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How do petrol thefts respond to changing prices?

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AIM

We examine the effect of changing petrol prices on petrol thefts, and the relationship between thefts and medium-term economic factors.

METHOD

We use two empirical approaches to test whether higher petrol prices lead to higher petrol thefts, and a third approach to model the association between the level of thefts and broader economic conditions. Two-way fixed effects and instrumental variables methods are used to consider the causal relationship between prices and thefts, each with different assumptions about how prices may affect thefts. Following this, an error correction model is used to estimate the longer-run relationship between petrol thefts and petrol prices, living costs, wages and the population.

RESULTS

We find that increases in petrol prices causally lead to higher petrol thefts. Looking at associations over the medium term, other economic factors like costs of living and wages may have a stronger association with petrol thefts than petrol prices. Our two-way fixed effects model shows no immediate effect of short run price differences on thefts, likely because daily petrol price variation is small and thefts may require some planning. However, the instrumental variables estimates show that a 1% increase in petrol prices causes thefts to rise by about 3%. Finally, the error correction model shows that the medium term level of petrol thefts is positively associated with petrol prices but has a stronger relationship with the level of living costs and wages.

CONCLUSION

This study finds that increases in petrol prices lead to higher petrol thefts, but that other economic conditions are also likely to be important for the level of theft.

KEYWORDS Theft | Petrol | Economic conditions

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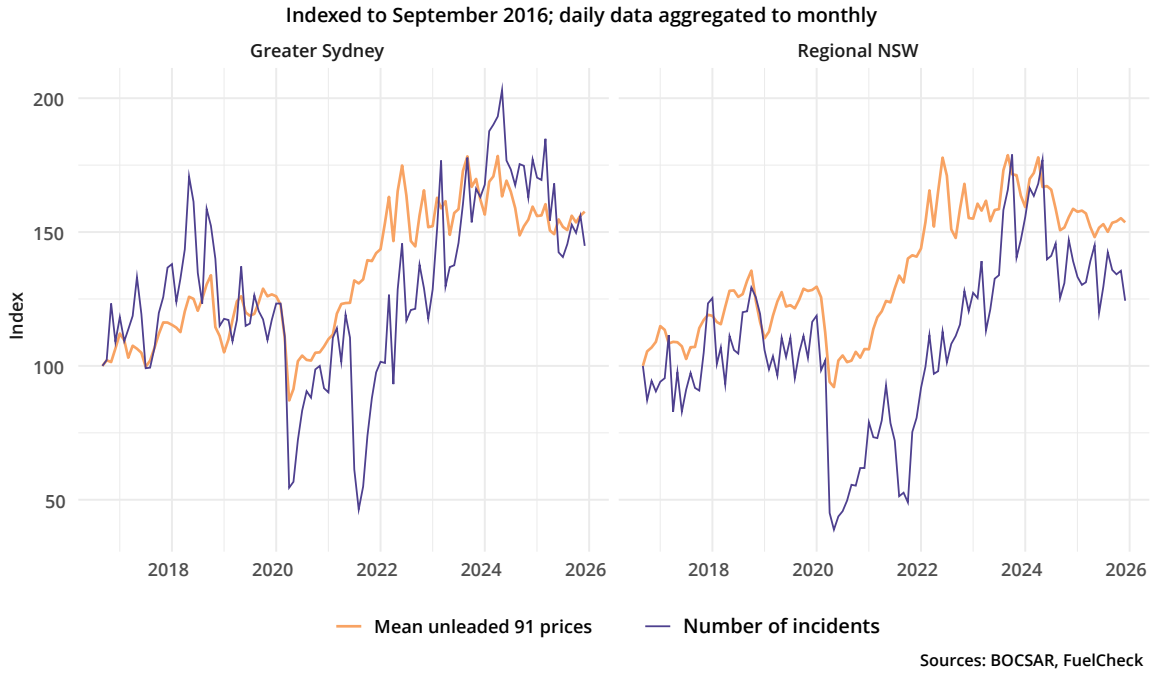
INTRODUCTION

The correlation between petrol prices and petrol thefts (fail to pay incidents) has been well documented both in Australia and overseas. However, Figure 1 shows that between 2022 and 2024, the number of petrol theft incidents in New South Wales (NSW) increased considerably, while at the same time petrol prices remained relatively stable. Then in 2025, petrol prices continued to be stable, while thefts in Greater Sydney and Regional NSW fell slightly. This raises the question of whether the previously observed relationship between prices and thefts has changed over time, or whether another unknown factor could be driving recent trends. In this context, this bulletin sets out to understand whether petrol prices have a causal effect on thefts, and/or whether there are other factors that should also be considered.

