

Financial and risk management analysis of the education sector in Southeast Texas during Hurricane Harvey

Gevorg Sargsyan, Enrique Venta, James Slaydon, Ricardo Colon, Paul Latiolais¹

Abstract

A well-developed education system is important for local economic growth. Without an educated and skilled labor force, local economic growth is almost impossible. This is one of the reasons why the education sector has the support and attention of various public and private stakeholders. Risks and interruptions of activities of educational institutions can have long-term effects on this sector and on the economy in general. Natural disasters are frequent in Southeast Texas and can have the potential to disrupt normal activities of schools and colleges including the financial sustainability of educational institutions. This study analyzes how risks were managed during natural disasters in the education sector of Southeast Texas. The second area of research focuses on understanding the financial resiliency and recovery of educational institutions in this region.

Keywords: Financial analysis, risk management, higher education institutions, school districts.

1. Introduction and background

Education is very important in the economy of Southeast Texas. According to the Texas Workforce Commission, employment in the education sector as a percentage of total employment in Hardin, Jefferson, and Orange counties was 13.29%, 7.1%, and 11.87%, respectively (Texas Labor Market Highlights, 2019). In 2018 there were 22,199 and 66,842 students enrolled in higher education and school districts of Southeast Texas, respectively. The share of educational services, health care, and social assistance in Gross State Product of Beaumont - Port Arthur MSA was \$1,469,559,000 (U.S. Department of Commerce Bureau of Economic Analysis, 2019). While the share of GDP in many sectors of the economy declined since 2008, the education sector grew steadily and the ten-year (2008-2018) growth of education services in GDP was 12.2%, 4.8%, and 7.3% in Hardin, Jefferson, and Orange counties, respectively.

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Acknowledgements: We are grateful to administrators of education institutions of Southeast Texas region for collaboration and participation in focus groups workshops, to U.S. Department of Commerce Economic Development Administration for funding “Lamar University Hurricane Harvey Economic Recovery and Resiliency Program”, Lamar University’s Center for Innovation Commercialization & Entrepreneurship (CICE) of for support of this research grant, to Nanda Vardhan Muppidi for research assistance.

“The data of the National Hurricane Center shows that the Southeast Texas region is vulnerable to frequent tropical storms and hurricanes. Since 2000 Texas saw more than three dozen tropical depressions, tropical storms, and hurricanes. The major storms in this period include Allison (2001), Rita (2005), Ike (2008), Harvey (2017), and Imelda (2019). These storms affected Southeast Texas dramatically. The following table of the value of economic and insured loss shows the negative impact of these storms.” (Sargsyan et al., 2020)

Table 1. Major storms in Texas and financial losses

#	Storm	Year	Economic loss	Insured loss
1	Allison	2001	\$ 12.0 billion	\$ 5 billion
2	Rita	2005	\$ 23.9 billion	\$ 11 billion
3	Ike	2008	\$ 43.0 billion	\$ 21 billion
4	Harvey	2017	\$ 125.0 billion	\$ 30 billion

Source: Texas Comptroller of Public Accounts web page

As the table shows about 25% of the losses from Hurricane Harvey were covered by insurance. While insurance is an important financial risk management tool, this research will not consider insurance in detail. Instead, the paper focuses on the discovery of innovative and alternative management practices used in the education sector to mitigate risk.

2. Research methods

To complete financial and risk management analysis of the education sector in Southeast Texas during Hurricane Harvey this study uses two research methods. First, the researchers use the Participatory Analysis of Risk Management (PARM) tool designed by Sargsyan et al. (2020) to understand the managerial practices of risk management in the education sector of Southeast Texas. The second method does a comparative analysis of financial data of higher education institutions and school districts of Hardin, Jefferson, and Orange counties of Southeast Texas during the specific time period surrounding Hurricane Harvey. The goal is to determine the financial resiliency and financial recovery of higher education institutions and school districts of the region.

2.1 Implication of Participatory Analysis of Risk Management (PARM) methodology to the education sector of Southeast Texas

Natural disasters are frequent in Southeast Texas and therefore there is a necessity of participatory local economic recovery plans. “Successful local economic development is based on collective action and involves a partnership between the public and private sector.” (Mayer-Stamer, 2006) Risk management, recovery, and resiliency of the education sector in Southeast Texas might also require community collective action plans. “Successful initiatives have a

common characteristic: shared understanding.” (Porter, 2000) The recovery and preparedness of the education sector from natural disasters like Hurricane Harvey should start with planning to manage risks in the future. Strategic planning of risk management is supported by Blakely and Bradshaw in their classic approach to local economic development (Blakely and Bradshaw, 2002). According to the World Bank “local economic development should always begin with the formulation of a strategy.” (World Bank, 2003)

“Active government participation in a privately led effort, rather than an initiative controlled by the government, will have a better chance of success.” (Porter, 2000) Mayer-Stamer concludes that the top-down approach “is no longer pursued a variety of reasons. One of the most important ones is the inability of governments to conduct such activities due to a lack of funds. Another important reason is that, in leading industrialized countries, development policies are successfully formulated and implemented at the local and regional level.”

This study uses the Participatory Analysis of Risk Management (PARM) methodology adapted by Sargsyan et al. (2020) from the Participatory Appraisal of Competitive Advantage (PACA) tool. PACA method emerged from the cooperation between the Chamber of Industry and Commerce, Brazil, and the Chamber of Arts and Crafts, Germany (Mayer-Stamer, 2006).

