number of jobs over a single year, 455 jobs lost in 1992. Similar results are reported for Franklin County. The net effects of relocations are insignificant by both number of establishments and number of jobs for Jefferson, Lewis and Saint Lawrence Counties.

4.3 Effect of Births and Deaths

Tables 3A and 3B show births and deaths, for the region overall, by number of establishments and number of jobs respectively. For every year from 1995 to 2005 the region lost more than one thousand businesses. The worst years were 2002, with 1502 establishments and 2005, with 1630 establishments. In terms of net effects, the total number of establishments increased by 7 percent in

Table 3. Business Birth and Death and Their Effect on Employment in the North Country Area, 1990-2007

A. By number of establishments

	Birth	Death	Net effect	Total number of	Net loss, % of
1990	725	638	87	15,531	0.560
1991	973	781	192	15,876	1.209
1992	2,047	886	1,161	17,142	6.773
1993	722	725	(3)	16,983	(0.018)
1994	1,963	696	1,267	18,223	6.953
1995	983	1,109	(126)	18,505	(0.681)
1996	1,693	1,124	569	19,071	2.984
1997	1,194	1,080	114	19,138	0.596
1998	1,124	1,061	63	19,186	0.328
1999	1,126	1,077	49	19,260	0.254
2000	1,288	1,011	277	19,474	1.422
2001	2,315	1,154	1,161	20,752	5.595
2002	1,700	1,502	198	21,293	0.930
2003	1,403	1,074	329	21,193	1.552
2004	1,093	1,466	(373)	21,205	(1.759)
2005	1,862	1,630	232	21,603	1.074
2006	1,403	985	418	21,377	1.955
2007	1,427	916	511	21,816	2.342

B. By number of jobs

	Birth	Death	Net effect	Total number of jobs	Net loss, % of
1990	3,758	4,544	(786)	165,690	(0.471)
1991	6,717	6,355	362	166,297	0.218
1992	19,142	5,521	13,621	178,832	8.197
1993	4,320	8,284	(3,964)	174,633	(2.217)
1994	11,633	5,129	6,504	181,767	3.724
1995	6,511	7,147	(636)	179,878	(0.350)
1996	11,232	8,244	2,988	181,040	1.663
1997	8,069	7,431	638	182,335	0.352
1998	5,204	6,736	(1,532)	183,652	(0.841)
1999	6,819	6,306	513	188,631	0.279
2000	9,921	5,470	4,451	194,898	2.361
2001	11,811	6,176	5,635	203,137	2.892
2002	4,639	12,584	(7,945)	197,294	(3.911)
2003	5,270	7,743	(2,473)	195,298	(1.255)
2004	5,754	9,638	(3,884)	191,560	(1.989)
2005	5,311	7,633	(2,322)	188,821	(1.212)
2006	4,829	6,063	(1,234)	188,461	(0.653)
2007	4,207	7,653	(3,446)	184,772	(1.829)

both 1992 and 1994, and 6 percent in 2001. The region gained 19,142 jobs in 1992, an 8 percent increase. From 2002 to 2007, the area experienced an average annual job loss of 1 – 1.5 percent.

Tables reporting births and deaths by number of establishments and number of jobs for each county are available on request from the author. The highest gains in new establishments were observed in 1992-1994, ranging from a 5 percent increase for Franklin County to a 10 percent increase for Lewis County. Saint Lawrence County reported the highest gain in jobs in a single year, an 11 percent increase of the total number of jobs in 1992. Jefferson County had the highest gain in both new establishments and new jobs over the whole period. Lewis County was the only county in the region that reported a net job loss over the whole period of observation. The most significant job losses, across all counties, were observed at the end of the period, in years when the number of new establishments outweighed the number of establishments closing down. What this means is that the new born businesses offered relatively fewer jobs compared to the jobs lost due to businesses shutting down.

4.4 Effect of Expansions and Contractions

Table 4 shows expansions and contractions by number of jobs for the region as a whole. For most of the years during the period of observation, expansion of establishments outweighs contraction. The highest negative effect is observed in 1995 when the 1,844 jobs (1 percent of the total number of jobs) were lost. The best years are 1997 and 1998, when the net positive effects of jobs gained amount to 3,173 and 2,096 respectively. For both years, this is about 2 percent of the total number of jobs for the region.

Table 4. Business Expansion and Contraction and their Effect on Employment in the North Country, 1990-2007

	Expansion	Contraction	Net effect	Total number of jobs	Net loss, % of
1990	9,414	9,543	(129)	165,690	(0.077)
1991	2,329	2,299	30	166,297	0.018
1992	4,711	5,851	(1,140)	178,832	(0.686)
1993	5,083	4,195	888	174,633	0.497
1994	4,080	4,832	(752)	181,767	(0.431)
1995	5,009	6,853	(1,844)	179,878	(1.014)
1996	4,982	4,769	213	181,040	0.119
1997	8,060	4,887	3,173	182,335	1.753
1998	8,551	4,455	4,096	183,652	2.248
1999	6,094	3,966	2,128	188,631	1.158
2000	5,382	2,561	2,821	194,898	1.496
2001	7,544	5,569	1,975	203,137	1.014
2002	8,162	7,232	930	197,294	0.458
2003	7,368	7,144	224	195,298	0.114
2004	6,959	7,954	(995)	191,560	(0.509)
2005	4,721	3,969	752	188,821	0.393
2006	3,682	3,999	(317)	188,461	(0.168)
2007	4,660	4,061	599	184,772	0.318

Tables reporting expansions and contractions in the number of jobs by county are available on request from the author. Franklin County experienced the highest number of years (ten) with negative net effects of expansions and contractions out of all counties in the region. The most significant loss was observed in 2004 when 2,225 jobs were cut due to business contractions, resulting in a total net loss of 7 percent of the total number of jobs.

4.5 Net Flows and Employment Change

The net contribution of each of the three net processes (birth -. death, expansion - contraction and relocation in -relocation out) is shown against the overall employment change in Figure 1. As was mentioned earlier, and confirmed in Figure 1, the net effect of relocation is almost zero, with no contribution to the employment changes observed.

The net effect of births and deaths mimics the overall employment changes for almost all periods. For the first four and the last two 3-year periods almost 100 percent of the employment change is due to the net effect of births and deaths. Not only relocations, but also expansions and contractions have zero net effect. For the rest of the periods included, the net effect of births and deaths still follows the overall employment changes. However, the net effect of expansions and contractions picks up significantly between 1996 and 2003. For example, the employment growth between 1997 and 2001 is

due to net flows from both births - deaths and expansions - contractions. The latter is positive until 2003, while the former plunges dramatically in 2002-2005.

An important lesson from this analysis so far is that both births and deaths of business establishments have significant and very distinguishable effects in the process of employment growth. Births of new establishments are widely recognized as a criterion for economic growth. At the same time, deaths of establishments are equally important in the process of job destruction. Overall, employment changes in the North Country region until 1996 are due to the net effect of the birth and death of business establishments, and to the net effect of expansions and contractions afterwards. Finally, one can conclude that due to the large magnitude of the effects of the births - deaths and expansion - contraction processes, a small change in each of the four underlying sources of employment change could potentially result in a significant shift in employment growth. Changes in in-and-out of the region relocations, on the other hand, will have little or no impact on local employment.

4.6 Changes in the Interval Length

As discussed above, the length of the interval of analysis will affect the magnitude of the effects of job creation and destruction on employment growth. A few things might be expected to change. The total number of jobs created or lost over shorter periods of time might be larger than those observed over relatively longer periods of time due to temporary fluctuations and seasonality. In addition, the effects of births and deaths will be relatively larger over longer periods of time. This is because when the interval of observation gets longer, more establishments experience birth and death. This reinforces the fact that the NETS database is more reliable for periods of three years or longer.

Table 5 presents the decomposition of employment change into births, deaths, expansions, contractions and relocations for one, two, three, five and nine years. The results show that changes in the interval length do not seem to affect the relative order of significance of the sources of job creation and job destruction. Regardless of the interval chosen, births and deaths have the largest contributions, followed by expansions and contractions, and relocations in and out of the region are last.

4.7 Types of Relocations

As shown in Table 6A and Table 6B, establishments are more likely to move locally than to exit. In Table 6A, all establishments that moved in the North Country region were divided in three groups: establishments that moved in from outside of the region, establishments that moved in from a different county within the region and, finally, establishments that moved within the same county. In a similar manner, Table 6B presents the results for the establishments that moved out, dividing them into three categories: establishments that moved out of the region, establishments that moved to a different county and establishments that moved within the same county. The average results for both tables

Table 5. Employment Change Decomposition, 1990-2007 Various Interval Lengths of Observation

A. In absolute values

	Birth (1)	Expansion (2)	Move in (3)	Gross Creation (4) (1) + (2) + (3)	Death (5)	Contraction (6)	Move out (7)	Gross Destruction (8) (5)+ (6) + (7)	Net Change (9) (4) – (8)
1 year	135,147	107,381	10,288	252,816	314,277	94,262	11,228	419,767	(166,951)
2 years	131,389	107,381	10,288	249,058	309,733	94,262	10,080	414,075	(165,017)
3 years	131,389	107,381	10,288	249,058	309,733	94,262	10,080	414,075	(165,017)
5 years	101,210	90,457	8,394	200,061	289,573	76,547	8,017	374,137	(174,076)
9 years	141,966	115,963	11,020	268,949	320,583	98,726	10,840	430,149	(161,200)

B. In percentage

	Birth (1)	Expansion (2)	Move in (3)	Gross Creation (4) (1) + (2) + (3)	Death (5)	Contraction (6)	Move out (7)	Gross Destruction (8) (5)+ (6) + (7)
1 year	53.5%	42.5%	4.1%	100%	74.9%	22.5%	2.7%	100%
2 years	52.8%	43.1%	4.1%	100%	74.8%	22.8%	2.4%	100%
3 years	52.8%	43.1%	4.1%	100%	74.8%	22.8%	2.4%	100%
5 years	50.6%	45.2%	4.2%	100%	77.4%	20.5%	2.1%	100%
9 years	52.8%	43.1%	4.1%	100%	74.5%	23.0%	2.5%	100%

should be the same. Of all establishments that relocate, 63 percent relocate within the same county, 10 percent move out of the county, but stay within the North Country region and 27 percent move out of the region. What this means is that the effect of relocations on the employment for the region as a whole would be smaller than the effect of relocations on the county level. In both cases, however, this effect is negligible.

5. Employment Dynamics across Industry

This section presents an analysis of the employment dynamics in the North Country Region by industry, based on the results in Table 7 and Table 8. Table 7 shows the decomposition of employment change by expansion-contraction, birth-death and relocation in and out of the region. Table 8 gives the 2007 average wages across industry sectors and subsectors and also across counties.

The North Country Region lost 31,298 jobs and gained 9,280 jobs between 1990 and 2007. This resulted in a net loss of 22,018 jobs for that period. The largest losses were in the areas of Manufacturing (7,755), Educational services (9,909) and Health Care and Social Assistance (7,852). Job losses in these three areas accounted for 81.5 percent of all job losses for the period. The largest gains were in the areas of Retail Trade (1,994), Professional, Scientific and Technical services (2,744) and Admin, Support, Waste Management and Remedial services (3,390). Job gains in these three areas accounted for 87.6 percent of all job gains.

All of the following calculations were determined using the 2007 average wage for the North Country Region.

Table 6. Relocations by Type, 1990-2007

A.Move in

	Total	From out of	From out of	Within	From out of	From out of	Within county.
1990	58	23	9	26	40%	16%	45%
1991	40	15	3	22	38%	8%	55%
1992	46	13	5	28	28%	11%	61%
1993	46	14	3	29	30%	7%	63%
1994	47	10	8	29	21%	17%	62%
1995	69	12	6	51	17%	9%	74%
1996	76	13	5	58	17%	7%	76%
1997	58	11	2	45	19%	3%	78%
1998	66	18	9	39	27%	14%	59%
1999	60	16	4	40	27%	7%	67%
2000	56	7	8	41	13%	14%	73%
2001	78	18	11	49	23%	14%	63%
2002	93	29	11	53	31%	12%	57%
2003	116	24	12	80	21%	10%	69%
2004	137	43	11	83	31%	8%	61%
2005	107	33	14	60	31%	13%	56%
2006	80	26	3	51	33%	4%	64%
2007	82	20	7	55	24%	9%	67%

B. Move out

	Total	Out of	Out of	Within	Out of the	Out of the	Within county.
1990	47	12	9	26	26%	19%	55%
1991	37	12	3	22	32%	8%	59%
1992	42	9	5	28	21%	12%	67%
1993	46	14	3	29	30%	7%	63%
1994	51	14	8	29	27%	16%	57%
1995	77	20	6	51	26%	8%	66%
1996	80	17	5	58	21%	6%	73%
1997	58	11	2	45	19%	3%	78%
1998	60	12	9	39	20%	15%	65%
1999	54	10	4	40	19%	7%	74%
2000	74	25	8	41	34%	11%	55%
2001	82	22	11	49	27%	13%	60%
2002	91	27	11	53	30%	12%	58%
2003	124	32	12	80	26%	10%	65%
2004	135	41	11	83	30%	8%	61%
2005	105	31	14	60	30%	13%	57%
2006	83	29	3	51	35%	4%	61%
2007	94	32	7	55	34%	7%	59%

5.1 Job Loss

The average wage for Manufacturing is $44,781. There are 11 sub-categories applicable to the North Country Region, with average wages ranging from $21,355 to $72,177. The net loss in wages for this category is $240,395,069. The average wage for Educational services is $28,345, resulting in a total loss of wages of $280,870,605. The average wage for Health Care and Social Assistance is $34,383. There are four sub-categories, with the average wage ranging from $20,170 to $43,143. The net loss for wages in this category is $284,357,934. The total loss of wages for these three areas of job loss is $805,623,608.

Table 7 Employment Change Decomposition by Industry in North Country region, 1990-2007

Industry Title	Net Employment Change, 1990-2007					Annualized Change as share of 1990 emloyment			
	Starting Employment	Total	Expansion-Contraction	Birth-Death	Move	Total	Expansion-Contraction	Birth-Death	Move
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
All Industries	**3,007,340**	**(32,698)**	**8,981**	**(40,890)**	**(789)**	**-0.06%**	**0.02%**	**-0.08%**	**0.00%**
Agriculture, Forestry, Fishing, and Hunting	**63,163**	**(884)**	**435**	**(1,312)**	**(7)**	**-0.08%**	**0.04%**	**-0.12%**	**0.00%**
Crop Production	16,310	(141)	102	(239)	(4)	-0.05%	0.03%	-0.08%	0.00%
Animal Production	37,198	(744)	261	(1,003)	(2)	-0.11%	0.04%	-0.15%	0.00%
Forestry and Logging	6,734	(25)	67	(92)	0	-0.02%	0.06%	-0.08%	0.00%
Fishing, Hunting and Trapping	291	(5)	1	(6)	0	-0.10%	0.02%	-0.12%	0.00%
Support Activities for Agriculture and Forestry	2,630	31	4	28	(1)	0.07%	0.01%	0.06%	0.00%
Mining	**11,155**	**(36)**	**243**	**(279)**	**0**	**-0.02%**	**0.12%**	**-0.14%**	**0.00%**
Oil and Gas Extraction	66	(11)	(12)	1	0	-1.01%	-1.11%	0.08%	0.00%
Mining (except Oil and Gas)	10,776	(7)	275	(282)	0	0.00%	0.14%	-0.15%	0.00%
Support Activities for Mining	313	(18)	(20)	2	0	-0.33%	-0.37%	0.04%	0.00%
Utilities	**23,940**	**(539)**	**(142)**	**(399)**	**2**	**-0.13%**	**-0.03%**	**-0.09%**	**0.00%**
Utilities	23,940	(539)	(142)	(399)	2	-0.13%	-0.03%	-0.09%	0.00%
Construction	**154,345**	**(89)**	**2,913**	**(2,841)**	**(161)**	**0.00%**	**0.10%**	**-0.10%**	**-0.01%**
Construction of Buildings	54,349	(507)	496	(988)	(15)	-0.05%	0.05%	-0.10%	0.00%
Heavy and Civil Engineering Construction	38,191	(1,968)	(600)	(1,302)	(66)	-0.29%	-0.09%	-0.19%	-0.01%
Specialty Trade Contractors	61,805	2,386	3,017	(551)	(80)	0.21%	0.27%	-0.05%	-0.01%
Manufacturing	**380,796**	**(7,755)**	**(1,118)**	**(6,596)**	**(41)**	**-0.11%**	**-0.02%**	**-0.10%**	**0.00%**
Food Manufacturing	34,005	(310)	249	(547)	(12)	-0.05%	0.04%	-0.09%	0.00%
Beverage and Tobacco Product Manufacturing	1,123	5	8	(3)	0	0.02%	0.04%	-0.01%	0.00%
Textile Mills	6,757	30	27	3	0	0.02%	0.02%	0.00%	0.00%
Textile Product Mills	1,246	2	69	(66)	(1)	0.01%	0.30%	-0.30%	0.00%
Apparel Manufacturing	5,292	(146)	(143)	(5)	2	-0.16%	-0.15%	-0.01%	0.00%
Leather and Allied Product Manufacturing	17,724	(766)	(780)	14	0	-0.25%	-0.25%	0.00%	0.00%
Wood Product Manufacturing	7,087	(84)	44	(123)	(5)	-0.07%	0.03%	-0.10%	0.00%
Paper Manufacturing	87,356	(2,571)	(1,169)	(1,402)	0	-0.17%	-0.07%	-0.09%	0.00%
Printing and Related Support Activities	9,595	(190)	209	(396)	(3)	-0.11%	0.12%	-0.23%	0.00%
Petroleum and Coal Products Manufacturing	1,170	(41)	7	(48)	0	-0.20%	0.03%	-0.23%	0.00%
Chemical Manufacturing	29,542	(920)	(355)	(565)	0	-0.18%	-0.07%	-0.11%	0.00%
Plastics and Rubber Products Manufacturing	17,214	(318)	670	(988)	0	-0.10%	0.21%	-0.33%	0.00%
Nonmetallic Mineral Product Manufacturing	10,221	(360)	(34)	(326)	0	-0.20%	-0.02%	-0.18%	0.00%
Primary Metal Manufacturing	51,954	(999)	(511)	(488)	0	-0.11%	-0.05%	-0.05%	0.00%
Fabricated Metal Product Manufacturing	11,850	4	34	(30)	0	0.00%	0.02%	-0.01%	0.00%
Machinery Manufacturing	11,258	325	224	132	(31)	0.16%	0.11%	0.06%	-0.02%
Computer and Electronic Product Manufacturing	14,432	(142)	(70)	(69)	(3)	-0.05%	-0.03%	-0.03%	0.00%
Electr. Equip., Appliance, & Compon. Manuftr.	17,675	(565)	(40)	(518)	(7)	-0.18%	-0.01%	-0.17%	0.00%
Transportation Equipment Manufacturing	24,231	(703)	44	(772)	25	-0.16%	0.01%	-0.18%	0.01%
Furniture and Related Product Manufacturing	3,561	55	(8)	68	(5)	0.09%	-0.01%	0.11%	-0.01%
Miscellaneous Manufacturing	17,503	(61)	407	(467)	(1)	-0.02%	0.13%	-0.15%	0.00%
Wholesale Trade	**113,576**	87	**1,361**	**(1,196)**	**(78)**	**0.00%**	**0.07%**	**-0.06%**	**0.00%**
Merchant Wholesalers, Durable Goods	61,964	675	747	(61)	(11)	0.06%	0.07%	-0.01%	0.00%
Merchant Wholesalers, Nondurable Goods	51,612	(588)	614	(1,135)	(67)	-0.06%	0.07%	-0.12%	-0.01%

