The U.S. Foreign-Trade Zones Program: Economic Benefits to American Communities

Prepared for the

National Association of Foreign-Trade Zones

By

THE TRADE PARTNERSHIP

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Laura M. Baughman
President
The Trade Partnership
1701 K Street, NW, Suite 575
Washington, DC 20006
202-347-1041
baughman@tradepartnership.com

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The U.S. Foreign-Trade Zones Program: Economic Benefits to American Communities

Executive summary

Foreign-trade zones (FTZs or zones) provide tariff savings and other benefits to companies that engage in import and export operations in the United States. These benefits were provided by Congress beginning in 1934 to encourage U.S. economic activity in manufacturing and distribution, and employment that might otherwise be performed abroad. Economic analysis of the effects of FTZs is limited, particularly the impact of FTZs on economic activity and jobs in localities with operational zones. To remedy this deficiency, the National Association of Foreign Trade Zones commissioned this study to inform policymakers and the public, and to provide an analytic tool for economic development institutions.

This study measures, both quantitatively and qualitatively, the economic effects of FTZs on the communities in which the zones operate, which we refer to as Zone Economic Communities (ZECs). We examine the economic impacts of FTZs on ZECs using an econometric approach that enables us to attribute changes in community employment, wages, and value added[1] to the operation of a zone. Specifically, we examine the changes in these three economic measures in each of 251 ZECs compared to an otherwise similar economic community in the same region that did not have an FTZ. We supplement the econometric analysis by profiling a variety of firms that use FTZs and describe the specific ways in which the program's benefits have affected company and community employment and other economic activity, including, the efficient allocation of company resources, domestic production, and exports.

The study makes the following findings supported by the data collected for 251 ZECs:

- Employment, wages, and value added exhibit an increase in the broader zone community following the establishment of an FTZ. Those gains are the greatest in the early years for employment and wages, and throughout the period for value added. This increased economic activity is also visible in advance of the formation of the FTZ.

- The establishment of an FTZ causes a positive increase in employment growth in the surrounding ZEC (up 0.2 percentage points), wage growth (up 0.4 percentage points), and value added growth (up 0.3 percentage points) in the ZEC, typically

[1] "Value added" refers to the difference between gross output and intermediate inputs and represents the value of labor and capital used in producing gross output.

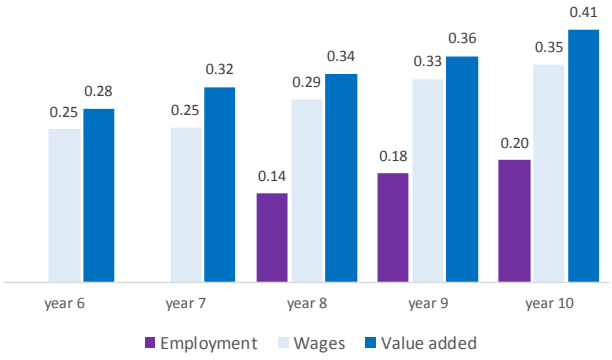
eight years and later, after establishment of the FTZ. The impacts begin sooner, in years six and later, for wages and value added in small- and medium sized ZECs.

- Company access to FTZ benefits has substantial ripple effects through the company's supply chain, much of which is typically located nearby (BMW Manufacturing in South Carolina, ExxonMobil Corporation in Louisiana, Yamaha Motor Manufacturing Corporation in Georgia, are important examples of this effect). FTZ benefits ensure that direct and indirect jobs remain in the United States (*e.g.*, Helly Hansen) despite considerable economic pressures to relocate operations to countries outside the United States. FTZ benefits support high-value U.S. R&D (*e.g.*, Lam Research Corporation). FTZ benefits have brought production jobs back to the United States (*e.g.*, Prodeco Technologies, and Piramal Critical Care). FTZ savings have enabled companies to direct company resources to their most efficient uses, such as worker training (*e.g.*, UniCarriers Americas).

FTZ effects on growth in ZEC employment, wages, and value-added six-ten years after commencement of zone operations (in percentage points)

a. All ZECs, on average

b. Small- and medium-sized ZECs, on average



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I. Introduction

Foreign-trade zones (FTZs or zones) are restricted-access areas within the United States that the U.S. government designates as being outside the customs territory of the United States for purposes of duty collection and customs processing.[2] As such, U.S. Customs and Border Protection (CBP) does not collect U.S. tariffs on products imported and admitted into FTZs. The purpose of the zones is to create and maintain U.S. employment "through the encouragement of operations in the United States *which, for customs reasons, might otherwise have been carried on abroad*."[3]

The program is designed to accomplish this goal, for example, by lowering the costs of imported inputs to U.S. production on which tariffs would otherwise be assessed if production took place in the United States outside the zone, where the imported inputs would be subject to U.S. duties.[4] It further makes U.S. production more competitive with imported goods that that may be subject to U.S. duties that are lower than those applicable to the inputs. It seeks to promote U.S. production destined for export by not collecting tariffs on inputs used to produce goods that are later exported. FTZs are also designed to benefit certain non-production activities and the U.S. jobs associated with them (*e.g.*, storage and exhibition).

The savings associated with using FTZs derive from a range of benefits (see Box for a summary list), including lower duty and other import cost savings, cash flow savings from duty deferral, duty exemption on exports, and state and local tax savings. There are start-up and maintenance costs associated with operating in an FTZ, however. Those costs include, but are not limited to, a detailed application process and the requirement for CBP to conduct background checks on importers and FTZ operators, a physical security system, an inventory control system that tracks the movement of products, at

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[2] There are two foreign trade zone types. A "general purpose zone," which can be used by more than one business, is the area (*e.g.*, an industrial park or sea/airport) within 60 statute miles or a 90-minute drive from the outer limits of a customs port of entry. A "subzone" is a location operated by only one business. A subzone can be located outside the statute mile/driving time limit for the general-purpose zone as long as CBP can adequately oversee its activities.

[3] U.S. Foreign-Trade Zones Board, "FTZ Regulations," 15 CFR Part 400, "Preamble," "Summary," 2012, https://enforcement.trade.gov/ftzpage/grantee/preamble.html#sum. (emphasis added)

[4] This is particularly useful in instances where the tariff on the input is higher than the tariff on the finished product in which it is incorporated (an "inverted tariff" situation). The producer can decide which tariff rate it prefers to pay (presumably, the lower one). In either case, U.S. value added and other domestic inputs are not included in the dutiable value of the finished product that laves the zone.

least one full-time person to manage the zone, and annual fees to the zone grantee for managing the zone.

Incentives to Use FTZs

Duty savings. Zone users can reduce higher normal Customs import duties on inputs, paying the lower duty rate applicable to the finished product goods into which inputs are incorporated (this duty may even be zero) when the finished good is entered into U.S. commerce. Similarly, no duty is paid on imports that are later exported, or are scrapped or destroyed in the zone.

Cash flow savings. Customs duties are paid only when and if the goods exit the zone for entry into the U.S. customs territory for consumption. While the goods are in storage (there is no time limit for how long imported merchandise can remain in the FTZ) companies can, for example, inspect them and only later enter those that pass inspection. This benefit is of particular value to retailers, to companies with higher capital costs, and to those who import goods subject to quotas.

Tax savings. Goods stored in zones and goods exported are subject to a federal preemption from state and local *ad valorem* personal property (i.e., inventory) taxes, and, in some cases, qualify for state-specific tax reductions. Such benefits are geographically limited.

Efficiency savings. Individual import entries can be "bundled" together and filed as a single entry weekly entry resulting in a cap of Merchandise Processing Fees (MPF) at $508 per weekly entry (rather than at 0.3464 percent of the value of each entry, up to a cap of $508 per entry), saving not only MPF costs but also time and paperwork costs. Harbor maintenance fee (HMF) payments can similarly be bundled and paid quarterly, rather than on a per-shipment basis, reducing administrative costs.

Although Congress first established the FTZ program many decades ago with the Foreign-Trade Zones Act of 1934, the FTZ program's benefits did not become a draw for companies until several significant changes were made to it. In a 1950 amendment to the Act, Congress permitted manufacturing in zones. Later in the 1950s, the FTZ Board allowed FTZ sites to be designated at a company's facility (referred to as a "subzone"). In the early 1980s, the U.S. Treasury Department clarified that value-added or domestic inputs were not added to dutiable value for entries of merchandise from zones into U.S. commerce.[5] These program changes occurred while integration of the U.S. economy into global supply chains and international competition were intensifying, and as global

[5] Bolle, M., and W. Brock, "U.S. Foreign-Trade Zones: Background and Issues for Congress," Congressional Research Service. November 12, 2013, p. 6, https://fas.org/sgp/crs/misc/R42686.pdf.

manufacturers sought to reduce production costs. Over the years, FTZ use increased sharply, from 10 general-purpose zones in 1970 to 191 in 2017 (the most recent year for which data are available). The number of subzones has grown from three to 329 over this period.

As noted above, the purpose of the U.S. FTZ program is to provide tariff and other cost saving benefits that incentivize U.S. based economic activity and related employment that might otherwise be performed abroad. While the connection between FTZ use and economic benefits is widely assumed, analysis of the economic effects of U.S. FTZs has been limited. As we detail later in this paper, good data useful for measuring the impacts of FTZs are lacking. Most research conducted thus far has examined the degree to which the existence of an FTZ draws foreign direct investment to a geographic area. A 2017 assessment of the U.S. FTZ program by the U.S. Government Accountability Office (GAO) found that research conducted to date showed that FTZs are connected with positive economic activity; however, GAO questioned whether the data supported the conclusion that the economic activity would not have occurred but for the FTZ.

This study seeks to address this gap in assessing the economic and employment impacts of the U.S. FTZ program on the zone and surrounding communities in which they are established. We measure, both quantitatively and qualitatively, the magnitude of these benefits to local economies, which we refer to here as Zone Economic Communities (ZECs). We examine the economic impacts of FTZs on ZECs using an econometric approach that enables us to identify and measure changes in economic activity attributed to the FTZ. Our results suggest that FTZs have positively affected U.S. employment, wages and value added in ZECs.[6]

We supplement the econometric analysis by profiling a variety of firms using FTZs. These profiles indicate that the economic activities in the zones have had positive direct impacts on the zone area and ripple effects to broader geographic regions. The profiles indicate that FTZs have contributed to increased U.S. exports, and have demonstrably kept economic activity and related jobs in the United States that might have been moved abroad had it not been for the benefits afforded by the zones. The profiles also show that FTZs have freed up funds and have enabled a more efficient allocation of resources. For instance, funds that would have been paid on duties and related administrative burdens can instead facilitate enhanced worker training and research and development.

[6] While it is possible that FTZ benefits may draw some economic resources to a ZEC away from a neighboring economic community, our ZEC areas are sufficiently large that such diversion of resources would be limited. Given this distance, the relocation costs are not trivial. Moreover, the growth in economic gains in ZECs represents a reallocation of resources to more productive uses, which is beneficial to the economy as a whole.

II. Do FTZs benefit the U.S. economy and workers?

U.S. FTZs are located across the United States and all states plus Puerto Rico have at least one zone. In 2017 191 general purpose and 329 production zones were active.[7] In 2017, $241.5 billion in imports were admitted into FTZs, or 10.3 percent of total U.S. imports. Zones directly employed over 450,000 workers in 2017, up 65 percent since 1993 (the earliest year for which employment data are reported (by fiscal year) by the Foreign-Trade Zone Board).[8] The number of firms using FTZs reached 3,200 in 2017, compared to 2,820 in 1991. Most zone activity and employment are driven by actual production activity. The leading products that are imported into zones for production activities are oil/petroleum, motor vehicle parts, consumer electronics, pharmaceuticals and machinery and equipment. Leading categories of imports destined for non-production activity (warehouse/distribution activities) are vehicles, consumer electronics, consumer products, electrical machinery, and oil/petroleum.

A. Data issues

With over 10 percent of general imports, approximately 3,200 firms and over 450,000 jobs, FTZs clearly account for meaningful economic activity and employment. However, other current U.S. data that would be needed to fully understand the broader economic and employment impacts of the U.S. FTZ program have been lacking or, if they were available, are unusable for even the most basic of assessments of the economic activity in zones. As already noted (footnote 6), time-trend analysis using historical data in the Board's annual reports suffers from a shift from fiscal years to calendar years in 2011. Also, the FTZ Board reports do not distinguish between production with imported but duty-paid inputs and inputs that are produced domestically. Both are termed "domestic status" merchandise in FTZ administration, complicating economic impact analyses.[9] Further, as direct export data reported by the Board represents only the value of the material inputs and not the value added by U.S. workers and companies,[10] it is not equivalent to other published U.S. direct export data and cannot be compared to it.

Other data collected by the Board that would be useful for this type of analysis are not publicly available. State data reported in the Board's annual reports, for example, are

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[7] Data in this section come from the most recent FTZ annual report issued by the U.S. government, U.S. Department of Commerce and U.S. Treasury Department, Foreign-Trade Zones Board, *79th Annual Report of the Foreign-Trade Zones Board to the Congress of the United States*, November 2018, https://enforcement.trade.gov/ftzpage/annualreport/ar-2017.pdf.

[8] It should also be noted that data for 1991 reflects a fiscal year; data for 2017, a calendar year. The Board switched from fiscal year reporting to calendar year reporting in 2011.

[9] See notes to Figure 1: Merchandise Received, Foreign-Trade Zones Board, *op. cit*.

[10] See notes to Summary Statistics, 2013-2017, *Ibid*.

reported as a range of values. Reports submitted by FTZ companies that are used to aggregate data for the overall program are also not available to the public.

In addition, data that would measure the impacts of the FTZs on individual companies operating in the zones are not collected. This would include, for example, the impacts of duty savings from zone use. Data measuring value added in the zones, by product, is imperative to an assessment of the economic effects of the zones and the corresponding supply chains; however, such data are also not available.

The significant gaps in the available data make a thorough assessment of the impact of FTZs on the U.S. economy and specific companies difficult and speculative. This study attempts examine those impacts using comparative techniques that have not previously been applied to FTZs.

B. Related research

Given the inadequacy of data, it is not surprising that little research exists quantifying the economic and employment impacts of the FTZ program. This void was noted by a review of the U.S. FTZ program by the Government Accountability Office (GAO 2017). According to the GAO, "Our literature review uncovered few academic studies regarding FTZs. The studies that we reviewed did not estimate the overall economic impact of FTZs on the United States or local economies. Several academic studies we reviewed used a theoretical framework, explaining why it was profitable for companies to use an FTZ, but the assertions were not corroborated with empirical analysis of the effect on the economy."

The few existing studies that examine the effects of FTZs combine the establishment of an FTZ with other economic and tax policies, and so the effects of FTZs on business activity can be hard to disentangle from other policies. For instance, Head, Ries, and Swenson (1999) examined the effects of policies on attracting foreign direct investment (FDI). They found that a set of U.S. state promotion efforts, which included foreign-trade zones, tax incentives, and employment-related had a statistically significant effect on the location of Japanese investment in the U.S. between 1980 and 1992.

Bobonis and Shatz (2007) examined the effects of certain state policies aimed to attract FDI to the state, including labor and capital subsidies, various tax incentives, and foreign-trade zones. In general, their results showed that these policies exhibit little influence over the location of FDI within the United States.[11]

One useful study by Ghosh *et al* (2016) investigated the degree to which the creation and expansion of FTZs can create jobs and attract other business in other industries

[11] Tiefenbrun (2013) provides a comprehensive and detailed treatment of the tax and economic benefits that FTZs provide to firms in the United States and around the world, although does not include empirical economic analysis.

