



## Contribution to Vietnamese manufacturing sector's aggregate TFP growth in the period 2007-2021

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### Abstract

*This research decomposes the contribution of surviving, entering, and exiting firms to aggregate total factor productivity growth of the Vietnamese manufacturing sector in the period 2007-2021 using the Melitz-Polanec method. The result indicates that the contribution by surviving firms has been the largest but tends to decrease in the research period. The contribution by exiting firms has a positive effect on the change in aggregate TFP because exiting firms with low productivity will have to leave the market, and the process of resource reallocation will move towards enterprises with higher productivity. Meanwhile, entrants' contribution to the change in aggregate TFP has been insignificant. To improve the contribution of firms to aggregate TFP growth, the government should create a competitive environment for firms, making it easier for high-productivity firms to enter and survive in the industry.*

**Keywords:** decomposition, productivity, resource reallocation.

**JEL classification:** D24, D30, D61, L11, L60, O47.

## 1. Introduction

Given an economy's endowment of labor, capital, and knowledge, how these factors of production are allocated within and across industries and within firms determines the economy's overall level of production. Well-functioning market economies are typically characterized by a continuous reallocation of resources between firms (Andrews and Cingano, 2014). To the extent that differences in per capita income across countries are driven by misallocation of resources within and across production units, more efficient reallocation of resources can lead to higher productivity growth and potential output growth. When resource reallocation occurs within an industry, capital and labor move from one firm to another, leading to the entry of new, more productive firms and the exit of less productive firms. Under this mechanism, aggregate productivity tends to increase. In general, this process will lead to faster growth and bring more benefits to society, such as a lower unemployment rate and higher average wages.

Some workers may fall into unemployment due to this reallocation process, but the process can also improve, promote economic growth, increase wages, and bring significant benefits to young workers, in particular. On the contrary, if the reallocation rate decreases, it will slow down the economy's recovery and development (Bartelsman *et al.*, 2013). However, in some developing countries, the misallocation of resources can cause less productive firms to remain operational. In contrast, highly productive firms that are not properly allocated resources must exit the market. Misallocation of resources causes the size of industries to shrink, leading to the release of labor and capital from efficient industries to less efficient industries. This transfer can impact the entry of dynamic new firms and hinder the exit of weak firms, resulting in shifts in market share.

Misallocation of resources at the micro level often reduces total factor productivity at the macro level, and reallocation of resources will maximize welfare and output in the long run (Jones, 2011). In the context of Vietnam's economic reforms aimed at improving productivity, resource allocation is drawing special attention from the government and economists. Since the Doi Moi period in 1986, the high-value-added manufacturing sector has been the initial driving force for Vietnam's economic growth. This sector has mainly attracted foreign direct investment (FDI) and accounted for about one-third of Vietnam's GDP in recent years. However, the efficiency of resource utilization among manufacturing sectors in Vietnam remains low. A higher-value-added sector needs to allocate resources effectively to ensure the economy can continue to grow.

The objective of this research is to decompose the contribution of resource reallocation to TFP growth of the manufacturing industries in the period 2007-2021 using the approach of the dynamic decomposition method of Melitz and Polanec (2015). Based on data extracted from Vietnam's General Statistics Office (GSO) annual enterprise survey, this research estimated TFP using the semi-parametric method developed by Levinsohn and Petrin (2003). Then it used the dynamic decomposition method of Melitz and Polanec (2015) to decompose the contribution to TFP growth of the industry into three groups of firms: surviving firms, entering firms, and exiting firms.

## 2. Methodology

In the process of reallocating resources, in addition to the contribution from the improvement of productivity of firms themselves, the growth or change of aggregate productivity also comes from the reallocation of resources in the market due to the presence of new entering firms, firms expanding/reducing in scale, and the withdrawal of inefficient firms (Olley and Pakes, 1996). This presence is the result of the elimination of inefficient firms, the maintenance of effective surviving firms and the intense efforts of entering firms to compete with existing firms.