Figure 1. Petrol prices and petrol theft incidents in NSW, September 2016 – December 2025



Sources: BOCSAR, FuelCheck

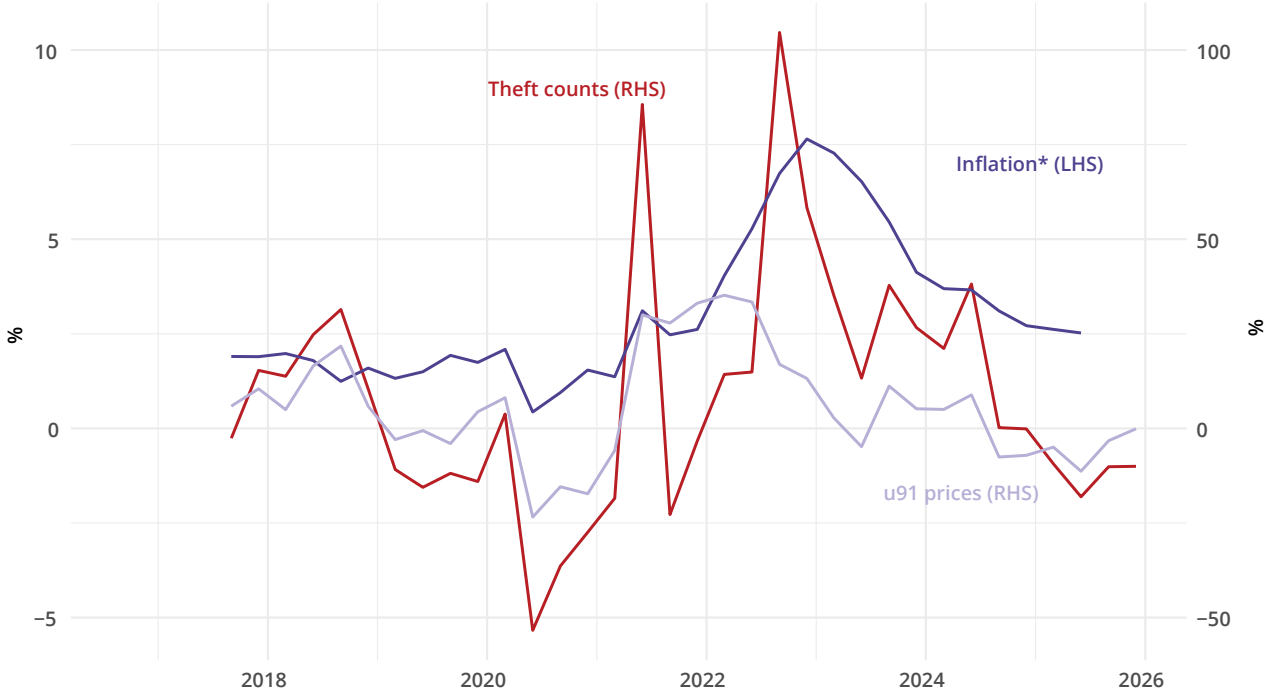
Though the existing literature has demonstrated a correlation between petrol prices and thefts, to our knowledge, there is no literature which assesses whether this relationship is causal, or merely an association. Most relevant to the NSW context is Moffatt and Fitzgerald (2006), which finds a correlation coefficient of 0.9 between monthly average metro Sydney petrol prices and counts of service station fraud. A theft response to prices has also been noted for Victoria, where there has been a "disproportionate rise in fuel thefts when fuel prices passed one dollar a litre" (Victorian Automobile Chamber of Commerce, 2016). Overseas, Sidebottom, Agar and Kurland (2023) find evidence for a weak price to theft relationship in England and Wales.

Intuitively, the idea of a causal link from higher prices to more thefts is plausible. All else equal, higher petrol prices should increase the returns (or payoffs) to theft. This is consistent with Becker (1968), who argues that people will commit crimes if they expect the payoff of those crimes to be larger than that of the legal activities they would have otherwise engaged in, after accounting for potential punishment. In other words, a criminal act will be undertaken if the benefits an individual expects to receive from the act are greater than the expected costs (Butler, 1998). In addition to the expected probability and severity of punishment, individuals also consider the effect of the "opportunity cost" of the time spent committing crimes. If an individual has higher wages, then their opportunity cost of theft is higher (as the return to the activity they could have been doing otherwise is larger). Under this framework, an increase in petrol prices would increase the benefits of stealing petrol, and so lead to more theft incidents, assuming there are no changes in other factors which also affect the decision.

These theoretical relationships outlined by Becker (1968) appear to hold in empirical research. For example, studies of U.S. transfer programs show an inverse relationship between property crime and cash benefits (Deshpande & Mueller-Smith, 2022; Foley, 2011; Watson et al., 2020).[1] Studies also show a relationship between the price of a specific good and thefts of that good. In London, Draca et al. (2019) find significant crime-price elasticities in a study of thefts and the value of stolen goods, while Braakmann et al. (2024) demonstrate that the rate of gold burglary responds to changes in the price of gold. In other words, theft behaviour is responsive to changes in the financial reward to that behaviour. Although theft behaviour may be different for a different good (petrol) and in a different setting (NSW), this research is consistent with the idea that petrol thefts would respond to changes in petrol prices.

There are likely to be other economic factors beyond petrol prices which could affect the relative costs and benefits of stealing petrol.[2] Bushway et al. (2012) examine the relationship between crime and the business cycle, and find that income-motivated crimes increase during recessions. Given this, other living costs and/or wages will likely also affect an individual's budgetary pressure, and thereby their expected benefit from stealing petrol. Consistent with this, the annual change in petrol theft counts in NSW has moved closely with both petrol prices and other prices over the past decade (Figure 2). This suggests that while petrol prices are important, there may be other factors that should be considered to understand the recent rise in thefts.