("spillover effects"). They focus on how FTZs may affect nearby non-manufacturing establishments (namely service establishments such as gas stations, small retail stores, or accounting offices) that are otherwise not directly affected by FTZ sites. They use zip-code level data on business activity to compare how non-manufacturing business activity in zip codes that receive FTZ status changes relative to a set of comparable zip codes that do not receive an FTZ site. The researchers found a 1.0 percent long-term increase in the growth rate of new non-manufacturing establishments in the FTZ zip codes and a similar longer-term increase in the growth rate in bordering zip codes. The spillover effects are strongest within a five-mile radius of an FTZ. This is a useful study but by limiting the analysis to non-manufacturing activity in a five-mile radius, the authors are essentially capturing local services such as gas stations, retail, and warehousing. Their approach does not capture other key services such as professional business and technical services that originate outside the five-mile radius.

Our report aims to help fill the gap in the research literature by isolating the effects of the establishment of the FTZ on local communities and casting a wide-enough net to capture all local economic activity, production as well as non-production (services). Our results support findings by Min and Lambert (2010) that firms in the FTZ often source from other local manufacturers (and service providers).

This research addresses two central questions:

(1) To what degree, if any, does the FTZ program support economic activity and employment in local communities? It is clear from the data provided by the FTZ Board that FTZs do support direct jobs, and their number is generally increasing. In addition, economic activity has increased, as indicated by the growing number of FTZs and the increase in the number of firms using them. But how broadly are these benefits shared with other companies and workers?
(2) Does the FTZ program support economic activity and jobs that would not otherwise exist – *i.e.*, "which, for customs reasons, might have otherwise been carried on abroad" (per the purpose of the program noted above from the FTZ regulations)? Of course, "proving a negative" is, in the view of many, impossible. Nevertheless, are there instances that demonstrate that economic activity would have taken place outside the United States had FTZ benefits not "tipped the scales" in favor of a U.S. location?

III. Our approach

We respond to these questions using two approaches. The first question is addressed by econometric analysis, which we summarize below and present in detail in Appendix A. The second question is answered by profiling a selection of companies that use the FTZ program. Highlights of individual company experiences with FTZs are described here; more detailed company profiles are provided in Appendix B.

A. Econometrics

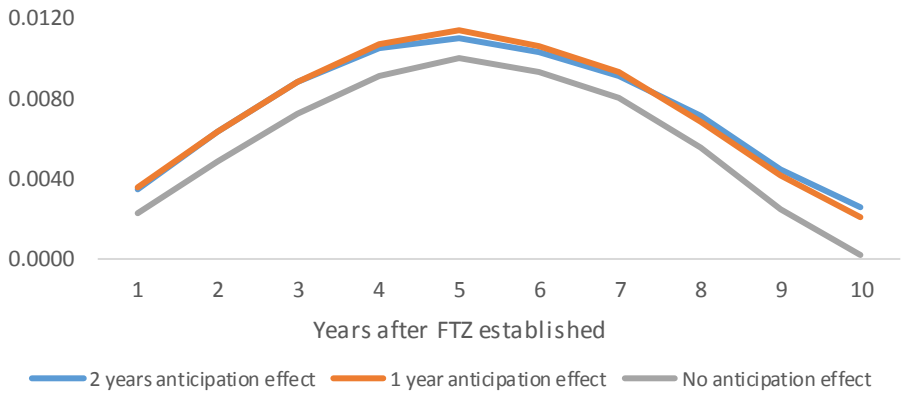
Firms that operate within an FTZ can take advantage of a variety of cost savings related to production and trade. One would expect that firms would use those cost savings to increase production, wages, or employment, or internalize cost savings in some other way (*e.g.*, increase research and development spending or increased distributions to shareholders). In other cases, we may expect new firms to use the FTZ program to take advantage of these cost savings. We also anticipate that firms active in FTZs do business with firms outside the zones, such that there are "ripple effects" on economic activity to a broader geographic area than the FTZ itself (the so-called "spillover effects" examined by Ghosh *et al* (2016) as noted above).

To assess the degree to which the establishment of an FTZ stimulates economic activity and employment in the greater FTZ area, we pursued a two-fold econometric approach. Unlike Ghosh *et al*, who focused on non-manufacturing activity in and out of the zones, we examine all FTZ activity, *i.e.*, manufacturing as well as non-manufacturing and its impacts on manufacturing and non-manufacturing activity both inside and outside the zones (in what we call Zone Economic Communities, ZECs). Appendix A provides details of the data, modeling, and results. Here, we present a summary of the results.

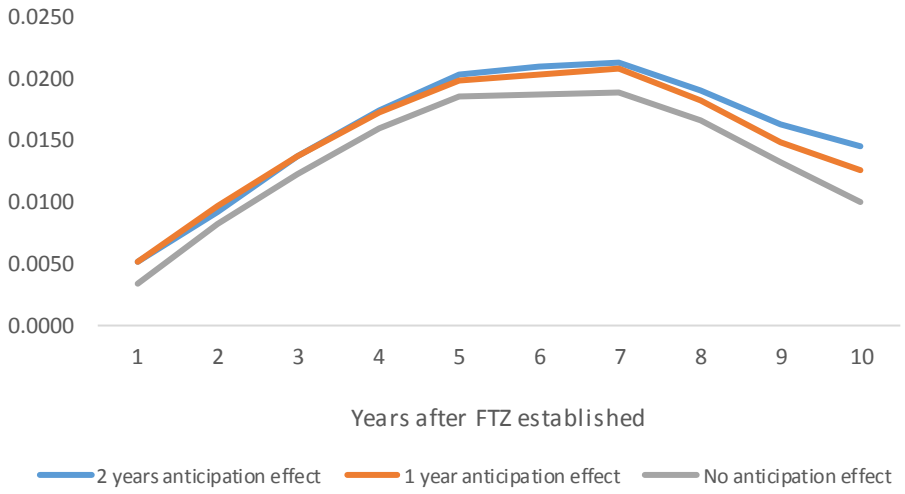
Figure 1 plots the average percentage point changes in employment, wages, and value added that a ZEC experiences in the 10 years following the establishment of an FTZ. It shows average growth for all 251 ZECs that have an active FTZ. The Figure shows that employment, wages, and value added increase in the broader zone community after the areas establish an FTZ. Those gains happen the most in the early years for employment and wages, and throughout the period for value added. They even begin in advance of the formation of the FTZ (something economists call an "anticipation effect"): local communities witness a ramping up of economic activity in concert with the effort that results in the establishment of the FTZ, typically one to two years in advance. For example, when measured from the date of establishment of the FTZ ("no anticipation effect"), the percentage change in employment in the ZEC five years later is 0.0100 percentage points greater than it was when the FTZ was established. When measured from the year *before* the FTZ was established ("one year anticipation effect"), employment in the ZEC was 0.0114 percentage points greater five years after the FTZ was established. Finally, when measured *two years prior* to the establishment of the FTZ ("two-year anticipation effect"), the percentage change in employment in the ZEC is 0.0111 percentage points greater five years after the FTZ was established.

Figure 1. Percentage point changes in ZEC economic activity after FTZ established

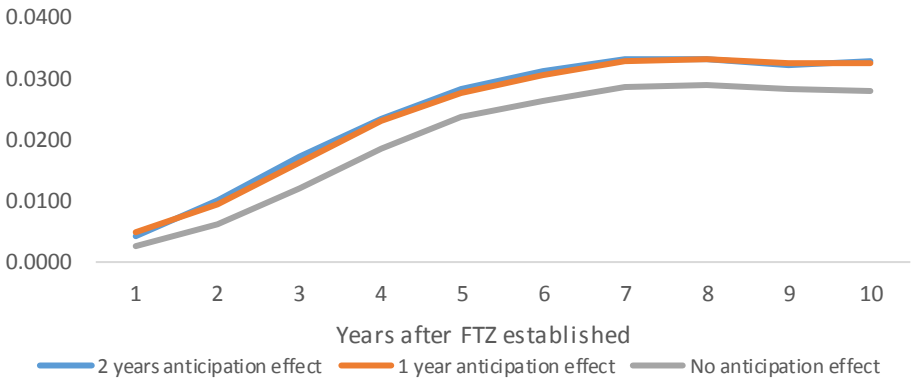
Panel 1a. Employment



Panel 1b. Wages



Panel 1c. Value added



While this finding is useful, it is not necessarily indicative of a causal effect – *i.e.*, that formation of the FTZ *caused* the observed increases in employment, wages and value added. For that, we need a different modeling approach.

To understand the portion of the changes in ZEC economic activity (shown in Figure 1) attributable to the establishment of an FTZ, we examined the changes in employment, wages and value added in each of the 251 ZECs compared to an otherwise similar economic community in the same region that did not have an FTZ. Our econometric modeling approach is detailed in Appendix A.

We found that the formation of an FTZ had a small but positive impact on employment, wages, and value added in the ZEC (see Figure 2). Each bar represents the estimated effect of the FTZ in the ZEC in the years following the establishment of the FTZ in which the impact occurred.

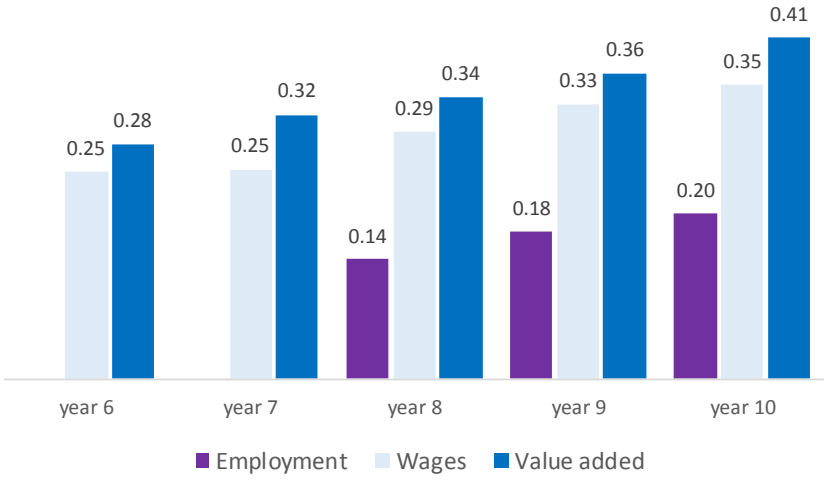
Specifically, the establishment of an FTZ results in about a 0.2 percentage point (ppt) increase in employment growth in the ZEC (that would not have occurred otherwise), and this increase occurs roughly eight years after the formation of the FTZ and lasts at least 10 years out. FTZs account for as much as a 0.35 ppt increase in wage growth for the ZEC, registering about six to eight years after the formation of the FTZ. The effect of the FTZ on value added growth starts in around the eighth year, and on the order of 0.31 to 0.37 ppts.

To put these results into context, employment in the Buffalo, New York ZEC is 762 jobs higher than it would be in the absence of the FTZ in that ZEC; in Milwaukee, WI, an additional 1,290 jobs are owed to the presence of the FTZ in that ZEC, and in Cleveland, OH, an additional 1,571 jobs exist because of the FTZ. Across all ZECs, and extrapolating, our analysis suggest that the establishment of the FTZ in a ZEC resulted in a total of 118,287 additional jobs across the all ZECs combined.

We disaggregated our results for small- and medium-sized ZECs (areas with population less than 500,000). The wage and output impacts begin earlier, are at least as large in magnitude, and last just as long. The FTZ effect on wages begins starting around the sixth year out, is on the order of 0.25 to 0.35 ppt, and lasts at least 10 years out. The FTZ effect on value-added also begins around the sixth year out, is on the order of 0.28 to 0.42 ppt, and lasts at least 10 years out. The employment impact for small- and medium-sized ZECs begins in the eighth year and reaches a rate of 0.2 ppt in the ninth and 10th years out. That is, eight to 10 years after the FTZ is established, the employment change in the ZEC is 0.2 ppt greater compared with an otherwise similar economic community, and that difference in the employment change can be attributed to the FTZ.

Figure 2. Effects on growth in ZEC employment, wages, and value added, average across all ZECs after commencement of zone operations (in percentage points)

Figure 3. Effects on growth in ZEC employment, wages, and value-added, average across small- and medium-sized ZECs after commencement of operations (in percentage points)



B. Company profiles

Min and Lambert (2010) surveyed nearly 200 companies using the FTZ program in 2007 about their reasons for using FTZs and the benefits they received. Nearly half believed FTZ cost savings helped them to retain employment at their facilities, and more than half believed their FTZ's activities spurred capital investment in the FTZ region. Beyond Min and Lambert and anecdotal evidence in Bolle and Williams 2013, company evidence of the impacts of the FTZ program is sparse. Therefore, to put a "face" on our

econometric results, we reached out to several U.S. FTZ companies to ascertain the ways in which the program impacts their business and the economic communities in which they operate, both directly and indirectly.

We found support for conclusions that company access to FTZs has substantial ripple effects through the company's supply chain, much of which is typically located nearby. BMW analyzed its economic impact on the South Carolina and national economies and found that its FTZ operations directly and indirectly add $6.3 billion annually to South Carolina's economy and lead to the employment of 36,285 people in the State. The overall footprint in the United States is even larger, with value added by BMW of $15.77 billion and employment of 120,855. In each case, these figures include both the direct contribution of BMW and the contribution via purchases of BMW and its employees that would not exist if BMW were not established in the United States. A 2017 study by the University of South Carolina finds that for every 10 jobs that are directly generated at a U.S. BMW facility, an additional 90 jobs are created elsewhere in the U.S. economy as a direct result of these BMW jobs.

Similarly, ExxonMobil assessed the economic impacts of its Louisiana operations (all within an FTZ) on the Louisiana economy and found one out of every eight jobs in the Baton Rouge area can be traced back to ExxonMobil. Every year, ExxonMobil's purchases of goods and services from providers in the local community support community payrolls $61.7 million and generate annual state and local tax well into the millions of dollars.

The FTZ operations in Georgia of Yamaha Motor Manufacturing Corporation of America resulted in expenditures of more than $170 million annually with more than 100 U.S. parts suppliers. About 30 percent of the parts and components used to make its products in the FTZ come from Georgia-based suppliers; another 20 percent comes from other U.S.-based suppliers.

FTZ benefits ensured that direct and indirect jobs remain in the United States. During a company restructuring, the savings afforded by the FTZ program tipped the scales in Helly Hansen's decision to locate company warehouse operations from Canada to the company's U.S. warehouse location in Auburn, Washington, expanding direct and indirect jobs there.

FTZ benefits are crucial to maintaining competitiveness in foreign markets from a U.S. production location. The savings afforded by the FTZ program support Lam Research Corporation's R&D activities in the United States, enabling it to remain a high-volume manufacturer based in America.

FTZ benefits have brought production jobs to the United States. Prodeco Technologies, an eBike manufacturer in Florida, uses its FTZ duty savings to keep its finished bike prices competitive with foreign-assembled eBikes that can be imported into the United States duty-free. Prodeco can compete with imports using American workers doing the assembly and with a closer eye on quality control. Piramal Critical Care's Bethlehem,

Pennsylvania-based production of anesthesia products are able to compete with lower-cost imported products thanks to duty-savings it gets from the FTZ program. The benefits enabled the company to grow, expand employment, modernize its facility, and increase capacity three-fold.

FTZ savings have enabled companies to direct company resources to their most efficient uses, *e.g.*, worker training (UniCarriers Americas). Savings afforded by the FTZ program have enabled companies to raise worker skills and to increase hiring as well.

From the profiles, it is evident that FTZ status contributes to a company's evaluation of relative costs of production in the United States versus outside the United States. In each case, FTZ benefits figured positively into the company decision to increase value added activity in the United States. This is true not just for small companies, but also for large multinational corporations. Also, in several cases FTZ benefits helped companies adjust to the competitive pressures created by multilateral tariff reduction affecting finished imported goods relative to their imported components.