Baily *et al.* (1992) were the first to introduce the method of decomposing the contribution to the growth of aggregate productivity. The technique was later improved by the contributions of numerous scholars, including Griliches and Regev (1995), Olley and Pakes (1996), Foster *et al.* (2001), and Melitz and Polanec (2015). Griliches and Regev (1995) introduced the decomposition of the contribution of entering and exiting firms as the deviation from the average aggregate productivity of the industry at the beginning and end of the research period. Meanwhile, Foster *et al.* (2001) proposed a way to decompose the contribution of this group of firms compared to the average aggregate productivity in the previous period.

Olley-Pakes (1996) demonstrated that productivity change is influenced by the improvement in average productivity of firms and the reallocation of resources among firms within industries. However, this method does not account for the contribution of entering and surviving firms to the change in aggregate industry productivity. Therefore, this method is known as the static decomposition method. Melitz and Polanec (2015) extended the Olley-Pakes (1996) decomposition to measure the contributions of entering, surviving, and exiting firms in the manufacturing industry in Slovenia from 1995 to 2000. This method separates the contribution of productivity change at the firm level from the reallocation of market

shares among existing and surviving firms to aggregate productivity growth in the industry. Hashiguchi (2015) studies allocative efficiency in Chinese manufacturing firms from 2004 to 2007 using an extension of the Olley-Pakes (1996) dynamic productivity decomposition. This extension allows simultaneous capture of within-group, parallel, and between-group allocation to examine the contribution of entering and exiting firms to aggregate productivity growth. Allocative efficiency within an industry is found to deteriorate in capital-intensive industries and firms with relatively higher shares of state ownership. Allocative efficiency across the three ownership sectors (state, private, and foreign) tends to improve in industries where market share shifts from the low-productivity state-owned sector to the higher-productivity private or foreign sector.

While resource misallocation has been studied in Vietnam and abroad to explain the potential for productivity growth over the previous decades, only a few current studies in Vietnam have addressed resource reallocation. Using Olley-Pakes (1996) dynamic analysis by ownership, size, and industry, the contribution of private and state-owned firms to TFP growth is 133 percent and -33 percent, respectively, and the contribution of small and medium-sized firms and large firms to TFP growth is 58.56 percent and 41.44 percent, respectively. Internal productivity of firms and net entry components are the main reasons for TFP growth (Nguyen *et al.*, 2019).

To examine the resource reallocation process contributing to the aggregate productivity growth of manufacturing industries, this research employs the dynamic decomposition method developed by Melitz and Polanec (2015) to analyze the contributions of entering, surviving, and exiting firms to the aggregate total factor productivity (TFP) of manufacturing industries. The dynamic model has an advantage over the static model in decomposing the source of contribution to TFP growth because this model considers the change in productivity based on the productivity difference among exiting, surviving, or entering firms. In contrast, the static model only decomposes the source of productivity change based on the relationship between the number of firms and the market size.

### ***2.1. Semi-parametric method of TFP estimation***

Total factor productivity is an indicator that reflects the production result due to improvements in the efficiency of capital and labor use, thanks to the impact of technological innovation, production rationalization, management improvements, and labor skill enhancements. To dynamically decompose the contribution of resource reallocation to TFP, it is necessary to estimate the TFP of firms in the industry. However, if TFP is estimated

through the production function using the ordinary least squares (OLS) method, the problem of correlation between unobserved productivity shocks arises with the level of use of production inputs by firms. This problem will cause the estimated coefficients of the production function, obtained using the OLS method, to be biased, and the TFP estimate will also be biased.

To overcome this phenomenon, Olley and Pakes (1996) used investment as a proxy to control for unobserved shocks. However, not all firms have investment activities in reality and firm-level data also shows that investment often changes slowly compared to productivity shocks. In other words, productivity shocks may not fully reflect in a firm's behavior. Levinsohn and Petrin (2003) addressed this problem by estimating the production function using intermediate inputs as a proxy to control for unobserved productivity shocks. This approach also allows solving the problem of simultaneous bias in the estimation of the production function. Specifically, we consider the following production function:

$$\ln VA_{it} = \beta_k \ln K_{it} + \beta_l \ln L_{it} + \varpi_{it} + \varepsilon_{it} \quad (1)$$

where  $\ln VA_{it}$ ,  $\ln K_{it}$  and  $\ln L_{it}$  denote the logarithms of value added ( $VA_{it}$ ), capital ( $K_{it}$ ), and labor ( $L_{it}$ ), respectively, and  $\varpi_{it}$  and  $\varepsilon_{it}$  are errors. Equation (1) can be abbreviated as follows:

$$va_{it} = \beta_k k_{it} + \beta_l l_{it} + \varpi_{it} + \varepsilon_{it} \quad (2)$$

