Insights into Economic Demand Surge After Hurricanes Harvey and Irma

2017 Hurricane Season Review

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AIR

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Introduction

Until the U.S. 2017 hurricane season, the industry view of economic demand surge was defined by the U.S. hurricanes Charley, Frances, and Jeanne in 2004 and Katrina in 2005. There have been major events before and after, but nothing caused the significant increase in construction costs seen in the following years. Those events also coincided with a housing construction bubble that hit real estate markets all over the country, just a few years after the dot-com bubble burst. One year after Hurricane Katrina, the housing construction bubble started to burst, and while no causation has been established, it's worth asking the question: Did the two worst hurricane seasons in decades back to back upset a precarious construction market equilibrium? Now that it has been three years since hurricanes Harvey and Irma made landfall in the U.S., we can determine whether the assumptions based on the economic fundamentals in the 2004/2005 season need to be reconsidered in light of the latest economic data from 2017. While the focus of this white paper is the U.S. 2017 hurricane season, we can provide more analysis for and deeper insights into subsequent seasons as sufficient data becomes available.

Economic demand surge after a natural catastrophe is the result of disruption to the local construction market. Every year construction projects are undertaken based on the prevailing wage, cost of materials, and the ability to make a profit. When a hurricane hits and there is a significant increase in the workload, prices can rise suddenly. We will first look at the economic theory that explains demand surge via changes in market equilibrium, and then consider the available U.S. economic data that can be used to measure it.

What Is Demand Surge?

The economics behind demand surge can best be explained by going back to a simple market equilibrium chart. This example looks only at the labor market to illustrate the point. The chart on the left in Figure 1 shows the supply and demand for a local construction labor market prior to a catastrophic event, with the assumptions that it is the start of the construction season and is at full employment. The supply of construction labor is assumed to be constrained in the short and medium terms as represented by the inflection in the supply curve S1. The demand for construction labor is assumed to be based on construction projects deemed profitable and put into production at the start of the season. Price (p1) and quantity (q1) identify the equilibrium in this chart, the point where everyone who wants a job in this market has one.

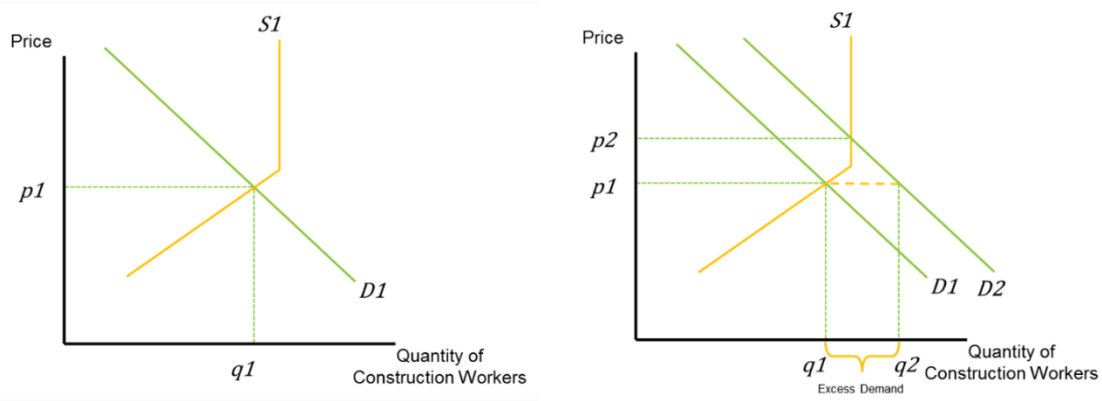

Figure 1. Supply-demand curve in a zero-demand surge market (left); supply-demand curve for a market undergoing demand surge (right).

After a catastrophe strikes the area, the demand curve (D1) shifts to the right (D2) in response to the increased demand for construction labor, as shown on the right in Figure 1. The quantity demanded shifts from q1 to q2; the difference is the excess demand because there is no supply amount that could lead to equilibrium at the same price. The market is at full employment, but there is still some slack at the top end of the supply curve between the old equilibrium and the inflection point. Once these remaining workers enter the market, where the demand curve crosses the vertical portion of the supply-constrained curve, S1 represents the unexpected increase in demand. The labor costs temporarily increase in response to the excess demand at the new equilibrium immediately after the event at (p2).