PARM method helped to come up with the risk management practices of recovery and resiliency from natural disasters. The other aim of this tool is to diagnose challenges and past experiences that local stakeholders had during previous disasters to avoid big losses next time. This comprehensive analysis tool provided us the opportunity to analyze practices of risk management in the education sector of Southeast Texas during Hurricane Harvey.

Figure 1 shows the three core elements of the PARM methodology:

PARM components are:

- **First element.**
Participatory approach, the involvement of local stakeholders in research.
- **Second element.**
Analysis, a careful investigation of resiliency and recovery efforts.
- **Third element.**
Risk management, identification of practices.

Figure 1. Three core elements of PARM methodology

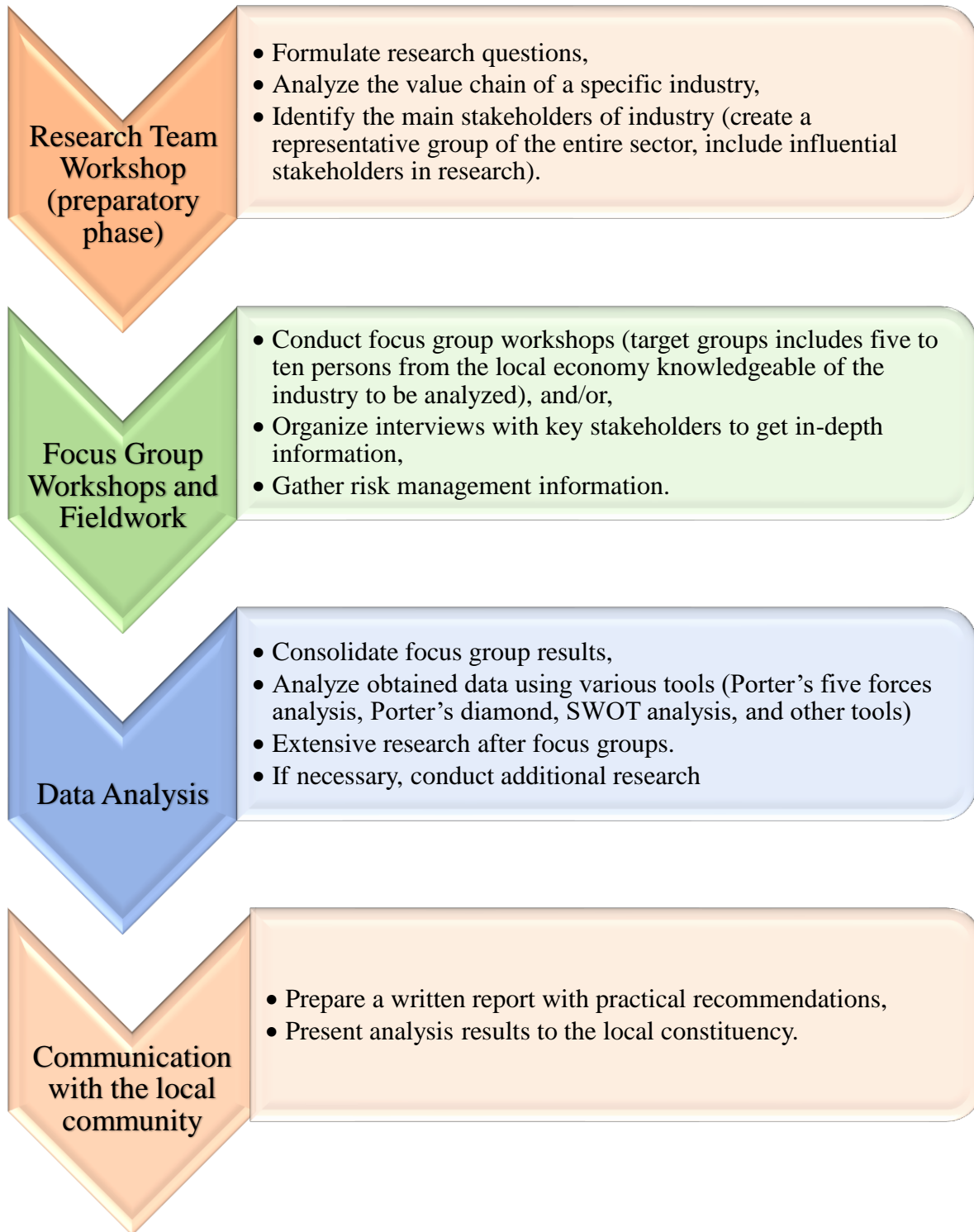


Source: Sargsyan et al., 2020

This methodology can help to analyze practices of risk management of the education sector. PARM has the capacity to analyze the post-disaster situation and provide valuable data for the successful strategic planning of educational institutions. The participatory approach can help develop concrete strategies for resiliency and recovery in a quick and effective manner. The recovery and resiliency of this sector relies on efficient public-private active collaboration and engagement.