To overcome the simultaneity problem in estimating the production function, since  $\varpi_{it}$  may be correlated with inputs, Levinsohn and Petrin (2003) used the intermediate input variable ( $m_{it}$ ) as a proxy to control for unobserved productivity shocks, assuming:  $m_{it} = m_{it}(k_{it}, m_{it})$  and monotonically increasing with  $\varpi_{it}$ . Through the inverse mathematical transformation of the intermediate input function, we obtain:  $\varpi_{it} = \varpi_{it}(k_{it}, m_{it})$ . Equation (2) is rewritten as follows:

$$va_{it} = \beta_l l_{it} + \varphi(k_{it}, m_{it}) + \varepsilon_{it} \quad (3)$$

where  $\varphi(k_{it}, m_{it}) = \beta_k k_{it} + \varpi_{it}(k_{it}, m_{it})$ .

The Levinsohn and Petrin (2003) estimation procedure consists of two steps. In the first step, Equation (3) is estimated using a non-parametric treatment for the labor input. The second step is to determine  $\beta_k$ . Assuming  $\varpi_{it}$  follows a first-order Markov process:  $\varpi_{it} = E(\varpi_{it}/\varpi_{it-1}) + \eta_{it}$ , and  $k_{it}$  is determined at t-1, then  $E[\eta_{it}/k_{it}] = 0$ , implying that  $\eta_{it}$  and  $k_{it}$  are uncorrelated. This moment condition is used to estimate the capital elasticity  $\beta_k$ . Finally, total factor productivity (TFP) is calculated according to Equation (4):

$$TFP_{it} = \exp(va_{it} - \hat{\beta}_k k_{it} - \hat{\beta}_l l_{it}) \quad (4)$$

**2.2. Dynamic decomposition method contributing to aggregate TFP growth**

After obtaining the TFP estimation results as in Equation (4), the next step will decompose the contribution of resource reallocation to the industry’s aggregate TFP growth. Whereas, aggregate productivity at time t is expressed as a share-weighted average of firm productivity  $\varphi_{it}$  and is described as in Equation (5):

$$\Phi_t = \sum_i s_{it} \varphi_{it} \tag{5}$$

where  $s_{it}$  is the weight of market share,  $s_{it} \geq 0$  and  $\sum s_{it} = 1$ .

The change in aggregate productivity over time (from t = 1 when the exit occurs to t = 2 when the entry occurs) is defined as follows:  $\Delta\Phi = \Phi_1 - \Phi_2$ .

The assumption that  $s_{Gt} = \sum_{i \in G} s_{it}$  represents the aggregate market share of a group G of firms, then the average aggregate productivity of the group of firms will be  $\Phi_{Gt} = \sum_{i \in G} (s_{it}/s_{Gt}) \varphi_{it}$ . Thereby, the aggregate productivity in each period (t=1 and t=2) is determined as a function of the market share and productivity of three groups of firms (where S, E and X denote the surviving, entering and exiting firms, respectively):

$$\Phi_1 = s_{S1} \Phi_{S1} + s_{X1} \Phi_{X1} = \Phi_{S1} + s_{X1} (\Phi_{X1} - \Phi_{S1}) \tag{6}$$

$$\Phi_2 = s_{S2} \Phi_{S2} + s_{E2} \Phi_{E2} = \Phi_{S2} + s_{E2} (\Phi_{E2} - \Phi_{S2}) \tag{7}$$

From Equations (6) and (7), the aggregate productivity is estimated by Equation (8) and then applied to the Olley-Pakes decomposition separately for the contribution of surviving firms:

$$\begin{aligned} \Delta\Phi &= (\Phi_{S2} - \Phi_{S1}) + s_{E2} (\Phi_{E2} - \Phi_{S2}) + s_{X1} (\Phi_{S1} - \Phi_{X1}) \\ &= \Delta\hat{\Phi}_s + \Delta\text{cov}_s + s_{E2} (\Phi_{E2} - \Phi_{S2}) + s_{X1} (\Phi_{S1} - \Phi_{X1}) \end{aligned} \tag{8}$$

Equation (8) decomposes the change in aggregate productivity into components for three groups of firms: survivors (S), entrants (E), and exiters (X). In which the contribution of survivors is further decomposed into a component caused by shifts in the distribution of firm productivity (the unweighted average change in productivity of survivors) and a component of resource reallocation or market share reallocation (the change in the covariance between market share and productivity for survivors  $\Delta\text{cov}_s$ ). Thus, the contribution of each group to the change in aggregate TFP is explicitly summarized as in Table 1.