Figure 2. Annual change in petrol thefts, inflation and petrol prices, NSW, September 2016 – December 2025



***Inflation is for all of Australia**
Sources: ABS, BOCSAR, FuelCheck

1 The same relationship does not appear to exist for violent crime. For an overview of this research, see Ludwig & Schnepel (2025).
2 This is not to say that other, non-economic, factors do not affect thefts – there is likely a large role to play for psychological traits, social norms, and cases where people simply forget to pay.

The Current Study

To understand the relationship between petrol prices and petrol theft we address two questions, both of which are necessary to form a complete picture:

1. Do higher petrol prices cause increases in petrol theft? Causal estimates are necessary to establish that the mechanism from prices to thefts exists. While previous research has established a correlation between fuel prices and theft, these studies are unable to rule out other confounding factors (either observed or unobserved factors).
2. How do petrol prices, petrol thefts, and broader economic conditions move together over the medium term? Since petrol prices rarely move in isolation, it is necessary to model a broader system that includes other macroeconomic variables that could affect thefts. This allows for more robust predictions based not only on changes in prices but also on changes in other economic conditions.

To address these questions, we employ three empirical strategies. The first two models – two-way fixed effects (TWFE) and instrumental variables (IV) – are intended to produce causal estimates, while the third model – an error correction model (ECM) – is used to examine longer-run relationships. Each approach uses a different source of price change and so produces a different estimate. The TWFE design uses within-day-cross-LGA variation to test the effect of price changes, the IV design uses monthly aggregate price shocks, and the ECM is a descriptive measure (unlike the causal TWFE and IV measures). As such, the ECM estimates are descriptive rather than causal.

Data

We use the following data for the analysis:

- **Petrol theft counts:** the daily count of recorded petrol thefts (fail to pay incidents) at service stations, by LGA, from 1 July 2004 to 31 December 2025. The data are sourced from the NSW Police Force's Computerised Operational Policing System (COPS). This enables us to consider thefts at a granular level, before aggregating to a regional, and later, state level.
- **Petrol prices:** petrol prices at a daily frequency, at the service station and petrol type level, were sourced from NSW Fair Trading's FuelCheck (NSW Fair Trading, 2025), and covered the period from 1 August 2016 to 31 December 2025.[3]
- **Oil prices:** oil prices are used to instrument for changes in petrol prices. The data are given as daily US dollar crude oil prices (West Texas Intermediate (WTI)) sourced from the Federal Reserve Economic Dataset, spanning 2 January 1986 to 23 February 2026 at the time of accessing the data (U.S. Energy Information Administration, 2026).
- **Population:** population data are drawn from the quarterly estimated resident population for NSW from the Australian Bureau of Statistics (ABS), from 30 June 1981 to 30 June 2025 (ABS, 2025a).
- **Wages:** wages data are drawn from the ABS's quarterly Wage Price Index for NSW (total hourly rates of pay excluding bonuses, for all industries in both the public and private sectors), to December 2025 (ABS, 2025d).

3 To cross-check the results against a longer time series, we also use the quarterly automotive fuel price index for Sydney produced by the Australian Bureau of Statistics (ABS), which begins in September 1973 (ABS, 2026a). These results are reported in Appendix B. We use the monthly mean of daily unleaded 91 prices for this analysis, though there is little difference in the results when using unleaded 91 compared to alternative petrol types such as E10 or unleaded 95.

- **Living costs:** the ABS's quarterly living cost index for employed people, from December 2015 to December 2025 (ABS, 2025b) is used to account for other costs which are likely to put pressure on household budgets.[4]
- **Unemployment:** the NSW unemployment rate from February 1978 to January 2026, sourced from the ABS's monthly labour force data (ABS, 2026b).

Summary statistics for these series are reported in Table 1. All quarterly series are interpolated to a monthly frequency using linear interpolation, and original (as opposed to seasonally adjusted) data are used. While this interpolation may smooth some variation, the monthly series is still likely to be a good proxy for the variables of interest, as the quarterly data series (population, wages and living costs) tend to be relatively slow-moving (particularly the underlying variables of interest for our model, which are individuals' perceived budgetary pressure from living costs and wages). The use of non-seasonally adjusted data may also introduce bias into the estimation, however the results are robust to the inclusion of monthly seasonal controls.

Table 1. Data frequency, measures of spread and number of observations

Variable	Frequency	Mean	Median	Observations	Standard deviation
Thefts (no.)	Daily	1	1	14	1
	Monthly	916	891	112	235
Unleaded 91 petrol prices (AUD, cents)	Daily	161	164	47,038	29
	Monthly	157	151	112	28
Oil prices (USD/barrel)	Daily	67	67	1,932	16
	Monthly	65	65	112	17
Population (no.)	Quarterly	8,178,057	8,104,758	38	251,064
	Monthly	8,152,621	8,098,303	106	225,895
Wages (index)	Quarterly	138	136	37	10
	Monthly	138	136	112	10
Living costs (index)	Quarterly	84	79	36	9
	Monthly	84	80	112	9
Unemployment (rate)	Monthly	4	4	112	1

4 This is our preferred measure of household costs, as it is designed to reflect "changes over time in the purchasing power of the after-tax incomes of households. It measures the impact of changes in prices on the out-of-pocket expenses incurred by households to gain access to a fixed basket of consumer goods and services" (ABS, 2025c). By contrast, the Australian Consumer Price Index (CPI) measures overall price growth, rather than changes in the purchasing power of households' disposable income (ABS, 2025c). Automotive fuel forms part of this index, so any estimates of its effect on thefts are likely to be a slight underestimate.