Table 7 Cont. p2

Retail Trade	**414,138**	1,994	**3,027**	**(946)**	**(87)**	**0.03%**	**0.04%**	**-0.01%**	**0.00%**
Motor Vehicle and Parts Dealers	49,889	(378)	408	(763)	(23)	-0.04%	0.05%	-0.09%	0.00%
Furniture and Home Furnishings Stores	10,685	88	37	55	(4)	0.05%	0.02%	0.03%	0.00%
Electronics and Appliance Stores	9,910	289	(50)	349	(10)	0.16%	-0.03%	0.19%	-0.01%
Buld. Material and Garden Equip. & Supplies Dealers	28,842	(164)	511	(674)	(1)	-0.03%	0.10%	-0.13%	0.00%
Food and Beverage Stores	107,651	770	701	73	(4)	0.04%	0.04%	0.00%	0.00%
Health and Personal Care Stores	27,930	(329)	204	(531)	(2)	-0.07%	0.04%	-0.11%	0.00%
Gasoline Stations	15,548	(206)	121	(326)	(1)	-0.07%	0.04%	-0.12%	0.00%
Clothing and Clothing Accessories Stores	21,853	998	(3)	1,022	(21)	0.25%	0.00%	0.25%	-0.01%
Sporting Goods, Hobby, Book, and Music Stores	18,106	767	59	718	(10)	0.23%	0.02%	0.22%	0.00%
General Merchandise Stores	76,913	(657)	546	(1,253)	50	-0.05%	0.04%	-0.09%	0.00%
Miscellaneous Store Retailers	33,925	522	191	342	(11)	0.08%	0.03%	0.06%	0.00%
Nonstore Retailers	12,886	294	302	42	(50)	0.13%	0.13%	0.02%	-0.02%
Transportation and Warehousing	**113,794**	31	**1,104**	**(944)**	**(129)**	**0.00%**	**0.05%**	**-0.05%**	**-0.01%**
Air Transportation	5,501	(150)	88	(229)	(9)	-0.15%	0.09%	-0.24%	-0.01%
Rail Transportation	1,077	(45)	3	(48)	0	-0.24%	0.02%	-0.25%	0.00%
Water Transportation	166	5	0	5	0	0.17%	0.00%	0.17%	0.00%
Truck Transportation	30,377	(51)	440	(455)	(36)	-0.01%	0.08%	-0.08%	-0.01%
Transit and Ground Passenger Transportation	12,271	265	387	(121)	(1)	0.12%	0.17%	-0.06%	0.00%
Pipeline Transportation	59	11	1	10	0	0.95%	0.09%	0.87%	0.00%
Scenic and Sightseeing Transportation	1,997	(45)	76	(121)	0	-0.13%	0.21%	-0.35%	0.00%
Support Activities for Transportation	33,041	404	422	9	(27)	0.07%	0.07%	0.00%	0.00%
Postal Service	14,049	19	175	(156)	0	0.01%	0.07%	-0.06%	0.00%
Couriers and Messengers	4,435	(34)	144	(177)	(1)	-0.04%	0.18%	-0.23%	0.00%
Warehousing and Storage	10,821	(348)	(632)	339	(55)	-0.18%	-0.33%	0.17%	-0.03%
Information	**64,676**	164	**200**	**21**	**(57)**	**0.01%**	**0.02%**	**0.00%**	**0.00%**
Publishing Industries (except Internet)	29,057	(3)	(138)	180	(45)	0.00%	-0.03%	0.03%	-0.01%
Motion Picture and Sound Recording Industries	1,290	80	8	72	0	0.33%	0.03%	0.30%	0.00%
Broadcasting (except Internet)	12,754	49	174	(113)	(12)	0.02%	0.08%	-0.05%	-0.01%
Telecommunications	5,418	24	71	(47)	0	0.02%	0.07%	-0.05%	0.00%
Data Processing, Hosting, and Related Services	4,473	284	(17)	301	0	0.34%	-0.02%	0.36%	0.00%
Other Information Services	11,684	(270)	102	(372)	0	-0.13%	0.05%	-0.18%	0.00%
Finance and Insurance	**73,692**	(1,664)	**(472)**	**(1,182)**	**(10)**	**-0.13%**	**-0.04%**	**-0.09%**	**0.00%**
Monetary Authorities-Central Bank	320	0	0	0	0	0.00%	0.00%	0.00%	0.00%
Credit Intermediation and Related Activities	35,440	(788)	1	(781)	(8)	-0.12%	0.00%	-0.12%	0.00%
Securities, Commodity Contracts, & Oth Relat. Activ.	5,273	(1)	15	(23)	7	0.00%	0.02%	-0.02%	0.01%
Insurance Carriers and Related Activities	32,348	(841)	(462)	(369)	(10)	-0.15%	-0.08%	-0.06%	0.00%
Funds, Trusts, and Other Financial Vehicles	311	(34)	(26)	(9)	1	-0.64%	-0.48%	-0.16%	0.02%
Real Estate and Rental and Leasing	**51,464**	(19)	**40**	**(31)**	**(28)**	**0.00%**	**0.00%**	**0.00%**	**0.00%**
Real Estate	38,515	(433)	63	(469)	(27)	-0.06%	0.01%	-0.07%	0.00%
Rental and Leasing Services	12,634	432	(14)	447	(1)	0.19%	-0.01%	0.19%	0.00%
Lessors of Nonfinancial Intangible Assets (w/o Copyri	315	(18)	(9)	(9)	0	-0.33%	-0.16%	-0.16%	0.00%
Professional, Scientific and Technical Services	**116,372**	2,744	**1,386**	**1,382**	**(24)**	**0.13%**	**0.07%**	**0.07%**	**0.00%**
Professional, Scientific, and Technical Services	116,372	2,744	1,386	1,382	(24)	0.13%	0.07%	0.07%	0.00%
Management of Companies and Enterprises	**4,950**	(92)	**(48)**	**(44)**	**0**	**-0.10%**	**-0.05%**	**-0.05%**	**0.00%**
Management of Companies and Enterprises	4,950	(92)	(48)	(44)	0	-0.10%	-0.05%	-0.05%	0.00%
Admin., Support, Waste Mngt, & Remed. Services	**78,239**	3,390	**1,548**	**1,879**	**(37)**	**0.24%**	**0.11%**	**0.13%**	**0.00%**
Administrative and Support Services	69,444	3,229	1,509	1,739	(19)	0.25%	0.12%	0.14%	0.00%
Waste Management and Remediation Services	8,795	161	39	140	(18)	0.10%	0.02%	0.09%	-0.01%
Educational Services	**385,848**	(9,909)	**4,081**	**(13,980)**	**(10)**	**-0.14%**	**0.06%**	**-0.20%**	**0.00%**
Educational Services	385,848	(9,909)	4,081	(13,980)	(10)	-0.14%	0.06%	-0.20%	0.00%
Health Care and Social Assistance	**441,148**	(7,852)	**5,665**	**(13,488)**	**(29)**	**-0.10%**	**0.07%**	**-0.17%**	**0.00%**
Ambulatory Health Care Services	105,208	805	1,210	(386)	(19)	0.04%	0.06%	-0.02%	0.00%
Hospitals	158,282	(6,529)	2,868	(9,397)	0	-0.23%	0.10%	-0.34%	0.00%
Nursing and Residential Care Facilities	74,817	(2,251)	908	(3,159)	0	-0.17%	0.07%	-0.24%	0.00%
Social Assistance	102,841	123	679	(546)	(10)	0.01%	0.04%	-0.03%	0.00%

Table 7 Cont. p3

Arts, Entertainment and Recreation	**50,793**	333	**7**	**343**	**(17)**	**0.04%**	**0.00%**	**0.04%**	**0.00%**
Performing Arts, Spectator Sports, and Related Indus	8,483	702	(35)	734	3	0.44%	-0.02%	0.46%	0.00%
Museums, Historical Sites, and Similar Institutions	10,398	(483)	(304)	(179)	0	-0.26%	-0.16%	-0.10%	0.00%
Amusement, Gambling, and Recreation Industries	31,912	114	346	(212)	(20)	0.02%	0.06%	-0.04%	0.00%
Accommodation and Food Services	**281,423**	(2,459)	**1,016**	**(3,427)**	**(48)**	**-0.05%**	**0.02%**	**-0.07%**	**0.00%**
Accommodation	88,670	(1,298)	1,245	(2,531)	(12)	-0.08%	0.08%	-0.16%	0.00%
Food Services and Drinking Places	192,753	(1,161)	(229)	(896)	(36)	-0.03%	-0.01%	-0.03%	0.00%
Other Services (except Public Administration)	**183,828**	537	**(1,585)**	**2,150**	**(28)**	**0.02%**	**-0.05%**	**0.06%**	**0.00%**
Repair and Maintenance	38,165	349	69	297	(17)	0.05%	0.01%	0.04%	0.00%
Personal and Laundry Services	32,744	326	(58)	385	(1)	0.06%	-0.01%	0.06%	0.00%
Religious, Grantmaking, Civic, Profes., & Similar Org.	112,919	(138)	(1,596)	1,468	(10)	-0.01%	-0.08%	0.07%	0.00%

Table 8. Annual Average Wages by Industry Sectors and Subsectors in the North Country Region, 1990-2007 (in dollars)

Industry Title	New York	Clinton	Essex	Franklin	Jefferson	Lewis	St Lawrence
All Industries	**61,402**	**33,130**	**29,305**	**28,149**	**30,213**	**29,073**	**31,884**
Agriculture, Forestry, Fishing, and Hunting	**27,154**	**29,334**	**26,239**	**nd**	**24,444**	**26,104**	**30,826**
Crop Production	24,541	26,649	31,818	nd	10,868	nd	16,155
Animal Production	29,072	31,981	21,085	22,285	24,411	25,362	23,918
Forestry and Logging	31,796	25,391	20,909	44,131	28,239	30,133	47,861
Fishing, Hunting and Trapping	33,299	nd	nd	--	--	--	nd
Support Activities for Agriculture and Forestry	31,138	nd	nd	nd	24,281	nd	nd
Mining	**54,411**	**22,828**	**47,962**	**nd**	**35,465**	**--**	**56,034**
Oil and Gas Extraction	82,189	--	--	--	--	--	--
Mining (except Oil and Gas)	51,210	22,828	47,962	nd	nd	--	56,034
Support Activities for Mining	65,357	--	--	--	nd	--	nd
Utilities	**92,622**	**82,251**	**65,958**	**62829**	**82,105**	**60,090**	**74,609**
Construction	**55,873**	**45,283**	**41,197**	**28995**	**41,497**	**39,424**	**41,698**
Construction of Buildings	55,180	39,014	34,908	27517	40,307	22,627	42,013
Heavy and Civil Engineering Construction	72,504	66,746	43,540	27951	51,737	161,554	46,530
Specialty Trade Contractors	54,220	44,848	47,104	30254	41,052	31,522	40,878
Manufacturing	**56,001**	**45,827**	**53,250**	**31486**	**40,189**	**42,527**	**55,411**
Food Manufacturing	38,114	11,079	17,684	nd	38,917	39,820	30,312
Beverage and Tobacco Product Manufacturing	98,178	nd	nd	--	nd	--	nd
Textile Mills	55,800	nd	--	--	23,898	--	--
Textile Product Mills	39,636	--	nd	nd	nd	--	--
Apparel Manufacturing	47,524	nd	nd	nd	nd	--	nd
Leather and Allied Product Manufacturing	39,778	nd	--	--	--	--	nd
Wood Product Manufacturing	36,219	22,557	nd	32,663	29,086	28,075	26,848
Paper Manufacturing	50,849	44,416	nd	--	43,850	50,027	52,296
Printing and Related Support Activities	46,805	23,613	23,638	21,473	27,859	nd	nd
Petroleum and Coal Products Manufacturing	60,612	nd	nd	nd	nd	--	nd
Chemical Manufacturing	69,330	nd	nd	nd	nd	nd	nd
Plastics and Rubber Products Manufacturing	42,174	31,721	--	nd	nd		nd
Nonmetallic Mineral Product Manufacturing	50,842	nd	31,955	20,034	36,034	nd	57,343
Primary Metal Manufacturing	57,140	nd	--	--	--	--	72,177
Fabricated Metal Product Manufacturing	47,134	37,092	nd	nd	nd	nd	39,207
Machinery Manufacturing	61,022	nd	nd	--	nd	nd	
Computer and Electronic Product Manufacturing	81,713	33,097	nd	--	nd	--	54,498
Electr. Equip., Appliance, & Compon. Manuftr.	52,123	nd	nd	--	32,142	--	nd
Transportation Equipment Manufacturing	66,489	nd	nd	--	nd	--	--
Furniture and Related Product Manufacturing	38,439	nd	23,086	21,868	nd	19,110	--
Miscellaneous Manufacturing	49,499	31,716	nd	nd	nd	nd	42,037
Wholesale Trade	**69,186**	**39,325**	**29,755**	**34,918**	**40,021**	**37,247**	**35,318**
Merchant Wholesalers, Durable Goods	65,353	39,682	32,427	36,717	38,275	nd	36,719
Merchant Wholesalers, Nondurable Goods	68,834	37,218	26,529	31,327	41,271	30,132	30,228