TABLE 1: **Dynamic decomposition of sources contributing to aggregate productivity change**

Group	Contributing to aggregate productivity change
Surviving firms	$\Phi_{S2} - \Phi_{S1}$
Entering firms	$S_{E2}(\Phi_{E2} - \Phi_{S2})$
Exiting firms	$S_{X1}(\Phi_{S1} - \Phi_{X1})$

Source: Melitz and Polanec (2015).

Table 1 shows the contributions of surviving, entering, and exiting firms to aggregate productivity change. If entering firms have higher productivity  $\Phi_{E2}$  than the surviving firms  $\Phi_{S2}$  in the same time period ( $t = 2$ ), they will contribute positively to aggregate productivity change. Similarly, if exiting firms have lower productivity  $\Phi_{X1}$  than the surviving firms  $\Phi_{S1}$  in the same time period ( $t = 1$ ), they will contribute positively to aggregate productivity change. For surviving firms, they contribute positively to aggregate industry productivity change when  $\Phi_{S2} > \Phi_{S1}$ .

### 3. Analysis and discussion of results

#### 3.1. Characteristics of Vietnam's manufacturing sector

Vietnam's manufacturing sector is categorized into 24 industries (Vietnam's standard industrial classification of economic activities - VSIC), and these industries have made significant contributions to economic growth. Table 2 presents a summary of the research sample with the characteristics of the three groups of firms (survivors, exits, and entrants) in the manufacturing sector.

TABLE 2: **Descriptive statistics of some characteristics of manufacturing firms in the period 2007-2021**

Characteristics	No of obs	Average	Standard deviation	Min	Max
<b>Surviving firms<sup>a</sup></b>					
Capital (million VND)	33,922	37451.98	1588990	0	2.90e+08
Labor (persons)	33,923	368.97	1706.78	0	85206
VA (million VND)	33,923	90583.19	1658589	16	2.90e+08
Profit (million VND)	33,922	29133.23	1585805	-120718	2.90e+08
TFP	33,923	3.11	0.78	-1.54	13.134

<b>Exiting firms<sup>b</sup></b>					
Capital (million VND)	269,633	6053.23	57880.70	0	7626015
Labor (persons)	269,677	111.51	599.87	0	36448
VA (million VND)	269,677	16744.09	119077.20	0.5	1.31e+07
Profit (million VND)	269,633	3412.28	41007.27	-5256027	5089345
TFP	269,677	2.86	0.74	-2.92	9.849714
<b>Entering firms<sup>c</sup></b>					
Capital (million VND)	127,870	14468.56	554337.30	0	7.45e+07
Labor (persons)	127,880	121.56	806.7241	0	66850
VA (million VND)	127,880	30865.06	708873.70	0.04	8.62e+07
Profit (million VND)	127,870	10467.18	461142.50	-5256027	6.07e+07
TFP	127,880	3.02	0.69	-6.07	9.13
<b>Sample</b>					
Capital (million VND)	431,425	11016.26	536832.40	0	2.90e+08
Labor (persons)	431,480	134.73	807.16	0	85206
VA (million VND)	431,480	26734.43	611923.20	0.04	2.90e+08
Profit (million VND)	431,425	7525.67	511717.30	-5256027	2.90e+08
TFP	431,480	2.93	0.74	-6.07	13.134

*Source:* Author's calculation based on enterprise survey data of Vietnam's General Statistics Office.

*Note:* (a) Surviving firms include firms that existed from 2007 to 2021;

(b) Exiting firms include firms that entered manufacturing industries between 2007 and 2021 and left manufacturing industries before 2021;

(c) Entering firms include firms that entered after 2007 and existed until 2021.

