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Changes in Total Demand, Productivity, and Offshoring Their Relationship with Declining Employment in U.S. Textile Industry, 2002 - 2011

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ABSTRACT

A quick observation of the industry-level employment trends depicts a sharp decline in U.S. textile industry employment. While decreasing demand, increasing offshoring activities and productivity enhancements due to technological change are usual suspects of this drop, there is little evidence so far to reveal the combined impact of these factors on the U.S. textile industry employment. By developing an empirical model, this paper uses regression analysis to examine the role of foreign and domestic demand, labor productivity and offshoring, captured by both foreign affiliate employment of U.S. MNCs and imported intermediate inputs, in continued trend of domestic job loss in U.S. textile industry between 2002 and 2011. The findings partially support those in the literature that suggest offshoring activities have a negative impact on U.S. parent employment outcomes in manufacturing sector and textile industry in particular. I also find that decreased domestic demand is associated with lower U.S. textile industry employment; however, unlike the widely held view, exports and productivity do not have a significant impact on domestic employment in the U.S. textile industry.

Keywords: Manufacturing Employment, U.S. Textile Industry, Regression Analysis, Domestic Demand, Productivity and Offshoring

Introduction

Between 2002 and 2013, more than 450,000 jobs or 50% of total textile industry workforce have been lost in the United States; a rapid job loss, steeper than the rate of decline in manufacturing sector as compared to whole economy (Fig.1). A more depressing fact arises when the share of textile industry of total economy employment is calculated; more than 60% of the share is lost just over ten years.

Meanwhile, Imports of textile, apparel and leather goods increased significantly when exports of such goods expanded firmly (Fig.2), and the foreign activities of U.S. multinational corporations (MNCs) in the textile industry leveled, despite continued reduction in home activities (Fig.3).

By looking at the labor productivity index variations over the past fifteen years it seems that U.S. textile industry is suffering from a plummeted labor productivity due to

traditional manufacturing and low innovation level (Fig.4). At the same time, there is a structural shift in occupations within the industry from traditional production occupations toward high skill occupations such as professional and managerial ones (Fig. 5).

Considering these trends, there are many public concerns about U.S. textile industry decline, particularly because of the likely effects on non-metro communities and minorities (MacDonald, Meyer, Hamrick, Wojan, Reeder, 2016). In recent years, the peril of offshoring for U.S. manufacturing sector and specifically production jobs has generated ongoing debates among policy makers as well as academia. However, an increasing number of publications investigate the relationship between foreign and domestic demand, offshoring and productivity, and decline in manufacturing employment (i.e. see Brainard and Riker, 1997; Burke, Oh and Epstein 2011; Wright, 2014; Autor, Dorn, Hanson, 2013), little work has been done so far to investigate the combined impact of these usual suspects on the U.S. textile industry. Considering the evidence mentioned in literature review, this paper aims to examine the relationship between decreasing demand, increasing offshoring, productivity changes and U.S. textile industry employment over a decade from 2002 to 2011 and contribute to the literature by updating published results with recent available data. This paper tries to explore the question that how changes in these factors are associated with downward trend in U.S. textile industry employment.