Table 8 Cont. p.2

Retail Trade	**29,191**	**22,223**	**21,698**	**21,366**	**22,614**	**19,449**	**21,182**
Motor Vehicle and Parts Dealers	44,414	30,760	31,207	25,904	34,490	26,301	29,378
Furniture and Home Furnishings Stores	33,654	24,185	nd	21,663	32,057	nd	25,305
Electronics and Appliance Stores	41,215	21,608	nd	nd	22,728	nd	20,382
Buld. Material and Garden Equip. & Supplies Dealers	32,781	32,044	28,153	26,654	26,423	23,016	22,621
Food and Beverage Stores	21,916	17,379	16,847	18,887	17,619	15,688	18,892
Health and Personal Care Stores	35,375	28,608	32,203	28,844	28,843	nd	28,476
Gasoline Stations	18,656	16,283	16,660	14,626	15,781	13,436	14,915
Clothing and Clothing Accessories Stores	27,726	12,485	16,460	20,049	13,683	--	15,083
Sporting Goods, Hobby, Book, and Music Stores	20,547	15,279	18,328	nd	15,541	nd	16,197
General Merchandise Stores	21,793	18,137	19,743	17,059	17,995	nd	18,309
Miscellaneous Store Retailers	30,888	24,117	16,950	17,214	18,533	6,241	16,203
Nonstore Retailers	52,245	35,710	33,737	31,010	35,152	nd	29,776
Transportation and Warehousing	**42,366**	**32,833**	**21,316**	**37,920**	**36,483**	**33,450**	**24,452**
Air Transportation	62,634	nd	nd	nd	nd	--	--
Rail Transportation	43,465	nd	--	--	nd	--	--
Water Transportation	79,131	nd	nd	--	--	--	--
Truck Transportation	42,484	37,080	21,618	38,566	34,279	28,691	33,913
Transit and Ground Passenger Transportation	30,215	20,388	nd	--	21,767	nd	12,743
Pipeline Transportation	69,374	--	--	--	nd	--	--
Scenic and Sightseeing Transportation	29,142	--	--	--	nd	--	nd
Support Activities for Transportation	48,173	34,550	nd	nd	45,199	--	31,139
Postal Service	27,505	--	nd	--	nd	--	--
Couriers and Messengers	39,150	29,044	--	--	37,998	--	nd
Warehousing and Storage	38,572	nd	nd	nd	--	--	51,107
Information	**86,303**	**40,278**	**34,567**	**30,838**	**37,143**	**20,657**	**35,679**
Publishing Industries (except Internet)	87,326	30,741	28,571	17,533	31,833	nd	25,103
Motion Picture and Sound Recording Industries	83,590	nd	nd	nd	nd	nd	nd
Broadcasting (except Internet)	102,087	37,058	nd	nd	33,858	nd	26,648
Telecommunications	82,275	63,173	60,042	72,740	56,631	nd	63,734
Data Processing, Hosting, and Related Services	93,929	nd	--	nd	nd	--	nd
Other Information Services	64,615	14,530	10,139	nd	17,276	6,809	19,729
Finance and Insurance	**207,965**	**42,180**	**38,299**	**32,503**	**44,116**	**39,529**	**37,713**
Credit Intermediation and Related Activities	113,118	36,480	34,945	30,951	37,551	33,454	33,948
Securities, Commodity Contracts, & Oth Relat.	379,615	77,490	nd	nd	nd	nd	154,065
Insurance Carriers and Related Activities	89,466	45,768	30,398	31,559	44,177	nd	34,028
Funds, Trusts, and Other Financial Vehicles	nd	--	nd	nd	nd	--	--
Real Estate and Rental and Leasing	**55,674**	**26,112**	**23,126**	**21,454**	**24,665**	**20,623**	**20,112**
Real Estate	56,249	28,314	nd	22,784	22,095	20,668	19,979
Rental and Leasing Services	44,730	21,606	nd	18,981	30,276	20,390	20,224
Lessors of Nonfin. Intangible Assets (w/o Copyright)	129,056	nd	nd	--	--	--	--
Professional, Scientific and Technical Services	**84,873**	**28,210**	**35,095**	**47,267**	**40,358**	**35,071**	**32,099**
Management of Companies and Enterprises	**141,205**	**358,745**	**25,813**	**nd**	**57,732**	**nd**	**45,890**
Admin., Support, Waste Mngt, & Remed. Serv.	**39,422**	**20,124**	**19,306**	**nd**	**23,153**	**nd**	**24,658**
Administrative and Support Services	38,924	18,563	17,903	26,447	23,042	15,043	23,457
Waste Management and Remediation Services	49,615	43,195	34,002	nd	25,178	nd	37,291
Educational Services	**43,660**	**25,563**	**29,985**	**26,826**	**20,451**	**nd**	**38,902**
Health Care and Social Assistance	**41,395**	**38,140**	**32,247**	**34,262**	**36,663**	**nd**	**30,605**
Ambulatory Health Care Services	47,654	43,033	nd	nd	47,767	42,258	39,512
Hospitals	54,365	nd	nd	nd	41,674	--	39,140
Nursing and Residential Care Facilities	31,992	25,201	31,852	22,092	25,804	nd	23,332
Social Assistance	24,665	nd	21,803	20,625	23,204	17,619	17,600
Arts, Entertainment and Recreation	**44,550**	**17,696**	**23,121**	**19,562**	**15,821**	**12,769**	**13,323**
Performing Arts, Spectator Sports, and Related Ind.	79,517	nd	16,569	nd	16,118	nd	nd
Museums, Historical Sites, and Similar Institutions	39,935	nd	19,413	nd	15,733	nd	nd
Amusement, Gambling, and Recreation Industries	21,431	17,899	25,541	17,575	15,790	13,277	12,278
Accommodation and Food Services	**21,114**	**13,343**	**19,422**	**13,642**	**13,288**	**10,095**	**11,614**
Accommodation	35,266	16,183	23,528	21,879	15,806	12,301	14,385
Food Services and Drinking Places	18,751	12,824	14,877	12,258	12,934	9,574	11,278
Other Services (except Public Administration)	**31,876**	**17,909**	**19,335**	**24,558**	**21,360**	**14,033**	**20,428**
Repair and Maintenance	32,957	28,405	23,423	20,800	31,929	22,440	27,792
Personal and Laundry Services	25,107	20,210	16,853	21,178	17,528	11,526	18,300
Religious, Grantmaking, Civic, Profes., & Similar Org.	37,753	13,535	18,939	26,703	13,445	10,309	18,253

5.2 Job Gain

The average wage for Retail Trade is $21,417. There are 12 sub-categories, with the average wage in each ranging from $15,283 to $33,077. The net gain in wages for this category is $28,127,406. The average wage for Professional, Scientific and Technical services is $36,350, resulting in a total wage gain of $99,744,400. The average wage for Admin, Support, Waste Management and Remedial services is $21,810. There are 2 sub-categories, with average wages of $20,743 and $34,917. The net gain in wages for this category is $71,728,954. The total wage gain for these three areas of job gain is $201,600,760.

The above calculations demonstrate that a large net loss is realized due to compounding of job gains and losses. The region's realized net gains/losses of wages are directly related to some of the findings discussed above. First, that new born businesses offered relatively fewer jobs compared to the jobs lost due to businesses shutting down; and second, that most of the new jobs are minimum wage, low paying jobs. These findings suggest possible changes in the region's tax base; disposable income, standard of living, as well as overall economic conditions.

5.3 Breakdown within Loss Areas

Jobs lost in the Manufacturing area accounted for approximately 24.8 percent of the total job loss for the region. Of these losses, the largest loss was in the paper manufacturing segment. This high job loss, coupled with the available data showing that the average wages for this segment were among the highest in the overall category, resulted in an overall wage loss of $122,500,437. This wage loss accounts for approximately 51 percent of the total wage loss in the manufacturing area, indicating that the loss of paper manufacturing jobs had a significant impact on the economy.

Although the average wage in the area of Educational services is much lower than that of Manufacturing or Health Care, it is significantly higher than both Retail and Admin., Support, Waste Management & Remedial Services. The job losses in this area also accounted for approximately 31.7 percent of the total job loss. With a total impact of $280,870,605 in lost wages, the loss felt from this area alone surpasses the total wages gained in the three areas of job gains noted above.

Finally, the loss of jobs in the Health Care category accounted for approximately 25 percent of the total job loss. Within this category, there was an increase in jobs (805) connected to Ambulatory Health Care services. The data shows that the average wage for this sub-category was the highest in the category. This increase offset the overall wage losses of this category by $34,729,310. There was a small increase (103) in jobs in the Social Services sub-category. The average wage in that category is the lowest in the segment at $20,170, which resulted in an offset of the category loss of $2,480,910.

5.4 Breakdown within Gain Areas

The largest gain in jobs (3,390) occurred within the area of Admin, Support, Waste Management and Remediation services. This category is divided into two sub-categories; Admin and Support

services, and Waste Management and Remediation services. The largest job gain (3,299) in this category occurred in the Admin and Support services sub-category. The average wage in that sub-category, $20,742, is far lower than that of the Waste Management sub-category, $34,916, meaning that the bulk of job growth in this category is attributed to the lowest average wage jobs.

The second largest gain in jobs (2744) occurred within the area of Professional, Scientific and Technical services. This category provided the largest financial gain of the three areas of job gains detailed here and was responsible for the largest gain of all job/wage gains.

Finally, the third largest gain in jobs occurred in the Retail Trade category. In this category, there was an overall gain of 3,728 jobs and an overall loss of 1,734 jobs, resulting in a net gain of 1,994. The largest amount of job gains in this category occurred in the sub-categories with the lowest average wages, ranging from $15,552 to $17,612, while the sub-categories with the highest average wages, ranging from $18,248 to $29,673, saw the largest job loss.

The top three job loss categories are also the top three categories in the number of business “deaths”. Both Educational Services and Health Care had establishment “deaths” of over 13,000 for the period. At the same time, these establishments had positive expansion in the workforce of surviving establishments which helped to offset the loss. The Manufacturing category saw a high “death” rate, 6,596 companies, along with a contraction of the workforce in surviving businesses which added to the reduction in jobs.

Both the Professional and Admin categories had the highest “birth” rates for the listed establishments. This, coupled with expansion of workforce in existing establishments for both categories, resulted in the highest job gains among all businesses. The Retail Trade category saw a death, or reduction, in the number of businesses, but that was offset by a large expansion in the workforce of surviving businesses.

There is evidence then, that most critical factors for job growth are the birth or death rate of establishments, combined with an expansion or contraction in the workforce of existing establishments.

With the exception of Agriculture, Forestry, Fishing and Hunting, the North Country Region falls well short of the average statewide wages for all businesses.

Most of the job creation has been in businesses that have relatively low average wages, while most of the job loss has been in businesses with higher wages.

During the period of review, deaths of companies totaled 47,525, while births totaled 6,635.

6. Conclusions and Policy Implications

The study looks at the sources of employment growth in the North Country region for the period 1990-2007. I found that employment growth is driven much more by expansion and contraction of existing establishments and birth and death of new establishments, than by business relocations. Business relocation of establishments in and out of the area has a small effect on the loss of jobs, with

businesses moving most often within, rather than out of the region. The length of the interval of analysis slightly affects the decomposition of the sources of employment change, however, the relative order of significance of the sources of job creation and job destruction remains the same. With the exception of Agriculture, Forestry, Fishing and Hunting, the North Country Region falls well short of the average statewide wages for all industries.

The overall employment figures in the North Country region appear to remain relatively stable during the period under observation. However, simply looking at employment figures alone does not give a complete picture of the economic health of the region. As detailed in the body of this study, job losses were greatest among those industries with higher wages and job gains were greatest among those industries with low wages. As this is a regional study, the impact of lower wages on Federal and State income taxes was not addressed. However, the impact of the resultant differential in wages must logically affect the region in a negative manner.

As overall wages and earning capability in an area decrease, disposable income will also fall, even if prices for necessities such as food and housing remain stable. Thus, even though businesses that provide necessities may remain fairly insulated from the downturn in wages, those that deal in nondurables, goods not considered as essential or necessary for day to day survival (new cars, electronics, household furnishings, etc.) will likely see a decrease in sales. If a positive can be taken from this, it is possible that businesses involved in the repair of these types of goods will see an increase in their business. Even those businesses that deal in necessities may see a change in the purchasing patterns of people with lesser wages. This slowing of consumption will affect not only the businesses, but will lower the amount of sales tax received by local governments.

There are some areas in the North Country region that will not be affected as strongly due to their proximity to major metropolitan areas in Canada coupled with a favorable exchange rate between the US and Canada. Indeed, this may explain the increase in jobs in the retail sector, which tend to be low paying.

In order to increase wages and the standard of living in the North Country region, I believe it is essential that local leaders recruit businesses that require workers with higher skills and, subsequently, that pay higher wages. Although tax breaks and low utility rates will help attract businesses, those factors alone will not necessarily attract businesses that will pay the wages necessary to increase the area's standard of living. It is essential, then, that local community colleges and technical schools institute programs that provide a skilled labor force, targeted toward those industries that are sought after. This may entail some visionary thinking regarding industries that are not yet established, but that have potential for long term growth and employment. It will take an investment, time and, to some, a leap of faith, but without the willingness to change the way the region approaches employment, we will remain, at best, stagnant and, at worst, will see more of a decline in the economic health of this region.

In conclusion, studying the sources of employment growth on local, regional and state levels proves invaluable when it comes to formulating labor market policies. In defense of this statement I would point out the fact that the Bureau of Labor Statistics started publishing quarterly data on business employment dynamics in 2003. The results of such studies can be used by local governments for allocation of resources, direction of incentives and recruitment of viable businesses with a long-term commitment to the area.

ENDNOTES

1. The information on employment, wages, regional competitive industries and employment projections by industry in this section is taken from the Bureau of Labor Statistics Quarterly Census of Employment and Wages. The information on age demographics by industry is taken from the New York State Department of Labor Local Employment Dynamics database.
2. The criteria state that location quotients (ratio of concentration of employment in the region to that of the state) should be greater than or equal to 1.25, relative average wage in the region compared to the state greater than 100 percent and differential employment growth rate greater than or equal to 20 percent.
3. The decomposition of the sources of employment growth (Table 1) is done for periods of three years, i.e., using more reliable averaged data, because the purpose of the decomposition is to detect possible trends over the observed period and to establish which of the three sources is the most important. The analysis of each of the three sources of employment growth is done annually because it helps establish a connection with changes occurring in the corresponding year.

REFERENCES

Neumark, D., Junfu Z. and B. Wall (2008). “Do Small Businesses Create More Jobs? New Evidence from the National Establishment Time Series.” *NBER Working Paper No. 13818*, Cambridge, Massachusetts.

Neumark, D., Junfu Z. and B. Wall (2006). “Employment Dynamics and Business Relocation: New Evidence from the National Establishment Time Series.” *NBER Working Paper No. 11647*, Cambridge, Massachusetts.

Neumark, D., Junfu Z. and B. Wall (2005). “Business Establishment Dynamics and Employment Growth.” *Public Policy Institute of California Working Paper.*

Walls & Associates (2003). “NETS: National Establishment Time-Series Database,” Oakland, California.

Basketball Market Efficiency and the *Big Dog Bias*

Ladd Kochman* and Randy Goodwin*

Abstract

A betting rule is devised to profit from an alleged unwillingness of strong favorites in the National Basketball Association to cover large point spreads. Imaginary wagers placed on NBA underdogs awarded 10+ points by Las Vegas oddsmakers produced a significantly nonrandom wins-to-bets ratio of 53.4 percent during the five consecutive seasons ending in 2007. The failure to generate a W/B ratio of at least 55.4 percent over the 758 games meeting our point spread constraint precludes any claim of profitability.

Introduction

Regarded by many researchers (e.g., Gandar et al., 1988) as a useful and handy laboratory for testing the average economic judgments of people, the sports betting market has generally supported the idea that regular profits in a competitive environment are elusive. Where they have surfaced (e.g., Vergin and Sosik, 1999), replications (e.g., Gandar et al., 2001) quickly exposed their short-lived nature. Even steady losses are unusual since the responsible betting rule could be reversed for consistent gains.

One exception to breakeven results may be the success of underdogs against the point spread. Where talent and game site make one team more likely to win, oddsmakers award points to the weaker opponent in order to divide the betting public in half. Kochman and Goodwin (2007) found that underdogs in the National Football League (NFL) generated a significantly nonrandom wins-to-bets ratio (51.9 percent) over the 1991-2004 seasons. Kochman and Goodwin (2004) reported a significantly profitable W/B ratio (58.1 percent) for NFL underdogs in preseason games between 1998 and 2002. Other studies touting the pointwise success of NFL underdogs include Golec and Tamarkin (1991) and Amoako-Adu et al. (1984).

Why betting outcomes seem to favor underdogs in the NFL went largely unaddressed until Kochman and Gilliam (2010). They reasoned that the significantly nonrandom W/B ratios (57.1 percent) produced by decided underdogs in the NFL during the 2002-2009 years benefited from the reluctance of favorites to win by wide margins. The writers argued that since NFL clubs often meet annually and even twice in the same season, a lopsided score might become a revenge factor for the humbled loser. Too, unlike outcomes in college football, winning margins in professional football have no bowl or ranking implications.

*Coles College of Business, Kennesaw State University

Methodology

The alleged unwillingness of favorites to roll up big margins in professional contests would seem to extend to basketball. In addition to the avoidance of a revenge factor and the absence of bowl and ranking significance, slimmer margins could result from the conservation of energy necessitated by multiple games in the space of a week. When Paul and Weinbach (2005) found that wagers on heavy underdogs in the National Basketball Association were nonrandomly profitable during the seven seasons ending in 2002, they attributed the success to the inclination of coaches to pull starters for fear of injury as well as a lessening of effort by players when the outcome is no longer in doubt.

To test (and update) that proposition, we hypothesized that wagers on underdogs in the NBA who are rated 10 or more points weaker their respective opponents would serve as a profitable betting rule. Specifically, wins-to-bets ratios generated by double-digit 'dogs in the NBA during the five consecutive seasons ending in 2007 were compiled and screened for nonrandomness and profitability with Equations (1) and (2), respectively. The source of point spreads and final scores was www.Goldsheet.com.

$$(1) \qquad Z_R = \frac{(W/B - 0.500)}{\{[(0.500)(1 - 0.500)]/B\}^{.5}}$$

$$(2) \qquad Z_\pi = \frac{(W/B - 0.524)}{\{[0.524)(1 - 0.524)]/B\}^{.5}}$$

where: Z_R = statistic for testing the null hypothesis of randomness
Z_π = statistic for testing the breakeven null hypothesis
W = number of winning bets
B = number of total bets

Results

What emerges from Table 1 is a competitive market which bends but doesn't break in response to efforts by participants to earn regular profits. While our results were not profitable in the statistical sense, the nonrandom wins-to-bets ratio of 53.4 percent produced a dollar profit when betting \$110 to win \$100[1]. Only by winning 420 or more of our 758 bets could we have legitimately laid claim to an inefficient market. However, recent offers by offshore gambling operators to bet \$105 to win \$100 are cause for re-evaluation. The resulting reduction in the bettor's breakeven mark from 52.4 percent to 51.2 percent[2] would improve our dollar profits from \$1670 to \$3435 and our nonrandom 53.4-percent

W/B ratio from $p < 0.10$ to $p < 0.05$ per Equation (1). Nonrandom profitability again proved elusive as significance gained only to $p < 0.20$ when 51.2 percent substituted for 52.4 percent in Equation (2).