Evidence of Demand Surge

To understand what the construction market equilibrium looks like, we can consider two pieces of information. First the permits per worker, which will give us some insight into what the demand for construction inputs of labor and materials looks like, and second, how the wages are increasing over the period before the construction season begins.

In Figure 2, the time series of permits per worker are shown for five states: California, Florida, Illinois, Massachusetts, and Texas. The high values of permits per worker in Florida through 2005 is immediately apparent. These high ratios are indicative of the workload in Florida, but it would be higher locally in more desirable markets and lower in less popular areas. The elevated trend begins prior to 2000. While we cannot tell from the data how much of this trend was driven by retirement speculation, the age-restricted community The Villages was one of the fastest growing areas in the country between 2000 and 2010, according to the U.S. census and shows no sign of stopping its growth.

Texas shows a slightly elevated trend, but not nearly as high as Florida's. The Texas trend can be validated through the U.S. census and other government surveys, which show a steady growth in job and inter-state population migration between 2000 and 2010. After the

housing bubble burst, both Texas and Florida follow a similar workload trend responding to the economy and its fluctuations. The trends of these two states contrast sharply with the states of California, Illinois, and Massachusetts. California and Illinois both show an elevated workload relative to Massachusetts; following the housing bubble burst and the Global Recession of 2008/2009, however, the workload reverted to similar trends for all three states and has not grown significantly since then.

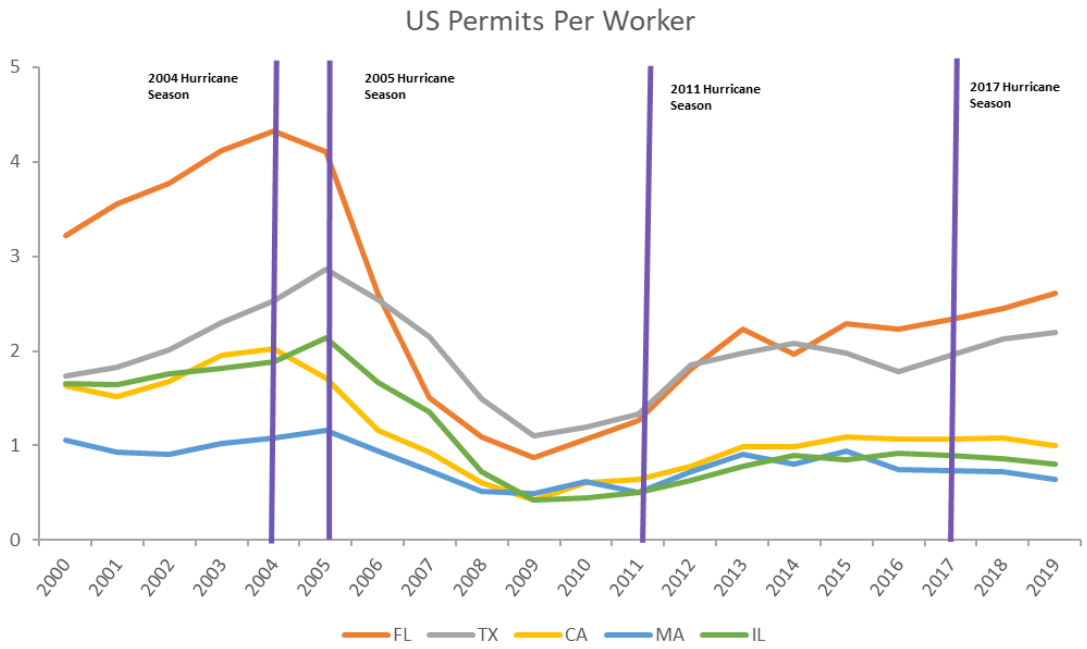

Figure 2. Time series of permits per worker for selected states. (Data sources: U.S. Housing Survey, NAICS 236, Quarterly Census of Employment and Wages)

Most of the published literature on demand surge over the past 15 years has focused on the U.S. It shows that the geographic scope of demand surge for labor and materials after a catastrophic event in the U.S. is not the same. For example, in most of the published work, the investigators use the Xactware® cost area geography as the unit of analysis. It is straightforward to demonstrate that the local labor market disturbance after the 2004 U.S. hurricane season caused real cost inflation (nominal demand surge less national cost inflation) and was significant. For the materials market, the same price signals are not present or are minimal at the cost area leading some to conclude there is no evidence of local demand surge. An alternative hypothesis is that because of supply chain sophistication in national building materials retailers, any local demand disturbance is quickly propagated through the national materials markets and the price signal shows up in regional or national markets. Which leads to the scenario where materials demand surge is a normal cost inflation, or a post-event cost inflation issue rather than a real localized trend.