METHOD

We use three empirical methods to test whether petrol prices cause changes in petrol thefts and to model the relationship between thefts and economic conditions. To understand whether higher petrol prices causally lead to increased theft, we begin by examining the evidence for a causal relationship. Since changes in petrol prices are correlated with a range of other factors which may also affect people's willingness to steal petrol, we require a change in petrol prices that is as close to random as possible. To achieve this, we use two methods: two-way fixed effects (TWFE) and instrumental variables (IV) estimation. Both methods are useful as, under certain conditions, they can produce causal estimates. However, these estimates give the effect of changes in prices while holding all other factors constant. Since petrol prices typically move alongside other prices, this is unlikely to reflect most observed price changes. As such, we complement the causal analysis with an error correction model (ECM) to examine the longer-run relationships between the level of petrol prices and petrol thefts, as well as a range of other factors which are likely to also influence the level of thefts.

The methods for each approach are outlined in the next section.

The short-term relationship between petrol prices and petrol thefts

The short-term theft response to changing petrol prices may occur through several channels. To account for this, we use two causal methods, each intended to capture a theft response over a different time frame. The TWFE model uses high-frequency, granular data to observe whether there is a near-immediate response to observing higher petrol prices. By contrast, the IV model uses monthly data to look at overall changes in thefts following a price shock. Further, since the two methods use different sources of exogenous variation (TWFE uses cross-sectional variation and the IV uses time series variation) and different data frequencies, they require different identifying assumptions. Given this, including both methods is not only helpful for understanding theft behaviour but also for cross-checking the validity of our results.

Two-Way Fixed Effects

To identify the short-term causal effect of a change in petrol prices on thefts, we first use variation in petrol prices by geography and time. Regressing petrol theft on changes in petrol prices alone will not produce a causal estimate, as there may be other factors changing at the same time which also affect thefts. As such, we require changes in prices which can be considered random. The granularity of the petrol price data means that we can use deviations in daily petrol prices between Local Government Areas (LGAs) as plausibly exogenous variation to test whether petrol thefts respond to these price differences. For this to be true, we assume that there are no other factors affecting daily changes in petrol prices at the LGA level which also affect thefts, and that people do not decide to steal petrol in specific LGAs based on the relative price in that LGA. Both assumptions are likely to hold. Given this, after controlling for LGA and day-specific effects using fixed effects, one could consider any remaining differences in petrol prices between areas and days to be random. This is the identifying assumption that must hold for our estimates to be causal: that is, the difference in daily prices between LGAs is random. One potential violation of this identification strategy would be if differences in price are spatially correlated and therefore not random. For example, if prices in one LGA were higher, and neighbouring petrol stations increased prices subsequently, there would be spatial correlation between prices. However, price changes are likely to propagate slowly over time (for example based on the geographic distance from the station which first raised prices), and so the daily frequency of the estimation therefore likely mitigates this potential violation.[5]

5 As a robustness check, the model is rerun using robust standard errors that allow cross-sectional dependence (two-way clustering and Driscoll-Kraay standard errors) and the results remain unchanged.

The regression specification for the two-way fixed effects model is given as:

$$F_{t,l} = \alpha + \beta_1 P_{t,l} + \gamma_l + \theta_t + \epsilon_{t,l} \quad (1)$$

Where for a given day t and LGA l:

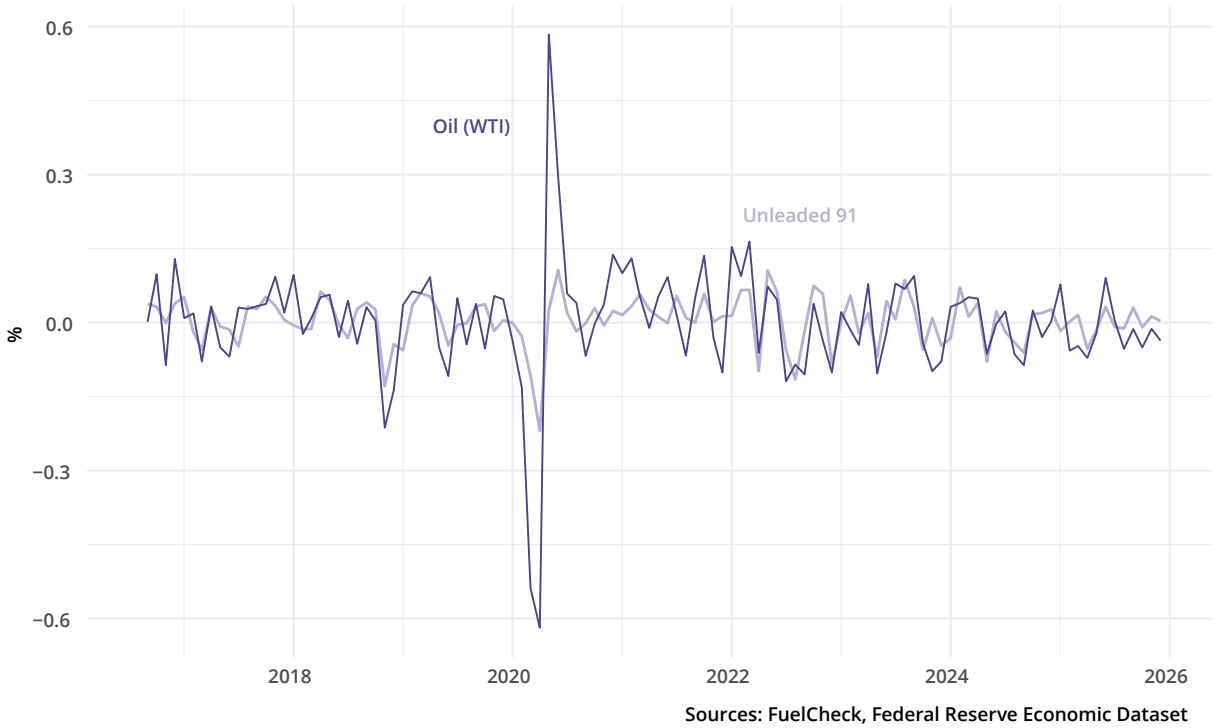
- $F_{t,l}$ represents daily theft counts by LGA;
- $P_{t,l}$ represents average petrol prices by day and LGA;
- γ_l represents LGA fixed effects; and
- θ_t day fixed effects.