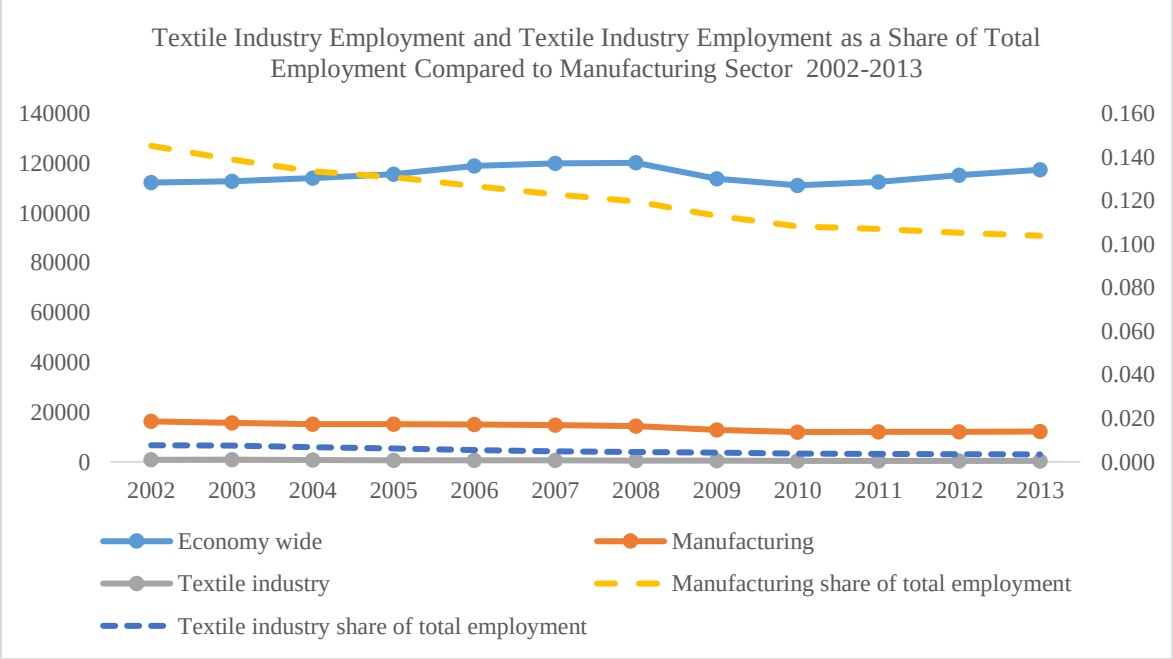

Figure 1. Textile industry employment trends compared to manufacturing sector and economy wide trends, 2002 - 2013