Detailed company profiles are presented in Appendix B.

IV. Conclusion

The economic impacts of the U.S. FTZ program on communities in which FTZs are located are positive. We find that the formation of an FTZ has a small but positive impact on employment, wages, and value added in the broader community of the FTZ. They are particularly important to local communities after the businesses that use the benefits have matured. Certainly, small effects can still be significant to smaller communities.

The size of the benefits of the FTZ program on growth in community employment, wages, and value added should be viewed in the context of the economy generally. Over 3,000 companies participate in the FTZ program in the United States, compared to nearly 6 million companies in the United States as a whole.[12] Over 450,000 people are employed by companies with FTZ operations – but out of nearly 147 million nonfarm employees nationally.[13] Our results demonstrate that the FTZ program's benefits to local communities are positive, but small because the program itself is relatively small.

As the FTZ program has expanded over the years, and as the "terms of engagement" broadened and made it easier to use, the number of companies – and the communities in which they operate – have grown. Knowing that the benefits of the program to local communities are positive, one way to increase those benefits is to broaden the "terms of engagement" even further. In the alternative, dampening the use of FTZ program benefits, for example, by increasing paperwork/recordkeeping requirements or narrowing the scope of the products that can be used within the company's FTZ operations, would reduce the company *and* community-wide economic benefits associated with the program, and likely have further negative ramifications for ZECs.

Finally, it is worth noting that companies typically have a choice: they can operate in the United States or outside the United States. They will decide which choice to make – and the level of commitment and investment to devote to that choice -- based in part on the relative costs of doing business in the United States or abroad. To the extent that the program can provide one (more) positive reason for a U.S. location, such programs merit the support of U.S. policymakers.

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[12] According to the Census Bureau, 5.9 million firms operated in the United States in 2015, the most recent year data are available. "2015 SUSB Annual Data Tables by Enterprise Industry," January 2018, https://www.census.gov/data/tables/2015/econ/susb/2015-susb-enterprise.html.

[13] Bureau of Labor Statistics, total nonfarm employment, 2017, https://www.bls.gov/data/#employment.

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Appendix A: Econometric analysis

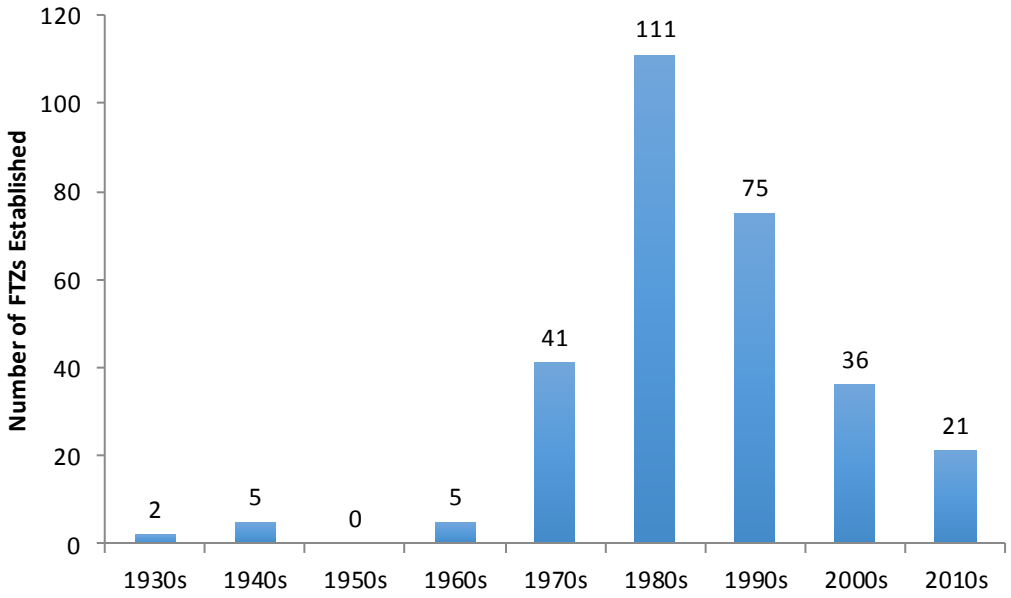
This Appendix describes our econometric approach to estimating the impacts of the Foreign-Trade Zone (FTZ) program's benefits on U.S. employment, wages and value added in the greater FTZ area. We first describe the data, then the econometric approach, and finally, the results.

A. Data

1. Data on FTZs in the United States

The establishment of FTZs goes back to the 1930s, although most were established in the 1980s and 1990s (See Figure A-1).

Figure A-1. Number of Foreign Trade Zones established by decade



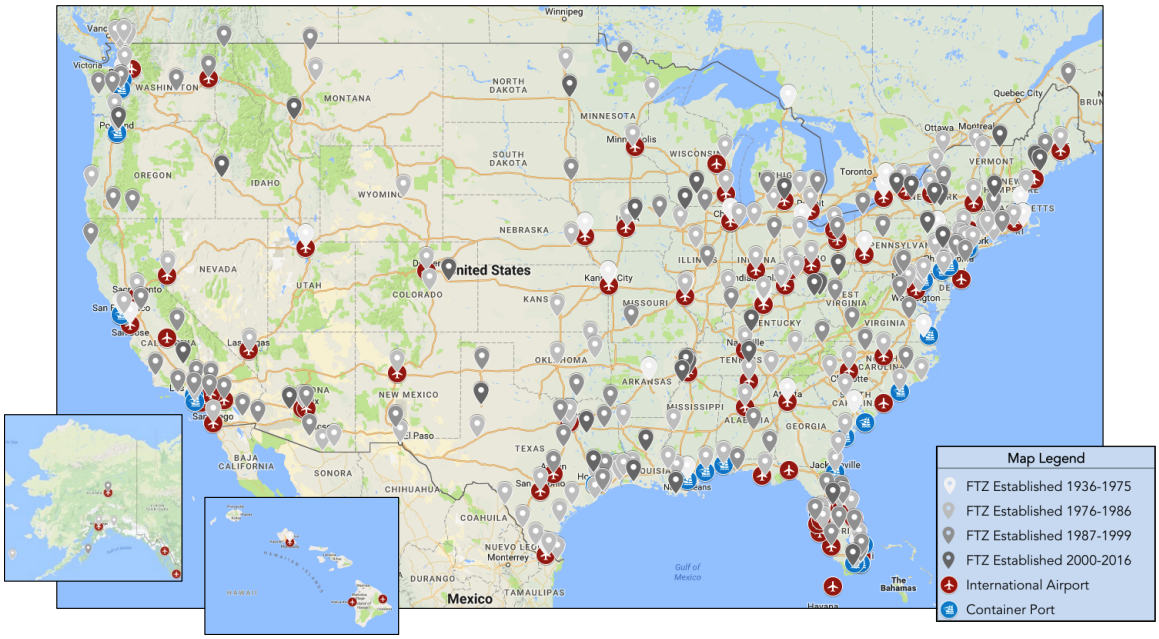
Source: U.S. Foreign Trade Zones, U.S. Department of Commerce. Available at: https://enforcement.trade.gov/ftzpage/letters/ftzlist-map.html.

FTZs have been established across the country and exist in every region and every state. Nearly all areas with an FTZ have some distinct economic geography and infrastructure, such as a comprehensive transportation infrastructure, an agglomeration of key industries, and economic hubs of activity.

The map in Figure A-2 marks each currently active FTZ by establishment period, along with international airports, and container ports. The map is composed of three separate layers, as noted in the legend in the lower right of the map. The first layer contains the

FTZ locations by establishment year, while the second and third contain the locations of international airports and container ports, respectively. Nearly every international airport and container port in the United States has an FTZ in the area. Communities with deep-water port facilities were some of the earliest zone projects to be established. More recently, over the last 40 years, the establishment of zone projects have mainly been in communities that do not have deep-water port facilities.

Figure A-2. FTZs in the United States



Sources: U.S. Port and Inland Waterways Modernization, U.S. Army Corps of Engineers, Institute for Water Resources; 2012; Bureau of Transportation Statistics, U.S. Department of Transportation; and National Association of Foreign Trade Zones. Map created in Google Maps by The Trade Partnership, 2018.

2. Matching FTZs with economic data

For the purposes of building the FTZ economic dataset, we define the geography of each FTZ economic community at the county level and then match county-level employment, wage and value added data, over time, to each FTZ area.

We start by defining the economic community of an FTZ as the area in a concentric circle with a 17.5-mile radius around the center of the zone.[14] The center of the

[14] We aim to cast a net sufficiently wide to capture relevant community-wide economic activity related to the FTZ, and we base the distance on the length of the average commute in the United States. An analysis by Brookings (2016) of the 2011 Longitudinal Employer Household Dynamics data shows the

concentric circle is the most central and dense area of the FTZ (in terms of population and industry). Each ZEC was mapped to the corresponding county or counties that have at least a majority of their area within the 17.5-mile radius.

We collected employment, wage, and value added data from Moody's Analytics for every U.S. county over time; specifically, employment (1970-2017), nominal wages (1975-2017), and nominal value added (1978-2017). The Moody's data contain 3,142 counties and 556 detailed sectors. The wage data cover hourly wages and salaries paid, and hence these wage data represent labor income in our dataset and analysis.

We summed each economic series across the sectors, by county, and obtained the corresponding longitudinal data on employment, wage, and value added, by county.

Seventeen (17) FTZs had lapsed or relinquished status and those were excluded. A relinquished FTZ status indicates that the entity granted the FTZ voluntarily relinquished its grant of authority from the Foreign-Trade Zones Board or the grant of authority lapsed under Foreign-Trade Zone Board policy/regulation due to lack of use. Two FTZ grantees have voluntarily relinquished their grants (FTZ 48, Tucson AZ and FTZ 188, Yakima WA). Fifteen FTZs are currently considered in lapsed status, with establishment dates ranging from 1983 to 2011.[15]

We also excluded the eight FTZs with merged status, which indicates that an FTZ's grant of authority was subsumed under an existing FTZ. For example, FTZs 66, Wilmington, NC and 67, Morehead City, NC, were merged with FTZ 214, Lenoir County, NC in 2014. FTZ 214, Lenoir County now effectively encompasses the areas previously covered by FTZs 66 and 67. By merging FTZs in close proximity to one another, grantees can reduce administrative costs. However, these mergers present methodological problems for our analysis because merged FTZs have no clear geographical, time-invariant boundary.

Our cleaned dataset consists of 251 ZECs that have FTZ status (are operating), with economic data for employment (1970-2017), wages (1975-2017), and value added (1978-2017), yielding a balanced panel dataset of 12,048 observations for FTZs and employment; 10,793 observations for FTZs and wages; and 9,400 observations for FTZs and value added.

These 251 ZECs all share distinct FTZ-type characteristics in terms of their economic geography, such as location, transportation infrastructure (e.g., the existence of a port,

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typical commute time across 96 metro areas in the United States ranges from 4.7 miles to 12.8 miles. Doubling those figures to capture those that work both in and on the outskirts of the economic center (9.4 and 25.6 miles, respectively) then taking the midpoint results in a 17.5-mile radius. See Brookings, "The growing distance between people and jobs in metropolitan America," by E. Kneebone and N. Holmes, 2016, (see appendix B).

[15] There were four terminated FTZs, but they were all established prior to 1975, the starting point of our analysis.

airport, highway system, or railway system), and connection to other hubs of economic activity. Thirty-six ZECs are in cities with population greater than 500,000, and the remaining 215 ZECs are in small or medium cities with less than 500,000 population. The population is the one major difference across the FTZs and hence we present the econometric results in three sets: all areas, small- and medium-sized (based on population) ZECs, and high population ZECs where the data allow.

B. Econometric approaches

We employed econometric analysis to examine the regional effects of establishing an FTZ on three measures of economic activity: employment, wages, and output as measured by value added. As detailed in this study and summarized earlier in Box 1, firms that operate within an FTZ can take advantage of a variety of cost savings related to production, trade, and corresponding supply chain logistics. One would expect that firms would use those cost savings to increase production, wages, or employment, or internalize cost savings in some other way (e.g., increase research and development spending, additional worker training, or increased distribution to shareholders). In other cases, we may expect new firms to begin using the zone in order to take advantage of these cost savings.

Our interest is the economic effects of FTZs on the host cities and immediately surrounding areas of the FTZ. We pursued a two-fold econometric approach. First, we use a "fixed effects" model to explore how economic activity in a ZEC changes after an FTZ is established. Second, we use a "difference in difference" (DID) estimation approach to estimate the FTZ effects on economic activity in the ZEC. The DID approach allows us to obtain an appropriate counterfactual to estimate a causal effect.

1. Fixed effects estimation

A fixed effects estimate is used to examine how economic activity in the ZEC changes after an FTZ is established. It enables us to assess the rate of growth in a variable (employment, wages, value added) in years prior to the formation of an FTZ, and in the years following the establishment of the FTZ. The fixed effects results are not necessarily an estimate of a causal effect of the FTZ, but are useful in understanding how economic activity changes after an FTZ is established in an area and serve as a useful check on the data and our results for our second econometric approach, described in the next section.

The fixed effects approach is shown by equation (1):

$$dy_{i,t_j} = \gamma_i + \delta_t + \beta_k x_{i,k} + \varepsilon_{i,t} \qquad (1)$$

where dy_{i,t_j} is the j-year change in FTZ i's economic activity (employment, wages, value added), and j=1, 2,…, 10. γ_i is the fixed effect for FTZ i, and δ_t is the fixed effect for year t. $x_{i,k}$ takes on a value of one k years after the FTZ was established and zero otherwise, where k=1, 2, …, 10. That is, we allow up to ten years for an effect to appear.

FTZ dummies $\gamma_i$capture the effects of time invariant characteristics that determine the change in economic activity y (employment, wages, value added), including secular productivity and geographic or other endowment differences. The FTZ fixed effects control for the time invariant, inter-FTZ variation, which is important because a regression relying on inter-FTZ variation would be problematic due to potential omitted variable bias. Hence, we include the FTZ fixed effects to control for inter-FTZ variation. The year fixed effects δ_t account for annual shocks common to all FTZ areas, and control for ("soak up") nationwide macroeconomic conditions including inflation. The coefficient on the indicator variable, β, is our coefficient of interest, and captures the variation within each FTZ over time (the intra-FTZ variation).

For instance, consider again y = employment. The coefficient on the indicator variable, β, captures the employment change in the FTZ *i* over a j-year period from FTZ establishment to k years out, where k is a subset of j. We use zero, one, and two year lags in the dependent variable to allow for anticipation effects, that is, a ramp-up of economic efforts and initiatives that forward-thinking communities and businesses engage in the years immediately preceding their efforts to create their FTZ project. If there is an anticipation effect, then using the year or two prior to the establishment date would allow for a more accurate estimate of the impact of the formation of an FTZ.

There is a sufficient number of observations in the fixed effects approach to examine all ZECs: small- and medium-sized ZECs, and high population ZECs. For the difference in difference approach, however, because we control for regional effects, we can only examine all areas and small- and medium-sized ZECs and due to an insufficient number of observations for high population ZECs by region we do not break out high population ZECs for the DID results.

a. Fixed effects employment results

Figure A-3 and Tables A-1, A-2 and A-3 report the econometric estimation results from equation (1) for employment in all ZECs, small- and medium-sized ZECs, and high population ZECs, respectively.

