

Impact of Automotive Tax Incentives During Covid-19: Evidence From Indonesia

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ABSTRACT

In 2021, as part of the Pemulihan Ekonomi Nasional / National Economic Recovery (PEN [National Economic Recovery]) program, the government introduced additional tax incentives to boost durable goods consumption, the PPnBM incentives, for qualified new car purchases. This study aims to explore the PPnBM incentives' impact on automotive sectors in 2021, utilizing the Interrupted Time-Series Analysis (ITSA) methodology and seasonal forecasting method with Holt-Winters exponential smoothing and Autor Regressive Integrated Moving Average (ARIMA) for four years from 2018 until 2021. In particular, using the automobile wholesales and tax administration data, this paper assesses the impact of the PPnBM incentives on car wholesales, participating firms' sales, purchases, and wages expenditure. The impact of the PPnBM incentives' impact on automotive sectors in 2021 suggested no significant difference in incentives-qualifying cars' wholesales before and after the PPnBM incentives. However, the impact of the PPnBM incentives on total sales recovery resulted that in the incentive participants recovered their total sales to the pre-Covid-19 level. In general, from the variables tested, the result suggests that the PPnBM incentives had a modest impact on wholesales recovery and economic activity for participating automotive manufacturers during the incentives period.

Keywords: tax incentives, automotive sectors, Covid-19, ITSA

1. INTRODUCTION

The Covid-19 pandemic caused significant global-scale health and economic disruption, especially in 2020 and 2021. In Indonesia, firms and businesses experienced the severe impact of the pandemic due to restricted social mobilization and falling demand (Badan Pusat Statistik [BPS-Statistics Indonesia], 2020; World Bank, 2020. Consequently, the economy contracted during the three quarters

of 2020, brandishing Indonesia with recession status – a first since the 1998 crisis (BPS, 2021).

Apart from a few resilient sectors, most industry groups' growth slashed, including manufacturing – the largest sector – which recorded a -2.93% growth in 2020 (BPS, 2021). Specifically, among the manufacturing subsectors, the transport equipment industry experienced the most alarming contraction, -19.86%, as car production contracted by 46.37% in 2020 (BPS, 2021). In March 2021, along with Covid-19 Tax

Incentives under the PEN, the government introduced additional tax incentives, providing a tax cut for new car purchases (Sales Tax on Luxury Goods [(PPnBM)]¹.

In March 2021, the government – through the Ministry of Finance – issued the Ministry of Finance Regulation Number 20/PMK.010/2021 to relieve the PPnBM levies on eligible vehicles based on the criteria by the Ministry of Industry. Before the incentives, car sales in Indonesia were subject to two indirect taxes, the VAT (Value -Added Tax) and PPnBM. In short, the PPnBM is a one-off tax payment at the manufacturing level or during importation, ranging from 5% to 30% based on car type and engine displacement size. Under the Minister of Finance Regulation Number 20/PMK.010/2021 Article 2 (subject to three amendments), the government provided a PPnBM relaxation for qualifying small-medium passenger car models. The Ministry of Industry regulated the eligible vehicles based on the local contents criteria and listed the models in Regulation 839 of 2021 (subject to further amendment).

While the macroeconomic indicators suggested that the PPnBM incentives boosted sectoral performance², the literature on the impact is limited³. The initial study from Institute for Strategic Initiatives (ISI) suggested that the PPnBM incentives significantly impacted the automotive sector recovery, increasing: total output, employment, and household revenue (Ministry of Industry, 2021). However, the study found that while motorcar sales improved from March to May 2021, they did not reach the pre-pandemic level (Ministry of Industry, 2021). Therefore, this study attempted to fill the knowledge gap, incorporating micro-level tax

administration data to provide an alternative assessment. Also, this study will contribute as an extension of the initial research on the PPnBM incentives' impact on the automotive industry, focusing on the sectoral performance following the incentives based on the firm's sales, purchases, and employment.

2. THEORETICAL FRAMEWORK AND HYPOTHESIS DEVELOPMENT

During a recession or economic downturn, the government could intervene in the output fluctuation through fiscal policy, stimulating the demand through increased spending and tax relaxation (Atkinson, 2008; Auerbach & Feenberg, 2000; Elmendorf & Furman, 2008). While there were concerns about the fiscal stimulus effectiveness during an economic crisis, some arguments suggested that discretionary fiscal stimulus would be "helpful if well-crafted" (Elmendorf & Furman, 2008). Summers (2008) proposed three principles for designing fiscal stimulus during a crisis: timely, targeted, and temporary. In short, Summers (2008) suggested that the government provide timely provisions, target "those in need," and ensure that the stimulus will not affect the long-run fiscal position (Elmendorf & Furman, 2008; Taylor & Castillo, 2015).