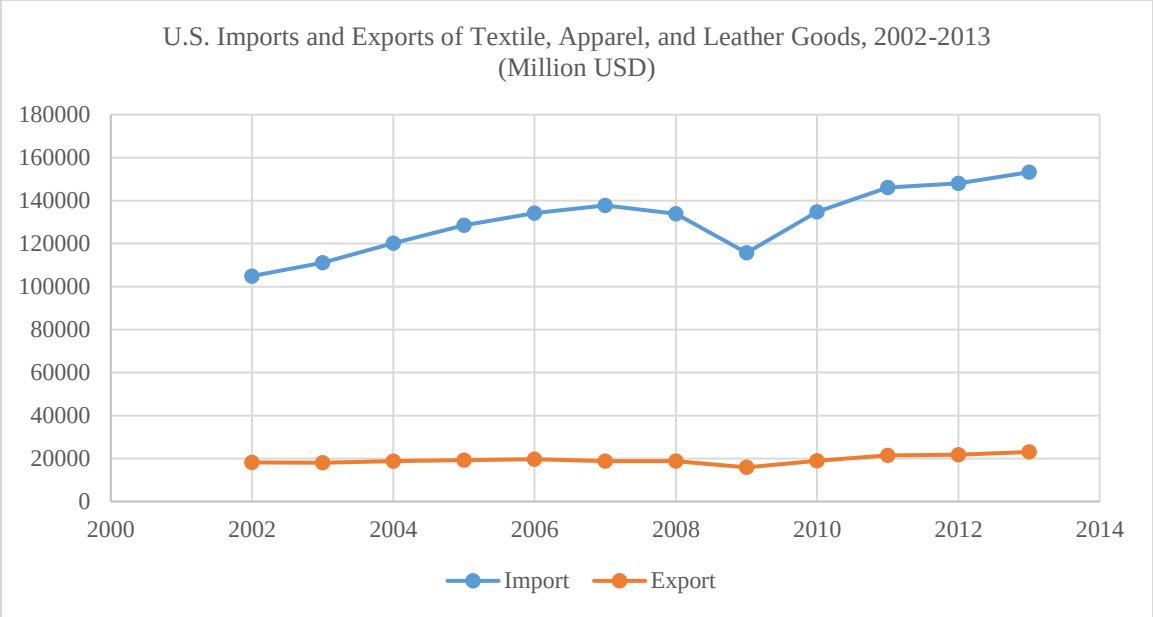

Figure 2. U.S. trade flows for textile industry goods, 2002 – 2013

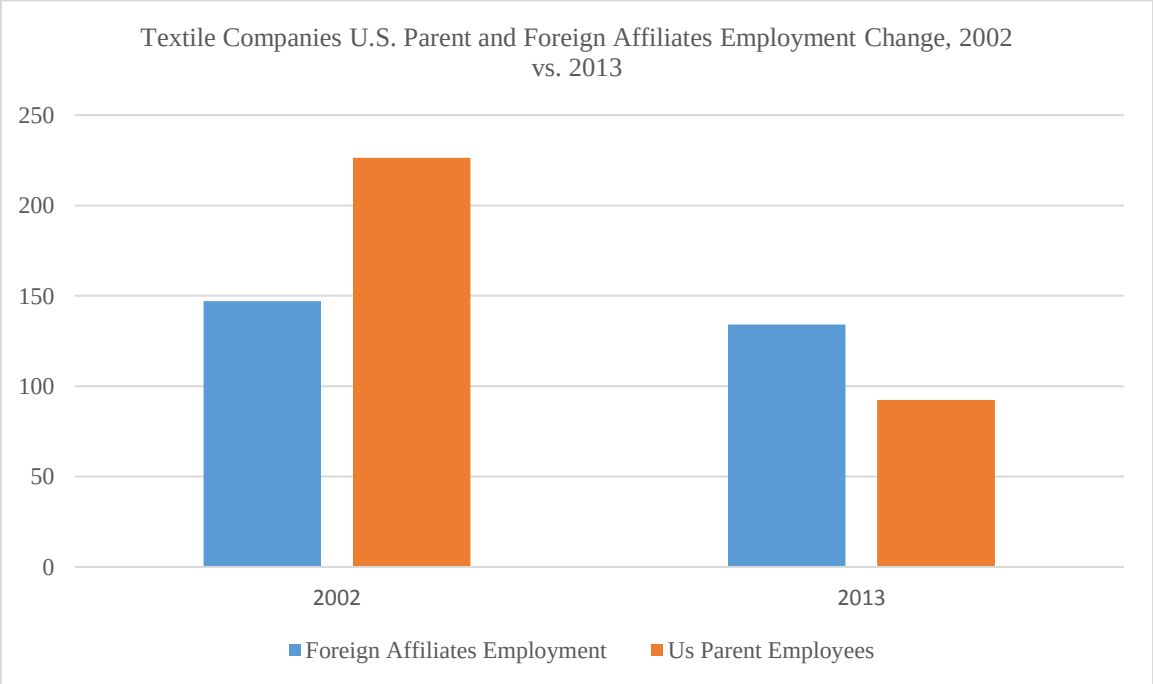

Figure 3. U.S. textile MNCs employment change, 2002 vs. 2013

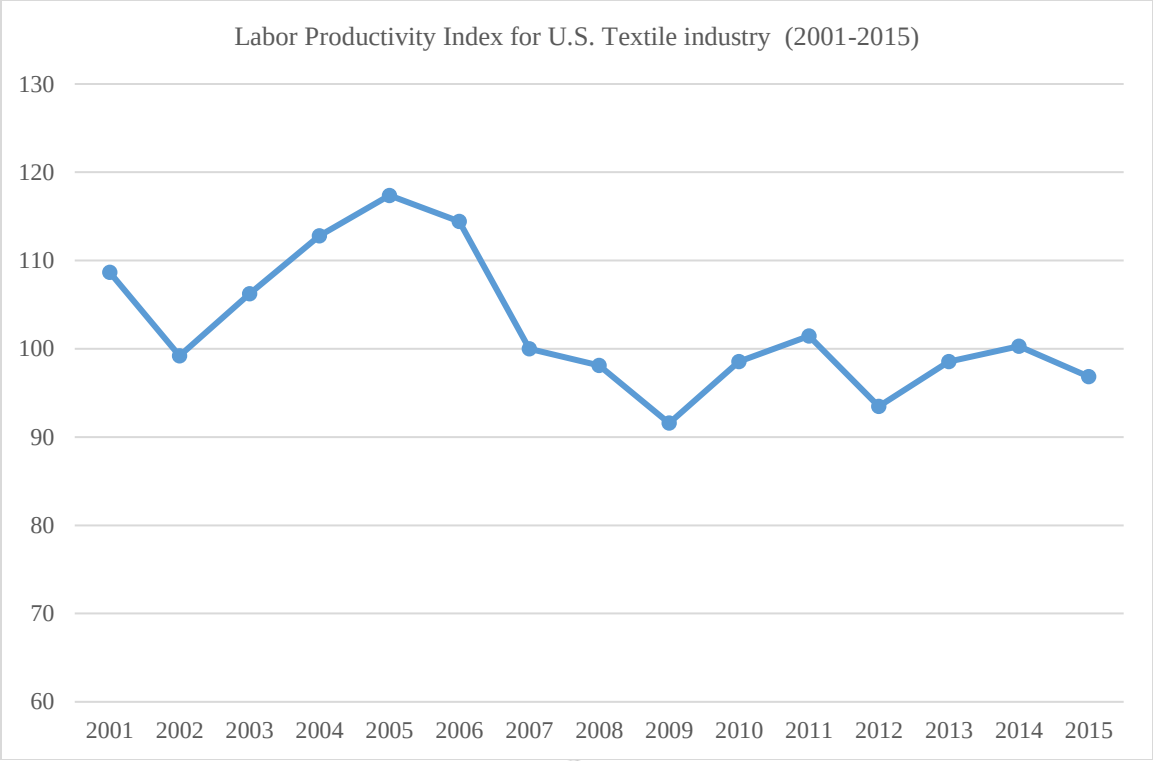

Figure 4. Trend of labor productivity index for U.S. textile industry, 2001 – 2015

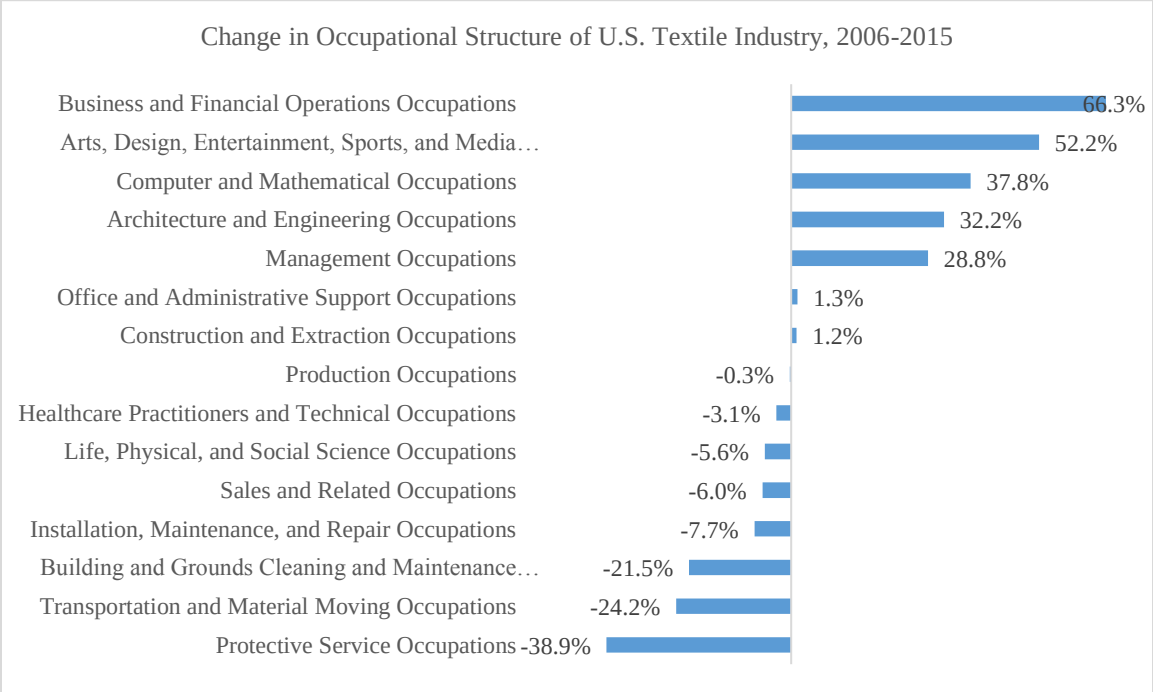

Figure 5. Changes in structure of occupational groups, 2006-2015

In order to respond this question, a regression model is developed to estimate the effects of foreign and domestic demand, labor productivity, imported intermediate inputs and U.S. MNC foreign affiliate employment on textile industry employment outcomes of U.S. MNC parents (as opposed to total employment in the textile industry). U.S. MNCS are more involved in global activities while employing about 50 percent of the industry workforce over the period of study. For this purpose, industry-level data publicly have been used.