These results suggest that, on average, the percentage change in employment in the ZEC after the establishment of an FTZ is positive and significant at one, two, three, four, five, six, and seven years after the FTZ is established, and that this result holds using data from one and two years prior to the establishment date. The anticipation effect is more visible for the smaller and medium areas than the high population areas. The timing also differs: the smaller and medium ZECs experience increases in employment almost immediately, while high population ZECs experience the increase in later years. The magnitude of the employment increase is approximately a 0.01 ppt change for small- and medium-sized ZECs, and 0.025 ppt for high population ZECs.

In other words, a small or medium ZEC that circles a location that becomes an FTZ, on average, experiences small but positive and statistically significant changes in employment in the first seven years, compared with otherwise similar ZECs that either

have already become FTZs or will in the future. High population ZECs experience slightly larger (and statistically significant) changes in employment but in later years, i.e., seven, eight, nine, and 10 years out.

Again, these results do not indicate of a causal effect. In other words, they do not demonstrate that the formation of the FTZ *caused* the acceleration in the growth in employment in the ZEC.

Figure A-3. Percentage point changes in ZEC employment after FTZ established

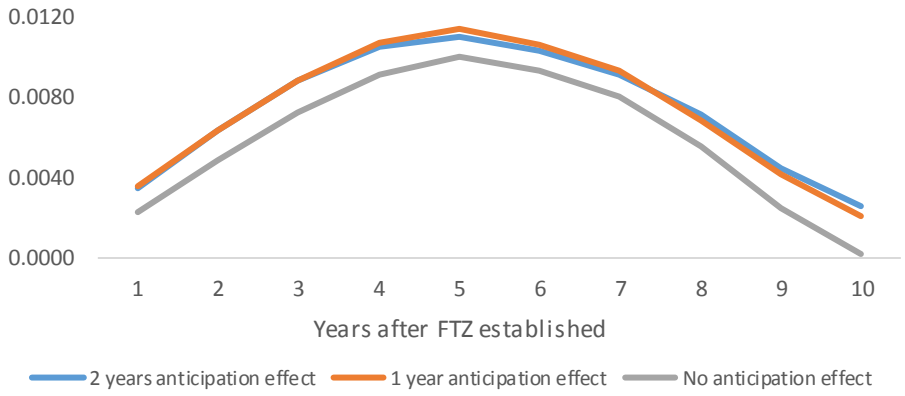

Table A-1. Employment changes following establishment of FTZ, all ZECs

Number of years after establishment date	Starting point: Two years before establishment date		Starting point: One year before establishment date		Starting point: Establishment date	
1	0.0035		0.0036	*	0.0022	*
	(.0025438)		(.0019592)		(.0011718)	
	0.175		0.066		0.056	
2	0.0063	**	0.0063	**	0.0049	**
	(.0030076)		(.0025433)		(.001959)	
	0.036		0.013		0.012	
3	0.0089	***	0.0088	***	0.0073	***
	(.0033939)		(.003007)		(.002543)	
	0.009		0.003		0.004	
4	0.0105	***	0.0108	***	0.0091	***
	(.0036878)		(.0033934)		(.0030069)	
	0.004		0.002		0.002	
5	0.0111	***	0.0114	***	0.0100	***
	(.0039496)		(.0036876)		(.0033936)	
	0.005		0.002		0.003	
6	0.0103	**	0.0107	***	0.0094	**
	(.0042051)		(.0039497)		(.0036882)	
	0.014		0.007		0.011	
7	0.0091	*	0.0094	**	0.0081	**
	(0.0044377)		(.0042041)		(.0039495)	
	0.04		0.025		0.041	
8	0.0071		0.0069		0.0056	
	(.0046362)		(.0044368)		(.0042039)	
	0.125		0.12		0.187	
9	0.0045		0.0042		0.0024	
	(.0047988)		(.0046349)		(.0044363)	
	0.35		0.367		0.584	
10	0.0026		0.0021		0.0002	
	(.0049036)		(.0047972)		(.0046341)	
	0.599		0.666		0.97	

Note: The standard error is reported in parentheses underneath the estimated coefficient. The plim is reported underneath the standard error. * denotes statistical significance at the 10 percent level, ** at the five percent level, and *** at the one percent level. *** p<0.01, ** p<.05, * p<.10.

Table A-2. Employment changes following establishment of FTZ, small- and medium-sized ZECs

	Starting point					
Number of years after establishment date	Two years before establishment date		One year before establishment date		Establishment date	
1	0.0050	*	0.0045	**	0.0026	**
	(.0028522)		(.0022082)		(.0013292)	
	0.08		0.042		0.049	
2	0.0081	**	0.0075	***	0.0056	**
	(.0033607)		(.0028515)		(.0022079)	
	0.016		0.009		0.012	
3	0.0106	***	0.0100	***	0.0080	***
	(.0037848)		(.0033601)		(.0028514)	
	0.005		0.003		0.005	
4	0.0120	***	0.0117	***	0.0096	***
	(.0041036)		(.0037845)		(.0033602)	
	0.004		0.002		0.004	
5	0.0122	***	0.0120	***	0.0102	***
	(.0043885)		(.0041036)		(.003785)	
	0.006		0.003		0.007	
6	0.0109	**	0.0107	**	0.0090	**
	(.0046699)		(.0043889)		(.0041046)	
	0.019		0.015		0.028	
7	0.0090	*	0.0088	*	0.0071	
	(.0049305)		(.0046693)		(.0043891)	
	0.067		0.061		0.107	
8	0.0063		0.0056		0.0039	
	(.0051573)		(.0049299)		(.0046695)	
	0.218		0.256		0.402	
9	0.0033		0.0025		0.0003	
	(.0053459)		(.0051566)		(.00493)	
	0.533		0.633		0.951	
10	0.0009		-0.0001		-0.0025	
	(.0054679)		(.005345)		(.0051566)	
	0.863		0.983		0.633	

Note: The standard error is reported in parentheses underneath the estimated coefficient. The plim is reported underneath the standard error. * denotes statistical significance at the 10 percent level, ** at the five percent level, and *** at the one percent level. *** p<0.01, ** p<.05, * p<.10. Excludes cities with a population of 500,000 or more.

Table A-3. Employment changes following establishment of FTZ, high population ZECs

	Starting point					
Number of years after establishment date	Two years before establishment date		One year before establishment date		Establishment date	
1	-0.0155		-0.0073	*	-0.0024	
	(.0050813)		(.003707)		(.0020594)	
	0.002		0.05		0.253	
2	-0.0165		-0.0082		-0.0030	
	(.0062299)		(.0050928)		(.0037109)	
	0.008		0.109		0.425	
3	-0.0148		-0.0067		-0.0015	
	(.0071801)		(.0062424)		(.005097)	
	0.039		0.285		0.775	
4	-0.0101		-0.0026		0.0023	
	(.0079738)		(.0071905)		(.0062446)	
	0.204		0.716		0.714	
5	-0.0051		0.0025		0.0067	
	(.0086583)		(.0079781)		(.0071886)	
	0.557		0.756		0.352	
6	0.0003		0.0079		0.0121	
	(9.0092653)		(.0086567)		(.0079718)	
	0.978		0.361		0.129	
7	0.0057		0.0135		0.0177	*
	(.0097476)		(.0092579)		(.008646)	
	0.556		0.145		0.04	
8	0.0103		0.0177	*	0.0220	*
	(.0100847)		(.0097365)		(.0092456)	
	0.306		0.07		0.018	
9	0.0121		0.0197	*	0.0242	*
	(.0103161)		(.0100595)		(.009714)	
	0.24		0.05		0.013	
10	0.0151		0.0221	*	0.0268	***
	(.0104591)		(.0102891)		(.0100354)	
	0.15		0.032		0.008	

Note: The standard error is reported in parentheses underneath the estimated coefficient. The plim is reported underneath the standard error. * denotes statistical significance at the 10 percent level, ** at the five percent level, and *** at the one percent level. *** p<0.01, ** p<.05, * p<.10. Only cities with a population of 500,000 or more.

b. Fixed effects wage results

Figure A-4 and Tables A-4, A-5, A-6 report the fixed effects estimation results from equation (1) for wages, for all ZECs, for small- and medium-sized ZECs, and for high population ZECs, respectively. Again, wages are defined as total wages and salary disbursements.

These results suggest that, on average, the percentage change in total wages paid is positive and statistically significant for the broader FTZ areas immediately after the FTZ is established and for every year out to 10 years. The change in wages is slightly larger when the year prior to establishment is used as the benchmark, which reflects an anticipation effect (firms may have increased the amount of wages paid out the year prior to the FTZ being established, as they ramped up activities in anticipation of the FTZ benefits). The change in wages reaches its maximum (0.02 ppt) at about six or seven years out.

Small- and medium-sized ZECs experience higher wages immediately after and until out eight or nine years after the establishment of the FTZ. High population ZECs experience a wage increases that are slightly greater in magnitude (0.03 ppt) although not until around six to eight years out. The anticipation effect is visible in small- and medium-sized ZECs but not high population ZECs.

As with employment, these wage increase results do not indicate of a causal effect. In other words, they do not demonstrate that the formation of the FTZ caused the acceleration in the growth in wages in the ZECs.

Figure A-4. Percentage point changes in ZEC wage growth after FTZ established, all ZECs

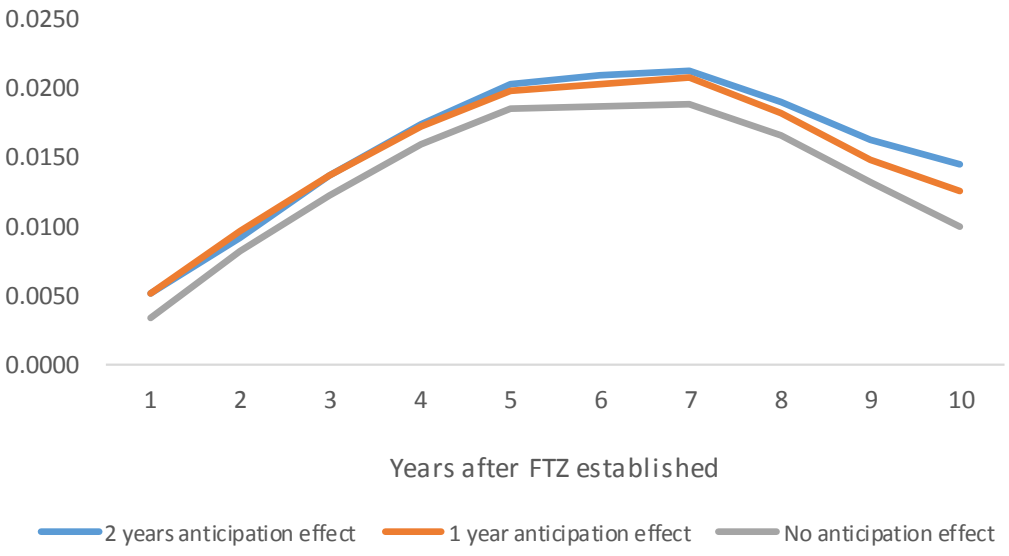

Table A-4. Wage changes following establishment of FTZ, all ZECs

	Starting point		
Number of years after establishment date	Two years before establishment date	One year before establishment date	Establishment date
1	0.0052	0.0052 **	0.0033 **
	(.0033045)	(.0025828)	(.0016339)
	0.1160	0.0420	0.0410
2	0.0093 **	0.0097 ***	0.0082 ***
	(.0038299)	(.0033011)	(.002582)
	0.0150	0.0030	0.0020
3	0.0137 ***	0.0138 ***	0.0122 ***
	(.0042849)	(.0038259)	(.0033)
	0.0010	0.0000	0.0000
4	0.0175 ***	0.0173 ***	0.0161 ***
	(.004679)	(.0042807)	(.0038249)
	0.0000	0.0000	0.0000
5	0.0203 ***	0.0199 ***	0.0185 ***
	(0.0050277)	(.004675)	(.0042801)
	0.0000	0.0000	0.0000
6	0.0210 ***	0.0203 ***	0.0188 ***
	(.0053323)	(.0050249)	(.0046756)
	0.0000	0.0000	0.0000
7	0.0214 ***	0.0208 ***	0.0189 ***
	(.0055997)	(.0053253)	(.0050221)
	0.0000	0.0000	0.0000
8	0.0191 ***	0.0183 ***	0.0167 ***
	(.0058439)	(.0055929)	(.0053228)
	0.0010	0.0010	0.0020
9	0.0163 ***	0.0149 **	0.0132 **
	(.006017)	(.0058353)	(.0055887)
	0.0070	0.0110	0.0180
10	0.0146 **	0.0125 **	0.0100 *
	(.0060874)	(.0060061)	(.005829)
	0.0160	0.0370	0.0850

Note: The standard error is reported in parentheses underneath the estimated coefficient. The plim is reported underneath the standard error. * denotes statistical significance at the 10 percent level, ** at the five percent level, and *** at the one percent level. *** p<0.01, ** p<.05, * p<.10.

Table A-5. Wage changes following establishment of FTZ, small- and medium-sized ZECs

	Starting point		
Number of years after establishment date	Two years before establishment date	One year before establishment date	Establishment date
1	0.0075 **	0.0064 **	0.0039 **
	(.0037124)	(.0029215)	(.0018651)
	0.0430	0.0280	0.0380
2	0.0118 ***	0.0112 ***	0.0091 ***
	(.0042766)	(.0037085)	(.0029206)
	0.0060	0.0030	0.0020
3	0.0162 ***	0.0152 ***	0.0138 ***
	(.0047693)	(.0042722)	(.0037074)
	0.0010	0.0000	0.0000
4	0.0196 ***	0.0183 ***	0.0166 ***
	(.01964)	(.0047652)	(.0042715)
	0.0000	0.0000	0.0000
5	0.0219 ***	0.0205 ***	0.0185 ***
	(.0055877)	(.0051968)	(.004765)
	0.0000	0.0000	0.0000
6	0.0217 ***	0.0200 ***	0.0180 ***
	(.0059309)	(.0055856)	(.0051981)
	0.0000	0.0000	0.0010
7	0.0212 ***	0.0197 ***	0.0175 ***
	(.0062351)	(.0059239)	(.0055829)
	0.0010	0.0010	0.0020
8	0.0179 ***	0.0163 ***	0.0144 **
	(.0065195)	(.0062282)	(.0059214)
	0.0060	0.0090	0.0150
9	0.0147 **	0.0123 *	0.0103 *
	(.0067277)	(.0065116)	(.0062247)
	0.0290	0.0590	0.0970
10	0.0126 *	0.0065	0.0065
	(.006814)	(.0067174)	(.0065058)
	0.0640	0.1590	0.3190

Note: The standard error is reported in parentheses underneath the estimated coefficient. The plim is reported underneath the standard error. * denotes statistical significance at the 10 percent level, ** at the five percent level, and *** at the one percent level. *** p<0.01, ** p<.05, * p<.10. Excludes cities with a population of 500,000 or more.