Table 1
Wins-to-bets ratios for NBA underdogs
(2002-03 through 2006-07)

Season	*Wins*	*Bets*	*W/B%*
2006-07	86	144	59.7
2005-06	81	146	55.5
2004-05	95	177	53.7
2003-04	71	144	49.3
2002-03	72	147	49.0
All	***405***	***758***	***53.4****

*significantly nonrandom at $p < 0.10$

Not unlike Paul and Weinbach, we separately tracked the pointwise performance of big underdogs playing at home. Where these writers reported a nonrandomly profitable wins-to-bets ratio of 60.2 percent for underdogs getting 10 or more points, we found similar success—62.5 percent. However, while they identified 166 double-digit 'dogs and were able to generate a nonrandomly profitable W/B ratio at $p < 0.05$, we located only 40 such opportunities and could claim neither significant profitability nor nonrandomness

Table 2
Wins-to-bets ratios for double-digit NBA home underdogs
(2002-03 through 2006-07)

Season	*Wins*	*Bets*	*W/B%*
2006-07	5	7	71.4
2005-06	4	8	50.0
2004-05	6	10	60.0
2003-04	4	6	66.7
2002-03	6	9	66.7
All	***25***	***40***	***62.5***

Conclusions

It is tempting to conclude that if Paul and Weinbach's success with double-digit home NBA underdogs for the seven seasons immediately preceding our five-year period were combined with our results, the competitive market for NBA wagers would be judged to be less than efficient. Winning 125 of 206 bets placed on heavy NBA underdogs playing at home over the 12 seasons ending in 2007 represents a wins-to-bets ratio (60.7 percent) that is nonrandomly profitable at $p < 0.02$ regardless of the breakeven rate. Another implication of the merged data is that the betting advantage connected to big home NBA underdogs has shrunk over time. While Paul and Weinbach found an average of nearly 24 games in which the home underdog was given 10+ points per season, our yearly mean was only eight. Although greater parity among NBA teams is one possible explanation, a more likely scenario is that oddsmakers have recognized and corrected the pattern.

ENDNOTES

1. The typical sports-betting wager requires bettors to risk $110 to win $100. It is referred to as the "10-cent line" or "dime line".
2. When wagering $110 to win $100, bettors must win 11 of 21 bets (or 52.4 percent) in order to break even. When betting $105 to win $100, bettors need to win only 21 of 41 wagers (or 51.2 percent) to break even.

REFERENCES

Amoako-Adu, B., H. Marmer and J. Yargil. "The Efficiency of Certain Speculative Markets and Gambler Behavior." *Journal of Economics and Business*, 1984.

Gandar, J., R. Zuber and R. Lamb. "The Home Field Advantage Revisited: A Search for the Bias in Other Sports Betting Markets." *Journal of Economics and Business*, July-August 2001.

Gandar, J., R. Zuber, T. O'Brien and B. Russo. "Testing Rationality in the Point Spread Betting Market." *Journal of Finance*, 1988.

Golec, J. and M. Tamarkin. "The Degree of Inefficiency in the Football Betting Market." *Journal of Financial Economics*, 1991.

Kochman, L. and K. Gilliam. "Market Efficiency and the 'Big Dog' Bias." *Journal of Business and Economic Perspectives*, Fall-Winter 2010.

Kochman, L. and R. Goodwin. "Behavioral Finance and Football Betting." *New York Economic Review*, Fall 2007.

Kochman, L. and R. Goodwin. "Underdogs are Man's Best Friend." *Journal of Sports Economics*, November 2004.

Paul, Rodney, and A. Weinbach. "Bettors Misperceptions in the NBA: The Overbetting of Large Favorites and the 'Hot Hand'." *Journal of Sports Economics*, November 2005.

Vergin, R. and J. Sosik. "No Place Like Home: An Examination of the Home Field Advantage in Gambling Strategies in NFL Football." *Journal of Economics and Business*, 1999.

Who Defaults on their Home Mortgage?

Eric Doviak* **Sean MacDonald†**

ABSTRACT

Since Feb. 13, 2010, detailed information on every home mortgage default and foreclosure in New York State must be filed with the New York State Department of Financial Services (DFS). The data come from pre-foreclosure filing (PFF) notices that mortgage servicers must send to both the borrower and the DFS 90 days prior to initiating the foreclosure process and when a foreclosure has commenced. Pairing the PFF data with data on originations from the Home Mortgage Disclosure Act (HMDA) reveals the race and ethnicity of borrowers who defaulted on their home mortgages. HMDA analyses consistently reveal strong racial and ethnic disparities in lending practices. Our analysis shows that the same disparities reappear in the default data (i.e the PFF data), which suggests that lending disparities contributed to the higher default rates that we observe among black and Latino borrowers. Our analysis also suggests that labor market recovery would do the most to reduce the rate of mortgage default.

1 INTRODUCTION

In 2006, borrowers' inability to repay subprime mortgages sounded the first warning bell that the nation's housing bubble was about to burst. Subprime lending – which was virtually non-existent at the peak of the previous real estate boom in 1989-90 – had increased from 5 percent of total mortgage originations in 1994 to almost 20 percent in 2005 (Doms et al., 2007). More disturbingly, at the beginning of the decade, the US Department of Housing and Urban Development (2000a) had already identified a pattern of racial and ethnic disparities in subprime lending and noted that the pattern transcended income level.

By the time markets tumbled in 2008, the racial and ethnic character of subprime lending ensured that minority borrowers would be particularly hard hit by the accelerating foreclosure crisis. To shed more light on the causes of the foreclosure crisis and its impact on minority borrowers, this article takes a closer look the factors affecting a homeowner's probability of default. Specifically, we look at defaults among owner-occupied, first-lien mortgages originated between 2004 and 2008 (the period when the most risky loans were originated).

To study the causes of default, we combine data on originations from the Home Mortgage Disclosure Act originations (HMDA) to the pre-foreclosure filing (PFF) data from the New York State Department of

*Brooklyn College, City University of New York – eric@doviak.net

†New York City College of Technology, City University of New York – smacdonald@citytech.cuny.edu

Financial Services (DFS), formerly known as the New York State Banking Department (NYSBD)[1,2], and trace loans from origination to default.

The HMDA data are particularly valuable because their geographic focus enables state bank regulators (like the DFS) to track institutions' lending neighborhood-by-neighborhood. When combined with other sources of information (e.g. reports from bank examinations), the HMDA data help bank regulators explore the question of whether local financial institutions are meeting the saving, borrowing and housing needs of low-to-moderate income communities and minority communities.

Academics frequently shun the HMDA data however because the data do not provide a detailed picture of each loan application. The HMDA data do contain borrower's income, loan amount and a small window on the interest rate, but critical details like the borrower's credit score and loan-to-value ratio are missing.

In defense of the HMDA data, we argue that they are a very important data source because they are the most comprehensive and it's the data source that the US Department of Housing and Urban Development had used in its (previously mentioned) research on racial and ethnic disparities in subprime lending. In his 2007 *Report to the Interagency Task Force on Subprime Mortgages*, NYS Banking Superintendent Neiman declared that "analysis of HMDA data is a priority" because the HMDA data is publicly available and because it is the data that regulators use to track lending neighborhood-by-neighborhood.

One year later, the task force was promoted to a governor's level task force and issued a follow-up report (Neiman, 2008) detailing its analysis of data from the Mortgage Bankers Association, the LoanPerformance Data, the HMDA data and the RealtyTrac data. The report noted a sharp increase in foreclosures since 2005, noted the racial disparities in lending practices, noted that subprime loans constituted almost half of serious delinquencies and noted that subprime loans with adjustable interest rates were seriously delinquent at rates far above the average for all loans (22 percent vs. 3 percent in New York State).

In the same report, Neiman also cited the State Foreclosure Prevention Working Group (2008) findings that seven out of ten seriously delinquent borrowers were not on track for any loss-mitigation outcome, that loss-mitigation departments were severely over-worked and – critically – that loss mitigation procedures (when followed) do increase the chances that homeowners will receive a loan modification.

Given these findings and upon Neiman's recommendation, the New York State legislature passed and Gov. David Paterson signed (on Dec. 15, 2009) the Mortgage Foreclosure Law which amended the *Real Property Actions and Proceedings* and inserted a new section (§ 1306) to require mortgage servicers to send borrowers a 90-day notice prior to commencing foreclosure proceedings on owner-occupied residential mortgages.

Additionally, the new law required mortgage servicers to electronically submit the pre-foreclosure filings (PFF) to the NYSBD (later DFS) for the purpose of putting borrowers in touch with non-profit mortgage counselors and "to perform an analysis of loan types which were the subject of a pre-foreclosure notice." The language in § 1306 does not permit state bank regulators to sanction a lender or mortgage servicer for infractions discovered in the PFF filings. Enforcement of the law is left to the courts. Consequently, servicers have a strong incentive to submit honest and accurate filings.

When deciding what information about the loans to collect from the mortgage servicers, the NYSBD chose to collect information that would help it match the pre-foreclosure filings to the corresponding HMDA filings. Furthermore, in its two reports analyzing the PFF data (2010a; 2010b), the NYSBD compared the

PFF data to the HMDA data to estimate the mortgage default rate by county and to compare mortgage default rates by loan amount.

Because the PFF data were designed to be matched to the HMDA data and given HMDA's historic and regulatory importance, this article continues the tradition of HMDA analysis by merging the PFF data into the HMDA data and asking what characteristics make a borrower more likely to default on his/her home mortgage.

We begin by discussing the literature on discrimination in mortgage lending in section 2. We then describe the PFF data in more detail and explain how we paired it with the HMDA data in section 3. Section 4 discusses the racial and ethnic disparities that we observe in the HMDA data (on originations) and the HMDA data (on defaults). The analysis there shows that blacks and Latinos tend to take high-cost loans at a higher rate than their white and non-Latino counterparts and those disparities in lending are reflected in the higher default rates among black and Latino borrowers.

Section 5 provides a basic regression analysis to further explore some of the questions that arise in the PFF to HMDA comparisons. Missing variables hinder efforts to properly understand what we observe in the HMDA data, but the estimated coefficients on race and ethnicity are striking. Our models also suggest that labor market conditions have the strongest effect on a borrower's probability of default.

2 REVIEW OF THE DISCRIMINATION LITERATURE

Although there is a link between lending disparities and the foreclosure crisis, we must separate the two events in time. To that end, this section will first review the literature on subprime lending in predominantly black and Latino communities before turning to its relationship with the subsequent foreclosure crisis. That having been said, several studies of the foreclosure crisis did look for its roots in the residential segregation seen in many of the nation's metropolitan areas (Rugh and Massey, 2010) and the lack of alternatives to subprime lenders in predominantly minority communities (US Department of Housing and Urban Development, 2000b). However, other factors also played a role. Doms et al. (2007) include changes in home prices and home price volatility among its causes, while Morgan et al. (2012) discuss the inability to exclude the mortgage on a primary residence from bankruptcy protection after passage of the 2005 Bankruptcy Reform Act.

Returning to the character of lending in black and Latino communities, we remind the reader that the HMDA data are limited. Analysis of the HMDA data strongly suggests that blacks and Latinos had difficulty obtaining loans on terms comparable to their white and non-Latino counterparts, but because the HMDA data omit important variables (such as the borrower's credit score and the loan-to-value ratio) one cannot prove a pattern of discrimination. In other words, it is easy to show that high-cost lending was most prevalent in predominantly minority communities, but it is difficult to take the next step and use the HMDA data to show that such lending is evidence of discrimination.

In an effort to overcome some of HMDA's limitations, Bocian et al. (2006) paired the 2004 HMDA data with a proprietary dataset of 177,000 subprime loans and found that after controlling for other factors (such as the borrower's FICO score and the loan-to-value ratio), blacks and Latinos received a disproportionate share of high-cost loans. The major limitation of their study however is that it does not sample from the universe of originations. It is a particular firm's sample of loans. The findings may suffer from selection bias

and are certainly not generalizable to the broader market. More importantly, Bocian et al.'s work cannot be considered evidence of discrimination because it does not explain why borrowers took a subprime loan as opposed to a prime loan.

When employing the HMDA data to study the broader market researchers are generally confined to finding a correlation between racial segregation and the probability of receiving a high-cost loan. For example, Squires et al. (2009) use the 2000 Census data to construct a dissimilarity index to obtain a measure of the ten most segregated and the ten least segregated metropolitan areas in the US. They then compare the indices derived to the percentage of high-cost loans originated. Using 2006 HMDA data and the 2006 American Community Survey, they employ a multivariate OLS model (to control for several MSA-level variables) and find that racial segregation is a significant predictor of the percentage of high-cost loan originations in an MSA. Their results suggest that a 10 percent increase in black segregation was associated with a 1.4 percent increase in high-cost loans.

Other studies have also found a link between the racial composition of a neighborhood and the share of subprime lending in that neighborhood. For example, in a joint study conducted by several community organizations, Bromley et al. (2008) focused on subprime lending activity in 2006 across seven large US metropolitan areas. Data collected on the number of high-risk loans originated by a sample of 35 subprime lenders during that year indicated that these lenders accounted for an estimated 20 percent of the market share of subprime loans in predominantly minority neighborhoods within these metropolitan areas. Further, more than 40 percent of the loans made by high-risk lenders in these metropolitan areas were in neighborhoods where the share of minority residents was 80 percent or more. Subprime lenders' market share was also positively correlated with a census tract's share of minority residents.

The US Department of Housing and Urban Development (2000b) also found a disproportionate concentration of subprime lending in predominantly minority – and particularly – African-American communities. In the study, which focuses primarily on subprime refinance lending, the number of subprime refinance loans originated in the New York metropolitan area between 1993 and 1998 increased by an estimated 350 percent. The study also found that subprime loans were three times more likely to be originated in lower-income neighborhoods in the New York metropolitan area than in higher-income neighborhoods, and more than four times more likely in predominantly black than in predominantly white neighborhoods.

It's particularly interesting to note that their study was published in 2000, which indicates that subprime lending expanded rapidly into minority communities long before the subprime mortgage meltdown began in 2006. According to Laderman (2001), one factor which contributed to the expansion of subprime mortgage lending in the early 1990s was the increasing frequency with which mortgages were securitized. Securitization reduced the risk associated with lending to subprime borrowers and it enabled large sums to be assembled for the purpose of subprime lending. Another factor that Laderman cites was deregulation. Prior to passage of the Depository Institutions Deregulation and Monetary Control Act in 1980, limits were imposed on the interest rates that lenders could charge. Once the caps were lifted, lenders could raise interest rates high enough to absorb the risk associated with lending to subprime borrowers.

In a separate but related report, the US Department of Housing and Urban Development (2000a) found that the pattern of originating subprime loans to minorities transcended income level and that this pattern established itself long before the subprime loan market reached its peak during the early 2000s.

Instead, borrowers in high-income black neighborhoods were twice as likely as those in low-income white neighborhoods to take out a subprime loan. Specifically, the study found that just six percent of borrowers in high-income white neighborhoods had subprime loans while 39 percent of borrowers in upper-income black neighborhoods had subprime loans. This figure was more than twice the 18 percent rate for borrowers in low-income white neighborhoods.

Such findings are disturbing. The lack of information on credit scores in the HMDA data may explain some of the disparities in the rate spreads among individual borrowers, but it is hard to see how this could be applicable across neighborhoods. In other words, it is easy to imagine individual cases where a high-income black borrower's credit score is lower than a low-income white borrower's credit score; however it is difficult to see how the average credit score of a high-income black neighborhood could be lower than the average credit score of a low-income white neighborhood.

Given that blacks and Latinos took a disproportionately high share of subprime loans, one would also expect a disproportionately high rate of foreclosure in black and Latino communities. This is precisely what two other studies have found.

Rugh and Massey (2010) attempt to link the correlation between high-cost lending and the patterns of residential segregation to the subprime foreclosure crisis. To find the link, they obtained the total number of foreclosures between 2006 and 2008 from RealtyTrac's foreclosure database and computed the foreclosure rate as the number of filings per household unit. They then used the 2004-2006 HMDA data to compute the share of high-cost loans[3] in each MSA. To derive a measure of regulatory oversight, they also computed the share of loans within the MSAs that were originated by institutions covered under the Community Reinvestment Act (CRA). Rugh and Massey then regress the number and rate of foreclosures in the nation's 100 largest MSAs on two measures of segregation: residential unevenness and spatial isolation. Their regression results suggest that residential segregation and the share of high-cost loans are both positively correlated with the number and rate of foreclosures across U.S. metropolitan areas.

One frustrating omission in their published paper however is the lack of a regression of the high-cost lending share on measures of racial and ethnic segregation. If segregation enabled lenders to target minorities for high-cost loans (as Rugh and Massey claim), then they should have regressed the high-cost lending share on measures of segregation. If the coefficient were positive and statistically significant, then their claims of racial and ethnic targeting would have a firmer foundation.

Gerardi and Willen (2008) also examine the relationship between foreclosures and subprime lending in urban and minority communities. By matching the 1998-2006 HMDA data to deed registry data in the State of Massachusetts, they generate a dataset that contains the universe of mortgages, foreclosures, purchases and sales. In their analysis of the data, they find that a disproportionate share of subprime loans were originated to blacks and Latinos, but these loans proved unsustainable when home prices fell. The records of property sales in their dataset indicate that a "sudden and severe fall in the share of minority home ownership" began in 2005 due to a significant increase in foreclosures among minority homeowners.