The coefficient of interest β_1 can be interpreted as the causal effect of a change in petrol prices on petrol thefts in that area on a given day. θ_t controls for variation across dates, including any effects of COVID-19 and related restrictions. This is particularly important given the significant fall in thefts during the pandemic (as demonstrated in Figure 1).

Instrumental Variable Approach

As an alternative source of exogenous variation in petrol prices, we use monthly changes in oil prices to instrument for changes in petrol prices. To produce a valid causal estimate, this instrument must meet three assumptions: (1) it should directly affect petrol prices (the "relevance condition"); (2) not be related to anything else that might affect thefts ("exogeneity"); and (3) it should only affect theft through the effect it has on petrol prices (the "exclusion restriction"). The relevance condition is straightforward in this case. We know that changes in oil prices have a direct impact on the price of oil, since crude oil is necessary to produce petrol (Australian Competition and Consumer Commission (ACCC), 2025) and historically, large changes in petrol prices have primarily been due to changes in global oil prices (ABS, 2022). As expected, the two series move closely together, supporting the relevance of the instrument (Figure 3). The exogeneity condition is slightly more complicated, but it is plausible to think that it holds in the short run. Oil prices are determined by a wide range of factors relating to global supply and demand. Since Australia's supply of and demand for oil are small relative to the rest of the world, it is unlikely that events in Australia will affect the oil price, and so price changes are independent of the local factors which may also affect theft. Finally, the exclusion restriction is also plausible in the short run - although we would expect oil prices to affect other factors which could also determine thefts (for example, inflation, consumer sentiment or employment), these effects will take some time to flow through to the Australian economy and will likely be slower than the effect on petrol prices. We consider only the first six months after the price increase to account for the weakening of the exclusion restriction over this time, though even within this period, it should be noted that the further the estimation goes away from month 0, the less likely it is that the assumption will hold. Nevertheless, we cannot entirely rule out an immediate effect of oil price changes on thefts. As such, this assumption is less likely to hold for estimates further out from the change, and these should therefore be interpreted with caution.

Figure 3. Monthly change in oil and NSW petrol prices



Sources: FuelCheck, Federal Reserve Economic Dataset

We estimate the Instrumental Variable (IV) using a two-stage least squares approach. The first stage estimates the effect of changes in oil prices on Australian petrol prices:

$$\Delta p_t = \alpha + \lambda \Delta z_t + \epsilon_t \qquad (2)$$

Where:

- z_t represents log-change monthly oil price in USD;
- p_t represents log-change monthly average petrol price.

Oil prices are measured in US dollars, rather than Australian dollars. This is to avoid inadvertently capturing the effect of movements in the exchange rate, as changes in the value of the Australian dollar can, in some cases, affect petrol prices (ACCC, 2025). Although this means that changes in the value of the US dollar will also be included in the oil price measure to some extent, repeating the analysis with oil prices converted to Australian dollars makes little difference to the results. An Olea Pflueger weak instrument test (Olea & Pflueger, 2013) rejects the null hypothesis of a weak instrument (effective F-statistic = 85.295).

The second stage is estimated as:

$$\Delta f_{t+h} = \gamma + \beta_1 \widehat{\Delta p_t} + \upsilon_t, \quad h = 0,1,\ldots \qquad (3)$$

Where:

- f_t represents log-change monthly theft counts[6];
- $\widehat{p_t}$ represents the predicted values estimated in the first stage.

The coefficient of interest, β_1, estimates the percentage change in monthly petrol thefts for a 1% change in monthly petrol prices. We do not include controls for any additional covariates, preferring a parsimonious specification for the short period considered in the regression.[7]

6 While the logarithm of 0 is undefined, this is not an issue for this specification, because there are no months with zero thefts.
7 The one exception to this was the inclusion of a dummy for pandemic-related lockdowns in the regression as a robustness test, since the pandemic affected both oil prices and the level of property crime in NSW. This made little difference to the results.