Table A-6. Wage changes following establishment of FTZ, high population ZECs

	Starting point		
Number of years after establishment date	Two years before establishment date	One year before establishment date	Establishment date
1	-0.0235 ***	-0.0111 **	-0.0042
	(.0063677)	(.0046172)	(.0025515)
	0	0.016	0.104
2	-0.0248 ***	-0.0115 *	-0.0039
	(.0078394)	(.0063927)	(.0046258)
	0.002	0.073	0.402
3	-0.0222 **	-0.0084	-0.0002
	(.009019)	(.0078662)	(.0064004)
	0.014	0.285	0.981
4	-0.0163	-0.0024	0.0062
	(.0099435)	(.0090404)	(.0078678)
	0.101	0.794	0.432
5	-0.0093	0.0044	0.0130
	(.010641)	(.0099536)	(.0090332)
	0.385	0.659	0.15
6	-0.0016	0.0115	0.0197 **
	(.0111513)	(.0106392)	(.0099385)
	0.886	0.278	0.048
7	0.0048	0.0186 *	0.0261
	(.011559)	(.0111379)	(.0106175)
	0.675	0.095	0.014
8	0.0079	0.0220 *	0.0300 ***
	(.0118346)	(.0115413)	(.0111164)
	0.505	0.057	0.007
9	0.0073	0.0219 *	0.0307 ***
	(.0119274)	(.0117859)	(.0114957)
	0.538	0.063	0.008
10	0.0063	0.0217 *	0.0308 ***
	(.0119699)	(.0118787)	(.0117399)
	0.598	0.068	0.009

Note: The standard error is reported in parentheses underneath the estimated coefficient. The plim is reported underneath the standard error. * denotes statistical significance at the 10 percent level, ** at the five percent level, and *** at the one percent level. *** p<0.01, ** p<.05, * p<.10. Only cities with a population of 500,000 or more.

c. Fixed effects value added results

Figure A-5 and Tables A-7, A-8, and A-9 report the econometric estimation results from equation (1) for value added, for all ZECs, small- and medium-sized ZECs, and high population ZECs, respectively.

Table A-7 reports the results for all ZECs and shows that, on average, the percentage change in value added is positive and statistically significant at two years out following the establishment of the FTZ, and this value added change persists until at least 10 years out. The value-added change is slightly larger in magnitude using one and two years prior to the establishment date, which reflects an anticipation effect, as described above.

For instance, six years after the FTZ establishment date, value added change is 0.0264 ppt greater than the establishment date, 0.0308 ppt greater if the year prior to the establishment date is used as the benchmark, and 0.0314 if two years prior is used as the benchmark. The ppt change in value added appears to reach its maximum at about seven years. That is, after about seven years, value added change is 0.02 to 0.03 ppt greater than it was at the establishment date or year before, and that result holds until at least 10 years out.

The results for small- and medium-sized ZECs (Table A-8) largely mirror those for all ZECs, with the ppt change in value added is 0.02 to 0.03 ppt higher two years after the FTZ is established, and persisting for at least 10 years out. The change in value added in high population ZECs (Table A-9) is roughly the same magnitude, albeit slower to appear (appears nine and 10 years out).

Figure A-5. Percentage point changes in ZEC value added growth after FTZ established, all ZECs

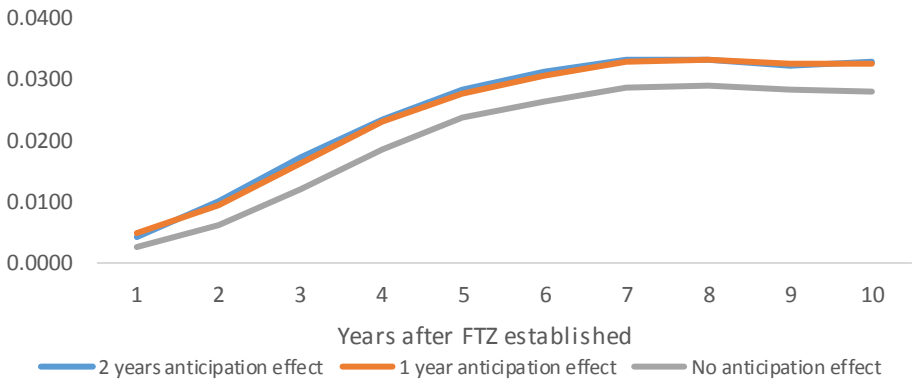

Table A-7. Value Added changes following establishment of FTZ, all ZECs

	Starting point		
Number of years after establishment date	Two years before establishment date	One year before establishment date	Establishment date
1	0.0042	0.0047 *	0.0027
	(0.003444)	(.0026503)	(.0016688)
	0.2270	0.0740	0.1100
2	0.0101 **	0.0094 ***	0.0063 **
	(.0040621)	(.0034189)	(.0026364)
	0.0130	0.0060	0.0170
3	0.0172 ***	0.0163 ***	0.0120 ***
	(.004572)	(.0040324)	(.0034011)
	0.0000	0.0000	0.0000
4	0.0236 ***	0.0230 ***	0.0185 ***
	(.0050184)	(.0045392)	(.0040121)
	0.0000	0.0000	0.0000
5	0.0284 ***	0.0279 ***	0.0237 ***
	(.0054283)	(.0049844)	(.0045181)
	0.0000	0.0000	0.0000
6	0.0314 ***	0.0308 ***	0.0264 ***
	(.0057806)	(.0053944)	(.0049639)
	0.0000	0.0000	0.0000
7	0.0331 ***	0.0331 ***	0.0286 ***
	(.0060777)	(.0057399)	(.0053684)
	0.0000	0.0000	0.0000
8	0.0334 ***	0.0333 ***	0.0290 ***
	(.006318)	(.0060365)	(.0057138)
	0.0000	0.0000	0.0000
9	0.0324 ***	0.0326 ***	0.0284 ***
	(.0065393)	(.0062747)	(.0060083)
	0.0000	0.0000	0.0000
10	0.0329 ***	0.0325 ***	0.0281 ***
	(.0067033)	(.006493)	0.006244
	0.0000	0.0000	0.0000

Note: The standard error is reported in parentheses underneath the estimated coefficient. The plim is reported underneath the standard error. * denotes statistical significance at the 10 percent level, ** at the five percent level, and *** at the one percent level. *** p<0.01, ** p<.05, * p<.10.

Table A-8. Value Added changes following establishment of FTZ, small- and medium-sized ZECs

	Starting point		
Number of years after establishment date	Two years before establishment date	One year before establishment date	Establishment date
1	0.0075 *	0.0067 *	0.0035 *
	(.0038469)	(.002974)	(.0018884)
	0.052	0.024	0.065
2	0.0139 ***	0.0120 ***	0.0077 ***
	(.0045269)	(.0038229)	(.0029613)
	0.002	0.002	0.009
3	0.0211 ***	0.0192 ***	0.0139 ***
	(.0050895)	(.0044988)	(.0038068)
	0	0	0
4	0.0274 ***	0.0260 ***	0.0207 ***
	(.0055815)	(.005059)	(.0044807)
	0	0	0
5	0.0321 ***	0.0306 ***	0.0259 ***
	(.0060391)	(.0055506)	(.0050409)
	0	0	0
6	0.0349 ***	0.0336 ***	0.0286 ***
	(.006438)	(.006009)	(.0055336)
	0	0	0
7	0.0360 ***	0.0354 ***	0.0305 ***
	(.0067753)	(.0064005)	(.005986)
	0	0	0
8	0.0358 ***	0.0350 ***	0.0304 ***
	(.0070459)	(.0067378)	(.0063777)
	0	0	0
9	0.0342 ***	0.0335 ***	0.0289 ***
	(.0072988)	(.0070088)	(.0067148)
	0	0	0
10	0.0342 ***	0.0328 ***	0.0280 ***
	(.0074807)	0.0072585	(.0069831)
	0	0	0

Note: The standard error is reported in parentheses underneath the estimated coefficient. The plim is reported underneath the standard error. * denotes statistical significance at the 10 percent level, ** at the five percent level, and *** at the one percent level. *** p<0.01, ** p<.05, * p<.10. Excludes cities with a population of 500,000 or more.

Table A-9. Value Added changes following establishment of FTZ, high population ZECs

Number of years after establishment date	Starting point: Two years before establishment date		Starting point: One year before establishment date		Starting point: Establishment date	
1	-0.0292	***	-0.0143	***	-0.0053	*
	(.0071316)		(.0052945)		(.0030566)	
	0		0.007		0.082	
2	-0.0293	***	-0.0158	**	-0.0074	
	(.0085559)		(.0070418)		(.0052319)	
	0.001		0.025		0.159	
3	-0.0251	**	-0.0130		-0.0061	
	(.0097001)		(.0084418)		(.0069566)	
	0.01		0.123		0.377	
4	-0.0182	*	-0.0062		-0.0010	
	(.0107394)		(.0095598)		(.0083342)	
	0.09		0.519		0.904	
5	-0.0117		0.0009		0.0059	
	(.0115918)		(.0105699)		(.0094298)	
	0.312		0.935		0.529	
6	-0.0063		0.0048		0.0104	
	(.0122427)		(.0113997)		(.0104229)	
	0.604		0.674		0.32	
7	-0.0010		0.0106		0.0145	
	(.0128219)		(.0120335)		(.0112401)	
	0.94		0.377		0.197	
8	0.0013		0.0146		0.0182	
	(.0133242)		(.0125991)		(.0118663)	
	0.922		0.248		0.125	
9	0.0016		0.0159		0.0208	*
	(.0137242)		(.0130404)		(.0123828)	
	0.907		0.224		0.093	
10	0.0028		0.0169		0.0222	*
	(.0141282)		(.0134331)		(.012819)	
	0.843		0.209		0.083	

Note: The standard error is reported in parentheses underneath the estimated coefficient. The plim is reported underneath the standard error. * denotes statistical significance at the 10 percent level, ** at the five percent level, and *** at the one percent level. *** p<0.01, ** p<.05, * p<.10. Only cities with a population of 500,000 or more.

2. *Difference in difference estimation*

Next, we employ a "difference in difference" (DID) estimation technique to formally investigate the causal relationship between the establishment of an FTZ and economic activity in the broader ZEC. DID is a useful estimation approach in this case because it allows us to compare economic communities that are otherwise similar except for the FTZ to those with an FTZ. The DID approach allows us to make use of the longitudinal data from the FTZ economic communities (the "treatment group") and otherwise similar areas that do not currently have an FTZ nearby.

The DID approach is ideal for the nature of this study and other researchers have used it to assess the focused economic effects on local economies of policy changes.[16] For instance, Card and Krueger (1994 and 2000) use DID to examine the effects of a raise in the minimum wage on low-skill employment. They compared fast-food industry data in New Jersey to Pennsylvania. Hastings (2004) used DID to examine the impact on gas prices of the take over of a California independent gas station by a vertically integrated firm. Hastings focused on gas prices at stations within a mile of the firm that was acquired, compared to those that had no stations previously owned by the acquired firm. Thus, DID can be used to examine very specific information for very specific local communities.

Using the DID approach, we compare how economic activity (employment, wages, value added) changed in the "treatment group" – an economic community that includes an operating FTZ -- to changes in economic activity in the "control group" (an otherwise similar economic community in that same region of the country that does not yet have an FTZ nearby) during the same time period. This allows us to obtain an appropriate counterfactual to estimate a causal effect. We control for regional economic differences by using time zones to divide the FTZs into four regions (Pacific, Mountain, Central, and Eastern).[17] The economic community with the most recently established FTZ in each region was used as the control group for that region, for the period of time *before* the FTZ was established. The control groups were FTZ 276, Kern County, CA for the Pacific zone; FTZ 280, Ada and Canyon Counties, ID, for the Mountain zone; FTZ 279, Terrebonne Parish, LA, for the Central zone; and FTZ 284, Genesee County, NY, for the Eastern zone.

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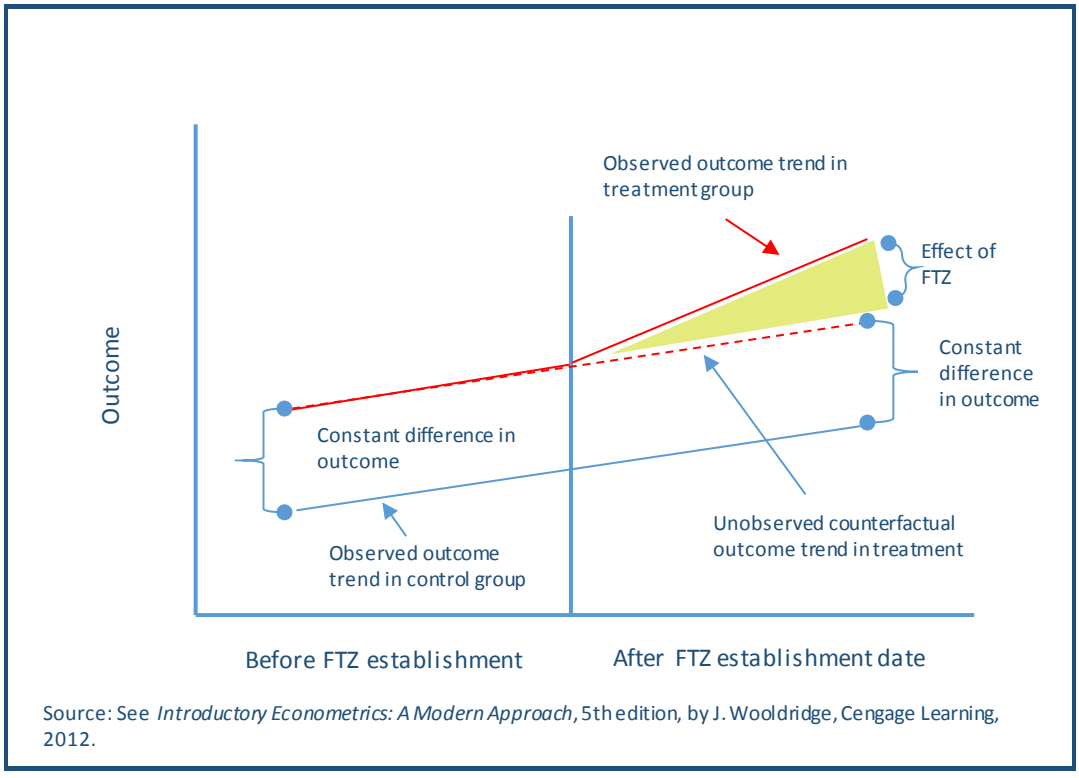
[16] See Wooldridge, J. (2012) and Imbens and Wooldridge (2007). In the case where the same units within a group are observed in each time period, the average gain in the second (control) group is subtracted from the average gain in the first group (the treatment group, the FTZ group). This removes biases in second period comparisons between the treatment and control group that could be the result from permanent differences between those groups, as well as biases from comparisons over time in the treatment group that could be the result of trends.

[17] The Alaska FTZs are included in the Pacific region; the one Hawaii FTZ was established prior to 1976 so was not included in our dataset.

Thus, we have two areas that have the same economic geography and infrastructure characteristics, and these two areas are in the same region of the country. At the beginning of the period, the only difference is that one area has within it an established FTZ and the other does not. Had it not been for the FTZ, we would expect economic activity in the two areas to change in roughly the same manner. The difference in difference approach essentially compares the difference in the changes in targeted economic variables of these two areas. So, for example, if the establishment of an FTZ had a positive effect on employment in an area, then we would expect the change in employment in that FTZ area over time to exceed the change in employment in an otherwise similar area over the same period.

Figure A-6 depicts the difference-in-difference estimation approach. After the intervention, in this case the establishment of an FTZ, the difference between the observed outcome in the control group and the observed outcome in the treatment group is attributed to the intervention (the FTZ). The FTZ effect is represented by the yellow shaded area.

Figure A-6. Depiction of difference-in-difference estimation approach



Source: See *Introductory Econometrics: A Modern Approach*, 5th edition, by J. Wooldridge, Cengage Learning, 2012.

We estimate the following equation:

$$dy_{i,t_j} = \gamma_i + \delta_t + \sum_{k=1}^{10} \beta_k \, x_{i,k} * DR1 + \cdots + \sum_{k=1}^{10} \beta_k \, x_{i,k} * DR4 + \varepsilon_{i,t} \quad (2)$$

where y_{i,t_j} is the j-year change in FTZ i's economic activity (employment, wages, value added). For example, we look at zero lag (the year established), one-year lag (one year prior to year established), and two-year lag (two years prior to year established). γ_i is the fixed effect for FTZ area i, and δ_t is the year fixed effect. x(i,k) takes on a value of one k years after the FTZ was established and zero otherwise. DR1 is a regional indicator that takes on value one when the region of FTZ i is located in region 1 and zero otherwise. The same applies for DR2, DR3, and DR4. The FTZ area with the most recent year establishment date for its FTZ is the control group for each region.