When the pandemic hit, the global governments prioritized measures to contain the virus outbreak and, expectedly, led to significant economic disruption (Organization of Economic Co-operation and Development [OECD], 2020). In particular, small and medium-sized enterprises (SMEs) and self-employed businesses faced a more

¹ Sales tax on luxury goods or PPnBM ('*Pajak Penjualan atas Barang Mewah*')

² For example, the Ministry of Industry's press release on car incentives ([https://kemenperin.go.id/artikel/23126/Insentif-PPnBM-DTP-Terbukti-Dongkrak-Pertumbuhan-Manufaktur-;](https://kemenperin.go.id/artikel/23126/Insentif-PPnBM-DTP-Terbukti-Dongkrak-Pertumbuhan-Manufaktur-) accessed 1 July 2022), the Gaikindo (Automotive Indonesia or '*Gabungan Industri Kendaraan Bermotor Indonesia*') statement on the PPnBM Incentives ([https://www.gaikindo.or.id/gaikindo-relaksasi-ppnbn-selamatkan-industri-otomotif/;](https://www.gaikindo.or.id/gaikindo-relaksasi-ppnbn-selamatkan-industri-otomotif/) accessed 1 July 2022), and the Ministry of Finance's explanation on the incentives ([https://www.kemenkeu.go.id/publikasi/berita/kemenkeu-perpanjang-insentif-ppnbn-kendaraan-bermotor/;](https://www.kemenkeu.go.id/publikasi/berita/kemenkeu-perpanjang-insentif-ppnbn-kendaraan-bermotor/) accessed 1 July 2022).

³ Based on the author's knowledge, there is one research on the impact of the PPnBM Incentives on car sales by Institute for Strategic Initiatives (ISI), presented in the Ministry of Industry's Webinar on 2021, September 23 available online at <https://www.youtube.com/watch?v=JOviVDj6e0>

significant constraint during the crisis (OECD, 2020). Therefore, through fiscal policy, many countries implemented policy responses to support impacted businesses and households, focusing on liquidity and income support (OECD, 2020). However, Chetty et al. (2020) suggested that the primary cause of the slashed economic output was the spending cut by more affluent households, especially during the initial period of the crisis. From a recovery perspective, consumers might decide to spend later, especially for durable goods, after a crisis (pent-up demand; Beraja & Wolf, 2021; Caballero, 1993; Hodbod et al., 2021). Thus, following the "pent-up demand" mechanism, it would be relevant for the government to encourage durable goods consumption, e.g. motorcars, through discretionary fiscal incentives – especially when the automobile market is relatively sensitive toward price change (Copeland, 2014).

According to Keynesian principles, private sector spending tends to contract during periods of recession or economic crisis, leading to a decline in aggregate demand and economic activity (Krugman, 2009; Mankiw, 2022). In response, governments may employ expansionary fiscal policies, such as increased government spending or tax cuts, to stimulate aggregate demand and subsequently stimulate economic growth. These fiscal interventions aim to fill the gap left by reduced private sector spending, thereby supporting businesses, preserving jobs, and preventing a prolonged economic downturn. Thus, the PPnBM incentive on car sales implemented by governments can be viewed through a Keynesian framework as a targeted fiscal measure to boost consumer spending on durable goods, such as automobiles, and stimulate overall economic activity.

At the same time, the theory of consumer behavior (Schiffman and Kanuk) offers insights into how individuals make consumption decisions in response to changes in incentives, prices, and economic conditions (Schiffman & Wisenblit, 2019). Consumers' responses to fiscal incentives are

influenced by various factors, including their preferences, income levels, and perceptions of economic stability. For instance, in the context of PPnBM incentives, consumers with higher income levels may be more responsive to tax incentives on car purchases, as they have greater discretionary income to allocate towards durable goods. Additionally, consumers' expectations about future economic conditions, such as job security and income prospects, can shape their willingness to make large purchases like cars. By incorporating insights from the consumer behavior theory, policymakers can design fiscal incentives that are more likely to resonate with consumer preferences and effectively stimulate demand, thereby maximizing the impact of such interventions on economic outcomes (Schiffman & Wisenblit, 2019).

Utilizing the government's PPnBM incentive on car sales as the independent variable, this study aims to examine its impact on three primary outcomes of companies: sales outcome, purchase outcome, and wage outcome. The hypothesis proposed is that companies with eligible car products for receiving fiscal incentives will experience a significant increase in their sales compared to non-participant firms. Additionally, fiscal incentives are expected to increase wages for company employees. It is anticipated that companies receiving timely, targeted, and temporary fiscal incentives will demonstrate a significant improvement in all three outcomes compared to non-participant firms, creating a sustained positive impact on the company's economic performance.