The following figure shows the five stages of PARM methodology:

Figure 2. PARM methodology's workflow



Source: Sargsyan et al., 2020

2.2 Comparative financial analysis of higher education institutions and school districts of Southeast Texas

The other method used is a complete comparative analysis of financial data of higher education institutions and school districts of Hardin, Jefferson, and Orange counties. The analysis of annual financial reports involves more than just reading financial data. Analysis of the structure of assets, liabilities, revenues, expenses, and net position helps to understand the financial health of each institution. The analysis of trends of those items pre and post-Harvey period shows the impact of Hurricane Harvey in the education sector of our region. Understanding statements of net position and statements of revenues, expenses, and changes in net position of higher education institutions and school districts are essential to reach conclusions about financial resiliency and financial recovery of higher education institutions. A model of comparative financial analysis was designed for and used in this research. This model addresses many questions of the financial analysis of higher education institution and therefore it can be a useful tool to use in future studies of financial reports of any institution in the education sector. The model is shown in tables 5-8 in the results and discussion section.

3. Application of PARM to the education sector in Southeast Texas

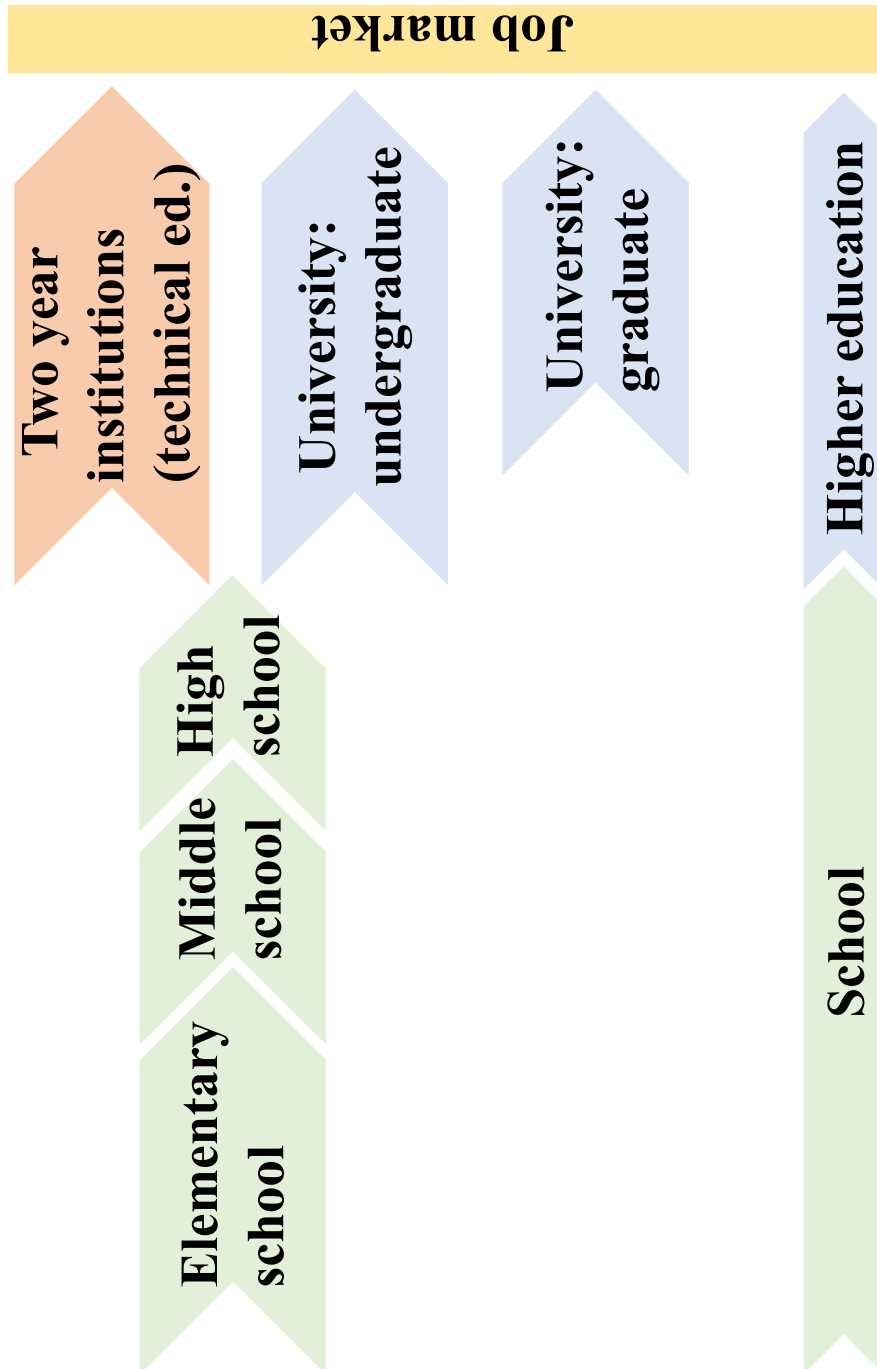
This study follows the PARM workflow. The **first step** was to set the research goal. The main question of this research was to analyze and identify the risk management practices that educational institutions implemented during Hurricane Harvey. Based on the research goal, focus group questions were developed:

- What risks/problems did you experience during Hurricane Harvey?
- What were the most successful risk management strategies that you/your group used during Hurricane Harvey? Why?
- Were there risk management strategies that were not as successful that were used during Hurricane Harvey? Why?
- How did you manage the recovery process? What risks or challenges did you encounter during recovery?
- What role did technology (including communications) play in the Hurricane Harvey response? Which were the most critical technologies? What do you see as the role of technology in the future?
- What would you like to see happen if there is ever another hurricane in Southeast Texas and what steps will help us to move in that direction?