Consider employment as the economic activity of interest. Then we identify the effect of the FTZ area on employment by comparing the change in employment from the establishment year date to k years out (where k=1,2, 3, .., 10), to employment changes in that same time period in the control group. The underlying assumption is that, controlling for other determinants of employment, employment would have moved in parallel to the area in that region that becomes an FTZ at a future date, in the absence of the FTZ being established. Thus, any divergence in employment changes after the FTZ establishment date is attributable to the FTZ being established.

The DID results reflect the difference between changes in the treatment group and control group over a certain time period, where that time period begins when the treatment group becomes an FTZ (and the control group is not yet an FTZ). This approach allows us to compare two otherwise similar economic communities in which the only main difference is that one of them (the treatment group) is an FTZ and the other is not.

a. DID employment results

Tables A-10 and A-11 report the econometric estimation results from equation (2) for all ZECs, and small- and medium-sized ZECs, respectively. An insufficient number of observations for high population ZECs by region prevented us from isolating the DID effects in high population ZECs.

These results suggest that the ppt change in employment in a ZEC due to the establishment of the FTZ within the ZEC is positive and statistically significant eight, nine and 10 years from the FTZ establishment date. Since our dataset includes the entire population of FTZs, some economic meaning can be ascribed to all of the estimated coefficients. Notwithstanding, the statistically significant employment effects appear in years eight, nine and 10. That is, employment changes were, on average, 0.14 ppt greater in ZECs eight years out, 0.17 ppt greater nine years out, and 0.19 ppt greater 10 years out.

To put these results in context, consider two economic communities over a 10-year period. One includes an FTZ at the beginning of this period and the other does not have an FTZ within its boundaries during this period (but does get one later). Suppose the economic community without the FTZ experienced a 4.8 percent increase in employment over this period. Then, the economic community with the FTZ would be expected to experience a 5.0 percent increase in employment over this same period.

There is evidence of a small anticipation effect, as the employment effect is positive, slightly larger, and statistically significant when the year before establishment is used as the benchmark.

We find that for all ZECs, and for small- and medium-sized ZECs (areas with population less than 500,000), the employment effect of the FTZ is small but positive, and reaches a rate of 0.2 ppt in the ninth and 10^{th} years out. That is, nine to 10 years after the FTZ is established, the employment change in the ZEC is 0.2 ppt greater compared with otherwise similar economic communities, and that difference in the employment change can be attributed to the FTZ.

Table A-10. Employment effects, all ZECs

Number of years after establishment date	Starting point: Two years before establishment date	One year before establishment date	Establishment date
1	0.0462	0.0494	0.0113
	(.0626979)	(.0482117)	(.0279329)
	0.462	0.526	0.686
2	0.0635	0.0462	0.0253
	(.0765668)	(.0636178)	(.0485753)
	0.407	0.468	0.602
3	0.0873	0.0698	0.0471
	(.0871495)	(.0751927)	(.0627859)
	0.317	0.354	0.453
4	0.1037	0.0862	0.0633
	(.0962604)	(.0847377)	(.0742148)
	0.282	0.31	0.394
5	0.1119	0.0947	0.0718
	(.1066974)	(.0950265)	(.0860008)
	0.295	0.319	0.404
6	-0.2337	-0.0858	-0.0129
	(.1670433)	(.1513092)	(.138555)
	0.163	0.571	0.926
7	-0.2591	-0.1118	-0.0414
	(.1745329)	(.1610283)	(.149446)
	0.139	0.488	0.782
8	0.1001	0.1482	0.1360 *
	(.102901)	(.0965023)	(.0721765)
	0.331	0.125	0.091
9	0.1296	0.1787 *	0.1683 *
	(.1057315)	(.099969)	(.0952736)
	0.221	0.075	0.078
10	0.1501	0.1996 *	0.1904 *
	(.109162)	(.103701)	(.0999868)
	0.17	0.055	0.058

Note: Standard errors are clustered at the regional level. The standard error is reported in parentheses underneath the estimated coefficient. The plim is reported underneath the standard error. * denotes statistical significance at the 10 percent level, ** at the five percent level, and *** at the one percent level. *** p<0.01, ** p<.05, * p<.10.

Table A-11. Employment effects, small- and medium-sized ZECs

	Starting point					
Number of years after establishment date	Two years before establishment date		One year before establishment date		Establishment date	
1	0.0461		0.0306		0.0109	
	(.063768)		(.0494478)		(.0287645)	
	0.47		0.536		0.705	
2	0.0638		0.0466		0.0253	
	(.0776029)		(.0648183)		(.0496135)	
	0.411		0.473		0.611	
3	0.0887		0.0713		0.0481	
	(.0878286)		(.0758818)		(.063469)	
	0.313		0.348		0.449	
4	0.1066		0.0892		0.0658	
	(.0965018)		(.0847852)		(.0743225)	
	0.27		0.294		0.377	
5	0.1171		0.1001		0.0766	
	(.1066602)		(.0946504)		(.0857203)	
	0.273		0.291		0.372	
6	0.0633		0.1104		0.0978	
	(.0950275)		(.0857962)		(.0785693)	
	0.505		0.199		0.214	
7	0.0636		0.1097		0.0980	
	(.0992988)		(.0914789)		(.0849792)	
	0.522		0.231		0.25	
8	0.1071		0.1553		0.1426	*
	(.1029707)		(.0966323)		(.0815584)	
	0.299		0.109		0.12	
9	0.1369		0.1861	*	0.1751	*
	(.1057923)		(.100209)		(.0959031)	
	0.197		0.064		0.069	
10	0.1574		0.2069	**	0.1970	*
	(.1093591)		(.1041109)		(.1009418)	
	0.151		0.048		0.052	

Note: Standard errors are clustered at the regional level. The standard error is reported in parentheses underneath the estimated coefficient. The plim is reported underneath the standard error. * denotes statistical significance at the 10 percent level, ** at the five percent level, and *** at the one percent level. *** p<0.01, ** p<.05, * p<.10. Excludes cities with a population of 500,000 or more.

b. Difference in difference wage results

Tables A-12 and A-13 report the FTZ effects on wage changes from equation (2) for all ZECs, and small- and medium-sized ZECs, respectively. Figures A-9 and A-10 plot the estimated coefficients.

The results suggest that for all ZECs, on average, the FTZ effect on ZEC wages is positive and significant starting at around the eighth year out, and is on the order of 0.28 to 0.34 ppt, and persists at least 10 years out. When we focus only on small- and medium-sized ZECs, the FTZ effect on wages is positive and statistically significant starting around the sixth year out and is on the order of 0.25 to 0.35 ppt, and lasts at least 10 years out.

Table A-12. Wage effects, all ZECs

	Starting point		
Number of years after establishment date	Two years before establishment date	One year before establishment date	Establishment date
1	-0.0059	-0.0107	-0.0094
	(.0897836)	(.0679619)	(.0389547)
	0.947	0.875	0.809
2	0.0004	-0.0064	-0.0057
	(.1078823)	(.0898931)	(.0667795)
	0.997	0.943	0.932
3	0.0211	0.0122	0.0109
	(.1215962)	(.1072078)	(.0878514)
	0.863	0.909	0.901
4	0.0333	0.0237	0.0203
	(.130035)	(.1191675)	(.1031554)
	0.798	0.842	0.844
5	0.0239	0.0148	0.0106
	(.1369567)	(.1293116)	(.118874)
	0.862	0.909	0.929
6	-0.3512 *	-0.1958	-0.1195
	(.2085137)	(.1965142)	(.181426)
	0.093	0.32	0.511
7	-0.3943 *	-0.2382	-0.1634
	(.2188424)	(.2061517)	(.1913218)
	0.073	0.249	0.394
8	0.3939 ***	0.3197 **	0.2871 **
	(.0785186)	(.1240531)	(.1150799)
	0	0.01	0.013
9	0.4067 ***	0.3510 ***	0.3203 ***
	(.081254)	(.1288284)	(.1214177)
	0	0.007	0.009
10	0.4301 ***	0.3722 ***	0.3418 ***
	(.0839767)	(.1322537)	(.1252831)
	0	0.005	0.007

Note: Standard errors are clustered at the regional level. The standard error is reported in parentheses underneath the estimated coefficient. The plim is reported underneath the standard error. * denotes statistical significance at the 10 percent level, ** at the five percent level, and *** at the one percent level. *** p<0.01, ** p<.05, * p<.10.

Table A-13. Wage effects, small- and medium-sized ZECs

	Starting point		
Number of years after establishment date	Two years before establishment date	One year before establishment date	Establishment date
1	-0.0070	-0.0111	-0.0101
	(.091985)	(.0701441)	(.0402365)
	0.939	0.875	0.803
2	-0.0004	-0.0065	-0.0060
	(.1104944)	(.0926366)	(.0688448)
	0.997	0.944	0.93
3	0.0213	0.0132	0.0116
	(.1241491)	(.1099715)	(.0900857)
	0.864	0.904	0.898
4	0.0356	0.0267	0.0230
	(.1322021)	(.1216086)	(.1052358)
	0.788	0.826	0.827
5	0.0298	0.0213	0.0168
	(.1381948)	(.1309647)	(.1204744)
	0.829	0.871	0.889
6	0.3186 ***	0.2843 **	0.2466 **
	(.0806081)	(.1130279)	(.1044103)
	0	0.012	0.019
7	0.3692 ***	0.2852 **	0.2502 **
	(.0841528)	(.117762)	(.1093537)
	0	0.016	0.023
8	0.3901 ***	0.3276 ***	0.2946 **
	(.0869406)	(.124376)	(.115476)
	0	0.009	0.011
9	0.3989 ***	0.3596 ***	0.3284 ***
	(.0898909)	(.1290102)	(.1219463)
	0	0.006	0.007
10	0.4148 ***	0.3814 ***	0.3504 ***
	(0.0932419)	(.1326564)	(.1261595)
	0	0.004	0.006

Note: Standard errors are clustered at the regional level. The standard error is reported in parentheses underneath the estimated coefficient. The plim is reported underneath the standard error. * denotes statistical significance at the 10 percent level, ** at the five percent level, and *** at the one percent level. *** p<0.01, ** p<.05, * p<.10. Excludes cities with a population of 500,000 or more.

c. Difference in difference value added results

Tables A-14 and A-15 report the FTZ effects on value added changes from equation (2) for all ZECs, and small- and medium-sized ZECs, respectively. Figures A-11 and A-12 plot the estimated coefficients.

The results suggest that for all ZECs, on average, the FTZ effect on value added change is positive and statistically significant starting at around the eighth year out, is on the order of 0.31 to 0.37 ppt, and persists at least until the 10^{th} year out (Table A-14). For small- and medium-sized ZECs, the FTZ effect on value added growth is positive and significant starting around the sixth year out and is on the order of 0.28 to 0.41 ppt, and persists for at least 10 years out (Table A-15).

In other words, these DID estimation results indicate that once we control for regional differences and isolate the FTZ effect, the ppt change in value added growth that is attributable to the FTZ is positive and statistically significant. The magnitude of the DID results is larger than the fixed effects, and reflects the importance of controlling for regional effects and comparing an area with a newly established FTZ with an otherwise similar area over the same time period and that has yet to have an FTZ.

Table A-14. Value added effects, all ZECs

	Starting point					
Number of years after establishment date	Two years before establishment date		One year before establishment date		Establishment date	
1	-0.0602		-0.0287		-0.0192	
	(.0913474)		(.0706006)		(.0426302)	
	0.51		0.684		0.653	
2	-0.0640		-0.0329		-0.0218	
	(.1106255)		(.0929775)		(.0714611)	
	0.563		0.724		0.76	
3	-0.0560		-0.0219		-0.0115	
	(.1220268)		(.1058199)		(.0894523)	
	0.647		0.836		0.898	
4	-0.0650		-0.0321		-0.0187	
	(.1326726)		(.1172623)		(.1024867)	
	0.625		0.785		0.855	
5	-0.0860		-0.0528		-0.0408	
	(.1422192)		(.1283797)		(0.1157861)	
	0.546		0.681		0.725	
6	-0.2898		-0.1512		-0.0864	
	(.2185376)		(.1993989)		(.1815598)	
	0.186		0.449		0.635	
7	-0.3249		-0.1815		-0.1195	
	(.2278216)		(.2093733)		(.1938166)	
	0.155		0.387		0.538	
8	0.3609	***	0.3752	***	0.3089	***
	(.0780663)		(.0872005)		(.0669589)	
	0		0		0	
9	0.4047	***	0.4228	***	0.3276	***
	(.0809655)		(.0904805)		(.0713919)	
	0		0		0	
10	0.4653	***	0.4477	***	0.3659	***
	(.0807974)		(.091153)		(.0723851)	
	0		0		0	

Note: Standard errors are clustered at the regional level. The standard error is reported in parentheses underneath the estimated coefficient. The plim is reported underneath the standard error. * denotes statistical significance at the 10 percent level, ** at the five percent level, and *** at the one percent level. *** p<0.01, ** p<.05, * p<.10.

Table A-15. Value added effects, small- and medium-sized ZECs

	Starting point		
Number of years after establishment date	Two years before establishment date	One year before establishment date	Establishment date
1	-0.0601	-0.0286	-0.0198
	(.093531)	(.0729697)	(.0441938)
	0.521	0.696	0.655
2	-0.0629	-0.0318	-0.0217
	(.1130719)	(.0956588)	(.0734365)
	0.579	0.739	0.768
3	-0.0528	-0.0188	-0.0094
	(.1240231)	(.1079807)	(.0911017)
	0.67	0.862	0.918
4	-0.0599	-0.0270	-0.0145
	(.1341508)	(.1187532)	(.1035518)
	0.655	0.82	0.888
5	-0.0785	-0.0453	-0.0340
	(.1428246)	(.1290071)	(.1162031)
	0.583	0.726	0.77
6	0.2631 ***	0.3350 ***	0.2805 ***
	(.0803948)	(.0848548)	(.0709663)
	0.001	0	0
7	0.2874 ***	0.3461 ***	0.3154 ***
	(.083901)	(.0892809)	(.0759925)
	0.001	0	0
8	0.3279 ***	0.3685 ***	0.3361 ***
	(.0863235)	(.094458)	(.0814366)
	0	0	0
9	0.3783 ***	0.4183 ***	0.3647 ***
	(.0892613)	(.0978819)	(.0869793)
	0	0	0
10	0.4500 ***	0.4407 ***	0.4065 ***
	(.0887242)	(.0983972)	(.0880735)
	0	0	0

Note: Standard errors are clustered at the regional level. The standard error is reported in parentheses underneath the estimated coefficient. The plim is reported underneath the standard error. * denotes statistical significance at the 10 percent level, ** at the five percent level, and *** at the one percent level. *** p<0.01, ** p<.05, * p<.10. Excludes cities with a population of 500,000 or more.