3. RESEARCH METHODOLOGY

3.1 Data

Data will incorporate two data sources: motorcar wholesales⁴ data from and Gabungan Industri Kendaraan Bermotor Indonesia (Gaikindo) aggregate firm-level data based on tax administration. Using the wholesale data, we

⁴ Gaikindo offers several datasets from <https://www.gaikindo.or.id/indonesian-automobile-industry-data/>, namely production, wholesales, and retail sales. As the government imposed PPnBM on the transaction from manufacturers to distributors, the wholesales data would be more representative to measure the incentives impact on direct output.

attempted to measure the impact of the PPnBM Incentives on car sales in 2021. Based on the brand and model monthly sales volume, we constructed a dataset based on the incentives eligibility (Minister of Industry Regulation Number 839 of 2021⁵) as the treated group and comparable car models as the control group. We match the comparable car models based on the Gaikindo classifications (i.e., sedan and 4X2 type) and the displacement size. Altogether, we collected around 24 thousand observations of around a thousand car models from 25 manufacturers (brands) spanning January 2018 to December 2021, summarized as follows.

For the tax administration data, we aggregated the firm-level data to maintain anonymity and allow for a more straightforward comparable group. As the treated group, we pooled the six incentive participants (manufacturer), all classified under the automotive manufacturing industry⁶. To create a comparable group, we aggregated other firms registered as automotive manufacturers (within the tax administration database). As indicators of a firm's

economic performance, this study focused on sales, purchases, and employment based on the reported tax return data. For sales and purchases, we aggregated the total sales and purchases based on the VAT return.

Meanwhile, for the employment data, we proxied it with the aggregated total wages based on the PPh (income tax) 21⁷ return. This study incorporates a parameter for employment as several studies found that employment strategies, e.g., wage cuts and furlough, were prevalent during the pandemic (BPS, 2020; Chetty et al., 2020; Rosid et al., 2022; World Bank, 2020). Thus, recovered employment would be one of the indicators of recovery.

3.2 Empirical and Analysis Approach

To measure the impact of the PPnBM incentives on the eligible vehicles and incentives participants, we incorporated the ITSA (Linden, 2015). In short, the Interrupted Time-Series Analysis (ITSA) approach is a quasi-experimental methodology for measuring an outcome variable by comparing pre and post-

GAIKINDO dataset summary						
Description/Category	Sample Period	Number of Obs.				
		Eligible (1)	Non-Eligible (0)	Total		
Total		7596	11052	18648		
Sedan (engine size < 1500 cc)	Jan 2018 to Dec	192	480	672		
4X2 Small (< 1500 cc)	2021	5784	3972	9756		
4X2 Medium (1500 - 2500 cc)	(48 months)	1572	5280	6852		
4X4 Medium (1500 - 3000 cc)		48	1320	1368		
Tax Administration dataset summary						
Description	Sample Period	Number of Obs.	Descriptive Stat. (log)			
			Min	Mean	Max	Std. Dev
Incentives Participant		6 Firms				
Total Sales	Jan 2018 - Dec 2021		22.5663	28.0810	29.6829	1.2871
Total Purchases	Jan 2018 - Dec 2021		23.2297	28.0009	29.6982	1.1576
Total Salary/Wage	Jan 2018 - Dec 2021		26.5913	27.0212	28.0610	0.3501
Non-Participant		6 Firms				
Total Sales	Jan 2018 - Dec 2021		20.1827	24.4676	27.0464	1.6417
Total Purchases	Jan 2018 - Dec 2021		19.4138	24.3717	27.1164	1.6348
Total Salary/Wage	Jan 2018 - Dec 2021		19.3885	21.7039	23.8421	0.6618

Table 1 Gaikindo and Tax Administration Dataset Summary

Source: Processed by Author

⁵ For the list of eligible vehicles, see Appendix 1.

⁶ We refer to the tax administration industrial classification ('*Klasifikasi Lapangan Usaha*' or KLU) code. All firms are registered under the 29100 KLU code for "Manufacture of motor vehicles" for the six incentive participants.

⁷ Income tax on employment income, generally salary and wage, withheld by the employer.

intervention periods (Linden, 2015). Using a control group as a comparison, the regression model is as follows (Linden, 2015).

$$Y_t = \beta_0 + \beta_1 T_t + \beta_2 X_t + \beta_3 X_t T_t + \beta_4 Z + \beta_5 Z T_t + \beta_6 Z X_t + \beta_7 Z X_t T_t + \varepsilon_t$$

In the equation, T_t denotes the time since the start of the study, X_t is an indicator of the intervention period (1), Z is a dummy variable for control group assignment, while $X_t T_t$, $Z T_t$, $Z X_t$, and $Z X_t T_t$ are interaction terms (Linden, 2015). Notably, we are interested in the value of β_t , which denotes the difference between treatment and control groups in the trend of dependent variable following the intervention compared to the preintervention (Linden, 2015).