For support of this hypothesis we can look at the Xactware data trends for the last 20 years. Figure 3 is a time series of labor and materials year-on-year cost inflation for

California, Florida, Illinois, Massachusetts, and Texas along with the national trend. Using the assumption that the national trend represents normal cost inflation we can start to see some regional variation indicating demand surge. Focusing on the left-hand panel, in the early 2000s what stands out is that the fluctuation in the labor cost trend is much more volatile than the materials cost trend shown in the right-hand panel, especially the well-known spike in Florida after the 2004 hurricane season. For the materials cost inflation, it is interesting to note that the regional inflation closely follows the national- level inflation. While not proof, it supports our hypothesis that sudden changes in demand for materials, on average, do not affect regional markets because the supply chain can easily handle the additional need without large fluctuations.

The labor trend in Florida is particularly interesting because there wasn't a big increase before the 2004 season, but there was a significant jump before the 2005 season. The left-hand permits-per-worker chart shows that the workload in Florida was significant going into 2004, but a small year-on-year increase in labor cost before that season suggests that labor coming into the market was not enticed by higher wages. Given the response before the 2005 season, there is reason to believe the market was fully employed and there was no excess capacity; this belief is partially supported by the fact that the Florida governor loosened construction requirements to allow out-of-state construction firms to complete repairs to 2004 hurricane damage in time for the 2005 season. It is also likely that with the overheated housing market, work did not let up on new speculative construction. So, while part of the labor increase prior to the 2005 hurricane season is attributable to the post-hurricane demand surge from 2004, significant non-catastrophe construction continued apace, and an already stressed labor market had to expand even more to meet all sources of demand.

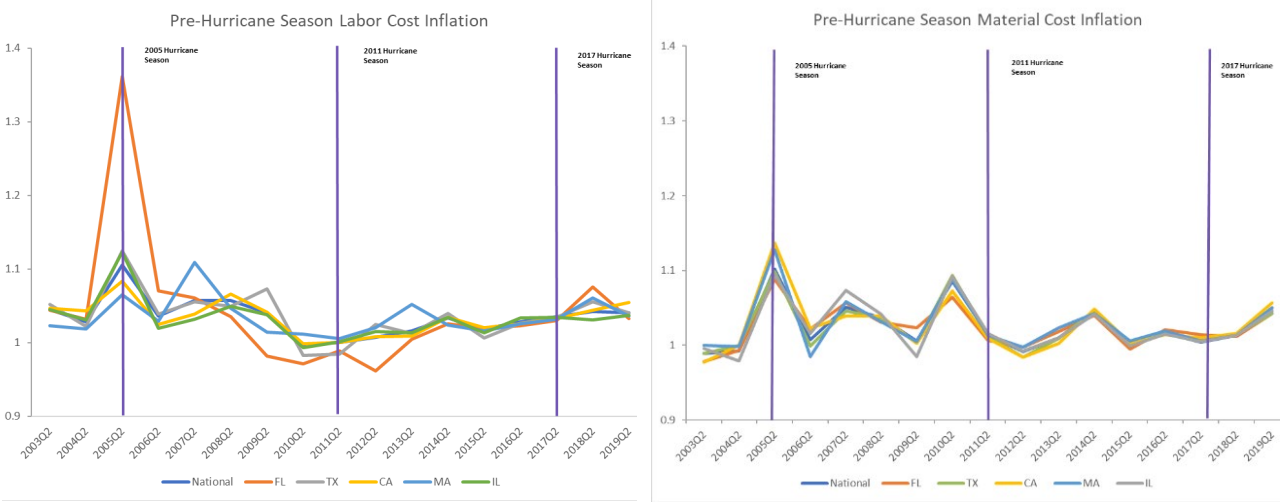

Figure 3. Time series of pre-hurricane season price trends; year-on-year trend in labor cost (left); year-on-year trend in material cost (right). (Data sources: Xactware® Retail Labor Index and the Basket of Materials for Construction)