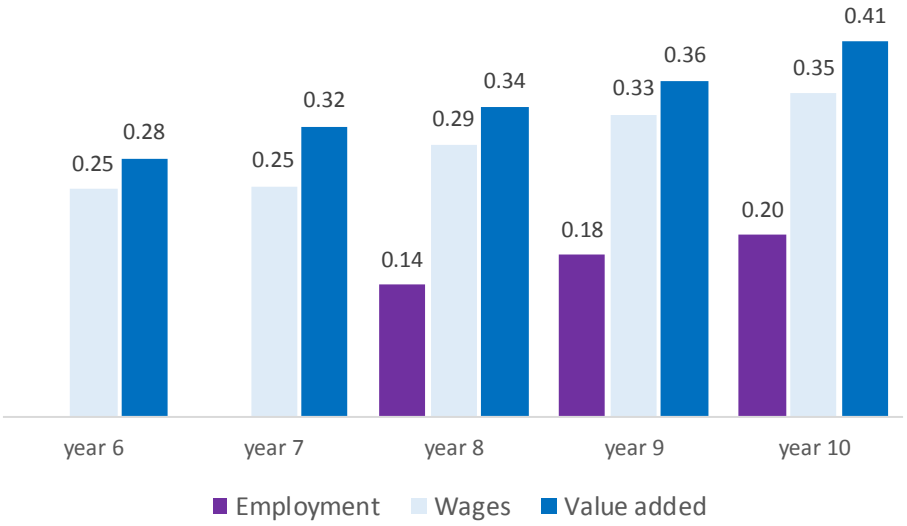
C. Summary of econometric results

Overall, the fixed effects estimation results show that areas, both small- and medium-sized ZECs and high population ZECs, experience a positive and statistically significant increase in economic activity after an FTZ is established in their area. This holds for employment, wages, and value added. The fixed effects results are not indicative of a causal effect, but do serve as a useful check on the data to understand how economic activity changes in these areas over time.

Our primary interest is the change in economic activity within the geographic area that contains an FTZ, and is attributable to the FTZ, and we use a difference in difference (DID) econometric approach to estimate these effects. Our results show that across the board, in terms of employment, wages (measured by total wages and salary disbursements), and value added, the effects of the FTZ are small but positive and statistically significant. Figures A-7 and A-8 plot the statistically significant effects of the FTZ across all three measures.

Figure A-7. FTZ effects on growth in ZEC employment, wages, and value added, average across all ZECs after commencement of zone operations (in percentage points)

Figure A-8. FTZ effects on ZEC employment, wages, and value added growth, average across small- and medium-sized ZECs after commencement of zone operations (in percentage points)



Each bar represents the estimated effect of the FTZ in the ZEC in the years following the establishment of the FTZ in which the impact occurred.

For all ZECs (figure A-7), the establishment of an FTZ results in about a 0.2 percentage point (ppt) increase in employment growth in the ZEC (that would not have occurred otherwise), and this increase occurs roughly nine to 10 years after the formation of the FTZ. FTZs account for as much as a 0.35 ppt increase in wage growth for the ZEC, registering about six to eight years after the formation of the FTZ. The effect of the FTZ on value added growth starts in around the eighth year, and on the order of 0.31 to 0.37 ppts.

For the small- and medium-sized ZECs, or areas with population less than 500,000, (figure A-8), the wage and value-added output impacts begin earlier, are at least as large in magnitude, and last just as long. The FTZ effect on wages begins starting around the sixth year out and is on the order of 0.25 to 0.35 ppt, and lasts at least 10 years out. The FTZ effect on value-added also begins around the sixth year out and is on the order of 0.28 to 0.42 ppt, and lasts at least ten years out. The employment impact for small- and medium-sized ZECs begins in the eighth year, and reaches a rate of 0.2 ppt in the ninth and 10th years out. That is, nine to 10 years after the FTZ is established, the employment change in the ZEC is 0.2 ppt greater compared with an otherwise similar economic community, and that difference in the employment change can be attributed to the FTZ.

To put these results into context, employment in the Buffalo, New York ZEC is 762 jobs higher than it would be in the absence of the FTZ in that ZEC; in Milwaukee, WI, an additional 1,290 jobs are owed to the presence of the FTZ in that ZEC, and in Cleveland, OH, an additional 1,571 jobs exist because of the FTZ. Across all ZECs, and extrapolating,

our analysis suggest that the establishment of the FTZ in a ZEC resulted in a total of 118,287 additional jobs across the all ZECs combined.

The main limitation with the DID approach is the selection of the control group. The DID results rely on the assumption of common shocks to the control and treatment group at the time of the FTZ establishment and afterwards, known as the parallel trend assumption. That is, the DID approach assumes that any shocks or events that occurred at the time of or after the FTZ equally affected the treatment and control groups. A violation of the parallel trend assumption can result in biased estimation of the causal effects. Ideally, the only difference between the control and treatment groups would be the establishment of the FTZ. In practice, such a group can be difficult to find. There is no definitive statistical test for the parallel trend assumption; however, the large number of observations in our control group contributes to the precision of our estimates and is likely a counterweight to any weakness in the parallel trend assumption.

This report contributes to the research on the economic effects of FTZs on the economic communities in which they are established. Future research should aim to better understand the underlying mechanics of how FTZ-related activity spurs economic activity in the greater surrounding area. For instance, firm-level data that includes information on the supply chain of those firms in and around the FTZ would be helpful in understanding these linkages.

Appendix B: Company use of FTZs

BMW Manufacturing, Spartanburg, South Carolina (FTZ-38): FTZ benefits multiply through the state

Motor vehicle and parts producers are major users of the U.S. FTZ program, used by such companies as Ford, General Motors, Mercedes-Benz, Honda, Hyundai, Nissan, Tesla, Toyota, Volkswagen and Volvo. The sector faces inverted tariffs for automobiles: U.S. tariffs on parts range up to 4 percent, while tariffs on finished automobiles are 2.5 percent. Thus, it makes sense to use the FTZ program to import certain parts and assemble the finished cars in the United States, entering them for U.S. sale at the 2.5 percent duty rate. According to the Foreign-Trade Zones Board, the motor vehicle and parts companies accounted for 20.5 percent of all foreign-status goods received into FTZs in 2017.[18]

BMW broke ground on its first American automobile factory in 1992 in Greer, South Carolina, and the first cars rolled off the line in 1994. Foreign-trade zone status for the operation was a key ingredient in the firm's start-up operations. In its application for an FTZ sub-zone, BMW projected it would employ 1,900 South Carolinians to produce up to 209,000 compact automobiles, which, until the plant's start up, were imported from Germany. The finished autos would be sold in the United States and exported. BMW estimated that up to 50 percent of the finished auto's material value would consist of foreign-sourced parts and materials that would benefit from FTZ procedures. Savings from these benefits, according to BMW's application, would help improve the plant's international competitiveness.[19] Subzone status was approved (nearly one year later).[20]

BMW Manufacturing

U.S. Headquarters: Spartanburg, South Carolina

Business: Automobile manufacturer

Value Added in SC: $6.3 billion

Employees: 10,000 in South Carolina directly; 36,285 directly and indirectly

Before BMW came to Spartanburg, the area was a ghost town of former textile plants and roughly 60,000 lost manufacturing jobs. BMW's investment in South Carolina changed all that. Its commitment to the area has grown over time, from an initial

[18] Foreign-Trade Zones Board, *op. cit*., Appendix A and Appendix B.

[19] U.S. Department of Commerce, "Foreign-Trade Zone 38 – Spartanburg County, SC; Application for Subzone, BMW Manufacturing Corporation Plant, (autos) Spartanburg Country, South Carolina," Docket 32-93, 58 *Federal Register*, July 29, 1993, http://ita-web.ita.doc.gov/FTZ/OFISLogin.nsf.

[20] Department of Commerce, "Grant of Authority for Subzone Status; BMW Manufacturing Corporation (Automobiles), Spartanburg County, SC, Greenville-Spartanburg Customs Port of Entry," Order No. 697, Federal Register, July 8, 1994, http://ita-web.ita.doc.gov/FTZ/OFISLogin.nsf.

investment of $600 million to a total of nearly $9 billion over the ensuing 24 years.[21] Today, BMW employs more than 10,000 workers and produces approximately 400,000 vehicles annually, more than 70 percent for export to 140 global markets (with China the largest foreign destination, followed by Germany). Inputs imported by BMW duty-free under the FTZ program supplement inputs from 235 U.S. suppliers, 40 of whom are in South Carolina. Thirty-six of South Carolina's 46 counties now have at least one automobile-related manufacturer. Moreover, some South Carolina business leaders believe that BMW's willingness to build high-end complicated cars in South Carolina signaled that companies like Boeing, Mercedes-Benz Vans, Volvo Cars, Honda and Haier Group could also operate there successfully.[22]

According to BMW, "As a consequence of this investment, BMW directly and indirectly adds $6.3 billion annually to South Carolina's economy and leads to the employment of 36,285 people there. The overall footprint in the U.S. is even larger, with value added by BMW of $15.77 billion and employment of 120,855. In each case, this includes both the direct contribution of BMW and the contribution via purchases of BMW and its employees that would not exist if BMW were not established in the United States. A 2017 study by the University of South Carolina finds that for every 10 jobs that are directly generated at a U.S. BMW facility, an additional 90 jobs are created elsewhere in the U.S. economy as a direct result of these BMW jobs.[23]

Even after so many years of increased engagement in the South Carolina and U.S. economies, keeping production costs free of import and export barriers (like tariffs and fees), as afforded by FTZ procedures, remains important to BMW to maintain its competitiveness in export markets. BMW relies on FTZ status for duty deferral, duty elimination on exports; duty reduction on inputs relative to finished automobiles; lower administrative costs from, for example, MPF bundling; lower insurance costs; and unlimited time for storage.[24] But for FTZ cost savings, the costs of imported automobile components would be higher. "[H]igher tariffs on imported components will directly

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[21] Lisa Errion Saums, BMW Group, Submission to the U.S. Department of Commerce, Docket No. DOC-2018-002: Comments of BMW Group on Section 232 Auto Investigation, June 28, 2018, http://www.goupstate.com/assets/pdf/NC178273.PDF.

[22] David Wren, "Economic driver: BMW's impact on South Carolina's manufacturing growth, psyche has been immeasurable," Post and Courier, June 17, 2017, https://www.postandcourier.com/business/economic-driver-bmw-s-impact-on-south-carolina-s-manufacturing/article_29b50b10-51e4-11e7-b3dc-83f7d1a3d4c0.html.

[23] Saums *op. cit*.

[24] South Carolina Manufacturing, "Foreign Trade Zone Key Part Of South Carolina Strategy," September 15, 2015, https://www.southcarolinamanufacturing.com/foreign-trade-zone-key-part-of-south-carolina-strategy/.

undermine the competitiveness of vehicles exported from the United States and relatively strengthen other production location[s] in relation to the U.S... [This] would increase the costs of exporting passenger cars to these markets from the United States and deteriorate the market access for BMW in these jurisdictions, potentially leading to strongly reduced export volumes and negative effects on investment and employment in the United States. Given the very high export share of our U.S. production, this negative impact could also overcompensate any positive effect of forced deeper localization of products supplying the U.S. domestic market."[25]

[25] Saums, op. cit.

Exxon Mobil Corporation, Baton Rouge, Louisiana (FTZ-154): Zone benefits are a net positive for the region

Oil/petroleum products account for the largest share of total foreign-status products brought into FTZs. In 2017, they represented 27.1 percent of all foreign status products received into U.S. FTZs.[26] Companies use the zones to process crude oil into gasoline and jet fuel, chemicals and plastics. Crude oil imports are assessed U.S. tariffs of 5.25 cents to 10.5 cents/barrel, depending on the API content. Many of the products made from crude can be imported into the United States at lower duties. Additionally, these by-products can be exported without paying the crude duties at all. For example, crude oil can be imported without payment of duty into an FTZ, processed into jet fuel in that FTZ, transferred in-bond to an airport in another FTZ (*e.g.*, an airport), and exported in the fuel tank of a plane bound for an international destination.

Exxon Mobil Corporation

U.S. Headquarters: Irving, Texas

Business: Petroleum, gas and chemical manufacturer

Employees: 6,600 in the FTZ

ExxonMobil is a leading example of a company making use of FTZs to import crude petroleum and process it into downstream products, mainly for domestic use in the United States but also for export. It has three FTZ subzones in operation, two in Texas (Baytown and Beaumont) and one in Louisiana. In Baton Rouge, Louisiana (FTZ-154), ExxonMobil operates a main refinery complex in East Baton Rouge Parish, a petrochemical plant in East Baton Rouge Parish, a Maryland Tank Farm storage facility and plastics plant in East Baton Rouge Parish, a lubricants plant in West Baton Rouge Parish, an Anchorage Tank Farm in West Baton Rouge Parish, and the Sorrento Salt Dome in Ascension Parish. Exxon operates the six sites as an integrated refinery/petrochemical complex.

ExxonMobil received approval for its subzone activities in FTZ-154 1996. The oil refinery and petrochemical complex then employed 4,000 people to produce fuels (*e.g.*, gasoline, jet fuel, distillates, residual fuels, and naphthas) and petrochemicals. In its application, Exxon noted that about 40 percent of the crude oil (85 percent of inputs), and some feedstocks and motor fuel blendstocks used in producing fuel products were sourced abroad, and zone procedures would exempt the refinery from Customs duty payments on the foreign products used in its exports. On domestic sales, the company would be able to choose the finished product duty rate (nonprivileged foreign status, NPF) on certain petrochemical feedstocks and refinery by-products (which would be duty-free) and save on U.S. duties on crude oil. Foreign merchandise would also be exempt from state and local *ad valorem* taxes.

[26] Foreign-Trade Zones Board, *op. cit*., Appendix A and B.

Today, even though more U.S.-sourced oil is used by ExxonMobil than in the past, the FTZ program continues to provide benefits that accrue to the company and the region. ExxonMobil employs more than 6,600 employees and contractors in the Baton Rouge area, with payroll totaling $491 million. ExxonMobil's operations in the zone and its ripple effects through the local economy over the years have been significantly positive. According to a recent (2017) study, one out of every eight jobs in the Baton Rouge area can be traced back to ExxonMobil.[27] Every year, ExxonMobil conducts maintenance activities on equipment in its facilities, hiring employees and local contractors and with ripple effects from equipment rental, supply purchases, taxes paid on work and materials, and services such as food and lodging for maintenance labor. The company estimates that this annual work supports as many as 1,600 contractors with an associated payroll of $61.7 million. Despite the exemptions from state and local *ad valorem* taxes made possible by the FTZ, ExxonMobil's activities in the Baton Rouge generate millions in annual state and local tax revenue, from property taxes ($33.2 million in East Baton Rouge alone in 2015), to direct sales taxes ($26.3 million in East Baton Rouge), to other state and local taxes (more than $100 million, after credits and rebates).

[27] *ExxonMobil Baton Rouge Economic Impact Report 2017*, https://cdn.exxonmobil.com/~/media/global/files/us-refineries/economic-impact-report-2017.pdf.

Yamaha Motor Manufacturing Corporation of America, Newnan, Georgia (FTZ-26): Zone production benefits spread to the greater economic community

Yamaha Motor Corporation US (YMUS) produces all-terrain vehicles (ATVs), golf carts, side-by-side vehicles, and personal watercraft at three Yamaha Motor Manufacturing Corporation of America (YMMC) plants in an FTZ subzone in Newnan, Georgia. YMUS has corporate offices in Cypress, California, and Kennesaw and Marietta, Georgia, and sales and distribution offices throughout the United States.