The studies reviewed above show that blacks and Latinos took a disproportionately high share of high-cost and subprime loans, but the evidence that this trend reflects discrimination suffers from the limitations of the HMDA data. Nonetheless, the studies do help explain our finding that blacks and Latinos defaulted on their mortgages at a higher rate than their white and non-Latino counterparts.

3 THE NEW YORK STATE PRE-FORECLOSURE FILING DATA

As mentioned previously, our findings come from an analysis of the data that the NYSBD began collecting home mortgage defaults in Feb. 2010. (The DFS later assumed those responsibilities). When borrowers default on their primary residence, their mortgage servicers must send them a pre-foreclosure notice at least 90 days before commencing foreclosure proceedings and file the notice with the DFS.

The DFS collects an extraordinary level of detail on the loans. In addition to names and address, the DFS also collects the current monthly payment, the delinquent contractual payments, the interest rate, whether the loan is a fixed-rate or adjustable-rate mortgage, the date and the amount of the original loan, the lien type, the loan term, whether the loan has been modified or not and whether an investor's approval is necessary to modify the loan. If the default progresses to a *lis pendens* filing (i.e. the first step in the foreclosure process – the filing of the complaint), then servicers are also required to follow up on their initial filing and provide information on the entity filing for foreclosure.

The New York State Banking Department (2010a,b) provided basic analysis of the PFF data. In another paper (Doviak and MacDonald, 2011), we compare the characteristics of loans that did and did not progress from default to a foreclosure filing. The analysis presented in this article uses our combined HMDA-PFF dataset to examine the loan characteristics which make a borrower more likely to default.

Prior to making such comparisons however, we first explain how we prepared the PFF dataset for statistical analysis in subsection 3.1. Then, in subsection 3.2, we explain how we matched the PFF data to the HMDA data. After providing those explanations, we discuss our comparisons in section 4 and we provide a very basic regression analysis in section 5. Section 6 concludes with a discussion of what we learned from the pre-foreclosure filing project.

3.1 PREPARING THE DATA FOR ANALYSIS

One of our first steps in preparing the dataset was to remove duplicate filings. Servicers who missed the three-business day deadline or submitted incorrect information would "re-file" the loan. Some servicers also submitted one filing for each borrower on the loan. The duplicates were fairly easy to identify however, because servicers almost always included their loan numbers with the filing, so the combination of the servicer's identity and the loan number enabled us to uniquely identify each loan[4]. In cases where a servicer submitted one filing for each borrower, we compared the borrower's first and last name to the names of other borrowers on the loan to see if there was a co-applicant or not.

Because servicers re-filed a loan to correct mistakes, we assumed that the filing which was submitted last contained the correct information. However if one of the duplicates contained information on a *lis pendens* filing, we retained that information. Using this method, we found a total of 214,705 unique loans and 33,859 duplicates in the PFF dataset. From there, we removed records that contained obvious errors (e.g. loans that were originated in the future) and records of 90-day letters that were not mailed in the year 2010. This reduced the PFF dataset to 211,962 clean records.

To ensure comparability across loans, we chose to focus on first-lien mortgages. This reduced the PFF dataset to 186,366 records, but it was a necessary step because a first-lien mortgage is very different from a home equity line of credit (HELOC). The former is frequently taken for the purpose of purchasing

Table 1: Distribution of Pre-Foreclosure Filings by Year of Origination

year	total	percent
1976-1989	2,502	1.3%
1990-1999	13,692	7.3%
2000	2,414	1.3%
2001	4,390	2.4%
2002	7,470	4.0%
2003	16,706	9.0%
2004	18,669	10.0%
2005	28,506	15.3%
2006	35,947	19.3%
2007	31,771	17.0%
2008	16,019	8.6%
2009	6,957	3.7%
2010	1,323	0.7%
total	186,366	100.0%
Data: Full PFF		

a home, while the latter is often used for home improvement.

Our analysis pays particular attention to the 130,912 first-lien mortgages that were originated in the years 2004-2008. Table 1 shows that these five years account for 70 percent of all PFF filings on first-lien mortgages. We chose to work with the years 2004-2008 because we wanted to compare the PFF data to the data on originations from the Home Mortgage Disclosure Act (HMDA). We chose 2004 as the first year, because the variables available in the pre-2004 HMDA data were quite limited. At the time of this writing, the 2009 HMDA data were available to us, but we chose not to work with it because lending practices changed dramatically after the subprime mortgage crisis crippled the world financial system in late 2008. Loans originated in 2009 were very different from loans originated in previous years, so – for this analysis – we wanted to focus on loans originated in the years leading up to and including the crisis. One avenue for future research is to compare lending patterns in the periods before and after the crisis to see how those differences affect the rate at which borrowers default.

3.2 MATCHING THE PRE-FORECLOSURE FILING DATA TO THE HMDA ORIGINATIONS DATA

The HMDA originations data contain the FIPS county code and census tract number of each property. This is a particularly valuable piece of information because census tracts have a small population (between 2,500 and 8,000 people) which is fairly homogeneous in terms of socio-economic characteristics and living conditions (US Census Bureau, 2000).

So our first step in matching the PFF data to the HMDA data was to identify the census tract of each property in the PFF dataset from the address. To identify the census tracts, we used Erle's (2005)

Table 2: Pre-Foreclosure Filings by Loan Amount

amount ($1000s)	no PFF	received PFF	overall
under 50	4.9%	2.8%	4.8%
50 to 99	16.5%	13.4%	16.3%
100 to 249	36.1%	27.7%	35.4%
250 to 399	25.8%	33.7%	26.4%
400 to 499	8.3%	12.7%	8.6%
500 and up	8.4%	9.7%	8.5%
total	1,544,118	130,722	1,674,840
Data: Combined HMDA-PFF			

Table 3: Pre-Foreclosure Filings by Applicant Income

income ($1000s)	no PFF	received PFF	overall
under 40	10.9%	9.9%	10.8%
40 to 59	18.0%	15.6%	17.8%
60 to 79	19.2%	18.3%	19.1%
80 to 99	15.8%	17.3%	15.9%
100 to 119	10.9%	12.9%	11.1%
120 to 159	11.9%	14.0%	12.0%
160 to 199	5.0%	5.4%	5.0%
200 and up	8.4%	6.6%	8.2%
total	1,465,078	123,878	1,588,956
Data: Combined HMDA-PFF			

"Geo-Coder-US-1.00" Perl module in conjunction with the US Census Bureau's (2007) TIGER/Line Files.

After using Erle's Perl module to create a database of New York State addresses from the TIGER/Line Files, we queried the database to obtain the latitudes and longitudes of the property addresses in the PFF dataset. Once we had the coordinates, we compared them to a database of census tract coordinates that we generated from the US Census Bureau's (2005) "Cartographic Boundary Files."

Using this method, we were able to identify the census tracts for 96 percent[5] of the addresses in the PFF database. To avoid losing the information that the other four percent contain, we identified each of the census tracts within the property's five-digit zip code and counted the number of times each census tract corresponded to that zip code. We then randomly assigned the property to one of those census tracts (using the number of occurrences as weights).

Once the Census Tracts of each property had been identified and we had purged the duplicates, matching the pre-foreclosure filing data to the HMDA originations data was fairly simple. We divided owner-occupied[6], first-lien mortgages in the HMDA data and first-lien mortgages in the PFF data into

buckets by year of origination, census tract and co-applicant status. On average, there were 34 loans in each HMDA bucket and 3 loans in each PFF bucket, so to figure out which HMDA origination corresponded to the pre-foreclosure filing, we compared the loan amounts and chose the closest match.

4 WHO DEFAULTS ON THEIR HOME MORTGAGE?

Having identified the defaults in the HMDA data, we could quickly proceed to our most striking finding: that black and Latino borrowers defaulted at a higher rate than their white and non-Latino counterparts. But proceeding with such haste would be unjust. First, we must identify the financial characteristics that are correlated with default. Then we must compare the loan characteristics of minority and non-minority borrowers. Only after these first two steps have been conducted can we examine the default rates among black and Latino borrowers in an impartial manner.

4.1 FINANCIAL CHARACTERISTICS

Using the combined HMDA-PFF data, we find that one strong predictor of default is the amount borrowed. As table 2 shows, 56 percent of the borrowers who received a pre-foreclosure filing took loans in excess of $250,000, whereas only 43 percent of the borrowers who did not default borrowed more than $250,000.

It would be particularly insightful to compare the amounts that borrowers owe to the value of their homes. Unfortunately, HMDA does not provide the loan-to-value ratio or any information on the down payment, so we cannot make such a comparison. Nonetheless, if individuals who borrowed less have a larger equity stake in their homes, then these findings would illustrate the general principle that borrowers who have a larger equity stake in their home are less likely to default and enter the foreclosure process.

Repaying a mortgage also depends on the ability to pay, of course. But it's particularly striking to note that borrowers with income in the $80,000 to $199,999 range received pre-foreclosure filings at a higher rate than borrowers above and below that range (as shown in table 3). Why borrowers in the $80-200K income range default at a higher rate than lower-income borrowers is puzzling. The regression models discussed in section 5 suggest however that borrowers with higher incomes are less likely to receive a pre-foreclosure filing after controlling for other factors, such as: loan amount, predicted rate spread, changes in county-level employment and changes in the FHFA home price index.

Another good predictor of default is the interest cost of the loan. Table 4 shows that borrowers who took "high-cost" loans were more likely to receive a pre-foreclosure filing. When viewed in a risk-premium context, this finding should not be surprising. Borrowers who are more likely to default will have to compensate the lender for the additional risk by paying a higher interest rate.

However, there is also a risk that the additional cost of the loan will make the borrower more likely to default and go into foreclosure. In particular, a borrower's monthly payment is an increasing function of the interest rate, so a higher interest rate reduces a borrower's ability to repay the loan.

Lenders do not set interest rates exogenously however. Since a borrower's income and loan amount affect his/her probability of default, all else equal one would expect lenders to compensate for the additional risk by charging a higher interest rate to low-income borrowers and borrowers who take out a larger loan.

Table 4: Pre-Foreclosure Filings by Loan Cost

loan cost	no PFF	received PFF	total
non-high cost	92.8%	7.2%	1,364,557
high cost	89.4%	10.6%	310,283
overall	92.2%	7.8%	1,674,840
Data: Combined HMDA-PFF			

Table 5: High Cost Loans by Applicant Income

income ($1000s)	non-high cost	high cost	overall
under 40	10.1%	13.9%	10.8%
40 to 59	17.8%	18.0%	17.8%
60 to 79	19.0%	19.4%	19.1%
80 to 99	15.6%	16.9%	15.9%
100 to 119	10.8%	12.1%	11.1%
120 to 159	12.1%	11.9%	12.0%
160 to 199	5.3%	4.1%	5.0%
200 and up	9.3%	3.8%	8.2%
total	1,290,774	298,182	1,588,956
Data: Combined HMDA-PFF			

Table 6: High Cost Loans by Loan Amount

amount ($1000s)	non-high cost	high cost	overall
under 50	4.4%	6.6%	4.8%
50 to 99	15.9%	18.0%	16.3%
100 to 249	37.1%	28.1%	35.4%
250 to 399	25.8%	29.0%	26.4%
400 to 499	8.1%	10.8%	8.6%
500 and up	8.7%	7.6%	8.5%
total	1,364,557	310,283	1,674,840
Data: Combined HMDA-PFF			

Table 7: High Cost Loans by Additional Applicant

status	non-high cost	high cost	total
no co-applicant	77.8%	22.2%	952,877
co-applicant	86.3%	13.7%	721,963
overall	81.5%	18.5%	1,674,840
Data: Combined HMDA-PFF			

Table 8: Pre-Foreclosure Filings by Additional Applicant

status	no PFF	received PFF	total
no co-applicant	91.1%	8.9%	952,877
co-applicant	93.6%	6.4%	721,963
overall	92.2%	7.8%	1,674,840
Data: Combined HMDA-PFF			

In line with this reasoning, we find that low-income borrowers are more likely to receive a high-cost loan than borrowers with higher income. Table 5 shows 80 percent of high-cost loans were originated to borrowers with income below $120,000, whereas only 73 percent of loans that were not high-cost loans were originated to such borrowers.

Surprisingly however, there does not appear to be any systematic relationship between loan amount and the likelihood of the loan being a high-cost loan. Table 6 shows that loan amounts below $100,000 were more likely to be high-cost loans and loan amounts in the $250,000 to $499,999 range were also more likely to be high-cost loans.

It is difficult to understand why small loan amounts (i.e. those under $100,000) were more likely to be high-cost loans and why large loan amounts (i.e. those over $500,000) were less likely to be high-cost loans. Regression analysis (which controls for other factors like income) does not even help to explain this puzzle. As discussed in section 5, borrowers who took out larger loan amounts tended to receive lower interest rates on their mortgages after controlling for other factors even though the larger loan amounts made them more likely to default.

Another important factor in explaining interest rates is whether there is a co-borrower on the loan or not. As table 7 shows, 22 percent of loans without a co-applicant were high-cost loans, whereas only 14 percent of loans with a co-applicant were high-cost loans. This may be attributable to the fact that a second borrower is a (potential) second source of income, which helps to mitigate the risk that the loan will go into default. As table 8 shows, 9 percent of loans without a co-borrower received a pre-foreclosure filing, whereas only 6 percent of loans with a co-borrower received a pre-foreclosure filing.

Table 9: High Cost Loans by Applicant Race

race	non-high cost	high cost	total
Asian	89.7%	10.3%	89,998
Black/Afr. Am.	64.9%	35.1%	166,380
White	84.2%	15.8%	1,161,960
not provided	76.8%	23.2%	234,393
overall	81.5%	18.5%	1,674,840
Data: Combined HMDA-PFF			

Table 10: High Cost Loans by Applicant Ethnicity

ethnicity	non-high cost	high cost	total
Hispanic/Latino	71.9%	28.1%	134,937
Not Hispanic/Latino	82.8%	17.2%	1,263,971
not provided	77.5%	22.5%	232,693
overall	81.5%	18.5%	1,674,840
Data: Combined HMDA-PFF			

4.2 RACE AND ETHNICITY

In section 2, we reviewed evidence of racial and ethnic discrimination in lending practices. The HMDA data captures one form of such discrimination – the difference in the rate spread between loans originated to minorities and loans originated to whites. As tables 9 and 10 show, blacks and Latinos received a disproportionately high share of high-cost loans. Asians, by contrast, received a disproportionately low share. Tables 11 and 12 show that blacks and Latinos also received a disproportionately high share of pre-foreclosure filings, so one also has to wonder if racial and ethnic discrimination in lending practices contributed to the disproportionately high share of defaults among blacks and Latinos.

One way to address this question is to ask if fundamental differences between minorities and non-minorities justify the difference in rate spreads. If so, then the next question to ask is if those fundamental differences could have caused blacks and Latinos to default at disproportionately higher rates.

The first fundamental factor that we'll consider is income. If minority borrowers tended to have lower income than their non-minority counterparts, then one could justify the difference in rate spreads on the basis of income. Such a hypothesis only finds partial support in the data. Table 13 shows that 26 percent of Asian borrowers and 18 percent of white borrowers had income over $140,000, while only 11 percent of black borrowers did. The distribution of income by ethnicity shows a similar pattern. As table 14 shows, 18 percent of non-Latino borrowers had income over $140,000, while only 14 percent of Latinos did.

At first glance, the fact that there is more weight in the upper region of the income distribution among non-minority borrowers than there is among minority borrowers appears to lend support to the hypothesis

Table 11: Pre-Foreclosure Filings by Applicant Race

race	no PFF	received PFF	total
Asian	92.8%	7.2%	89,998
Black/Afr. Am.	88.0%	12.0%	166,380
White	92.8%	7.2%	1,161,960
not provided	91.7%	8.3%	234,393
overall	92.2%	7.8%	1,674,840
Data: Combined HMDA-PFF			

Table 12: Pre-Foreclosure Filings by Applicant Ethnicity

ethnicity	no PFF	received PFF	total
Hispanic/Latino	89.0%	11.0%	134,937
Not Hispanic/Latino	92.4%	7.6%	1,263,971
not provided	92.0%	8.0%	232,693
overall	92.2%	7.8%	1,674,840
Data: Combined HMDA-PFF			

that differences in income help explain why blacks and Latinos received a disproportionate share of high-cost loans. However, the lower region of the income distributions refutes the hypothesis. It appears to have been easier for low-income whites and non-Latinos to obtain a mortgage. Specifically, 31 percent of white borrowers had income below $60,000, while only 25 percent of black borrowers did. Similarly, 30 percent of non-Latinos had income below $60,000, while only 19 percent of Latinos did. Consequently, it would be hard to justify the disproportionate share of high-cost loans that blacks and Latinos received on the basis of income differentials.

Turning to default rates, the fact that a larger share of black and Latino borrowers fall into the $80-200K income range (than their white and non-Latino counterparts) provides some support for the hypothesis that income differences may help explain why blacks and Latinos were more likely to default, but the default rates among Asians casts doubt on the hypothesis. Specifically, table 13 shows that 50 percent of black borrowers fell in the $80-200K income range. That's higher than the 42 percent of white borrowers, but less than the 58 percent of Asian borrowers. Table 14 shows that 57 percent of Latino borrowers had income between $80,000 and $199,999 income, but only 43 percent of non-Latinos did.

Given the inability of income to explain the racial and ethnic disparities in loan cost and defaults, we now consider the amount of the original loan. Differences in loan amounts help explain why blacks and Latinos received a disproportionate share of pre-foreclosure filings, but they do not necessarily explain why they received a disproportionate share of high-cost loans.