2017 Hurricanes Provide Perspective

More than a decade later in 2017, a very different economic picture emerges. In all regions, the number of workers per permit follows a steady trend with no great fluctuations. Florida and Texas are increasing slightly, but both are below the maximum value for Texas during the housing bubble. The regional cost inflation trends for materials and labor had been following the national trend. There is a normal increase in labor, about 3%, but the materials trend is flat. While there may be variations locally, they are not significant; otherwise, they would show up in the regional trend. The next sections will look at the localized impact of Harvey and Irma on the economies of Texas and Florida, respectively.

Hurricane Harvey

Hurricane Harvey made landfall and dumped trillions of gallons of precipitation on southeast Texas in August 2017. To understand the price response, we should take a closer look at what was happening at the county level. In the left panel of Figure 4, you can see the relatively higher concentrations of employees in the urban areas of Houston, Dallas, and San Antonio indicated by red. The highest concentration of construction workers is centered around Houston in Harris County, where Harvey had its greatest impact. The panel on the right shows a map of the relative amount of insured industry losses from the ISO® Property Claims Service® (PCS®), with the higher losses indicated by red. The hurricane storm track is overlaid for reference. The highest losses are in Harris County, close to the highest construction employment areas, so the industry could quickly respond to any needed repair work.

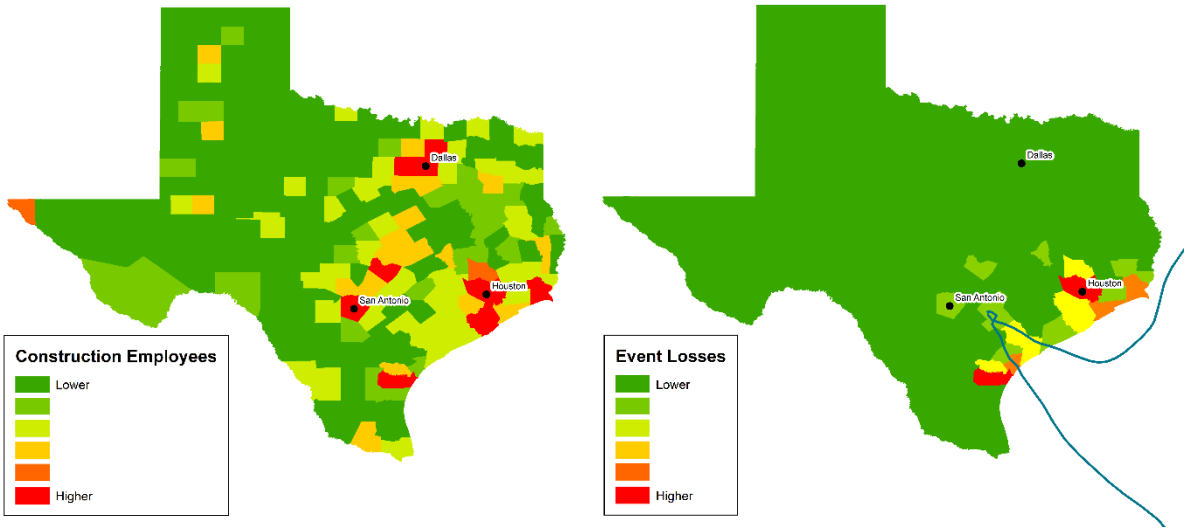

Figure 4. The distribution of building construction employees by county for 2017 Q3 (Data source: U.S. Quarterly Census of Employment and Wages) and the distribution of insured industry losses by county for Hurricane Harvey (Data Source: PCS).

Figure 5 shows the calculated demand surge after Harvey for the State of Texas, including changes in labor and materials after the event. The average changes in labor and materials are calculated by assuming that claims are uniformly settled over the following four quarters; for Texas, the average change in labor is 4% and the average change in materials is 3%, including cost inflation. These changes are not significantly different from the national trend over that period, which was 3% for both labor and materials. The economic demand surge for Texas over the same period is the equal weighting of materials and labor increases of about 4% to account for the contribution of 1% from regional cost increases and cost inflation of 3%—which, in effect, we consider to be the national increase. Given the extent of the repair work, the most significant contributor to economic demand surge in Texas is normal cost inflation, not catastrophe-specific damage. There is a little differentiation locally, but it is not significant with only a couple of areas going as high as a 6% increase.