Figure 3 shows the education sector's value chain for Southeast Texas. Value chain analysis helps identify the main stakeholders of the education sector. Among these are Lamar University, Lamar Institute of Technology, Lamar State College-Port Arthur, Lamar State College-Orange, seven Independent School Districts of Jefferson County, five public school districts of Hardin County, five Public School Districts of Orange County and various private education institutions. A representative group of the sector was selected to participate in focus group workshops.

In addition to main players of this sector, we also met with with the significant local stakeholders and broad community, including government officials (county judge, first responders, city and local government emergency management personnel), ports, waterways and transportation, public community organizations (Lower Neches Valley Authority, South East Texas Regional Planning Commission, Greater Beaumont Chamber of Commerce), representatives of oil and gas industry, health care providers (hospitals, long-range care facilities), and prisons and law enforcement. The findings shown later in this work combine the observations of the education sector players with observations about education from the rest of the community outlined above.

Figure 3. Education sector’s value chain analysis in Southeast Texas



4. Results and discussion

4.1 Hurricane Harvey and enrollment in education institutions of Southeast Texas

The main institutions of the education sector of Hardin, Jefferson, and Orange counties of Southeast Texas are Lamar University, Lamar Institute of Technology, Lamar State College-Port Arthur, Lamar State College-Orange, seven Independent School Districts of Jefferson County, five public school districts of Hardin County, five Public School Districts of Orange County and various private education institutions. The following table shows the enrollment in the higher education institutions in Southeast Texas.

Table 2. Enrollment (headcount) in higher education of Hardin, Jefferson, and Orange counties of Southeast Texas

Institution	Fall 2015	% change (15/14)	Fall 2016	% change (16/15)	Fall 2017	% change (17/16)	Fall 2018	% change (18/17)	Fall 2019	% change (19/18)
Doctorate-granting University										
Lamar University Headcount	14,494	0	14,391	-1	13,929	-3	14,176	1.8	14,811	4
Associates Colleges										
Lamar Institute of Technology	2,846	5	2,757	-3	2,983	8	3,260	9.3	4,011	23
Lamar State College-Orange	2,318	3	2,338	1	2,293	-2	2,350	2.5	2,395	2
Special Focus Two-Year Institution										
Lamar State College-Port Arthur	1,802	-13	2,051	14	2,293	12	2,413	5.2	2,710	12

Source: TSUS Board of Regents Meeting Materials Feb. 2015, Feb. 2016, Feb. 2017, Feb. 2018, Feb. 2019, TSUS Certified Enrollment Reports

Table 3. Enrollment (student credit hours) in higher education of Hardin, Jefferson, and Orange counties of Southeast Texas

Institution	Fall 2014-Summer 2015	% change	Fall 2015-Summer 2016	% change	Fall 2016-Summer 2017	% change	Fall 2017-Summer 2018	% change	Fall 2018-Summer 2019	% change
Lamar University	359,067	5	352,763	-1.8	338,796	-4	334,805	-1.2	350,979	4.9
Lamar Institute of Technolog	58,259	-2	60,138	3.2	57,586	-4	59,862	4	63,321	5.8
Lamar State College-Orange	46,437	-3	46,350	-0.2	45,588	-1.7	44,329	-2.8	43,286	-2.4
Lamar State College-Port Arthur	41,909	-16	40,643	-3	43,822	7.8	44,441	1.4	50,294	13.2

Source: TSUS Board of Regents Meeting Materials Feb. 2015, Feb. 2016, Feb. 2017, Feb. 2018, Feb. 2019, TSUS Certified Enrollment Reports

As can be seen, enrollment, both in headcount and student credit hours, was affected temporarily by Hurricane Harvey, but higher education institutions of the region were able to recover and return to patterns of growth, demonstrating resiliency. As can be observed from table 4 below, all institutions experienced a loss of student credit hours from Spring 2017 (before Harvey) to Spring 2018 (after Harvey). The change is noticeable in the spring but not in the fall because Harvey occurred at the beginning of the Fall semester after enrollment had taken place. Hurricane Harvey caused significant devastation which resulted in students not being able to matriculate for the spring semester.

Table 4 helps to analyze the enrollment in each school district of the Southeast Texas region. As the previous table, this one also captures the pre- and post-Harvey period. As expected, enrollment in school districts was not affected by the storms. This occurs because school attendance is a legal requirement and so enrolment depends only on the population of the district. There was no substantial change in the population of Southeast Texas as a result of Hurricane Harvey.

Table 4. Enrollment (headcount) in school districts of Hardin, Jefferson, and Orange counties of Southeast Texas