Table 2 shows that in the research sample, there are 33,923 surviving firms, 269,677 exiting firms, and 127,870 entering firms. The amounts of capital, labor, value added, profit, and total factor productivity (TFP) are the largest for surviving firms, followed by entering firms, and the lowest for exiting firms. The results also show that firms surviving for 15 years from 2007 to 2021 are often large-scale firms in terms of capital, profit and labor. Specifically, the average capital of surviving firms (37,451.98 million VND) is more than 2.5 times that of entering firms (14,468.56 million VND) and about six times that of exiting firms (6,053.23 million VND). During this period, the average labor size of the surviving firms is the largest (about 369 workers), followed by entering firms (about 122 workers) and the lowest was the exit firms (112 workers). However, during this period, there were still large-scale firms with thousands of workers that had to leave the industry before 2021.

Table 2 also shows that the TFP of the surviving firms (3.11) is the highest, followed by entering firms (3.02) and exiting firms (2.86). This result indicates that to enter and dominate the market, entry firms must compete with surviving firms, and their productivity must be higher than that of exit firms, thereby eliminating these firms from the market.

Table 3 below summarizes the average labor productivity and TFP of 24 industries in the research sample of Vietnam's manufacturing sector during the research period 2007-2021.

**TABLE 3: Average labor productivity and TFP of manufacturing industries during the period 2007-2021**

<b>VSIC code</b>	<b>Manufacturing industries</b>	<b>Labor productivity (million VND)</b>	<b>TFP</b>
10	Food products	127.23	2.79
11	Beverages	313.06	2.70
12	Tobacco products	239.61	4.85
13	Textiles	190.74	2.95
14	Wearing apparel; dressing and dyeing of fur	55.50	3.03
15	Leather and products of leather; leather substitutes; footwear	57.33	3.11
16	Wood and wood products, excluding furniture	60.44	2.64
17	Paper and paper products	110.48	2.93
18	Publishing, printing and reproduction of recorded media	94.34	2.89
19	Coke, refined petroleum products and nuclear fuel	996.06	3.39
20	Chemicals and chemical products	244.58	3.21
21	Drugs, pharmaceutical chemicals and medicinal herbs	170.66	3.26
22	Rubber and plastics products	116.23	3.03
23	Other non-metallic mineral products	120.94	2.85
24	Basic metals	184.09	2.97
25	Products from prefabricated metal	110.50	2.88

26	Electronic products, computers and optical products	225.38	3.45
27	Electrical equipment	123.65	3.16
28	Machinery and equipment not elsewhere classified	146.04	3.01
29	Motor vehicles, trailers and semi-trailers	172.54	3.49
30	Other transport equipment	220.03	3.09
31	Furniture and other products not classified elsewhere	67.06	2.77
32	Other manufacturing industries	79.01	3.03
33	Repair, maintenance and installation of machinery and equipment	105.62	3.19

*Source:* Author's calculation based on enterprise survey data of Vietnam's General Statistics Office.

Labor productivity is highest in the coke, refined petroleum products, beverage, and chemical industries. Minerals and petroleum are essential commodities in the monopoly market because only state-owned firms are allowed to exploit them, so the selling price is controlled by these companies and is therefore high. This monopoly yields exceptionally high revenue and labor productivity in mineral and petroleum mining firms.

The beverage industry has high labor productivity due to soaring revenue thanks to improvements in distribution and consumption channels. In addition to traditional channels, such as markets and dealer stores, modern channels, including on-site consumption at restaurants, supermarkets, convenience stores, and e-commerce, have grown strongly. The annual output of Vietnam's chemical industry accounts for about 10-11 percent of the total value of the manufacturing sector. The labor force of the chemical industry accounts for nearly ten percent of the manufacturing sector, and its labor productivity is 1.36 times higher than the average labor productivity of the entire manufacturing sector, mainly due to a relatively high level of automation. Labor productivity is lowest in labor-intensive industries, such as textiles, footwear, and furniture production. Vietnam's productivity growth has been gradually shifting from industries that rely on capital and labor-intensive processes to those with high total factor productivity.