Association between petrol theft, petrol prices and other economic conditions

Error correction model (ECM)

Following the causal methods described above, we use an error correction model (ECM) to estimate the relationship between petrol thefts and a range of macroeconomic variables, including petrol prices, living costs, wages and the NSW population. In contrast to the IV and TWFE approaches, which isolate the causal effect of price changes in an experimental setting, the ECM asks what the expected level of thefts is, given the historical relationships between thefts and the above variables. The ECM goes beyond the IV and TWFE estimations by accounting for both the change in, and overall level of, a range of variables in conjunction. Modelling these relationships together is useful for making predictions about thefts when petrol prices move alongside other economic conditions. For example, we might observe an increase in petrol prices accompanied by an increase in wages. In this instance, predicting the level of petrol theft using only the IV estimates becomes difficult. In addition to estimating the levels relationship between thefts and economic variables, we also use the ECM to estimate the response of thefts to an increase in petrol prices, living costs and wages. ECMs have been commonly used to study petrol price dynamics (see for example Lewis (2011) and Borenstein et al. (1997)).

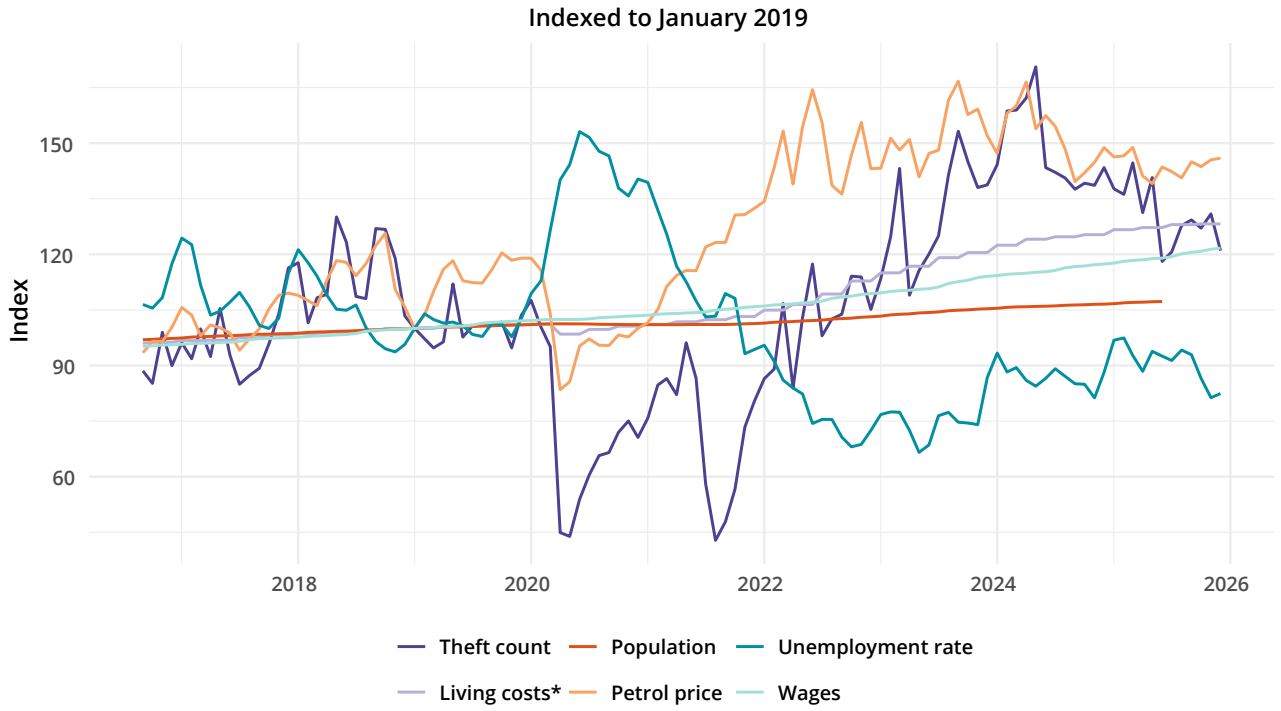
We estimate the ECM using an Engle-Granger two-step procedure (Engle & Granger, 1987) on data from September 2016 to June 2025. First, we estimate a medium-term (the eight years covered by our data) relationship in levels using Ordinary Least Squares (OLS) and test the residuals for joint cointegration between the medium-term variables.[8] Following this, we estimate a short-run error correction equation in first differences, including the speed of adjustment term to capture the speed at which thefts return to the medium-term equilibrium following a short-term shock.[9] Importantly, ECM estimates are not causal but should be interpreted as describing historical correlations.

The model relies on the assumptions made about the determinants of theft. The choice of variables to include in the medium-term estimation should be based on both empirical and theoretical evidence that they fundamentally affect the level of petrol theft in the medium term. Our medium-term specification includes petrol prices, living costs, nominal wages and the NSW population, all of which appear to have some degree of correlation with the level of petrol thefts (Figure 4). While there is not, to our knowledge, literature which models demand for petrol theft, these factors are included based on theoretical grounds, drawn from the economics of crime literature. The rationale for including each variable is as follows. Holding everything else constant, higher petrol prices present a higher return to theft, consistent with economic theory. Similarly, higher living costs increase budget pressures and therefore returns to theft, while higher wages decrease budget pressures and therefore returns to theft. The inclusion of both nominal wages and living costs captures changes in real incomes. Finally, a higher population mechanically should increase the level of theft, holding all else constant.[10]

It is important to note that this is not necessarily an exhaustive list of all determinants of petrol thefts. It is possible that there are omitted factors, observed or unobserved, which also matter for thefts (for example, increased CCTV monitoring at service stations over time). As such, the results of the model should be interpreted only in the context of these included variables; that is, a change in one variable is associated with a change in thefts, holding constant only the other controls in the model.