Specifically, minorities tended to borrow much more than their non-minority counterparts. Table 15

Table 13: Applicant Income by Applicant Race

income ($1000s)	Asian	Black/Afr. Am.	White	not provided	overall
under 40	4.0%	8.0%	12.2%	8.7%	10.8%
40 to 59	11.7%	16.5%	18.9%	16.1%	17.8%
60 to 79	16.3%	23.0%	18.7%	19.4%	19.1%
80 to 99	17.3%	20.1%	15.1%	16.0%	15.9%
100 to 119	14.4%	13.6%	10.4%	11.0%	11.1%
120 to 159	17.6%	12.4%	11.5%	12.5%	12.0%
160 to 199	8.3%	3.7%	4.9%	5.5%	5.0%
200 and up	10.5%	2.7%	8.4%	10.8%	8.2%
total	85,965	156,030	1,105,913	220,741	1,588,956
Data: Combined HMDA-PFF					

Table 14: Applicant Income by Applicant Ethnicity

income ($1000s)	Hispanic/Latino	Not Hispanic/Latino	not provided	overall
under 40	5.8%	11.6%	8.9%	10.8%
40 to 59	12.9%	18.5%	16.3%	17.8%
60 to 79	20.6%	18.9%	19.2%	19.1%
80 to 99	21.4%	15.4%	15.8%	15.9%
100 to 119	15.9%	10.6%	10.9%	11.1%
120 to 159	14.8%	11.7%	12.4%	12.0%
160 to 199	4.8%	5.0%	5.5%	5.0%
200 and up	3.8%	8.2%	11.0%	8.2%
total	125,440	1,203,686	219,669	1,588,956
Data: Combined HMDA-PFF				

suggests that 62 percent of white borrowers borrowed less than $250,000 whereas only 40 percent of blacks did. Interestingly however, Asians appear to have borrowed even more than blacks (only 34 percent borrowed less than $250,000), but had the lowest rate of high-cost loans. Turning to ethnicity, table 16 shows that 59 percent of non-Latinos borrowed less than $250,000, whereas 36 percent of Latinos borrowed less than that amount.

The finding that blacks and Latinos tended to borrow more helps explain why they received a disproportionately high share of pre-foreclosure filings, but it does not explain why they took high-cost loans at a higher rate than their white, Asian and non-Latino counterparts. Asians also borrowed more, but took fewer high-cost loans. Moreover, as mentioned previously, the regression analysis in section 5 also refutes the hypothesis that borrowers who took out larger loan amounts would receive lower interest rates. The opposite is true. All else equal, the rate spreads on larger loans tend to be lower.

Table 15: Loan Amount by Applicant Race

amount ($1000s)	Asian	Black/Afr. Am.	White	not provided	overall
under 50	1.0%	3.2%	5.7%	2.7%	4.8%
50 to 99	6.3%	8.4%	19.1%	12.1%	16.3%
100 to 249	26.3%	28.3%	37.2%	35.2%	35.4%
250 to 399	33.3%	40.5%	23.0%	29.9%	26.4%
400 to 499	18.0%	12.8%	7.1%	9.4%	8.6%
500 and up	15.1%	6.8%	7.8%	10.7%	8.5%
total	89,998	166,380	1,161,960	234,393	1,674,840
Data: Combined HMDA-PFF					

Table 16: Loan Amount by Applicant Ethnicity

amount ($1000s)	Hispanic/Latino	Not Hispanic/Latino	not provided	overall
under 50	2.1%	5.4%	2.9%	4.8%
50 to 99	7.1%	17.8%	12.7%	16.3%
100 to 249	26.4%	36.1%	35.6%	35.4%
250 to 399	41.7%	24.4%	29.0%	26.4%
400 to 499	13.6%	8.1%	9.0%	8.6%
500 and up	9.2%	8.1%	10.7%	8.5%
total	134,937	1,263,971	232,693	1,674,840
Data: Combined HMDA-PFF				

In summary, neither income nor loan amount appear to justify the higher rate spreads on loans originated to blacks and Latinos. This finding is particularly disturbing because borrowers who took out high-cost loans were more likely to default, but the finding is not evidence of discrimination because the HMDA data does not contain critical information, such as the credit score and loan-to-value ratio.

5 ECONOMETRIC MODELS OF RATE SPREADS AND DEFAULTS

Section 4 describes several questions raised by the combined HMDA-PFF dataset. The most striking questions are why blacks and Latinos were more likely to take high-cost loans and why they are more likely to default on their mortgages. But there were other questions too. One is why there isn't a clear relationship between the amount of the original loan and the whether the loan was a high-cost loan. Another was why borrowers in the $80-200K income range default at a higher rate than borrowers with income both above and below that range.

In an attempt to answer some of these questions, this section presents a basic regression analysis. Although we have not developed a formal theory from microeconomic foundations, the analysis below

presents an intuitive reduced form model. We acknowledge that our model may contain omitted-variable bias if race and ethnicity are correlated with credit score or loan-to-value ratio, but the bias is unlikely to be so severe that it invalidates all of the findings of the studies discussed in our literature review. We attempt to mitigate some of the omitted-variable bias in the model of default probability by including the log difference in the FHFA Home Price Index and the log difference in county-level employment between the year that the loan was originated and the year 2010.

Furthermore, the reader should notice that our Tobit model of a borrower's rate spread is a reduced form model of the price at which a lender and a borrower agree to originate a loan. While lenders charge a higher interest rate to borrowers at greater risk of default, the higher interest rate also makes the loan more difficult to repay. Therefore, our predicted rate spread from the first stage serves as an instrument in the second stage model of a borrower's probability of defaulting on his/her home mortgage.

The limitations of the HMDA data prevent us from testing more sophisticated models of the implicit supply and demand decisions and the estimates presented in this article suffer from omitted-variable bias. Nonetheless, if the signs of the regression coefficients are correct, then the model does provide us with insight into the causes of mortgage default.

5.1 ECONOMETRIC METHODS

One problem confronting any econometric analysis of the HMDA data is how to work with the rate spread. The HMDA data only provide a value of the rate spread when the difference between the interest rate on the mortgage and the yield on the comparable U.S. Treasury exceeds three percentage points[7]. Consequently, when addressing the question of why black and Latino borrowers were more likely to take out a high-cost loan, we have to find a way to work with the rate spread.

The simplest method is to reduce the rate spread to a binary variable (i.e. one if high-cost, zero otherwise) and employ a probit or logit model to estimate the probability that a borrower took a high-cost loan. The trouble with such a strategy is that is discards valuable information on the magnitude of the differences in rate spread among borrowers.

The alternative is to employ a Tobit model to obtain an estimate of the rate spread itself. The trouble with this strategy is that 81 percent of the loans in the combined HMDA-PFF dataset are not high-cost loans, so no value of the rate spread is reported for these loans. Therefore, instead of using the Tobit model to estimate the tail of the distribution, the Tobit model has to estimate 81 percent of the distribution.

We chose to use the Tobit model however because it provides an estimate of the rate spread which can be used as an instrument in a second-stage regression on the probability of defaulting on the home mortgage. One must use an instrument for the rate spread in the second-stage to overcome the endogeneity problem that arises when lenders charge higher interest rates to borrowers who are more likely to default.

To obtain efficient estimates of the parameters in the second-stage probability model, we used an algorithm that Adkins (2009) developed to implement Amemiya's Generalized Least Squares (AGLS). Adkins (2008) shows that the AGLS estimator yields consistent estimates of the parameters' standard errors and can be used to test the statistical significance of the parameters.

The AGLS algorithm requires estimates of the residuals from the first-stage regression, but – because

the rate spread is censored at three percentage points – we could not use response residuals as we would if the first-stage regression were a standard OLS regression model. Therneau and Lumley's (2009) "survival" package for R (R Development Core Team, 2010) provides a viable alternative however. As its "survreg" function iteratively maximizes the log-likelihood function, it predicts the value of the dependent variable and calculates a correction term, called the "working residual" (Therneau, 1999), which we use in place of the response residual.

5.2 DISCUSSION OF THE REGRESSION RESULTS

As shown in table 17, the rate spreads on owner-occupied, first-lien mortgages originated to blacks and Latinos were higher than those originated to their white and non-Latino counterparts and the differences were statistically significant, even after controlling for other variables such as income, loan amount, whether there was a co-borrower on the loan, the purpose of the loan and region of the state and year of origination.

As emphasized repeatedly throughout this article, the estimated coefficients suffer from omitted-variable bias, but the racial and ethnic disparities in interest rates are too large to ignore. The coefficient estimates in model 1 suggest that the interest rate on a loan originated to a black borrower was 1.36 percentage points higher than a the interest rate originated to an equivalent white borrower. Model 2 suggests a slightly smaller difference: 0.86 percentage points. Turning to Latinos, the coefficient estimates in model 1 suggest that Latinos paid 0.92 percentage points more than an equivalent non-Latino borrower, while model 2 puts the gap at 0.64 percentage points. While this is deeply disturbing, the HMDA data omits many important variables (such as the borrower's credit score and the loan-to-value ratio), so we cannot conclude that this is evidence of discrimination.

With one exception, the signs of the other coefficients in the model are not surprising. The coefficient on loan amount is the exception. It seems odd to us that borrowers who took out larger loans would pay a lower interest rate. In the case of the HMDA data however, a large loan amount may be acting as a proxy for variables that we do not observe and thus indicate that the borrower is more creditworthy.

Before accepting our findings at face value however, one must note an important limitation of using the Tobit model to predict the rate spread: the estimates are far from perfect. By adding the average yield on a 30-year U.S. Treasury to the predicted rate spread, we can compare the Tobit models' predicted interest rates to the ones in the pre-foreclosure filing data. As tables 18, 19 and 20 show, the predicted interest rates do not have as much weight in the upper region as the interest rates in the PFF dataset. We believe that the predicted rate spread is correlated with the unobserved true values of the rate spread, but there is no way to check the validity of our model.

Turning to the second-stage model of the probability that a borrower will default, we find that the coefficient on the predicted rate spread is positive (suggesting that borrowers with higher rate spreads were more likely to default), but is only statistically significant at the 10 percent level in model 1 and is not statistically significant at all in model 2.

Both models suggest that black race and Latino ethnicity are positively correlated with the probability of default after controlling for other factors, such as income, loan amount and whether there is a co-applicant on the loan. We do not believe however that the melanin level in a person's skin affects his probability of

Table 17: Two-Stage: Tobit predicts Rate Spread, then Probit predicts PFF

	Model 1				Model 2			
	Tobit		probit		Tobit		probit	
Intercept	−0.0513	***	−2.1133	***	0.0037		−2.1071	***
	(0.0004)		(0.1183)		(0.0054)		(0.1715)	
Pred. Rate Spread			0.4093	.			0.3302	
			(0.2434)				(0.3173)	
ln(Loan Amount)	−0.0005	***	0.2511	***	−0.0005	***	0.2486	***
	(0.0001)		(0.0252)		(0.0001)		(0.0366)	
ln(App. Income)	−0.0014	***	−0.2067	***	−0.0009	***	−0.2054	***
	(0.0001)		(0.0251)		(0.0001)		(0.0365)	
Co-Applicant	−0.0053	***	−0.1044	***	−0.0049	***	−0.1059	**
	(0.0001)		(0.0243)		(0.0001)		(0.0352)	
Conv'l Loan	0.0156	***			0.0158	***		
	(0.0002)				(0.0002)			
Home Purchase	0.0114	***			0.0112	***		
	(0.0001)				(0.0001)			
Home Improve.	0.0075	***			0.0073	***		
	(0.0001)				(0.0001)			
Hispanic/Latino	0.0092	***	0.1705	***	0.0064	***	0.1702	**
	(0.0001)		(0.0424)		(0.0001)		(0.0616)	
Asian	−0.0017	***	−0.0447		−0.0034	***	−0.0456	
	(0.0002)		(0.0510)		(0.0002)		(0.0742)	
Black/Afr. Am.	0.0136	***	0.2381	***	0.0086	***	0.2396	***
	(0.0001)		(0.0395)		(0.0001)		(0.0575)	
Race not provided	0.0060	***	0.0662	*	0.0047	***	0.0640	
	(0.0001)		(0.0334)		(0.0001)		(0.0485)	
Female	0.0019	***	−0.0174		0.0018	***	−0.0180	
	(0.0001)		(0.0249)		(0.0001)		(0.0363)	
Δ ln(County Emp.)			−1.8524	**			−1.9836	*
			(0.5722)				(0.8206)	
Δ ln(House Price Idx.)			−0.3514	.			−0.3530	
			(0.1844)				(0.2678)	
Minority Pop. Pct.					0.0001	***		
					(0.0000)			
ln(HUD Median Family Income)					−0.0059	***		
					(0.0005)			
AIC	−561,338		827,003		−572,134		826,728	

*** $p < 0.001$, ** $p < 0.010$, * $p < 0.050$, . $p < 0.100$

Standard errors in parenthesis. Models also contain geographic, year and purchaser-type dummies.

Data: Combined HMDA-PFF

Table 18: Pre-Foreclosure Filings by Predicted Interest Rate (Tobit Model #1)

interest rate	no PFF	received PFF	overall
under 4.000	18.9%	13.2%	18.4%
4.000 to 5.999	49.2%	47.0%	49.0%
6.000 to 7.999	26.0%	30.4%	26.4%
8.000 to 9.999	5.8%	9.1%	6.0%
10.000 to 11.999	0.1%	0.3%	0.1%
total	1,435,566	122,402	1,557,968
Data: Combined HMDA-PFF			

Table 19: Pre-Foreclosure Filings by Predicted Interest Rate (Tobit Model #2)

interest rate	no PFF	received PFF	overall
under 4.000	19.4%	13.7%	19.0%
4.000 to 5.999	48.4%	45.6%	48.2%
6.000 to 7.999	26.0%	30.9%	26.4%
8.000 to 9.999	6.0%	9.6%	6.3%
10.000 to 11.999	0.1%	0.3%	0.2%
total	1,435,566	122,402	1,557,968
Data: Combined HMDA-PFF			

Table 20: Distribution of Interest Rates in Pre-Foreclosure Filing Data

interest rate	total	percent
under 4.000	11,133	6.0%
4.000 to 5.999	49,876	26.8%
6.000 to 7.999	94,870	50.9%
8.000 to 9.999	21,643	11.6%
10.000 to 11.999	7,060	3.8%
12.000 to 13.999	1,430	0.8%
14.000 and up	354	0.2%
total	186,366	100.0%
Data: Full PFF		

default. Instead we believe that black race and Latino ethnicity are acting as a proxy for some missing variable that does increase their probability of default, such as differences in socio-economic status, racial and ethnic disparities in the impact of the recent economic recession and/or forms of discrimination that we cannot measure with the HMDA data.

As one would expect, the coefficient on applicant income was negative and statistically significant in both models. We could have used a quadratic term in the regression model to reproduce the result in table 3 (where we found that borrowers in the $80-200K income range were more likely to default), but given the possibility that income is correlated with some of the other explanatory variables, we were reluctant to over-fit the model. Testing a quadratic term is left to future research.

It's interesting to note that the coefficient on the percentage change in the home price index is only statistically significant at the 10 percent level in model 1 and is not statistically significant at all in model 2. By contrast, the coefficient on the percentage change in county-level employment is statistically significant at the 5 percent level in both models. Importantly, the effect of changes in county-level employment is large. *Labor market recovery would sharply reduce the rate of mortgage default in New York State*.

6 CONCLUSION

After a year of collecting data, the NYSBD had collected enough data to support this analysis, to begin studying the causes of mortgage default and foreclosure and to begin studying the role that racial and ethnic disparities played in causing the foreclosure crisis.

Importantly, this analysis also suggests that employment growth may have the strongest effect on the home mortgage default rate. *In the absence of employment growth, even large principal balance reductions would only have a minimal effect on the rate of mortgage default.* The coefficient estimates in section 5 imply that, for a borrower with a 20 percent probability of default, having taken out a loan 10 percent smaller (i.e. the equivalent of a 10 percent principal balance reduction) would only reduce the default probability to 19.3 percent. Regardless of how downward-biased our coefficient estimate might be, it seems clear that the large losses that principal balance reductions would impose on lenders would not be outweighed by lower default rates. There are no easy solutions.

Because mortgage servicers found themselves too understaffed to handle the wave of defaults (State Foreclosure Prevention Working Group, 2008) and because the foreclosure crisis has had a disproportionate impact on minority communities, Neiman's (2008) report concluded that lenders, servicers, counselors and governments must work together to identify deliquent borrowers, assign to them counselors who will help them achieve the best possible outcome given the circumstances. That enforced cooperation took the form of the pre-foreclosure filing project, which supplied the data for this analysis.

In his 2011 "State of the State" address, newly-inaugurated New York Gov. Andrew Cuomo assigned blame for the foreclosure crisis on both "Washington" and "Albany." Cuomo then proposed a merger of the state banking and insurance departments, which was enacted and became effective on Oct. 3, 2011. Since Cuomo's speech, neither the NYSBD nor its successor, the DFS, have issued a single report on the pre-foreclosure filing project. Nor has the pre-foreclosure filing project generated any policy response.

7 ACKNOWLEDGEMENTS

We would like to thank the New York State Banking Department for making the Pre-Foreclosure Filing data available to us and for supporting our research. The views expressed in this paper are our own opinions and do not necessarily reflect the opinions of the New York State Banking Department or its successor, the New York State Department of Financial Services.