School District	2014-2015	% in school district	2015-2016	% in school district	2016-2017	% in school district	2017-2018	% in school district	2018-2019	% in school district	% change 14-15/13-14	% change 15-16/14-15	% change 16-17/15-16	% change 17-18/16-17	% change 18-19/17-18
Hardin County Public School Districts	9,716	100	9,697	100	9,763	100	9,939	100	9,976	100	1.0	-0.2	0.7	1.8	0.4
Kountze	1,226	13	1,182	12	1,173	12	1,159	12	1,136	11.4	-0.6	-3.6	-0.8	-1.2	-2.0
Lumberton	3,889	40	3,915	40	3,911	40	3,986	40	4,037	40.5	1.8	0.7	-0.1	1.9	1.3
Silsbee	2,787	29	2,750	28	2,844	29	2,928	29	2,968	29.8	1.8	-1.3	3.4	3.0	1.4
Warren	1,230	13	1,265	13	1,273	13	1,302	13	1,277	12.8	-1.8	2.8	0.6	2.3	-1.9
West Hardin	584	6	585	6	562	6	564	6	558	5.59	1.2	0.2	-3.9	0.4	-1.1
Jefferson County ISDs	43,012	100	42,848	100	42,856	100	42,213	100	41,778	100	-0.2	-0.4	0.02	-1.5	-1.0
Beaumont	19,453	45	19,232	45	19,204	45	18,858	44.7	18,470	44.2	-2.1	-1.1	-0.1	-1.8	-2.1
Hamshire-Fannett	1,786	4	1,819	4	1,838	4	1,931	4.57	1,934	4.63	3.1	1.8	1.0	5.1	0.2
Hardin-Jefferson	2,228	5	2,254	5	2,257	5	2,248	5.33	2,341	5.6	5.9	1.2	0.1	-0.4	4.1
Nederland	5,207	12	5,203	12	5,254	12	5,388	12.8	5,207	12.5	3.4	-0.1	1.0	2.6	-3.4
Port Arthur	9,045	21	8,972	21	8,898	21	8,280	19.6	8,319	19.9	-1.0	-0.8	-0.8	-6.9	0.5
Port Neches-Groves	4,914	11	4,982	12	5025.0	12	5,136	12.2	5136.0	12.3	1.2	1.4	0.9	2.2	0.0
Sabine Pass	379	1	386	1	380	1	372	0.88	371	0.89	-0.5	1.8	-1.6	-2.1	-0.3

Orange County Public School Districts	15,234	100	15,325	100	15,334	100	14,884	100	15,088	100	0.2	0.6	0.1	-2.9	1.4
Bridge City	2,818	18	2,887	19	2,953	19	2,988	20.1	3,057	20.3	0.8	2.4	2.3	1.2	2.3
Little Cypress-Mauriceville	3,342	22	3,377	22	3,355	22	3,153	21.2	3,170	21	1.3	1.0	-0.7	-6.0	0.5
Orangefield	1,782	12	1,762	11	1,759	11	1,787	12	1,848	12.2	1.1	-1.1	-0.2	1.6	3.4
Vidor	4,881	32	4,868	32	4,818	31	4,552	30.6	4,548	30.1	-1.5	-0.3	-1.0	-5.5	-0.1
West Orange - Cove	2,411	16	2,431	16	2,449	16	2,404	16.2	2,465	16.3	0.8	0.8	0.7	-1.8	2.5

Source: Texas Education Agency, Student Enrollment Data for 2013-2014, 2014-2015, 2015-2016, 2016-2017, 2017-2018, 2018-20

4.2 In-depth interviews with administrators of education/educational institutions

In-depth interviews were conducted with higher education institutions. The research team organized focus group workshops and interviews with the key stakeholders in Southeast Texas to discuss resiliency and recovery in the aftermath of Harvey. This helped to discover and elicit the risk management practices used by the education sector. The following are the findings of PARM methodology for **campus closure**:

Preparedness to Hurricanes and Storms

- Educational institutions follow the National Hurricane Center’s updates and instructions.
- Some of the institutions had a subscription to StormGeo service to have additional weather forecasting information.
- At the end of spring some institutions meet internally to update emergency plans for the season.
- Educational institutions have manuals and policies to manage these risks.
- These risk management documents also state “who is in charge of what” in case of natural disasters.

Risks Related to Harvey

- The rain came fast and intensively so most of the institutions could not keep up.
- Montagne Center converted to an evacuation center providing shelter to 500+ evacuees from the city.
- Red Cross was not able to manage the shelter in the first 24 hours. Temporarily Lamar University assumed a management role, including provided food to all evacuees.
- In total there were around 1400 people (students and evacuees from the city) on campus.
- City water shut down complicated the situation as campus needed potable and non-potable water.
- Water damaged various buildings and equipment.

Practices of Risk Management and Lessons from Harvey

- Emergency teams stayed on campus around the clock during Hurricane Harvey to manage the risk more efficiently.
- During the time when the campus was impacted by the water shut down, the administration was able to deliver water via tanker.
- Educational institutions have plans to purchase diesel generators for buildings to avoid risks of electricity interruptions in future disasters.
- Educational institutions revised various policies and included response strategies to events like Harvey.
- Online software/apps provide an opportunity to continue university services.
- IT servers are installed in specific locations away from campus to offer protection from hurricanes and other natural disasters.

The next section presents the results of the PARM methodology during **campus opening:**

Post-Hurricane Recovery

- Legislative appropriation requests during the 86th Regular Session provided educational institutions significant support and financial resources to recover from Hurricane Harvey.
- Texas Senate Bill 500 made supplemental appropriations to public institutions including educational institutions of Southeast Texas.
- Various education institutions have contracts for repairs in place in order to be able to recover quickly if natural disasters damage campuses.

Risks Related to Harvey

- Loss of student credit hours led to tuition revenue loss. The loss of tuition revenue was generally short-lived.
- In general, the effect of an event such as Harvey on an academic institution is prolonged, and generally lasts from 3 to 5 years.
- FEMA has special procedures to apply for compensation. The FEMA procedure from application to compensation is slow and time-consuming.
- Many buildings don't have electricity generators.
- Lack of specific financial reserves for natural disasters slows down the recovery.