8 Cointegration is necessary to establish that there is a stable medium-term relationship between the variables, which themselves are not stationary.
9 The specification only uses a single lag in the short-run estimation. This is to preserve degrees of freedom, given the short sample, and to enable clear distinction between contemporaneous changes and long-term relationships.
10 This approach is also consistent with research which models petrol consumption (though consumption and theft may not necessarily have the same drivers). Demand for gasoline in the U.S. has been (roughly speaking) modelled as a function of gasoline prices, real incomes, population and the stock of motor vehicles (see for example Baltagi & Griffin, 1997). Breunig and Gisz (2009) model Australian petrol demand in a similar manner.

Figure 4. NSW petrol thefts, petrol prices, population and economic conditions over time



*** Living costs are for all Australia**

Sources: ABS, BOCSAR, FuelCheck

Medium-term equilibrium

The baseline medium-term relationship is specified as:

$$f_t = \alpha_0 + \alpha_1 p_t + \alpha_2 l_t + \alpha_3 w_t + \alpha_4 pop_t + \epsilon_t \quad (4)$$

Where for each month t, in log-levels:

- f_t represents the number of petrol thefts;
- p_t represents average unleaded 91 petrol prices;
- l_t represents cost of living (measured using ABS living cost series);
- w_t represents nominal wages.
- pop_t represents the NSW resident population;

The intuition behind the model specification can be demonstrated by taking the exponential of Equation 4 (given in Equation 5) and rearranging (Equation 6). Then, roughly speaking (noting that the α coefficients may not be the expected sign or size), the ratio of thefts to population is proportional to inverse real wages (with some multiplicative error owing to the α coefficients). This reflects the role of both petrol prices and household purchasing power in theft decision making.

$$F = e^{\alpha_0} P^{\alpha_1} L^{\alpha_2} W^{\alpha_3} POP^{\alpha_4} \epsilon \quad (5)$$

$$\frac{F}{POP^{\alpha_4}} = e^{\alpha_0} \left(\frac{P^{\alpha_1} L^{\alpha_2}}{W^{-\alpha_3}}\right) \epsilon \quad (6)$$

A key assumption of the model is that the medium-term variables are jointly cointegrated of order 1 (in other words, that the residual of the long-run relationship is stationary). If this assumption fails, the model does not effectively describe a stable medium-term relationship. Joint cointegration is verified using an Augmented Dickey-Fuller (ADF) test of the medium-term regression residuals.[11]

11 An ADF test run on the residuals of the baseline medium-term regression rejects the null hypothesis that variables are (jointly) non-stationary (Dickey-Fuller = -4.792, Lag order = 4, p-value = 0.01)

Short-term changes

To examine factors which are likely to have a short-term influence on petrol thefts and the speed at which the level of theft returns to its medium-term path, we estimate the baseline short-run relationships as:

$$\Delta f_t = \beta_0 + \beta_1 \Delta p_t + \beta_2 \Delta l_t + \beta_3 \Delta w_t + \beta_4 \Delta pop_t + \beta_5 \Delta u_t + \gamma_0 \hat{\epsilon}_{t-1} + \mu_t \quad (7)$$

Where each term represents the monthly log-change in each variable, and the lagged residuals from Equation 4 are given by $\hat{\epsilon}_{t-1}$. Of particular interest is the speed of adjustment term γ_0, which measures how quickly thefts return to their medium-term path following a shock. By contrast, the β coefficients are interpreted as the effect of transitory shocks on theft.

In addition to the above baseline short-term specification, we rerun the model with additional controls to account for other factors which may affect petrol thefts. Short-term Models 3, 4 and 5 in Table 4 control for the short-term effects of the pandemic-related lockdowns. These activity restrictions led to a considerable reduction in property crime (see for example Kim & Leung (2020)) by limiting individuals' movement. To account for this, we also include a dummy variable equal to one in the months where stay-at-home orders were in place. Additionally, although wages are included in the model, higher unemployment will also reduce purchasing power, which may not necessarily be reflected in wages if the wages of the individuals who remain employed do not change. To account for this, Model 2 in Table 4 includes the NSW unemployment rate.