Total factor productivity (TFP) is highest in the production of tobacco products, electronics, computers, optical products, and motor vehicles and trailers. Tobacco is a long-standing industry. The tobacco industry has a small labor force because the government does

not encourage the consumption of tobacco products. However, many stages in the production process invested in by the tobacco industry have been automated, such as the tray loading system, the carton packing machine, the automatic fiber feeding and dust extraction system, the cigarette conveyor belt, etc., which have contributed to reducing manual labor, labor intensity, and increasing productivity. The electronics, computer, motor vehicle, and trailer industries are high-value-added industries with significant demand in both domestic and export markets, as well as substantial scientific and technological requirements, so it is understandable that these industries exhibit high total factor productivity.

### **3.2. The contribution of resource reallocation of exiting, entering and surviving firms to aggregate TFP change**

Tables 4 and 5 show the contribution to aggregate TFP change and market share for all three groups of firms during the period. Period  $t = 1$  is when firms exit the industry, and  $t = 2$  is when firms enter the industry. As discussed in the productivity decomposition method above, since total factor productivity is not observable for entrants at period  $t = 2$  (2007) and exits at period  $t = 1$  (2021), a set of surviving firms can be used as a benchmark to examine the contribution of the group of entrants/exiters to the change in aggregate productivity.

**TABLE 4: Changes in the aggregate productivity of exiting and surviving firms in the period  $t = 1$**

$t = 1$	Surviving firms		Exiting firms		Total firms at $t = 1$
	$\Phi_{S1}$	$S_{S1}$	$\Phi_{X1}$	$S_{X1}$	$\Phi_1$
2007	2.487	0.428	2.441	0.572	2.461
2008	2.585	0.381	2.548	0.619	2.562
2009	2.608	0.417	2.568	0.583	2.585
2010	2.608	0.435	2.580	0.565	2.592
2011	2.757	0.431	2.729	0.569	2.741
2012	2.859	0.430	2.840	0.570	2.848
2013	2.813	0.456	2.782	0.544	2.796
2014	2.945	0.452	2.928	0.548	2.936
2015	2.866	0.439	2.840	0.561	2.851
2016	2.817	0.459	2.784	0.541	2.799
2017	3.244	0.477	3.219	0.523	3.231
2018	3.144	0.475	3.112	0.525	3.127
2019	3.246	0.527	3.222	0.473	3.235
2020	3.280	0.502	3.257	0.498	3.269
2021	3.182				3.182

*Source:* Author's calculation based on enterprise survey data of Vietnam's General Statistics Office.

TABLE 5: Changes in aggregate productivity of entering and surviving firms in the period  $t = 2$ 

$t = 2$	Surviving firms		Entering firms		Total firms at $t = 2$
	$\Phi_{S2}$	$S_{S2}$	$\Phi_{E2}$	$S_{E2}$	$\Phi_2$
2007	2.666				2.666
2008	2.722	0.932	2.550	0.068	2.71
2009	2.756	0.901	2.609	0.099	2.741
2010	2.735	0.868	2.623	0.132	2.720
2011	2.866	0.846	2.774	0.154	2.852
2012	2.931	0.826	2.868	0.174	2.92
2013	2.899	0.807	2.823	0.193	2.884
2014	2.984	0.775	2.935	0.225	2.973
2015	2.936	0.769	2.883	0.231	2.924
2016	2.861	0.749	2.786	0.251	2.842
2017	3.280	0.722	3.245	0.278	3.27
2018	3.173	0.71	3.132	0.290	3.161
2019	3.255	0.681	3.228	0.319	3.246
2020	3.257	0.67	3.231	0.330	3.248
2021	3.004	0.333	2.989	0.667	2.994

Source: Author's calculation based on enterprise survey data of Vietnam's General Statistics Office.