For this study, we incorporated two periods of time interruption: March 2020 to denote the start of the pandemic in Indonesia and March 2021 to indicate the PPnBM incentives period. The seven remaining measures of interest for calculation are β_0 for automotive sectors, β_1 for car wholesales, β_2 for participating firms' sales, β_3 for total sales, β_4 for firms' total purchases, β_5 for total purchases, β_6 for firms' employment, and β_7 for total wages recovery.

This study also attempted to measure such phenomena by echoing the ISI findings, which suggested that car sales have not reached the pre-pandemic level. However, rather than using the pre-pandemic figures as a comparison (also in Chetty et al., 2020), we forecasted the 2020 and 2021 levels based on the previous periods' trends – to create a non-pandemic counterfactual. The extrapolated figures, e.g., wholesales and the firm's economic activity, will be a reference level to assess the sectoral recovery. An equal or higher post-incentives trend (from March to December 2021) will suggest a recovery indicator. To allow for a more straightforward and intuitive analysis, we alternated between the Holt-Winters seasonal smoothing and ARIMA based on the monthly figures of 2017 to 2019⁸ to forecast the target outcomes (i.e., car wholesales and the firm's economic activity).

3.3 Research Limitations

This paper addresses three prominent limitations encountered in the analysis. The first challenge arises from the need for unit price data, impeding the measurement of price elasticity. The dataset exclusively provides unit sales information, leaving the calculation of price elasticity of demand challenging, as this metric traditionally relies on the percentage change in quantity demanded relative to the percentage change in price.

Lastly, the constraint associated with covariate matching, specifically based on vehicle type and cylinder size. It emphasizes extending this matching process to encompass the same price bracket, ensuring a more comprehensive and accurate analysis.

4. ANALYSIS AND DISCUSSION

In this section, we explored the impact of PPnBM incentives on wholesales and participants' economic performance, namely sales, purchases, and wage expenditure. The first part of the analysis for each parameter began with the post-incentives assessment, focusing on the trend differences between the eligible group and the non-eligible. Subsequently, we measured the recovery trend of the actual figures in 2021 compared to the pre-pandemic trajectory.

H1: The PPnBM incentives' impact on automotive sectors in 2021

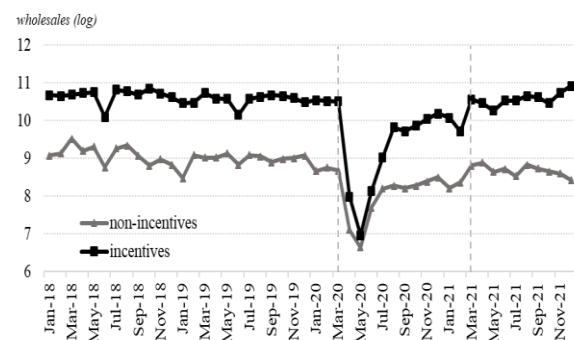


Figure 1 Monthly Wholesales (log-scale)

Source: Author

⁸ Except for the wage and salary data, which is only available from January 2018

Figure 1 plots the aggregate monthly wholesales for incentives-eligible and non-eligible motorcars from January 2018 to December 2021. Based on a quick visual interpretation, we could observe that: (1) the eligible motorcars took up a more significant market share than the non-incentives group; (2) within three months into the pandemic, i.e., May 2020, both groups experienced rock-bottom sales level, but gradually recovered; and (3) at the lowest point, the eligible vehicles experienced the most severe sales contraction, relative to the pre-Covid trend. Following the rolling out of the PPnBM Incentives in March 2021, the eligible group demonstrated an expansive trend while the non-incentives vehicles' trend dwindled. The difference grew more evidently towards the last quarter of 2021, nearing the concluding period of PPnBM Incentives.

For the first empirical analysis, this paper employed the ITSA approach for the wholesales parameter, including for subgroups, i.e., sedan, 4X2 small, and 4X2 medium. Table 2 summarizes the ITSA output for all assessed indicators. As the primary objective of this study, we estimated the slope difference between eligible cars and the non-eligible group during the incentives period. The empirical result suggested that eligible car models experienced more expansive wholesales from March to December 2021 than non-eligible models (positive coefficient, statistically significant at 5% confidence level – see line 1). However, the result also suggested no significant difference in incentives-qualifying cars' wholesales before and after the PPnBM Incentives. While the negative coefficient would suggest a slower trend, it is not statistically significant, even at a 10% confidence level. When looking into the car models, we found

	Impact on Wholesales			
	Total	Sedan	4X2 Small	4X2 Medium
(1) Difference (during PPnBM) (Treated - Control)	0.0850** (0.0360)	0.0630 (0.1440)	0.1170** (0.0581)	0.0782 (0.0678)
(2) PPnBM x Incentives (from March 2021)	-0.0260 (0.1049)	0.0779 (0.1606)	0.0790 (0.1214)	-0.1077 (0.1175)
(3) COVID x Incentives (from March 2020)	0.1198 (0.0989)	-0.0580 (0.0861)	0.0483 (0.1076)	0.1845* (0.0971)
(4) Treatment (Incentives)	8.5071*** (0.1377)	1.9759** (0.7818)	8.1802*** (0.2111)	5.5291*** (0.2264)
(5) PPnBM Period	0.0360 (0.2435)	-0.4703 (0.4729)	-0.0483 (0.4170)	0.2125 (0.4507)
(6) COVID Period	-0.6824*** (0.1861)	-0.1959 (0.3587)	-1.0960*** (0.3176)	-0.7155** (0.3320)