NOTES

[1]Both authors of this paper are former employees of the NYSBD. One of us wrote code for the PFF database, worked with the mortgage servicers who filed the notices, took calls from foreclosure lawyers and, on occasion, took calls from terrified homeowners. As heads of the NYSBD's research unit, we supported the department's regulatory oversight of the home mortgage market by providing regular analysis of the HMDA data to the department's executive team. Neither the NYSBD nor its successor, the DFS, have compensated us for conducting this analysis or for writing this article. We wanted to write it because we believe that it is important to understand the causes of the subprime mortgage crisis and how it has disproportionately affected minority communities.

[2]New York Gov. Andrew M. Cuomo's 2011 budget abolished the state banking and insurance departments and merged their functions into the Department of Financial Services on Oct. 3, 2011.

[3]Rugh and Massey use the term "subprime" to describe high-cost loans.

[4]In the rare cases where the servicer did not include a loan number, we used the property address instead of the loan number.

[5]238,830 of the 248,556 (non-unique) addresses

[6]Mortgage servicers only file pre-foreclosure filing notices when the property is a primary residence, so when matching the PFF data to the HMDA data, we focus on mortgages originated for owner-occupied properties.

[7]More precisely, the HMDA data provide a value for the rate spread of a first-lien mortgage when it exceeds three percentage points. For other lien statuses, the HMDA data provides a value for the rate spread when it exceeds five percentage points. Our analysis focuses exclusively on first-lien mortgages.

REFERENCES

L. C. Adkins. "Small Sample Performance of Instrumental Variables Probit Estimators: A Monte Carlo Investigation". *Joint Statistical Meetings Proceedings, Business and Economics Statistics Section*, 4 Aug. 2008.

L. C. Adkins. "An Instrumental Variables Probit Estimator using gretl". *Econometrics with gretl, Proceedings of the gretl Conference 2009*, pages 59–74, 28-29 May 2009.

D. G. Bocian, K. S. Ernst, and W. Li. "Unfair Lending: The Effect of Race and Ethnicity on the Price of Subprime Mortgages", 31 May 2006. URL http://www.responsiblelending.org/mortgage-lending/research-analysis/rr011-Unfair_Lending-0506.pdf.

C. Bromley, J. Campen, S. Nafici, A. Rust, G. Smith, K. Stein, and B. van Kerkhove. "Paying More for the American Dream: The Subprime Shakeout and Its Impact on Lower-Income and Minority Communities", Mar. 2008. URL http://www.policyarchive.org/handle/10207/19021.

A. Cuomo. "State of the State Address", 5 Jan. 2011. URL http://www.governor.ny.gov/sl2/stateofthestate2011transcript.

M. Doms, F. Furlong, and J. Krainer. "Subprime Mortgage Delinquency Rates". Working Paper 2007-33, Nov. 2007. URL http://www.frbsf.org/publications/economics/papers/2007/wp07-33bk.pdf.

E. Doviak and S. MacDonald. "Who Enters the Foreclosure Process?". *Proceedings of the New York State Economics Association*, 4:20–35, Sept. 2011. URL http://nysea.bizland.com/nysea/publications/proceed/2011/Proceed_2011_p020.pdf.

S. Erle. "Geo-Coder-US-1.00: Geocode (estimate latitude and longitude for) any US address". Comprehensive Perl Archive Network, 17 May 2005. URL http://search.cpan.org/~sderle/Geo-Coder-US-1.00/.

K. S. Gerardi and P. S. Willen. "Subprime Mortgages, Foreclosures, and Urban Neighborhoods". Public Policy Discussion Papers, no. 08-6, 22 Dec. 2008. URL http://www.bos.frb.org/economic/ppdp/2008/ppdp0806.pdf.

E. Laderman. "Subprime Mortgage Lending and the Capital Markets". *FRBSF Economic Letter*, 2001(38), 28 Dec. 2001. URL http://www.frbsf.org/publications/economics/letter/2001/el2001-38.pdf.

D. P. Morgan, B. Iverson, and M. Botsch. "Subprime Foreclosures and the 2005 Bankruptcy Reform". *FRBNY Economic Policy Review*, 18(1):47–57, Mar. 2012. URL http://www.newyorkfed.org/research/epr/12v18n1/1203morg.pdf.

R. Neiman. "Report to the Interagency Task Force on Subprime Mortgages". NYSBD document, 27 July 2007.

R. Neiman. "Report to the Governor's Interagency Task Force to Halt Abusive Lending Transactions (HALT)". NYSBD document, 30 Apr. 2008.

New York State Banking Department. "90-Day Pre-Foreclosure Notice Report", 10 June 2010a. URL http://www.dfs.ny.gov/reportpub/pff100610.pdf.

New York State Banking Department. "90-Day Pre-Foreclosure Notice Report", 7 Oct. 2010b. URL http://www.dfs.ny.gov/reportpub/pff101007.pdf.

R Development Core Team. *R: A Language and Environment for Statistical Computing*. R Foundation for Statistical Computing, Vienna, Austria, 2010. URL http://www.R-project.org.

J. S. Rugh and D. S. Massey. “Racial Segregation and the American Foreclosure Crisis”. *American Sociological Review*, 75(5):629–651, 2010.

G. D. Squires, D. S. Hyra, and R. N. Renner. “Segregation and the Subprime Lending Crisis”. EPI Briefing Paper, 4 Nov. 2009. URL http://www.epi.org/page/-/pdf/110409-briefingpaper244.pdf.

State Foreclosure Prevention Working Group. “Analysis of Subprime Mortgage Servicing Performance”. Data Report No. 2, Apr. 2008. URL http://www.csbs.org/regulatory/Documents/SFPWG/DataReportApr2008.pdf.

T. Therneau and T. Lumley. *survival: Survival analysis, including penalised likelihood.*, 2009. URL http://CRAN.R-project.org/package=survival. R package version 2.35-8.

T. M. Therneau. “A Package for Survival Analysis in S”, 27 Jan. 1999.

US Census Bureau. “Census Tracts and Block Numbering Areas”, 19 Apr. 2000. URL http://www.census.gov/geo/www/cen_tract.html.

US Census Bureau. “Cartographic Boundary Files”, 27 June 2005. URL http://www.census.gov/geo/www/cob/tr2000.html.

US Census Bureau. “2006 Second Edition TIGER/Line Files”, 5 Mar. 2007. URL http://www.census.gov/geo/www/tiger/tiger2006se/tgr2006se.html.

US Department of Housing and Urban Development. “Unequal Burden: Income and Racial Disparities in Subprime Lending”, May 2000a. URL http://archives.hud.gov/reports/subprime/subprime.cfm.

US Department of Housing and Urban Development. “Unequal Burden in New York: Income and Racial Disparities in Subprime Lending”, May 2000b. URL http://www.huduser.org/Publications/pdf/newyork.pdf.

.

REFEREES

1. Paul Bauer
2. Brid Gleeson Hanna
3. Elia Kacapyr
4. Ray MacDermott
5. Arindam Mandal
6. Rodney Paul
7. Jonathan Schwabish
8. Della Lee Sue

The New York State Economics Association
64th Annual Conference
Rochester Institute of Technology
September 23 and 24, 2011

Final Program
September 24, 2011

Friday, September 23
6:00-8:00 p.m. Reception, RIT Inn and Conference Center

Saturday, September 24 on the RIT Campus
7:30-8:00 a.m. Registration and Continental Breakfast
7:55-8:00 a.m. Welcome
8:15-9:35 a.m. Concurrent Sessions: Group 1
9:35-9:50 a.m. Morning Break
9:50-11:10 a.m. Concurrent Sessions: Group 2
11:25-12:40 p.m. Luncheon and Keynote Address
12:50-2:10 p.m. Concurrent Sessions: Group 3
2:10-2:25 p.m. Afternoon Break
2:25-3:45 p.m. Concurrent Sessions: Group 4
4:00-5:00 p.m. Business Meeting (all are welcome)

Friday, September 23

6:00-8:00 p.m. Reception, RIT Inn and Conference Center, Charades Lounge
Welcome, 6:30 p.m.

James Winebrake
Dean, College of Liberal Arts
Rochester Institute of Technology

Saturday, September 24

7:30-8:00 a.m. Registration and Continental Breakfast, CIMS Room 2240
7:55-8:00 Welcome

William W. Destler
President
Rochester Institute of Technology

8:15-9:35 Concurrent Sessions: Group 1

Session 1-A: Undergraduate Research Session 1
CIMS Room 2220

Chairs: Manimoy Paul and Florence Shu
Affiliation: Siena College, Department of Quantitative Business Analysis (Paul);
SUNY Potsdam, Department of Economics and Employment Relations (Shu)
e-mail: mpaul@siena.edu; shufp@potsdam.edu

Title: *Misconstrued and Misunderstood: The Impact of Official Development Assistance on Corruption in Africa*
Discussant: Edouard Mafoua
Affiliation: SUNY- Canton, Department of Business and Liberal Arts—Economics
e-mail: mafouae@canton.edu

Title: *Economic Development Institutions' Effect on Labor Market Frictions: Workforce Development and the DMP Model*
Discussant: Bríd Gleeson Hanna
Affiliation: Rochester Institute of Technology, Department of Economics
e-mail: bxggse@rit.edu

Title: *The Effect of Technology on Development*
Discussant: John J. Heim
Affiliation: Rensselaer Polytechnic Institute, Department of Economics
e-mail: heimj@rpi.edu

Title: *The Rationality of Politicians*
Discussant: James Booker
Affiliation: Siena College, Department of Economics
e-mail: jbooker@siena.edu

Session 1-B: Cancelled

Session 1-C: Financial Economics (G)
CIMS Room 2150

Chair: Yochanan Shachmurove
Affiliation: The City College of the City University of New York
e-mail: yshachmurove@ccny.cuny.edu

Title: *The Impact of the Dodd-Frank Financial Regulations on Bank CEO Compensation* (G)
Author: Richard Proctor
Affiliation: Siena College, Department of Finance
e-mail: proctor@siena.edu

Discussant: Yochanan Shachmurove
Affiliation: The City College of the City University of New York
e-mail: yshachmurove@ccny.cuny.edu

Title: *Earnings Response Elasticity and Post-Earnings-Announcement Drift* (G)
Author: Zhipeng Yan
Affiliation: New Jersey Institute of Technology, Department of Finance
e-mail: zyan@adm.njit.edu

Discussant: Richard Proctor
Affiliation: Siena College, Department of Finance
e-mail: proctor@siena.edu

Title: *Financing Innovations* (G, L)
Author: Yochanan Shachmurove
Affiliation: The City College of the City University of New York
e-mail: yshachmurove@ccny.cuny.edu

Discussant: Zhipeng Yan
Affiliation: New Jersey Institute of Technology, Department of Finance
e-mail: zyan@adm.njit.edu

Session 1-D: Economics of Health and Education (JEL Code I)
CIMS Room 2130

Chair: Javier Espinosa
Affiliation: Rochester Institute of Technology, Department of Economics
e-mail: jxegse@rit.edu

Title: *Health Uncertainty and Medical Expenditure: A Model of Savings with Endogenous Transitions* (I, J)
Author: Shooshan Danagoulian
Affiliation: Cornell University, Department of Economics
e-mail: sd454@cornell.edu

Discussant: Javier Espinosa
Affiliation: Rochester Institute of Technology, Department of Economics
e-mail: jxegse@rit.edu

Title: *Happiness and Expected Future Income: Evidence from Urban China* (D, I)
Author: Qingyan Shang
Affiliation: SUNY at Buffalo, Department of Economics
e-mail: qshang2@buffalo.edu

Discussant: Shooshan Danagoulian
Affiliation: Cornell University, Department of Economics
e-mail: sd454@cornell.edu

Title: *Perceptions of Health: Comparing Self-reported Health Measures to Objective Measures in 7 Latin and Caribbean Countries* (I)
Author: Javier Espinosa
Affiliation: Rochester Institute of Technology, Department of Economics
e-mail: jxegse@rit.edu

Discussant: Qingyan Shang
Affiliation: SUNY at Buffalo, Department of Economics
e-mail: qshang2@buffalo.edu

9:35-9:50 Morning Break, CIMS Room 2210

9:50-11:10 Concurrent Sessions: Group 2

Session 2-A: Undergraduate Research Session 2
CIMS Room 2220

Chairs: Manimoy Paul and Florence Shu
Affiliations: Siena College, Department of Quantitative Business Analysis (Paul); SUNY Potsdam, Department of Economics and Employment Relations (Shu)
e-mail: mpaul@siena.edu; shufp@potsdam.edu

Title: *The New Normal, Myth or Reality?*
Discussant: Darius Conger
Affiliation: Ithaca College, Department of Economics
e-mail: dconger@ithaca.edu

Title: *The Effect of Major League Baseball Rehab Assignments on Attendance in the International Baseball League*
Discussant: Rodney Paul
Affiliation: Syracuse University, Department of Sport Management
e-mail: rpaul@sbu.edu

Title: *Economic Impacts of Restoring Condemned Houses in Lynchburg, Virginia*
Discussant: Cynthia Bansak
Affiliation: St. Lawrence University, Department of Economics
e-mail: cbansak@stlawu.edu

Session 2-B: Economic Development (JEL Code O)
CIMS Room 2170

Chair: Amit Batabyal
Affiliation: Rochester Institute of Technology, Department of Economics
e-mail: aabgsh@rit.edu

Title: *Say at Home, or Stay at Home? A Theory of Female Labor Supply* (J, O)
Author: Vidya Atal
Affiliation: Montclair State University, Department of Economics & Finance
e-mail: atalv@mail.montclair.edu

Discussant: Marta Bengoa
Affiliation: City University of New York at CCNY, Department of Economics and Colin Powell Center for Policy Studies
e-mail: mbengoa@ccny.cuny.edu

Title: *Human Capital Use, Innovative Activity, and Patent Protection in a Model of Regional Economic Growth* (R, O, L)
Author: Amit Batabyal
Affiliation: Rochester Institute of Technology, Department of Economics
e-mail: aabgsh@rit.edu

Discussant: Vidya Atal
Affiliation: Montclair State University, Department of Economics & Finance
e-mail: atalv@mail.montclair.edu

Title: *Foreign Direct Investment among MERCOSUR Custom Union Economies: An Economic Integration Analysis* (F, E, O)
Authors: Marta Bengoa (presenter), B. Sanchez-Robles, and Y. Shachmurove
Affiliations: City University of New York at CCNY, Department of Economics and Colin Powell Center for Policy Studies (Bengoa); Department of Economia, University of Cantabria (Sanchez-Robles); Department of Economics, City University of New York at CCNY (Shachmurove)
e-mail: mbengoa@ccny.cuny.edu

Discussant: Amit Batabyal
Affiliation: Rochester Institute of Technology, Department of Economics
e-mail: aabgsh@rit.edu

Session 2-C: Economics of Education (JEL Code I)
CIMS Room 2150

Chair: Michael McAvoy
Affiliation: SUNY Oneonta, Department of Economics, Finance and Accounting
e-mail: mcavoym@oneonta.edu

Title: *The Rate of Return to Education in China* (J, I)
Author: Xu Zhang
Affiliation: SUNY Farmingdale, Department of History, Economics and Politics
e-mail: zhangx@farmingdale.edu

Discussant: Yaqin Su
Affiliation: SUNY at Buffalo, Department of Economics

e-mail: yaqinsu@buffalo.edu

Title: *Matching Students' Deficit Reduction Choices in "The New York Times Deficit Project" to An Economic Ideology Measurement* (I, H, A)
Author: Michael McAvoy
Affiliation: SUNY Oneonta, Department of Economics, Finance and Accounting
e-mail: mcavoym@oneonta.edu

Discussant: Xu Zhang
Affiliation: SUNY Farmingdale, Department of History, Economics and Politics
e-mail: zhangx@farmingdale.edu

Title: *Does School Quality Matter? Evidence from Individual Earning in China* (I)
Author: Yaqin Su
Affiliation: SUNY at Buffalo, Department of Economics
e-mail: yaqinsu@buffalo.edu

Discussant: Michael McAvoy
Affiliation: SUNY Oneonta, Department of Economics, Finance and Accounting
e-mail: mcavoym@oneonta.edu

Session 2-D: Environmental and Resource Economics (JEL Code Q)
CIMS Room 2130

Chair: Wisdom Akpalu
Affiliation: SUNY-Farmingdale, Department of History, Economics & Politics
e-mail: akpaluw@farmingdale.edu

Title: *An Ecological Economic Study of the Impact of the Yali Falls Dam* (Q, O, C)
Author: John M. Polimeni
Affiliation: Albany College of Pharmacy and Health Sciences, Department of Pharmacy Practice
e-mail: john.polimeni@acphs.edu

Discussant: Wisdom Akpalu
Affiliation: SUNY-Farmingdale, Department of History, Economics & Politics
e-mail: akpaluw@farmingdale.edu

Title: *On the Theory of Willingness-to-Pay, State Dependent Preferences and Endogenous Risk* (Q, B)
Author: Wisdom Akpalu
Affiliation: SUNY-Farmingdale, Department of History, Economics & Politics
e-mail: akpaluw@farmingdale.edu

Discussants: Alexander Petre (presenter) and Jeffrey Wagner
Affiliation: Rochester Institute of Technology, Department of Economics
e-mail: adp7750@rit.edu; jeffrey.wagner@rit.edu

Title: *Green Consumption under Misperceived Prices: An Application to Active Transportation* (R, Q, D)
Author: Alexander Petre and Jeffrey Wagner
Affiliation: Rochester Institute of Technology, Department of Economics
e-mail: adp7750@rit.edu; jeffrey.wagner@rit.edu

Discussant: John Polimeni
Affiliation: Albany College of Pharmacy and Health Sciences, Department of Pharmacy Practice
e-mail: john.polimeni@acphs.edu

Session 2-E: Financial Economics (JEL Code G)
CIMS Room 2120

Chair: Zhipeng Yan
Affiliation: New Jersey Institute of Technology, Department of Finance
e-mail: zyan@adm.njit.edu

Title: *The Tilt Effect and Firm Value in the Presence of Finance Transactions Costs* (G)
Author: Robert Culp
Affiliation: Dalton State College, School of Business
e-mail: rculp@daltonstate.edu

Discussant: Zhipeng Yan
Affiliation: New Jersey Institute of Technology, Department of Finance
e-mail: zyan@adm.njit.edu

Title: *International Diversification: Simple or Optimal Strategies?* (G)
Author: Zhipeng Yan
Affiliation: New Jersey Institute of Technology, Department of Finance
e-mail: zyan@adm.njit.edu

Discussant: Robert Culp
Affiliation: Dalton State College, School of Business
e-mail: rculp@daltonstate.edu

11:25-12:40 Luncheon and Keynote Address
CIMS Rooms 2240-2230

"New York's Economy and Competitive Position"
Dr. Kent Gardner
President and Chief Economist
Center for Governmental Research, Inc.