The first section of this paper is a focused review of the empirical literature on the relationship between foreign and domestic demand, productivity, offshoring, and manufacturing employment. The second section describes my empirical framework and the data and the last section presents the results of the main empirical findings on the relationship between total demand, productivity, offshoring, and the U.S. textile industry employment where the conclusion summarizes the findings and proposes some recommendations for future policy making in the U.S. textile industry.

Literature Review

There is a heated literature investigating the relationship between offshoring and employment. However, there are some challenges in the literature due to using various definitions and measures of offshoring such as foreign affiliate employment, and imported intermediate inputs, as well as different estimation methods and databases.

Brainard and Riker (1997) show that foreign affiliate employment partially substitutes for employment in the U.S. Feenstra and Hanson, (2003) find that foreign low-skilled employment substitutes domestic employment, while high-skilled employment in foreign affiliates complements U.S. parent employment. Study by Becker and Muendler (2006) which explores the impact of offshore outsourcing on domestic employment in Sweden and Germany finds that foreign affiliate employment is a substitute for employment in a company's home country; however, the effect is not significant.

On the other side, Burke et al. (2011) assume imported intermediate inputs as main measure of offshoring and by examining relationship between this factor and the U.S. manufacturing employment trend between 1991 and 2005 based on industry-level data available on BEA's database, conclude that offshoring displaces domestic employments since U.S. companies rely on foreign plants to supply manufactured inputs previously produced at home. However, Kurz and Lengerman (2008) by using same accounts over the period between 1997 and 2005, claim that increase in imported intermediate inputs leads to growth in U.S. manufacturing employment. Wright (2014) developed an empirical model predicts that offshoring displaces manufacturing workforce by cost-savings enables companies to hire new employees. However, the combined effect on employment depends on the extent of offshorable tasks in an industry.

Kletzer (2002) examined the relationship between trade, employment, and job displacement for a sample of U.S. manufacturing industries. Her results suggest that imports have a direct negative impact on manufacturing employment, especially in high import-competing industries like textiles, apparel and leather. She found that within textile industry, one percentage increase in import penetration is associated with a 0.4 percent reduction in employment. Her findings also display a 0.7 percent increase in employment growth due to 1 percent increase in exports. According to Burke et al. (2011), increase in foreign and domestic demand for an industry's goods are the strongest growth engines for employment based on the results of empirical analysis of available data for time period between 1990 and 2005. Autor et al. (2013) analyzed the impact of increased imports from China on U.S. job market over the 1990 to 2007 period, and found that import competition is responsible for almost 25% of sharp decline in U.S. manufacturing employment over this period. Pierce and Schott (2014) investigated relationship between U.S. policy changes in

trade with China and potential impact on U.S. manufacturing employment and reports a strong link between these two trends starting from 2001.

Burke et al. (2011) concludes that improvement in labor productivity as a measure of production technology negatively affects industry employment growth. On the other side, Wright (2014) states that transferring production tasks abroad will lead to productivity-enhancing cost saving in workforce that brings new hiring opportunities implicating positive effect of labor productivity improvement on manufacturing employment. Nordhaus (2005) studied the relationship between productivity improvements and employment changes in the U.S. in two overlapping periods 1955–2001 and 1998–2003. He finds that productivity enhancements resulted in growth in U.S. manufacturing employment because it led to lower prices and higher demand.