	Impact on Sales			Impact on Purchases			Impact on Wages
	Total	Domestic	Export	Total	Domestic	Import	
(1) Difference (during PPnBM) (Treated - Control)	0.0327 (0.0751)	0.0528 (0.0825)	-0.4206 (0.5357)	-0.0003 (0.0764)	-0.0584 (0.0416)	0.4289 (0.4746)	0.0285 (0.0597)
(2) PPnBM x Incentives (from March 2021)	-0.0417 (0.1113)	-0.0585 (0.1358)	-0.1538 (0.6712)	-0.1548 (0.0980)	-0.1158* (0.0693)	0.1105 (0.5130)	0.0200 (0.0678)
(3) COVID x Incentives (from March 2020)	0.1169 (0.0847)	0.1583 (0.1096)	-0.2065 (0.4247)	0.1907*** (0.0648)	0.0743 (0.0571)	0.5919*** (0.2165)	0.0092 (0.0342)
(4) Treatment (Incentives)	6.4136*** (0.3545)	6.3544*** (0.3403)	17.1677*** (1.9169)	6.1931*** (0.3564)	7.2773*** (0.2252)	10.6021*** (1.7103)	5.2797*** (0.1651)
(5) PPnBM Period	0.2304 (0.4294)	0.0157 (0.4808)	-2.9159 (4.1876)	0.8204 (0.5411)	-0.0991 (0.2900)	0.5175 (2.8466)	0.1230 (0.2558)
(6) COVID Period	-1.2630** (0.4877)	-1.2845** (0.4965)	-4.7098 (3.2822)	-0.4446 (0.3566)	-0.8165*** (0.2305)	-0.9791 (1.2931)	-0.1971 (0.1933)

Standard errors in parentheses; asterisks indicate significance level at 1% (***), 5% (**), and 10% (*)

Table 2 The Impact of PPnBM Incentives on Observed Indicators

Source: Processed by Author

that only the small-sized 4X2 category demonstrated a similar result: a higher post-intervention trend than the non-eligible cars. The output for other car models—sedan and medium-sized 4X2—indicated a non-significant slope difference. Meanwhile, all car models' results implied that the wholesale trend was relatively unchanged during the pandemic and incentives period.

Even though the primary output confirmed the initial expectation that PPnBM Incentives boosted eligible car sales, there are several concerns about the interpretation. First, a non-price factor might affect the qualifying car sales during the incentive period, such as new car models. At the same time, the price effect might motivate consumers to decide on eligible cars or substitutes. Lastly, the not statistically significant difference between the pandemic and the incentives period might have resulted from the "pent-up demand." Visually, it is observable that from August 2020, the wholesale for both eligible and non-eligible cars had recovered – albeit limited. Thus, we would argue that consumers resumed their consumption of durable goods, and the incentives managed to catch the recovery momentum to bolster the demand.

H2: The impact of the PPnBM incentives on car wholesales

In order to assess the recovery, we incorporated the Holt-Winters exponential smoothing approach to extrapolate the eligible car sales. Subsequently, we assessed the recovery indication by comparing the actual sales with the forecasted wholesale for the period starting from March until December 2021. We expect comparable or higher actual sales than projected to affirm the notion of recovery. Thus, we performed t-tests on the equality of means for the projected sales compared to the actual values.

The exponential smoothing approach provided a robust forecasting model with more than 97% accuracy for the testing period. Figure 2 below exhibited the seasonal model, 24 months extrapolation (from January 2020 to December 2021), and actual wholesales. The t-test result

suggested no significant difference between extrapolated and actual wholesales during the incentives period (March to December 2021). While the forecasted value had a relatively higher mean (difference of 0.0054), the p-value is not significant even at a 10% confidence level: $\Pr(|T| > |t|) = 0.9457$ and $\Pr(T > t) = 0.5272$. Therefore, this study would argue that during the PPnBM Incentives period, eligible-car sales had recovered to the pre-pandemic trend.

H3: The impact of the PPnBM incentives on participating firms' sales.

The subsequent analysis is on the firms' total sales parameter based on the reported sales from the VAT returns. Figure 3 below plots the monthly total sales for PPnBM Incentives participants and non-participants from January 2018 to December 2021. The general trend suggested that: (1) similar to the wholesales data, the participants of the incentive had a more significant total sales compared to non-participants; (2) both groups experienced severe contraction during the pandemic, but incentive participants demonstrated a relatively shorter period of slashed sales; (3) notably, the participants of the incentive were having a "v-shaped" trend while the non-participants undergo a somewhat "w-shaped" trend. However, during the PPnBM period, the non-participants began to recover, and the participants maintained their sales trajectory.