Practices of Risk Management and Lessons from Harvey

- Drones were acquired to survey of damage assessment across campus.
- Due to water shutdown university rented portable toilets to maintain hygienic conditions on campus
- The company ServicePro has been contracted to assist in recovery and restoration for certain types of damage on campus.
- There are plans to elevate KVLU radio equipment, in order to provide Southeast Texas community objective news without interruptions.

The following explains **human resource management** during campus closure and campus opening.

Risk Related to Harvey

- Loss of productivity due to educational institutions' decisions to suspend operations.
- Even if employees didn't report to work during natural disasters they still get compensated as administrative leave.
- Overtime payment to employees engaged in recovery efforts (some institutions compensated at the rate of two and a half pay) have been provided.
- Building coordinators don't have incentives to maintain an updated assessment of existing conditions and vulnerabilities of buildings.

Practices of Risk Management and Lessons from Harvey

- Special policies for remote work have been established.
- An incident command center has been established.
- Personnel policies state responsibilities for emergency situations.
- Business continuity plans, risk management policies, procedures, and manuals were revised and now include better approaches to address disasters like hurricanes and tropical depressions.
- Crowdsourcing App has been made available to better manage the crisis and have an additional instant communication channel with employees.

The following presents the **impact on students**:

Risk Related to Harvey

- A temporary decrease in enrollment.
- Risk of not returning school of student population especially taking into consideration that many students are first-generation
- The majority of students were in residential halls and experienced issues to get food and had parking problems due to flooding.
- Parents complained that LU evacuated athletes but not other students from residential halls.
- The design of residential halls makes the buildings vulnerable in events of this magnitude.
- Food shortages in town caused problems to find food for students.

Practices of Risk Management and Lessons from Harvey

- E-learning resources such as Blackboard allow uninterrupted teaching.
- Educational institutions have engaged in more consistent and proactive communications via messaging, emails, social media and other channels.
- The LiveSafe App has been adopted and its use is encouraged among the university community.
- In order to address students' needs various institutions created surveys to gather information about hurricane impacts.
- Financial aid supported students to overcome financial hardship resulting from Harvey.
- University purchased special vehicle, hired commercial driver to be able to move through campus and address students' needs, this helped to serve cold lunch students and evacuees. These actions helped to provide dinner at night.

4.3 Results of comparative financial analysis of higher education institutions and school districts of Southeast Texas

Table 5. Lamar University

thousand dollars

	<i>Fall 2014- Summer 2015</i>	<i>% in assets 2 & revenues 3.1-7</i>	<i>Fall 2015- Summer 2016</i>	<i>% in assets 2 & revenues 3.1-7</i>	<i>Fall 2016- Summer 2017</i>	<i>% in assets 2 & revenues 3.1-7</i>	<i>Fall 2017- Summer 2018</i>	<i>% in assets 2 & revenues 3.1-7</i>	<i>Fall 2018- Summer 2019</i>	<i>% in assets 2 & revenues 3.1-7</i>	<i>% change 16/15</i>	<i>% change 17/16</i>	<i>% change 18/17</i>	<i>% change 19/18</i>	
Comparative Analysis of Statements of Net Position															
1	Total Assets	348,220		362,225		454,420		436,225		423,378		4	25	(4)	(3)
2	Net Position	258,353	74	277,222	77	376,663	83	351,127	80	341,953	81	7	36	(7)	(3)
Comparative Analysis of Statements of Revenues, Expenses, and Changes in Net Position															
3	Operating Revenues	145,434		149,845		136,713		127,377		131,301		3	(9)	(7)	3
	<i>Tuition revenues & fees</i>	126,442	87	136,141	91	124,101	91	114,752	90	120,929	92	8	(9)	(8)	5
	<i>Discounts & allowances</i>	(15,875)	(11)	(24,905)	(17)	(28,220)	(21)	(28,415)	(22)	(29,362)	(22)	57	13	1	3
4	Operating expenses	202,943	140	213,347	142	210,208	154	217,578	171	222,317	169	5	(1)	4	2
5	Operating Income (loss)	(57,510)	(40)	(63,502)	(42)	(73,495)	(54)	(90,202)	(71)	(91,017)	(69)	10	16	23	1
6	Non-operating revenues	74,053	51	86,233	58	89,037	65	88,067	69	86,940	66	16	3	(1)	(1)
7	Change in net position	11,119	8	18,863	13	99,399	73	(7,824)	(6)	(9,133)	(7)	70	427	(108)	(17)

Student credit hours for Lamar University decreased by a modest 1.18% after Harvey. Most of that decrease came in the Spring 2018 semester (5%). However, tuition revenues and fees post-Harvey decreased 8%, a much higher amount than the decrease in student credit hours. There is no clear explanation for why this happened. From the detailed analysis of the balance sheet, the conclusion is

that there was no substantial impact from Harvey on assets and net position. The ratio of net position to assets remains around 80% post-Hervey. Although there have been increases in operating expenses post-Harvey, the increases are not unusual for the history of the institution. Comparative analysis of statements of revenues and expenses demonstrates a \$7.5 mln increase in operating expenses and this increase from FY 2017 to FY 2018. This increase is mostly attributed to scholarships and fellowships, operations and maintenance, institutional support, and student services. The loss before capital contributions, endowments, and transfers increased substantially in FY 2018 and has continued to increase in FY 2019. Before FY 2018 (before Harvey) these figures showed income, even though lower than in the past. After Harvey as losses have occurred. The magnitude of the changes is much larger than the limited and short-lived decreases in student credit hours.