	Demand Surge 4Q	Labor Surge 4Q	Material Surge 4Q
Texas	4%	4%	3%
National	3%	3%	3%

Figure 5. Demand surge after Hurricane Harvey in Q4 2017. (Data sources: Xactware® Retail Labor Index and Basket of Materials for Construction.)

Hurricane Irma

Hurricane Irma made an initial U.S. landfall on September 10, 2017, in Cudjoe Key, Florida, two weeks after Harvey, and a second landfall later the same day on Marco Island, just southwest of Naples, Florida. Building construction in Florida is a little different than in Texas: Texas draws workers to its ever-expanding economy, but Florida draws more than its share of retirees and tourists. This is evident in the left panel of Figure 6, which shows that, as in Texas, the relative concentrations of employees are in the urban areas; in Florida these areas are Jacksonville, Miami, Orlando, and Tampa (indicated by red). The highest concentration of construction workers is in Southern Florida, which includes Miami-Dade and Broward counties, although the tourism and retirement industries in Florida make it attractive to build anywhere in the state, so there tends to be a greater spread of construction workers. The panel on the right shows a map of the relative amount of Hurricane Irma industry losses from PCS, with the higher losses indicated by red. The hurricane storm track is overlaid for reference. The highest losses are in a diagonal geographic strip across Southern Florida from the landfall county to Miami. Most of the area subject to loss is either close to the highest construction employment areas or within a short driving distance, so the industry can quickly respond to any needed repair work.

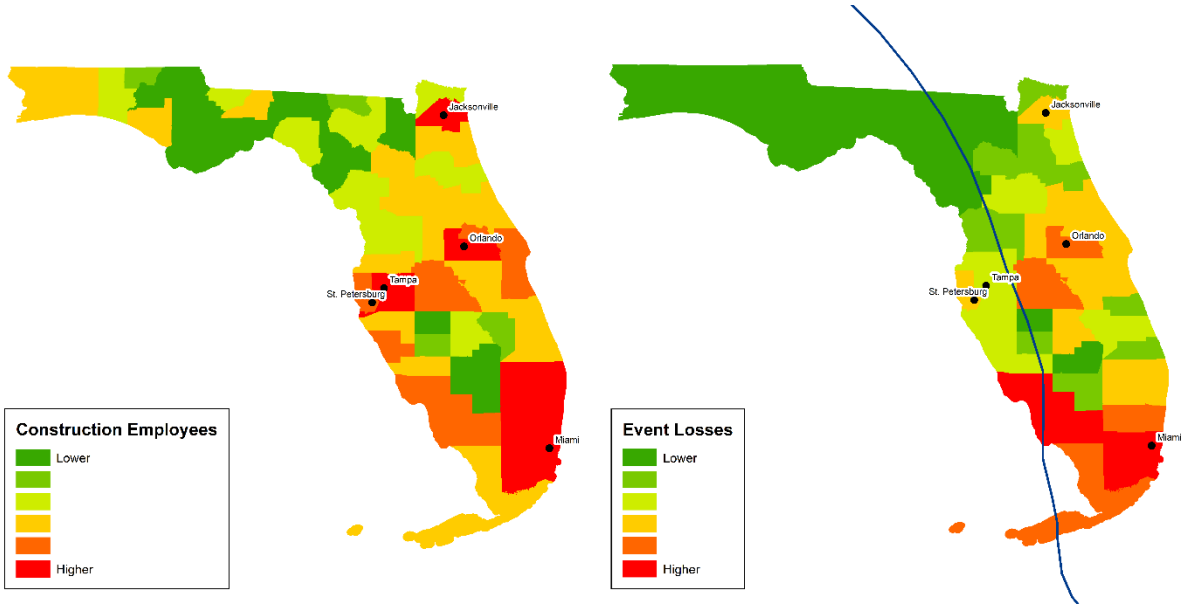

Figure 6. The distribution of building construction employees by county for 2017 Q3 (Data source: U.S. Quarterly Census of Employment and Wages) and the distribution of insured industry losses by county for Hurricane Irma. (Data Source: PCS)