The ITSA output confirms the less striking difference for both groups post-intervention, the higher coefficient for treated groups was insignificant, even at a 10% confidence level (see Figure 3). In other words, there was no significant difference in total sales between treated and

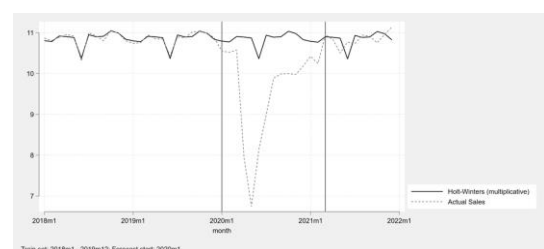


Figure 2 Projected vs Actual Wholesales, Eligible Vehicles (log-scale)
Source: Author

control groups during the incentives period. For the incentive participant, the post-intervention slope is not significantly different compared to the Covid-19 period. One possible explanation is that the total sales for participating firms recovered before the PPnBM period. The visual representation in Figure 3 indicates that the total sales for the participating firms began to stabilize around the fourth quarter of 2020. Similarly, in the ITSA output, the treated groups experience a significantly higher total sales trend than the control group during Covid – at a 5% significance level.

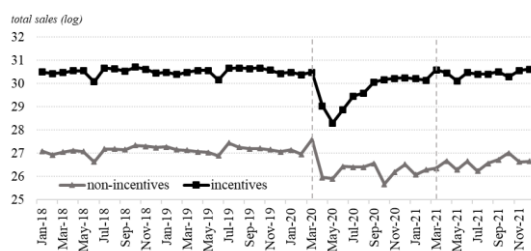


Figure 3 Monthly Total Sales (value, log-scale)
Source: Author

When zooming into sales components, domestic sales and export demonstrated no slope difference (not statistically significant) between the treated and control firms – similar to the total sales result. Also, there is no significant difference between the pre and post-intervention sales components for incentive participants. Based on the export components, there are no significant differences for all parameters between the participants and non-participants (aside from the higher export level for treated groups). The result might be expected as the PPnBM is a domestic sales levy, and the incentives policy targeted local consumption rather than bolstering export activities.

H4: The impact of the PPnBM incentives on total sales recovery

The subsequent analysis for the total sales parameter assesses the recovery trend by comparing the total sales of participating firms with the projected sales. The ARIMA with a 12-period seasonality model provided a robust fit for the

trained dataset (see Figure 4). This research continued with the participants' total sales projection during the incentives period, which served as a pre-pandemic baseline. Based on the t-test approach, this study found no significant difference between the actual total sales and projected values. The extrapolated total sales had a relatively higher mean (difference of 0.0516), the p-value is not significant at a 10% confidence level: $\Pr(|T| > |t|) = 0.4738$ and $\Pr(T > t) = 0.2369$. Thus, this study would argue that the incentive participants recovered their total sales to the pre-Covid level during the PPnBM incentives period.

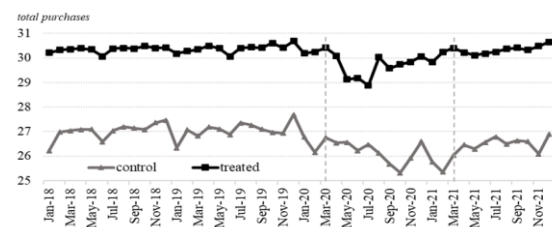


Figure 4 Projected vs Actual, Total Sales for Incentives Participants (log-scale)
Source: Author

H5: The impact of the PPnBM incentives on firms' total purchases

Another primary indicator of a firm's performance is purchasing activity. In this study, the firms' total purchases will be based on the reported input from VAT returns. We could observe a relatively contrasting trend based on the monthly purchases for treated and non-treated firms from 2018 to 2021 (see Figure 7). The visual representation suggests that (1) similar to the previous parameters (wholesales and total sales), the treated group had a more significant total purchase compared to non-participants; (2) both groups experienced slashed purchases during the pandemic, but incentives participants demonstrated a relatively modest contraction; (3) the treated firms were having a "v-shaped" recovery while the control groups demonstrated a "w-shaped" purchases during the pandemic. However, both groups began to expand during the

PPnBM period, which will be subject to subsequent empirical analysis.