Empirical Model and Data Sources

Based on literature review, three elements including: decreasing domestic and foreign demand, increasing offshoring activities, and productivity growth due to technological change are introduced as main suspects for declining trend of U.S. manufacturing employment and textile industry in particular over the recent decades. At the first step, I assume

$$(1)\quad HE_i = f(O_i, D_i, P_i, t)$$

Where *HE* or domestic (home) employment is a function of offshoring (*O),* total demand (*D),* labor productivity (*P)* for industry *i* over the time period of *t.*

While, several studies like Wright (2014) and Burke et al. (2011), have measured offshoring activity in an industry by calculating the ratio of imported intermediate goods to total intermediate goods used in that industry, some others like Harrison and McMillan (2007) have considered foreign activities of U.S. multi-national companies as a displacement of U.S. production of final goods or exports which provides a measurable indicator for offshoring. Here, I assume that offshoring itself is a function of both imported inputs ratio (*I)* which is equal to imported intermediate inputs divided by total intermediate inputs, and foreign affiliate employment (*FE)*. Following, displays the equation:

$$(2)\quad O_i = g(I_i, FE_i)$$

Burke et al. (2011), define "domestic demand" (*DD)* as shipments plus exports minus imports. Given total exports value indicates foreign demand for an industry's goods, I express total demand (D) for industry *i*, as a function of domestic demand (DD) and exports (X):

$$(3)\quad \mathrm{D_i} = \mathrm{h(DD_i}, \mathrm{X_i})$$

Substituting equations (2), (3) into (1) and taking logs, yields:

$$(4)\quad \mathrm{Ln\ HE_{it}} = \alpha + \beta_1 \mathrm{Ln\ DD_{it}} + \beta_2 \mathrm{Ln\ X_{it}} + \beta_3 \mathrm{Ln\ P_{it}} + \beta_4 \mathrm{Ln\ FE_{it}} + \beta_5 \mathrm{I_{it}} + \varepsilon_{it}$$

Where,

DD_{it} is domestic demand, X_{it} is exports, P_{it} is labor productivity index, FE_{it} is foreign affiliated employment of U.S. MNCs and I_{it} is imported input ratio for industry i in year t.

From the literature review, I expect the coefficient for imported inputs to be negative and the coefficient for exports and domestic demand to be positive. The coefficient for affiliate employment will be negative if foreign affiliate employment acts as a substitute to parent domestic employment and positive if it is complementary to parent domestic employment. Finally, the coefficient on productivity index is expected to be positive in the case of long-term effect wins and negative in the case of a stronger short-term effect.

Table 1, summarizes all data sources used in this study. Data cover for five variables including domestic demand, exports, imported inputs ratio, labor productivity index, and foreign affiliate employment of U.S. MNCs for U.S. textile

industry over ten years from 2002 to 2011. Table 2 shows correlation between these variables. Total economy wide and manufacturing employments over the time period of 2002 to 2013 (as depicted in Fig. 1), were extracted from Business Dynamics Statistics tables of U.S. Census Bureau. By defining textile industry as sum of textile production and mills, apparel manufacturing and leather and allied product manufacturing based on North American Industry Classification System (NAICS) codes of 313, 314, 315 and 316. Employment data gathered from Bureau of Labor Statistic including historical data of occupational employment in manufacturing sector from 2002 to 2013. For Fig.5, All major occupation groups for the textile industry have been considered. It worth to mention that occupations with fewer than 50 jobs, confidential data, or poor quality data are not displayed.

Data of U.S. MNCs activities over period of time between 2002 and 2013, extracted from Direct Investment & Multi National Enterprises tables of International Economic Accounts of Bureau of Economic Analysis.

Imports and exports data for textile industry goods, including NAICS codes of 313, 314, 315 and 316, derived from USITC database. In this case, CIF value of the goods was the base of calculations.

Data of labor productivity index for above NIACS codes gathered from productivity tables of Bureau of Labor Statistics. Also, Bureau of Economic Analysis was the source of collecting and calculating data for shipments and imported intermediate inputs ratio.

Results and Discussion

Results of regression analysis of relationship of affecting factors on the textile industry employment are reported in table 3. As it is expected, the relationship between affiliate employment and U.S. parent employment in textile industry is negative. Also, imported inputs factor as the second element of offshoring has a negative impact on domestic employment indicative of foreign import competition displacing jobs in domestic manufacturing. So, the results show that offshoring in overall has a negative relationship with domestic employment in U.S. textile industry and is one of the reasons behind continued job loss in this industry.