Figure 7 shows the calculated demand surge after Irma for the state, including changes in labor and materials after the event. The average changes in labor and materials are calculated by assuming that claims are uniformly settled over the following four quarters. For Florida the average change in labor is 6% and the average change in materials is 3%, including cost inflation. Unlike Texas there is an obvious difference from the national trend for the labor component. The economic demand surge for Florida over the same period is the equal weighting of materials and labor increases to account for the contributions of cost increases and cost inflation. As elsewhere we consider the national increase to be the effective cost inflation of 3%. Given the extent of the repair work, the most significant contributor to economic demand surge in Florida is labor demand surge from catastrophe-specific damage as well as normal cost inflation. There is a little more differentiation locally than in Texas, so this more widespread local demand surge has a bigger impact on the state average in Florida with several areas going as high as 7%.

	Demand Surge 4Q	Labor Surge 4Q	Material Surge 4Q
Florida	5%	6%	3%
National	3%	3%	3%

Figure 7. Demand surge after Hurricane Irma.

How Did the 2017 Hurricane Season Improve Our Understanding of Demand Surge?

Until recently the understanding of post-catastrophe economic demand surge was heavily biased toward the 2004/2005 hurricane seasons. Cost data at a high enough resolution to understand the relationship between repair work and resource shortages has only been readily available since 2001. The significant events of those years also coincided with an unprecedented housing boom in the U.S. that was concentrated in southeastern states. Since then there has been limited experience in the U.S. until the 2017 season when multiple hurricanes made landfall along the Gulf Coast.

This new data allows us to look back and re-examine the events of 2004/2005 to determine if the economic fundamentals still hold true. We analyzed two events from 2017 and found two different outcomes. Hurricane Harvey was a significant event in total, but examination of the economic demand surge effect in the most affected state shows that it had little impact. Hurricane Irma was equally significant, affecting mostly Florida but showed a moderate impact on economic demand surge. Hurricane Irma was comparable to the Florida events in 2004, so why the disparity?

One possible explanation is substitution effects. For example, every year in Florida there can be multiple demands for construction inputs, such as the normal construction of buildings or repair work after a natural catastrophe. Repair work can be thought of as an essential demand that would normally supplant other building projects that can be delayed temporarily. The permits per worker in could explain what is happening in every other season except 2004. In the case of 2004, if the concurrent demand for construction of new buildings did not give way in a construction market operating at capacity, then that could explain why prices responded so dramatically

Additional Challenges to Understanding Demand Surge

It's important to note that the 2017 hurricane season also challenged our view of demand surge with additional sources of loss inflation beyond economic demand surge, the most frequently cited of which is popularly known as social inflation. An example of social inflation is when a roof in Florida is partially damaged, but the repair responsibility is transferred to a third party through assignment of benefits (AOB). Ultimately the whole roof is replaced and the effect is to inflate the value of the claim. There are two key differences in these sources of loss inflation: Economic demand surge or cost inflation affects everyone in the area, regardless of insurance coverages; social inflation affects insurance claims by artificially inflating the assumed damage. Because the scope and the sources of these two types of loss inflation are different, they need to be examined separately. We provide a good understanding of the sources of economic demand surge, so further study of the remaining loss inflation will help us to understand what circumstances contribute to what can reasonably described as fraud.

that year. This is also supported by the Florida governor's executive order allowing out-of-state contractors in to complete repair work before the start of the 2005 hurricane season.

Any economic demand surge relationships based on these assumptions are valid, but they are not immutable. The surge in demand for essential post-catastrophe construction services without an apparent drop in demand for pre-catastrophe construction services did happen in 2004, so it makes sense to factor it in when considering demand surge. But it may make sense to allow demand surge to be fine-tuned to existing economic conditions to get a more realistic response when there is a likely substitution effect. Because economic demand surge is only a part of overall loss inflation affecting insured losses after a natural catastrophe and we have the data to improve our understanding of it, it is important to get it right so that we do not under- or overestimate other sources of loss inflation. This is consistent with the growing view that other sources of loss inflation are equally important; by better accounting for economic demand surge, we can get a better understanding of other sources of loss.

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