The ITSA result generally confirms the participating firms' positive trend during the treatment period, as shown in Table 2. The treated firms experienced relatively higher purchases than the control group (significant at a 5% confidence level). However, the difference was only significant for total purchases, while the coefficients were not statistically significant for local purchases and imports. Also, for the incentive participants, the post-intervention slope was not significantly higher than the Covid-19 period, which might indicate an early recovery before the PPnBM incentives. The early recovery for purchase activity could be

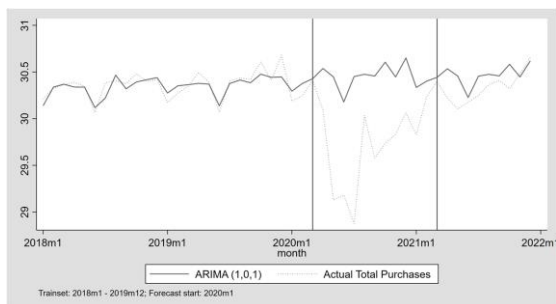


Figure 5 Monthly Total Purchases (value, log-scale)

Source: Author

observed from the positive coefficients for the treated groups during the pandemic, to which the import activity contributed. At the same time, during the Covid-19 period, only the local purchases were significantly affected, while total purchases and imports were relatively stable (coefficients were not statistically significant). The early recovery trend was apparent in Figure 7, with total purchases for the treated group experiencing a positive trend beginning in July 2021.

H6: The impact of the PPnBM incentives on total purchase recovery

This research uses ARIMA to set a projection model to assess the treated firms' recovery on total purchases. Figure 6 below suggests the model robustly fits the 2018 – 2019 purchase data. Based on the visual interpretation, the projected purchases during the treatment

period were relatively higher than the participating firms' actual purchases. The t-test result confirms the speculation: the extrapolated total purchases had a relatively higher mean (difference of 0.1312), significant at a 5% confidence level, i.e., $\Pr(|T| > |t|) = 0.0174$ and $\Pr(T > t) = 0.0087$. Thus, this study would argue that the treated firms had yet to recover their total purchases to the pre-pandemic level during the incentives period.

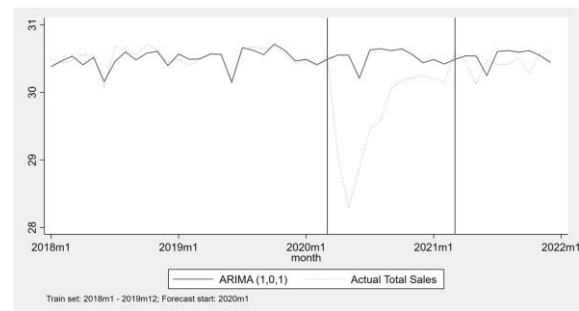


Figure 6 Projected vs Actual, Total Purchases for Incentives Participants (log-scale)

Source: Author

H7: The impact of the PPnBM incentives on firms' employment

The last parameter to measure firms' economic activity during the treatment period is employment, proxied with the total salary and wage spending. This study incorporates salary payments based on the monthly payroll tax data from 2018 to 2021, comparing the treated firms with non-participants. Figure 7 below plots the monthly data for treated and control groups, which suggests: (1) the participants of the incentive had a higher wage spending than the non-participants; (2) both groups reported a relatively modest drop in salary and wages; (3) following the treatment

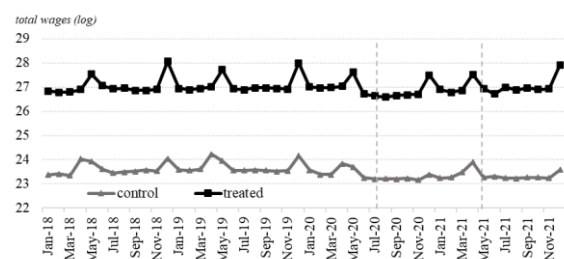


Figure 7 Monthly Total Wage Spending (value, log-scale)

Source: Author

period, both groups experienced a relatively sustained level of salary spending. Therefore, empirical analysis is required to measure the coefficient and significance level.

The ITSA result confirms the less observable difference between the treated and control groups. The post-intervention coefficient suggests a steeper slope for participating firms but is not statistically significant at $\alpha = 10\%$ (see Table 2). There are no statistically significant coefficients for all other parameters except the treatment dummy, which could represent relatively stable wage spending before and after the intervention. One possible explanation might be that the employment-related strategies in the sample firms were less prevalent during the pandemic. Based on the previous parameters, incentives participants experienced a somewhat “v-shaped” recovery in sales and purchases in the second semester of 2020. The uptake might contribute to relatively stable wage spending. However, the interpretation would require further scrutinization as the tax return data represents workers earning more than personal income tax allowance.