12:50-2:10 p.m. Concurrent Sessions: Group 3

Session 3-A: Microeconomics (JEL Code D)
CIMS Room 2220

Chair: Thomas E. Cone
Affiliation: SUNY Brockport, Department of Business Administration & Economics
e-mail: tcone@brockport.edu

Title: *Price and Quantity Determination with Unknown Demand* (L, D, C)
Authors: Bharat Bhole and Bridget Gleeson Hanna (presenter)
Affiliation: Rochester Institute of Technology, Department of Economics
e-mail: blbgse@rit.edu (Bhole); bxggse@rit.edu (Gleeson Hanna)

Discussant: Rodney Paul
Affiliation: Syracuse University, Department of Sport Management
e-mail: rpaul@sbu.edu

Title: *Fighting and Attendance in the ECHL* (D)
Author: Rodney Paul
Affiliation: Syracuse University, Department of Sport Management
e-mail: rpaul@sbu.edu

Discussant: Thomas E. Cone
Affiliation: SUNY Brockport, Department of Business Administration & Economics
e-mail: tcone@brockport.edu

Title: *Learning, Regime Changes, and Switching Differential Equations* (D, C)
Author: Thomas E. Cone
Affiliation: SUNY Brockport, Department of Business Administration & Economics
e-mail: tcone@brockport.edu

Discussant: Bridget Gleeson Hanna
Affiliation: Rochester Institute of Technology, Department of Economics
e-mail: bxggse@rit.edu

Session 3-B: Teaching Economics: Alternative Formats, Alternative Themes (Contributed Panel Discussion)
CIMS Room 2170

Chair: Della L. Sue
Affiliation: Marist College, School of Management, Economics Program
e-mail: della.lee.sue@marist.edu

Title: *The Fed Challenge: An Innovation in Cooperative Learning*
Authors: Cynthia Bansak (presenter) and Julie K. Smith
Affiliations: St. Lawrence University, Department of Economics (Bansak) and Lafayette College, Department of Economics (Smith)
e-mail: cbansak@stlawu.edu; smithjk@lafayette.edu

Title: *The Impact of a Web-based Course Supplement on Hearing Impaired Student Performance*
Authors: Jeannette C. Mitchell (presenter) and Johanna Mitchell
Affiliations: Rochester Institute of Technology, Department of Economics (Jeannette Mitchell) and Hartwick College, Department of Education (Johanna Mitchell)
e-mail: jcmgsm@rit.edu; mitchellj@hartwick.edu

Title: *Switching Economics Courses from Online Back to the Classroom: Student Performance and Outcomes*
Author: Richard Vogel
Affiliation: SUNY Farmingdale, Department of History, Economics and Politics
e-mail: richard.vogel@farmingdale.edu

Title: *Teaching Economics Courses in an Online Format*
Author: Della L. Sue
Affiliation: Marist College, School of Management, Economics Program

e-mail: della.lee.sue@marist.edu

Session 3-C: Macroeconomics (JEL Code E)
CIMS Room 2150

Chair: John Heim
Affiliation: Rensselaer Polytechnic Institute, Department of Economics
e-mail: heimj@rpi.edu

Title: *Commercial Bank Deposit Liabilities, Saving and Keynes's Monetary Theory of Production* (E)
Author: Christy Huebner Caridi
Affiliation: Marist College, Department of Economics
e-mail: Christy.Caridi@marist.edu

Discussant: Sinem Buber
Affiliation: CUNY, The Graduate Center
e-mail: sbuber@gc.cuny.edu

Title: *Is Crowd Out a Problem In Recessions?* (E, C)
Author: John J. Heim
Affiliation: Rensselaer Polytechnic Institute, Department of Economics
e-mail: heimj@rpi.edu

Discussant: Christy Huebner Caridi
Affiliation: Marist College, Department of Economics
e-mail: Christy.Caridi@marist.edu

Title: *International Transmission of US Government Spending Shocks: The Case of Canada* (F, E, Z)
Author: Sinem Buber
Affiliation: CUNY, The Graduate Center
e-mail: sbuber@gc.cuny.edu

Discussant: John J. Heim
Affiliation: Rensselaer Polytechnic Institute, Department of Economics
e-mail: heimj@rpi.edu

Session 3-D: Mathematical/Quantitative Methods (JEL Code C)
CIMS Room 2130

Chair: Manimoy Paul
Affiliation: Siena College, Department of Quantitative Business Analysis
e-mail: mpaul@siena.edu

Title: *Applied Statistics, Data Visualization, Market Research, and Consumer Survey* (Z)
Authors: Florence Shu (presenter) and M. Shahadat Hossain
Affiliations: SUNY Potsdam, Department of Economics and Employment Relations (Shu); SUNY Potsdam, Department of Business Administration (Hossain)
e-mail: shufp@potsdam.edu

Discussant: Manimoy Paul
Affiliation: Siena College, Department of Quantitative Business Analysis

e-mail: mpaul@siena.edu

Title: *New Methods in Data Clustering: QUANTCOR* (C)
Author: Alexander Brehm
Affiliation: Skidmore College, Department of Economics
e-mail: abrehm@skidmore.edu

Discussant: Florence Shu
Affiliation: SUNY Potsdam, Department of Economics and Employment Relations
e-mail: shufp@potsdam.edu

Title: *A Measure to Identify "Bubble Formation" in Real Estate Markets* (C)
Authors: Manimoy Paul, Arindam Mandal and Michelle Andreo
Affiliation: Siena College, Department of Quantitative Business Analysis
e-mail: mpaul@siena.edu

Discussant: Sean Piatek
Affiliation: Buffalo State College, Department of Economics and Finance
e-mail: piateksm01@mail.buffalostate.edu

Title: *The Feasibility of Martian Colonization: An Input-Output Analysis* (Z, C, O)
Authors: Sean Piatek (presenter) and Victor Kasper
Affiliation: Buffalo State College, Department of Economics and Finance
e-mail: piateksm01@mail.buffalostate.edu; kasperv@buffalostate.edu

Discussant: Alexander Brehm
Affiliation: Skidmore College, Department of Economics
e-mail: abrehm@skidmore.edu

Session 3-E: Microeconomics and Economic History (JEL Codes D and N)
CIMS Room 2120

Chair: James Irwin
Affiliation: Central Michigan University, Department of Economics
e-mail: irwin1jr@cmich.edu

Title: *Assessing Consumer Preference for Hall of Fame Baseball Player Cards* (D, A, J)
Author: Michael McAvoy
Affiliation: SUNY Oneonta, Department of Economics, Finance and Accounting
e-mail: mcavoym@oneonta.edu

Discussant: James Irwin
Affiliation: Central Michigan University, Department of Economics
e-mail: irwin1jr@cmich.edu

Title: *A Tale of Two Cities: Capital Gains in Real Estate in Albany NY and Richmond VA, 1800-1860* (N)
Author: Catherine McDevitt and James Irwin (presenter)
Affiliation: Central Michigan University, Department of Economics
e-mail: mcdev1cl@cmich.edu; irwin1jr@cmich.edu

Discussant: Michael McAvoy
Affiliation: SUNY Oneonta, Department of Economics, Finance and Accounting
e-mail: mcavoym@oneonta.edu

Title: *Deterability by Age* (K, D)
Authors: Shawn Bushway, Gregory DeAngelo (presenter), and Benjamin Hansen
Affiliations: University at Albany, SUNY, School of Criminal Justice (Bushway); Rensselaer Polytechnic Institute, Department of Economics (DeAngelo); University of Oregon, Department of Economics (Hansen)
e-mail: deangg@rpi.edu

Discussant: Bryan McCannon
Affiliation: St. Bonaventure University, Department of Finance
e-mail: bmccannon@sbu.edu

Title: *The Effect of the Election of Prosecutors on Criminal Trials* (K)
Author: Bryan McCannon
Affiliation: St. Bonaventure University, Department of Finance
e-mail: bmccannon@sbu.edu

Discussant: Gregory DeAngelo
Affiliation: Rensselaer Polytechnic Institute, Department of Economics
e-mail: deangg@rpi.edu

2:10-2:25 Afternoon Break, CIMS Room 2210

2:25-3:45 Concurrent Sessions: Group 4

Session 4-A: Education and Ecology: Applied Economics (Contributed Session)
CIMS Room 2220

Chair: Bill Ganley
Affiliation: Buffalo State College, Department of Economics and Finance
e-mail: ganleywt@buffalostate.edu

Title: *Degrowth and the Social Structure of Accumulation*
Author: Kent Klitgaard
Affiliation: Wells College, Economics and Management Program
e-mail: kentk@wells.edu

Discussant: Bruce Fisher
Affiliation: Buffalo State College, Department of Economics and Finance, Center for Economic & Policy Studies
e-mail: fisherbl@buffalostate.edu

Title: *The Revitalization of Economic Education: Course Redesign and Learning*
Authors: Anna Cummings (presenter) and Bill Ganley
Affiliation: Buffalo State College, Department of Economics and Finance
e-mail: cumminam01@mail.buffalostate.edu

Discussant: Kent Klitgaard

Affiliation: Wells College, Economics and Management Program
e-mail: kentk@wells.edu

Title: *Educational Production and School Districts*
Author: Barbara J. Smith
Affiliation: Buffalo State College, Department of Economics and Finance
e-mail: BJSmith@Buffaloschools.org

Discussant: Ted Schmidt
Affiliation: Buffalo State College, Department of Economics and Finance
e-mail: schmidtp@buffalostate.edu
Title: *Economic Crisis and Crisis in Economics: Incorporating Heterodox Approaches into Principles of Macroeconomics*
Author: Ted Schmidt
Affiliation: Buffalo State College, Department of Economics and Finance
e-mail: schmidtp@buffalostate.edu

Discussant: Bill Ganley
Affiliation: Buffalo State College, Department of Economics and Finance
e-mail: ganleywt@buffalostate.edu

Title: *The World is in Overshoot*
Author: Ana Diaz
Affiliation: Wells College, Economics and Management Program
e-mail: adiaz@wells.edu

Discussant: Bruce Fisher
Affiliation: Buffalo State College, Department of Economics and Finance, Center for Economic & Policy Studies
e-mail: fisherbl@buffalostate.edu

Session 4-B: Economic Education (JEL Code A)
CIMS Room 2170

Chair: Kristin Roti Jones
Affiliation: Hartwick College, Department of Economics
e-mail: jonesk@hartwick.edu

Title: *The Taylor Rule, The Fed's Dual Mandate, and Aggregate Demand: A Variation on a Theme by Romer* (A)
Author: David Ring
Affiliation: SUNY Oneonta, Department of Economics, Finance and Accounting
e-mail: ringdw@oneonta.edu

Discussant: Kristin Roti Jones
Affiliation: Hartwick College, Department of Economics
e-mail: jonesk@hartwick.edu

Title: *The Effectiveness of Using Online Games as a Teaching Aid* (A)
Authors: Chin-Wen Huang (presenter) and Chun-Pin Hsu

Affiliations: Western Connecticut State University, Finance Department (Huang); CUNY, York College, Department of Accounting and Finance (Hsu)
e-mail: huangc@wcsu.edu; chsu@york.cuny.edu

Discussant: Emma Bojinova
Affiliation: Canisius College, Department of Economics and Finance
e-mail: bojinove@canisius.edu

Title: *Service Learning in an Introductory Poverty Course* (A)
Authors: Kristin Roti Jones and Lindsey Frawley
Affiliation: Hartwick College, Department of Economics
e-mail: jonesk@hartwick.edu

Discussant: David Ring
Affiliation: SUNY Oneonta, Department of Economics, Finance and Accounting
e-mail: ringdw@oneonta.edu

Title: *Evaluating the Impact of Clickers on Student Learning* (A, I)
Authors: Emma Bojinova
Affiliation: Canisius College, Department of Economics and Finance
e-mail: bojinove@canisius.edu

Discussant: Chin-Wen Huang
Affiliation: Western Connecticut State University, Department of Finance
e-mail: huangc@wcsu.edu

Session 4-C: International Economics (JEL Code F)
CIMS Room 2150

Chair: Ayse Erdogan
Affiliation: Rochester Institute of Technology, Department of Economics
e-mail: ayse.erdogan@rit.edu

Title: *Do International Capital Flows Worsen Macroeconomic Volatility in Transition Economics?* (F, E, P)
Author: Scott Hegerty
Affiliation: Canisius College, Department of Economics and Finance
e-mail: hegertys@canisius.edu

Discussant: Ayse Erdogan
Affiliation: Rochester Institute of Technology, Department of Economics
e-mail: ayse.erdogan@rit.edu

Title: *Income and Substitution Effects of Exchange Rate Changes* (F, E, D)
Author: John Heim
Affiliation: Rensselaer Polytechnic Institute, Department of Economics
e-mail: heimj@rpi.edu

Discussant: Scott Hegerty
Affiliation: Canisius College, Department of Economics and Finance
e-mail: hegertys@canisius.edu

Title: *Regulation of Labor Standards in Open Economies* (F, J)
Author: Ayse Erdogan
Affiliation: Rochester Institute of Technology, Department of Economics
e-mail: ayse.erdogan@rit.edu

Discussant: John Heim
Affiliation: Rensselaer Polytechnic Institute, Department of Economics
e-mail: heimj@rpi.edu

Session 4-D: Industrial Organization (JEL Code L)
CIMS Room 2130

Chair: Jason Patalinghug
Affiliation: University of Connecticut, Department of Economics
e-mail: jpatalinghug@gmail.com

Title: *Corporate Governance and Innovation* (L)
Author: Vicar Valencia
Affiliation: Rochester Institute of Technology, Department of Economics
e-mail: vsvgse@rit.edu

Discussant: Sora Park
Affiliation: University at Buffalo, Department of Economics
e-mail: sorapark@buffalo.edu

Title: *Structural Change in the US Confectionery Industry* (L, M)
Author: Jason Patalinghug
Affiliation: University of Connecticut, Department of Economics
e-mail: jpatalinghug@gmail.com

Discussant: Vicar Valencia
Affiliation: Rochester Institute of Technology, Department of Economics
e-mail: vsvgse@rit.edu

Title: *Do Legacy Airlines Mimic Low-Cost Carriers by Mergers & Acquisitions? Empirical Study on the Delta-Northwest Merger in 2008* (L, D, Z)
Author: Sora Park
Affiliation: University at Buffalo, Department of Economics
e-mail: sorapark@buffalo.edu

Discussant: Jason Patalinghug
Affiliation: University of Connecticut, Department of Economics
e-mail: jpatalinghug@gmail.com

Session 4-E: Microeconomics (JEL Code D)
CIMS Room 2120

Chair: Eric Doviak

Affiliation: CUNY, Brooklyn College
e-mail: eric@doviak.net

Title: *Assessing Some Externalities of Non-Profit Home Restoration: The LNDF in the Lynchburg, Virginia and Tinbridge Community* (H, D)
Authors: Safiyah Lopez and Shradha Shrestha (presenter)
Affiliation: Randolph College, Department of Economics
e-mail: sshrestha@randolphcollege.edu

Discussant: Eric Doviak
Affiliation: CUNY, Brooklyn College
e-mail: eric@doviak.net

Title: *Who Defaults? Who Goes into Foreclosure?* (G, D, H)
Authors: Eric Doviak (presenter) and Sean MacDonald
Affiliations: CUNY, Brooklyn College (Doviak); CUNY, New York City College of Technology (MacDonald)
e-mail: eric@doviak.net; smacdonald@citytech.cuny.edu

Discussants: Safiyah Lopez, Shradha Shrestha (presenter) and Elizabeth Perry-Sizemore
Affiliation: Randolph College, Department of Economics
e-mail: sshrestha@randolphcollege.edu

Title: *Factors Determining Consumer Sentiment – Evidence from Household Survey Data* (C, D)
Author: Yongchen Zhao
Affiliation: University at Albany, SUNY, Department of Economics
e-mail: yz881172@albany.edu

Discussant: Bharat Bhole
Affiliation: Rochester Institute of Technology, Department of Economics
e-mail: blbgse@rit.edu

4:00-5:00pm **Business Meeting (all are welcome)**
CIMS Rooms 2240-2230

NYSEA

65TH ANNUAL CONFERENCE

FRIDAY AND SATURDAY

OCTOBER 5-6, 2012

@

FARMINGDALE STATE COLLEGE - FARMINGDALE, NY