Table 6. Lamar Institute of Technology

thousand dollars

	<i>Fall 2014- Summer 2015</i>	<i>% in assets 2 & revenues 3.1-7</i>	<i>Fall 2015- Summer 2016</i>	<i>% in assets 2 & revenues 3.1-7</i>	<i>Fall 2016- Summer 2017</i>	<i>% in assets 2 & revenues 3.1-7</i>	<i>Fall 2017- Summer 2018</i>	<i>% in assets 2 & revenues 3.1-7</i>	<i>Fall 2018- Summer 2019</i>	<i>% in assets 2 & revenues 3.1-7</i>	<i>% change 16/15</i>	<i>% change 17/16</i>	<i>% change 18/17</i>	<i>% change 19/18</i>	
Comparative Analysis of Statements of Net Position															
1	Total Assets	38,839		37,637		50,709		51,476		53,877		(3)	35	2	5
2	Net Position	28,603	74	27,526	73	40,381	80	41,411	80	44,655	83	(4)	47	3	8
Comparative Analysis of Statements of Revenues, Expenses, and Changes in Net Position															
3	Operating Revenues	8,741		8,942		8,903		8,828		8,366		2	(0)	(1)	(5)
	<i>Tuition revenues & fees</i>	10,753	123	10,779	121	10,778	121	11,976	136	12,033	144	0	(0)	11	0
	<i>Discounts & allowances</i>	(3,251)	(37)	(3,243)	(36)	(3,278)	(37)	(4,374)	(50)	(4,846)	(58)	(0)	1	33	11
4	Operating expenses	24,213	277	25,820	289	25,787	290	26,453	300	26,520	317	7	(0)	3	0
5	Operating Income (loss)	(15,472)	(177)	(16,878)	(189)	(16,883)	(190)	(17,625)	(200)	(18,154)	(217)	9	0	4	3

6	Non-operating revenues	14,763	169	14,725	165	15,296	172	17,669	200	19,017	227	(0)	4	16	8
7	Change in net position	968	11	(1,077)	(12)	12,855	144	1,030	12	3,272	39	(211)	*1	(92)	(218)

*1 (1,293)

Student credit hours for the Lamar Institute of Technology did not decrease after Harvey. There was a small decline in Spring 2018 followed by a substantial increase in Summer 2018. Tuition revenues and fees post-Harvey increased by 11%, a much higher amount than the 4% increase in student credit hours. There is no clear explanation for why this happened. From the detailed analysis of the balance sheet, the conclusion is that there was no substantial impact from Harvey on assets and net position. The ratio of net position to assets remains around 80% post-Harvey. There have been minor increases in operating expenses post Harvey. The income before other revenues, expenses, gains/losses, and transfers increased in FY 2018 and has continued to increase in FY 2019. Before FY 2018 (before Harvey) these figures showed losses. The magnitude and direction of the changes are much larger than the limited and short-lived decreases in student credit hours.

Table 7. Lamar State College-Orange

thousand dollars

	<i>Fall 2014-Summer 2015</i>	<i>% in assets 2 & revenues 3.1-7</i>	<i>Fall 2015-Summer 2016</i>	<i>% in assets 2 & revenues 3.1-7</i>	<i>Fall 2016-Summer 2017</i>	<i>% in assets 2 & revenues 3.1-7</i>	<i>Fall 2017-Summer 2018</i>	<i>% in assets 2 & revenues 3.1-7</i>	<i>Fall 2018-Summer 2019</i>	<i>% in assets 2 & revenues 3.1-7</i>	<i>% change 16/15</i>	<i>% change 17/16</i>	<i>% change 18/17</i>	<i>% change 19/18</i>	
Comparative Analysis of Statements of Net Position															
1	Total Assets	50,184		52,581		64,952		65,678		65,693		5	24	1	0
2	Net Position	45,119	90	46,925	89	58,613	90	59,165	90	60,229	92	4	25	1	2
Comparative Analysis of Statements of Revenues, Expenses, and Changes in Net Position															
3	Operating Revenues	7,804		7,766		7,600		7,442		7,631		(0)	(2)	(2)	3

3	<i>Tuition revenues & fees</i>	8,073	103	7,902	102	8,558	113	8,722	117	8,491	111	(2)	8	2	(3)
3	<i>Discounts & allowances</i>	(2,913)	(37)	(2,836)	(37)	(2,974)	(39)	(3,418)	(46)	(3,292)	(43)	(3)	5	15	(4)
4	Operating expenses	20,309	260	19,097	246	19,060	251	20,049	269	21,084	276	(6)	(0)	5	5
5	Operating Income (loss)	(12,506)	(160)	(11,331)	(146)	(11,460)	(151)	(12,608)	(169)	(13,452)	(176)	(9)	1	10	7
6	Non-operating revenues	13,674	175	12,845	165	12,336	162	13,076	176	13,802	181	(6)	(4)	6	6
7	Change in net position	1,539	20	1,806	23	11,688	154	569	8	1,064	14	17	547	(95)	87

Student credit hours for Lamar State College-Orange decreased by 2.78% after Harvey, and decreases have continued ever since. Most of the decrease in FY 2018 came in the Spring 2018 semester (6%). However, tuition revenues and fees post-Harvey increased by 2%. There is no clear explanation for why this happened. From the detailed analysis of the balance sheet, the conclusion is that there was no substantial impact from Harvey on assets and net position. The ratio of net position to assets remains around 90% post-Harvey. There was an increase in operating expenses post-Harvey, followed by another increase in the following year. The income before other revenues, expenses, gains/losses, and transfers decreased substantially in FY 2018 and has continued to decrease in FY 2019. The magnitude of the changes is much larger than the limited and short-lived decreases in student credit hours.