H8: The impact of the PPnBM incentives on total wage recovery

Figure 10 below plots the Holt-Winters exponential smoothing forecast based on the treated firms' monthly wages data from 2018 – 2019. A quick visual analysis would suggest that the actual wages were relatively weaker than the extrapolated figures. However, given the relatively small magnitude, the difference might not be statistically significant. The t-test result suggests that while the mean difference is around 0.1787 for projected wages, it is not significant even at a 10%

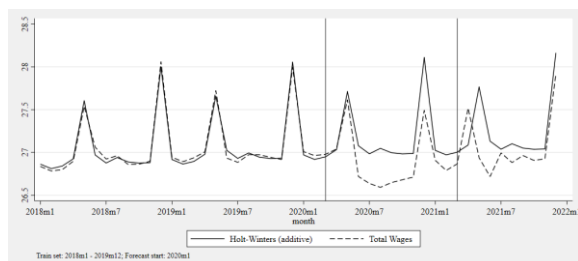


Figure 8 Projected vs Actual, Total Wages for Incentives Participants (log-scale)

Source: Author

confidence level, i.e., $\Pr(|T| > |t|) = 0.3061$ and $\Pr(T > t) = 0.1530$. Therefore, this study would argue that the incentive participants reached the pre-pandemic level of total wages during the treatment period.

5. CONCLUSION AND RECOMMENDATION

During the pandemic, automobile firms were among the severely impacted manufacturing sectors. The wholesales and total sales slashed significantly during the pandemic for both treated and control groups (see Table 2). While the coefficient for total purchases during the pandemic was somewhat not statistically significant, the visual representation suggests that both groups hit the lowest point in 2020. Only wage spending reported a relatively comparable level across the observation period. Thus, following the ‘targeted’ principle, it might be admissible to implement the PPnBM Incentives.

In 2021, the government implemented the PPnBM Incentives and disbursed around IDR 4.6 trillion during the intervention period. However, the empirical analysis in this research indicates a modest impact of the incentives. Based on the post-intervention level, only wholesale and total purchases were the treated groups significantly higher than the control groups. Meanwhile, the recovery towards the pre-pandemic level is limited, only observable for total sales. Table 3 below summarizes the selected results of wholesales, firms' total sales, purchases, and wage spending.

Parameters	Treated > Control Post-intervention?	For treated groups, post- intervention > pre?	For treated groups, post-intervention ≥ pre-pandemic level?
Wholesales	Yes	No	No
Total Sales	No	No	Yes
Total Purchases	Yes	No	No
Salary & Wages	No	No	No

Table 3 Summary Result of Observed Parameters

Source: Author

Based on the result and modest impact of the incentives, two identified factors might contribute to the somewhat lackluster conclusions: the “pent-up demand” and consumers' decisions. Based on the “pent-up demand” hypothesis, people might be motivated to postpone their decision on durable goods consumption during a

crisis. As consumers postpone their purchases, consumption is expected to resume during the economic recovery. Such phenomena were visually apparent in this study, especially for the treated group. For example, although limited, the wholesales for incentives-eligible vehicles began to uptake in the second semester of 2020. Arguably, the recovered trend would distort the pre-intervention analysis to measure the impact of the PPnBM Incentives. Therefore, it might be relevant to assess the timeliness of the PPnBM Incentives in future research.

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APPENDICES

Appendix 1 List of Eligible Vehicles
Source: Processed from Minister of Industry Number 839 of 2021

No.	Model	No.	Model
1	Toyota Yaris	19	Honda Brio RS
2	Toyota Vios	20	Honda Mobilio
3	Toyota Sienta	21	Honda BR-V
4	Toyota Innova 2.0	22	Honda CRV 1.5 T
5	Toyota Innova 2.4	23	Honda H-RV 1.5 L
6	Toyota Fortuner 2.4 4x2	24	Honda HR-V 1.8 L
7	Toyota Fortuner 2.4 4x4	25	Honda CRV 2.0 CVR
8	Toyota Avanza	26	Honda City Hatchback
9	Daihatsu Xenia	27	Suzuki New Ertiga
10	Daihatsu Grand Max	28	Suzuki XL7
11	Daihatsu Luxio	29	Wuling Confero
12	Daihatsu Terios	30	Wuling Formo
13	Toyota Rush	31	Toyota Veloz
14	Toyota Raize	32	Toyota Agya
15	Daihatsu Rocky	33	Toyota Cayla
16	Mitsubishi Expander	34	Daihatsu Agya
17	Mitsubishi Expander Cross	35	Daihatsu Siga
18	Nissan Livina	36	Honda Brio Satya

Appendix 2 Predicted vs Actual: t-test summary for all parameters
Source: Author

Parameters	Predicted (mean)	Actual (mean)	Diff. Predicted - Actual	Pr(T < t) diff. < 0	Pr(T > t) diff. ≠ 0	Pr(T > t) diff. > 0
Wholesales	10.6600	10.5793	0.0806	0.8406	0.3189	0.1594
Total Sales	30.5228	30.4442	0.0787	0.8975	0.2050	0.1025
Total Purchases	30.4698	30.3385	0.1313	0.9769	0.0462	0.0231
Salary & Wages	27.2417	27.0630	0.1787	0.8470	0.3061	0.1530