There is a strongly significant and positive coefficient for the domestic demand variable. Increases in domestic demand for the textile industry's output appear to be a clear stimulus for employment growth in this industry. This is consistent with Burke et al. (2011) finding about the effect of domestic demand on manufacturing jobs in United Stated between 1997 and 2005. But, increases in foreign export demand for the industry's goods do not play a meaningful role in the industry employment growth. In Tables 3, the coefficient on exports is positive but not significant in regression equation.

The direction in which productivity growth would impact domestic employment is negative but not significant to effect domestic employment. This result is consistent with labor productivity index trend for the industry over the past 15 years; suggest that manufacturing technology in U.S. textile industry has not changed significantly due to likely lack of disruptive innovations.

Table 1. Data sources

Variable	Years	Source
Employment	2002 - 2015	BLS: Bureau of Labor Statistics, U.S. Department of Labor; *Current Employment Statistics* http://www.bls.gov/oes/tables.htm
U.S. MNCs - Parent Employment	2002 - 2013	BEA: Bureau of Economic Analysis, U.S. Department of Commerce; *International Economic Accounts* http://www.bea.gov/international/index.htm#omc
Intermediate Inputs	2002- 2014	BEA: Bureau of Economic Analysis, U.S. Department of Commerce; Annual *Industry Accounts and Input-Output Accounts Data* https://www.bea.gov/industry/more.htm http://www.bea.gov/industry/io_annual.htm
Shipments	2002 - 2011	BEA: Bureau of Economic Analysis, U.S. Department of Commerce; *GDP-by -Industry Data* http://bea.gov/industry/iedguide.htm
Imports and Exports	2002 - 2015	USITC: United States International Trade Commission; *Trade Dataweb* https://www. dataweb.usitc.gov/
U.S. MNCs - Foreign Affiliate Employment	2002 - 2013	BEA: Bureau of Economic Analysis, U.S. Department of Commerce; *International Economic Accounts* http://www.bea.gov/international/index.htm#omc
Productivity Index	2002- 2015	BLS: Bureau of Labor Statistics, U.S. Department of Labor; http://stats.bls.gov/lpc/home.htm#tables

Table 2. Correlation estimates for different variables

	Constant	Ln(DD)	Ln(X)	Ln(P)	Ln (FE)	I
Constant	1.0000	-0.4409	-0.6303	0.2494	0.0836	0.4807
Ln(DD)	-0.4409	1.0000	-0.2286	-0.7623	-0.2929	0.1435
Ln(X)	-0.6303	-0.2286	1.0000	0.1463	-0.3066	-0.6957
Ln(P)	0.2494	-0.7623	0.1463	1.0000	0.0538	-0.3198
Ln(FE)	0.0836	-0.2929	-0.3066	0.0538	1.0000	0.2991
I	0.4807	0.1435	-0.6957	-0.3198	0.2991	1.0000

Table 3. Regression analysis results

Dependent Variables	Ln (HE)	Std Error	t Ratio	Prob>|t|
Ln(DD)	4.5186946	0.741308	6.10	0.0037*
Ln (FE)	-1.072941	0.336199	-3.19	0.0332*
I	-15.12266	4.974275	-3.04	0.0384*
Ln(P)	-0.604095	0.858534	-0.70	0.5205
Ln(X)	-0.443894	0.78851	-0.56	0.6035
Constant	-21.39589	7.223859	-2.96	0.0415*
Observations	10			
RSquare	0.952054			
RSquare Adj	0.892121			

Conclusion

The U.S. textile industry has lost more than 450,000 jobs between 2002 and 2013 as its share of total employment in economy has been reduced, drastically. By examining the relationship between domestic and foreign demand, labor productivity as a result of technological change, and both imported intermediate inputs and foreign affiliate employment in U.S. MNCs as indicators of offshoring, and domestic employment in U.S. textile industry over the time period between 2002 and 2011 using regression analysis, it is cleared that the biggest factors that emerge are the level of domestic demand and the rise in offshoring of activities in form of increasing foreign affiliate employment and imported intermediate inputs. Changes in technology, as manifested by stagnated indices of labor productivity, have put a little effect on the employment level in the U.S. textile industry. It appears that technological innovation, highly skilled workers and new work processes are needed to improve labor productivity in this industry. Also, regarding the important role of domestic demand in employment growth, policy makers should work on offering some non-cash grants to simulate demand for domestic manufacturing goods and specifically textile products.

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