YMMC has used Atlanta-based FTZ benefits to support its exports of golf carts and U.S. and export sales of personal watercraft since 1989; benefits for production of ATVs in the Newnan subzone were added in 1998. In 2011, to take advantage of more efficient production that would result from a centralized location -- including one that benefits from the efficiencies offered by the FTZ program -- YMMC began to transfer production of nearly all its mid- and large-engine ATVs models to the United States from overseas facilities into its FTZ factory in Newnan. The move, completed in 2013, increased employment there to more than 1,250, up 150 since the ATV production transfer began in 2011, along with jobs at its over 100 U.S. based supplier companies. Current 2018 employment at the Newnan plants is nearing 1,600. About 30 percent of YMMC's production in the zone is exported, and the FTZ program saves the company duties on imported parts that are used by those workers to manufacture the exported vehicles. In addition, the administrative ease of weekly customs entry and direct delivery of its imported components speed up the supply chain and improve the company's ability to react to custom demand around the world.

Yamaha Motor Manufacturing Corp. of America

U.S. Operations: Newnan, GA

Business: Sports vehicles

Employees: about 1,600 in FTZ

YMUS, and especially its production facility in the Newnan FTZ, have had a strong positive impact on the broader economic community, particularly in Georgia. Employment growth has been particularly significant. Today, YMUS directly employs about 3,400 workers in the United States, over 2,000 of them in Georgia alone and about 1,600 in its FTZ operations in Newnan, Georgia.[28] (This compares to approximately 2,500 when the company began operations in its FTZ in 1989.) The company today supports more than 30,000 additional U.S. jobs overall, including those at its supplier and dealer partners.

[28] Yamaha Celebrates 30 Years of U.S. Manufacturing," Motor Sports Newswire, June 11, 2018, https://motorsportsnewswire.com/2018/06/11/yamaha-celebrates-30-years-u-s-manufacturing/.

In addition, the Newnan factories spend more than $170 million annually with more than 100 U.S. parts suppliers.[29] About 30 percent of the parts and components used to make its products in the Newnan FTZ come from Georgia-based suppliers; another 20 percent comes from other U.S.-based suppliers. By 2018, Yamaha had invested more than $354 million in its Newnan facility,[30] spending that has rippled through the local community and beyond.

The savings YMMC realizes from FTZ benefits feed back to the local community in other ways. YMMC funds scholarships for high school students, and supports local teachers and school environmental projects, as well as youth character development programs like the (Boy and Girl Scouts and 4H, among others) for example. Monies not spent inefficiently processing import entries can be spent instead on these community projects.

[29] "Yamaha Moving Majority of Worldwide ATV Manufacturing to U.S.A.," MotoUSA.com, May 18, 2011, https://www.prnewswire.com/news-releases/yamaha-moving-majority-of-worldwide-atv-manufacturing-to-usa-122148489.html; Lucas Cooney, "All Yamaha ATV and SxS Production Moved to U.S.," ATV.com, June 12, 2013, http://www.atv.com/blog/2013/06/all-yamaha-atv-and-sxs-production-moved-to-u-s.html.

[30] "Yamaha Celebrates 30 Years of U.S. Manufacturing," Motor Sports Newswire, June 11, 2018, https://motorsportsnewswire.com/2018/06/11/yamaha-celebrates-30-years-u-s-manufacturing/.

Helly Hansen U.S. Inc., Tacoma, Washington (FTZ-86): FTZs keep economic activity in the United States

Warehouse and distribution activities represent a significant share of FTZ activity. In 2017, 54 percent of foreign status inputs were placed in warehouse or distribution centers.[31] Some of that is exported; the rest is later entered into U.S. consumption. The products most commonly admitted into FTZ warehouse/distribution centers are vehicles, consumer electronics, and consumer products.

Helly Hansen imports specialty water-resistant cold weather apparel for professionals working in extreme environments. It imports most of this apparel from suppliers in Asia. The Norwegian company, recently sold to a Canadian company, has a strong brand presence in Canada; the U.S. market is still small but starting to grow. Thus, when the company in 2010 undertook a reassessment of its North American warehouse locations, it made sense to lean towards consolidating operations at its existing warehouse in British Columbia, Canada.

Helly Hanson U.S. Inc.

U.S. Headquarters: Tacoma, Washington

Business: Apparel and footwear distributor

Employees: 103 in FTZ

Value of FTZ Savings: $200,000 annually

However, the savings afforded by the U.S. Foreign-Trade Zone program tipped the scales to the company's U.S. warehouse location in Auburn, Washington. It formally activated an FTZ at its Auburn warehouse, which was wrapped into the Port of Seattle FTZ (#5) in 2011. Growth followed and by 2016, Helly Hanson needed a bigger warehouse, which it found in the Port of Tacoma (FTZ 86), where it moved consolidated operations.

Approximately 55 percent of Helly Hanson's imports into Tacoma are re-exported to Canada. Helly Hanson pays no U.S. import duties on those products.

It does pay U.S. import duties on products destined for the U.S. market, when they exit the FTZ for U.S. sale. But while they wait at the warehouse, the company saves money from deferred duty (the value of tighter cash flow and reduced interest costs) and reduced processing fees. Helly Hanson estimates that in 2017/2018 (June/June), it saved $64,458 thanks to deferred duty payments, and $128,524 thanks to bundling of entries that result in savings of merchandise processing fees. On several occasions when it had to destroy damaged goods, the company did not have to pay duties (another benefit of the FTZ program), realizing duty savings in the amount of $5,625 immediately in

[31] Foreign-Trade Zones Board, *op. cit*., Appendix A.

2017/18, thus eliminating the need to recover those duties via duty drawback later and pay fees associated with the drawback process. So, the FTZ saved Helly Hanson a total of nearly $200,000 during that period.

Company officials estimate that FTZ benefits are the reason the company operates in Tacoma and employs 103 workers, up from about 50 in 2011. Indirectly, Helly Hanson supports jobs at the port processing 400-500 containers a year, containers that would otherwise go to a port in Canada. Estimated income to truckers of $67,500 would also evaporate but for the FTZ savings realized by Helly Hanson.

Lam Research Corporation, San Jose, California (FTZ-18) and Portland, Oregon (FTZ-45): FTZ benefits support high U.S.-based R&D

Machinery and equipment producers are among the leading users of the U.S. FTZ program. They include Caterpillar, Cincinnati Milacron, CNH Industrial America, Deere & Co., IBM and many others. According to the Foreign-Trade Zones Board, machinery and equipment (including electrical machinery) companies accounted for 9.0 percent of all foreign-status goods received into FTZs in 2017.[32]

Lam Research is a global supplier of innovative wafer fabrication equipment and services to the semiconductor manufacturers located around the world. Its products and services are designed to help customers build smaller, faster, and better performing devices that are used in a variety of electronic products, including mobile phones, personal computers, servers, wearables, automotive devices, storage devices, and networking equipment.

Lam Research

U.S. Headquarters: Fremont, California

Business: Designs and manufactures production tools for the semiconductor industry

Employees: ~6,000 in FTZs

Lam manufactures, assembles, repairs, kits, and wafer fabrication equipment in FTZ subzones. It also conducts global parts distribution to its depots. Zones are in the Bay Area California (FTZ-18, San Jose, since 2010) and Tualatin, Oregon (FTZ-45, Portland, since 2016). Around 6,000 employees work in zone-based activities, which include not only the manufacture and assembly of semiconductor equipment but the spares distribution network as well.

Components and materials sourced from abroad are admitted free of duty under the FTZ program; those duties would otherwise range from zero to 10.7 percent. Lam estimates that this program benefit alone saves the company a significant amount of its import costs.

Once implemented, the zone has helped Lam to manage fluctuations in supply chain and international trade. The zone savings support Lam's R&D activities in the U.S., where the company drives innovation as a high-volume advanced manufacturer.

[32] Foreign-Trade Zones Board, *op. cit*., Appendix A and Appendix B.

Prodeco Technologies, LLC, Oakland Park, FL (FTZ-25): FTZ benefits keep jobs in the United States

ProdecoTech is an electric bicycle (eBike) manufacturer in Oakland Park, Florida. It makes bikes that retail for $1,000 to $5,000 each, with most sales in the $1,300-$2,000 range. The company produces several thousand bikes a year. It has joined with Samsung for battery systems and markets some eBikes under the Samsung name. Prodeco now employs as many as 100 people in Oakland Park.

Prodeco Technologies, LLC

U.S. Headquarters: Oakland, FL

Business: Electric bicycles

Employees: 30-100 (seasonal), all in FTZ

Prodeco was founded in 2008 and began selling its eBikes in the United States in 2010. It replaced finished bikes it produced abroad with U.S. production in FTZ-25 in 2015, using zone benefits to assemble bikes from components imported from China, Japan, Taiwan, Korea, and Vietnam, as well as from U.S. manufacturers (the handlebars are U.S.-made) in the Broward County FTZ. The FTZ program enables ProdecoTech to avoid paying duties on those imports that can range up to 10 percent, saving approximately 4 percent of the cost of the finished eBikes. Once assembled in Oakland Park, the bikes are then imported duty-free – the U.S. tariff rate applicable to electric bicycles.

The duty inversion savings amount to about $40 per bike, which when multiplied by the thousands of bikes a year sold by the company, amounts to several million dollars annually. The FTZ has contributed significantly to the firm's ability to reduce its cost of goods sold 30 percent below that if its competition. These duty savings enable Prodeco to keep its finished bike prices competitive with foreign-assembled eBikes that can be imported into the United States duty-free – and thus to move foreign bike production to the United States. In other words, Prodeco can compete with imports using American workers doing the assembly and with a closer eye on quality control.

Piramal Critical Care, Inc., Bethlehem, PA (FTZ-272): FTZ benefits keep manufacturing jobs in the United States

U.S. pharmaceutical producers and distributors are major users of the U.S. FTZ program. According to the Foreign-Trade Zones Board, the pharmaceutical companies accounted for 3.2 percent of all foreign-status goods received into FTZs in 2017.[33] Pharmaceutical companies using U.S. FTZs include companies like AstraZeneca Pharmaceuticals, Bayer, Bristol-Myers Squibb, Eli Lilly & Co., GlaxoSmithKline, Pfizer. They face inverted tariffs: zero duties on finished pharmaceutical made by foreign competitors and imported into the United States, but high tariffs on raw materials and active pharmaceutical ingredients they may import to use in U.S. produced-pharmaceuticals.[34] Input costs inflated by tariffs of remaining ingredients and raw materials put U.S.-produced pharmaceuticals at a competitive disadvantage, unless they are made in FTZs where the duties on inputs can be avoided when the finished drug is entered into U.S. commerce. Another important FTZ benefit to U.S. pharmaceutical producers is the ability to manufacture pharmaceuticals in the United States that are not yet approved by the Food and Drug Administration (FDA) for U.S. consumption, but may be exported.[35]

Piramal Critical Care, Inc.

U.S. Headquarters: Bethlehem, PA

Business: Pharmaceutical products

Employees: 120

Piramal Critical Care, Inc. is an example of a U.S. pharmaceutical manufacturer that could no longer compete paying tariffs on imported inputs while its foreign competitors shipped finished pharmaceuticals to the United States duty free. At the time its 95 employees manufactured and distributed inhalation anesthetics from chemicals and other materials sourced from abroad, primarily India. These inputs represented 23 percent of the value of the finished product and faced duties of up to 5.5 percent.

It applied for and received FTZ benefits in 2012. Piramal estimated that 40 percent of the finished pharmaceuticals would be exported from the FTZ to more than 100

[33] Foreign-Trade Zones Board, *op. cit*., Appendix A and Appendix B.

[34] This disadvantage for U.S.-produced pharmaceuticals really escalated following the implementation in 1995 of the World Trade Organization's Trade in Pharmaceutical Products agreement (a zero-for-zero initiative), after which imports of formulated pharmaceuticals and some ingredients were reduced to zero and imports of these products grew from $8.6 billion in 1996 to over $113 billion in 2016. Elizabeth Nesbitt, Office of Industries, "Changes in the U.S. Pharmaceutical Import Mix under the Agreement on Trade in Pharmaceutical Products," U.S. International Trade Commission, *Executive Briefings on Trade*, August 2017.

[35] Some have suggested that the FDA seems more comfortable approving pharmaceuticals produced in the United States, so pharmaceutical manufacturers in U.S. FTZs can more readily win FDA approval for U.S. distribution than overseas manufacturers.

countries. Finished pharmaceuticals manufactured in the FTZ and then sold into the U.S. market would enter duty-free.

The FTZ designation came at a time that Piramal was faced with competition from lower-priced imported anesthesia products, competition it was finding hard to match. It was considering moving production abroad and laying off about 70 highly paid manufacturing workers.[36]

The FTZ program saves Piramal hundreds of thousands of dollars annually in duties on the inputs it imports. With the savings manifested by the FTZ program, Piramal was able not only to stay in Bethlehem and maintain existing production employment, but increase employment, modernize its facility, and increase capacity three-fold.[37] Today, the company employs about 120 workers, and exports to more than 100 countries from Lehigh. This U.S. economic activity would have been lost but for the FTZ savings that enabled Piramal to stay in the United States.

[36] Colin McEvoy, "Foreign Trade Zone Designation Saves Lehigh Valley Companies Millions," *The Lehigh Valley Insider*, November 18, 2014, https://lehighvalley.org/foreign-trade-zone-designation-saves-lehigh-valley-companies-millions/.

[37] "FTZ status levels playing field for Lehigh Valley companies vs. rivals abroad," *Keystone Business News*, August 29, 2018, https://keystonebusinessnews.com/stories/510349417-ftz-status-levels-playing-field-for-lehigh-valley-companies-vs-rivals-abroad.

UniCarriers Americas, Rockford, Illinois (FTZ-176): FTZ cost savings fund U.S. worker training

UniCarriers Americas received approval to manufacture rider-type forklift trucks in an FTZ subzone in Rockford, Illinois in 2005. Known then as Nissan Forklift Corporation, N.A., the company sought to use imported components, accounting for about 48 percent of the finished forklift truck's value, to paint, assemble and test what it hoped would be up to 15,000 units a year. Duties on these parts could reach as high as 9 percent, compared to zero for finished forklift trucks. UniCarriers argued that FTZ benefits would improve the company's competitiveness in export markets.[38]

UniCarriers Americas

U.S. Headquarters: Marengo, IL

Business: Designs and manufactures forklift trucks

Employees: 518 in FTZ

Value of FTZ savings: $2 million annually

Its request was approved in 2006. UniCarriers estimates that it saves about $2 million a year[39] thanks to the FTZ subzone benefits – in particular, duty savings and MPF bundling. Those benefits outweigh the costs, which include a full-time employee to handle paperwork and file reports, daily, with U.S. Customs and Border Protection.

Demand for forklift trucks is stronger than ever thanks to a booming U.S. economy and growth in demand from warehouses stocking goods for internet shoppers. UniCarriers has used some of the duty savings to expand the company by adding space and employees. FTZ savings have helped to fund the training of its workforce to operate sophisticated production new equipment.[40] Company President and CEO, James J. Radous III, notes that whereas many manufacturers are replacing workers with robots, UCA is retraining and redeploying employees to work and train alongside automation. The company has increased its automation capabilities by 50 percent while doubling its number of employees from approximately 300 to 600 over the past five years.

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[38] U.S. Department of Commerce, Foreign-Trade Zones Board, Foreign-Trade Zone 176—Rockford, Illinois, Application for Subzone Status, Nissan Forklift Corporation North America Facilities (Fork-Lift Trucks), Marengo, Illinois, *Federal Register*, June 15, 2005.

[39] Rockford Area Development Council, "FTZ = $$$ Savings, Foreign Trade Zone Means Savings Millions," *Developments*, June 2014, http://rockfordil.com/images/stories/PDFdocs/DevelopmentNews/RAEDC_Dev-June_2014.pdf.

[40] Claire Bushey, "When automation doesn't bring layoffs," Chicago Business, August 26, 2017, http://www.chicagobusiness.com/article/20170826/ISSUE01/170829905/when-automation-doesnt-bring-layoffs.