Tables 4 and show the contribution of resource reallocation to the change in aggregate TFP and market share for all three groups of firms from 2007 to 2021. The market shares of groups in each period sum to 1. In the period  $t = 1$ , the market share of surviving firms tends to increase slightly while the market share of exiting firms tends to decrease, especially after the COVID-19 pandemic broke out strongly in Vietnam in 2020. In the period  $t = 2$ , over time, as new firms enter the market to replace the exiting firms, the market share of entering firms increases rapidly, dominating the market, and the market share of surviving firms decreases. The change in aggregate productivity indicates a positive contribution of exiting firms to the change in aggregate TFP as exiting firms have lower productivity  $\Phi_{X1}$  than surviving firms  $\Phi_{S1}$  when the exit occurs ( $t = 1$ ). Meanwhile, despite the rapid change in market share, because of their young age, TFP of entrants has not yet surpassed that of surviving firms, so there is no positive contribution of entrants to the change in aggregate TFP because entrants have lower  $\Phi_{E2}$  productivity than surviving firms  $\Phi_{S2}$  when entry occurs ( $t = 2$ ).

**TABLE 6: The contribution of firms group to the change in aggregate TFP of manufacturing sector**

<b>Year</b>	<b>Surviving firms</b>	<b>Exiting firms</b>	<b>Entering firms</b>	<b>Change in aggregate TFP</b>
2007	0.179	0.026		0.205
2008	0.137	0.023	-0.012	0.148
2009	0.148	0.023	-0.015	0.156
2010	0.127	0.016	-0.015	0.128
2011	0.109	0.016	-0.014	0.111
2012	0.072	0.011	-0.011	0.072
2013	0.086	0.017	-0.015	0.088
2014	0.039	0.009	-0.011	0.037
2015	0.07	0.015	-0.012	0.073
2016	0.044	0.018	-0.019	0.043
2017	0.036	0.013	-0.010	0.039
2018	0.029	0.017	-0.012	0.034
2019	0.009	0.011	-0.009	0.011
2020	-0.023	0.011	-0.009	-0.021
2021	-0.178		-0.010	-0.188

*Source:* Author's calculation based on enterprise survey data of Vietnam's General Statistics Office.

The results in Table 6 show the contribution to the change in aggregate TFP of the manufacturing sector from surviving, entering, and exiting firms. During the 15 years, when resource reallocation occurred towards firms with higher productivity, the contribution of surviving firms to aggregate TFP tends to decrease, especially after the COVID-19 pandemic affected most production and business activities. Although surviving firms have high productivity, they face intense competition from the remaining group of firms, especially new entrants. The contribution of exiting firms tends to increase gradually, while entering firms have not contributed to the change in aggregate TFP. This result reflects the vital role of surviving and exiting firms in the change in aggregate TFP for the Vietnamese manufacturing sector. If strong firms do not replace weak firms, it will not promote the change in the aggregate TFP of the manufacturing sector. Meanwhile, although there is a rapid change in market share, new firms have not yet contributed positively to the change in aggregate TFP due to their young age.

#### 4. Conclusion

This research decomposes the contribution of resource reallocation to TFP aggregate change, using the dynamic decomposition method of Melitz and Polanec (2015), for the manufacturing sector in Vietnam from 2007 to 2021. During the study period, firms with high capital, labor and added value have a greater chance of survival in the industry than other firms. Among three groups of firms, the group of surviving firms is the group with the highest scale of capital, labor, revenue, and TFP, followed by the group of entering firms and the group of exiting firms.

During the research period, most industries have experienced scale growth accompanied by growth in labor productivity and TFP productivity. The group of surviving firms has the most significant contribution to aggregate TFP growth of the manufacturing sector. When new firms enter the market to replace exiting firms, the market share of surviving firms decreases significantly. The contribution of exiting firms has a positive effect on the change in aggregate TFP of the manufacturing sector because exiting firms have lower productivity than surviving firms. Meanwhile, the result has not shown a significant contribution of entrants to the change in aggregate TFP. Although surviving firms have higher productivity compared to other groups of firms, they still face intense competition from these other groups for market share and productivity. Therefore, as resource reallocation occurs towards more productive firms, the contribution to aggregate TFP change of surviving firms has declined over time, especially since the COVID-19 pandemic.

The analysis results show that to improve the efficiency of resource reallocation, it is necessary to increase the contribution of entering and exiting firms to the aggregate TFP growth of the manufacturing sector. Thus, in the coming time, the Vietnam Government should to continue to remove barriers in the capital and labor markets, improve the business environment, make tax and subsidy policies transparent, etc., aiming to create a more equal playing field among firms, helping firms easily enter and maintain in the industry, thereby improving the level of resource reallocation among manufacturing firms.

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