Table 8. Lamar State College-Port Arthur

thousand dollars

	<i>Fall 2014-Summer 2015</i>	<i>% in assets 2 & revenues 3.1-7</i>	<i>Fall 2015-Summer 2016</i>	<i>% in assets 2 & revenues 3.1-7</i>	<i>Fall 2016-Summer 2017</i>	<i>% in assets 2 & revenues 3.1-7</i>	<i>Fall 2017-Summer 2018</i>	<i>% in assets 2 & revenues 3.1-7</i>	<i>Fall 2018-Summer 2019</i>	<i>% in assets 2 & revenues 3.1-7</i>	<i>% change 16/15</i>	<i>% change 17/16</i>	<i>% change 18/17</i>	<i>% change 19/18</i>	
Comparative Analysis of Statements of Net Position															
1	Total Assets	30,540		30,795		43,253		42,389		43,743		1	40	(2)	3
2	Net Position	24,546	80	25,164	82	35,569	82	35,722	84	37,645	86	3	41	0	5

Comparative Analysis of Statements of Revenues, Expenses, and Changes in Net Position															
3	Operating Revenues	7,640		6,889		6,789		6,921		7,953		(10)	(1)	2	15
3	<i>Tuition revenues & fees</i>	7,570	99	7,553	110	8,709	128	8,943	129	10,309	130	(0)	15	3	15
3	<i>Discounts & allowances</i>	(2,348)	(31)	(2,717)	(39)	(3,198)	(47)	(3,185)	(46)	(3,836)	(48)	16	18	(0)	20
4	Operating expenses	23,130	303	22,034	320	22,568	332	23,434	339	24,773	311	(5)	2	4	6
5	Operating Income (loss)	(15,489)	(203)	(15,144)	(220)	(15,778)	(232)	(16,513)	(239)	(16,820)	(211)	(2)	4	5	2
6	Non-operating revenues	15,748	206	15,354	223	17,046	251	16,223	234	18,161	228	(3)	11	(5)	12
7	Change in net position	(42)	(6)	619	9	10,405	153	153	2	1,923	24	(245)	*2	(99)	*3

*1 1,582, *3 1,157

Student credit hours for Lamar State College-Port Arthur increased by a modest 1.41% after Harvey. The pattern of decreasing student credit hours for Spring 2018 (6%) is also present as it was in other institutions from the region. Tuition revenues and fees post-Harvey increased 3%, a higher amount than the increase in student credit hours. There is no clear explanation for why this happened. From the detailed analysis of the balance sheet, the conclusion is that there was no substantial impact from Harvey on assets and net position.

The ratio of net position to assets remains around 85% post-Harvey. Although there have been increases in operating expenses post-Harvey, the increases are not unusual for the history of the institution. The income before other revenues, expenses, gains/losses, and transfers decreased substantially in FY 2018 becoming a loss. The income before other revenues, expenses, gains/losses, and transfers recovered in FY 2019 (after Harvey) to levels of FY 2017 (before Harvey). The magnitude of the changes is much larger than the limited and short-lived decreases in student credit hours.

The final step in the PARM methodology is communication with the local community. To that end, the results of this work have resulted in reports, research papers, and conference presentations available to stakeholders on the website for the project (<https://www.lamar.edu/resilience-recovery/recovery-and-resiliency-grant/index.html>). In addition, the Recovery and Resiliency Summit: Building Tomorrow (August 2020) was sponsored in part by this project.

5. Conclusion

According to the National Hurricane Center, hurricanes and storms are frequent in Southeast Texas. It is a reality that Southeast Texas is under recurring risk of natural disasters. These risks may have a significant negative impact on recruiting and retention of students in the educational institutions of Southeast Texas. This means that educational institutions in Southeast Texas are going to constantly deal with such events. This research shows that the education sector of Southeast Texas was able to demonstrate resiliency and recover from Harvey. Better preparation and strategic planning are key to the education sector's resiliency and recovery, in Southeast Texas and elsewhere.

Harvey didn't affect the financial health or stability of the educational institutions of Southeast Texas. The results presented in this work show that Hurricane Harvey did indeed affect student credit hours. The effect was about a 5-6% reduction and it was short-lived. The reductions occurred in the semester following Harvey (Spring 2018). By the Fall semester of 2018, student credit hours had returned to levels before Harvey at three of the institutions of higher education. The student credit hours at the remaining institution have not returned to pre-Harvey levels. However, the magnitude of the financial changes of all institutions is much larger than the limited and short-lived decreases in student credit hours.

Despite the short-lived enrollment declines, in general, the effect of an event such as Harvey on an academic institution is prolonged. This is related in part to the role that FEMA plays in reimbursement of expenses. FEMA has special procedures to apply for compensation. The FEMA procedure from application to compensation is slow and time-consuming.

Acknowledgments

We are grateful to administrators of educational institutions of Southeast Texas region for collaboration and participation in focus groups workshops, to U.S. Department of Commerce Economic Development Administration for funding "Lamar University Economic Recovery and Resiliency Program", Lamar University's Center for Innovation Commercialization & Entrepreneurship (CICE) of for support of this research grant, to Nanda Vardhan Muppidi for research assistance.

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