RESULTS

Short-term effect of higher petrol prices on petrol theft

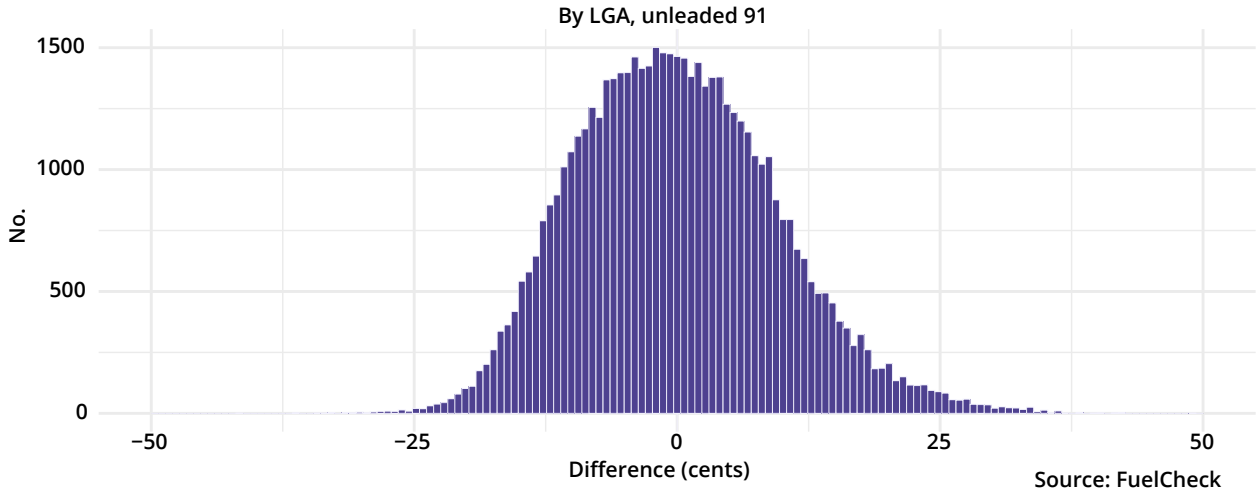
The TWFE estimation finds no effect of prices on thefts (Table 2). A one cent increase in petrol prices leads to a near-zero change in thefts (or 0.003 extra thefts a day for a 10 cent price rise) and this change is not statistically significant. This lack of statistical significance is likely due to the lack of price variation between LGAs (Figure 5), which is consistent with petrol retailers being incentivised to avoid deviating too much from their competitors. Additionally, the specification uses over 100 LGA fixed effects and many date fixed effects (Table 1), and so likely lacks statistical power.

Table 2. TWFE model (Equation 1) estimation results

	Daily
Change in thefts	0.0003 (0.0006)
No. of LGA fixed effects	111
No. of time fixed effects	3,440
Observations	54,893
Adjusted R^2	0.241

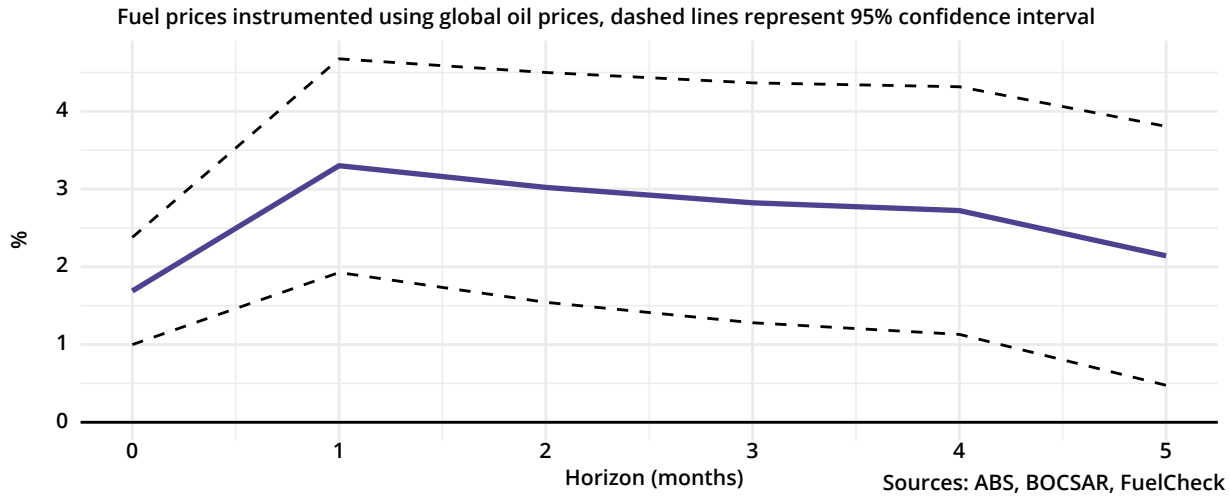
Notes: Standard errors in parentheses. ***Significant at the 1% level. **Significant at the 5% level. *Significant at the 10% level.

Figure 5. Fuel price deviation from daily mean price



The IV estimates show a significant theft response to higher petrol prices. After a 1% price rise, thefts are over 3% higher than they were prior to the price increase (Figure 6). Thefts rise by 1.7% in the first month and then increase to around 3.3% before stabilising. Based on the 1,118 thefts per month on average in NSW in 2025, this would amount to 37 additional thefts per month.

Figure 6. Cumulative petrol theft response to higher fuel prices



Taking the results of the two estimations together provides both evidence for the existence of a causal effect of higher prices on petrol thefts and insights into the nature of this relationship. The TWFE results suggest no immediate reaction at the bowser to observing a higher price relative to previous days and other areas. This is not necessarily surprising, as an effect would only be expected if people waited until they had observed the price for that day and location before deciding whether to pay for their petrol. It may also be the case that, since the price variation in this case is measured relative to other LGAs, people may instead travel to other LGAs where petrol is cheaper (assuming they are aware of cheaper alternatives and are willing and able to travel to them). Further, this estimation only identifies an effect if individuals react almost immediately to observing increased prices. If there is a high correlation between thefts and concealing licence plates as suggested by Moffat and Fitzgerald (2006), it may be the case that most theft incidents require some degree of premeditation. As such, the impact of price changes may take some amount of time to flow through to thefts. By contrast, the IV results demonstrate that thefts do respond to higher prices over time, and that the correlations reported by previous research are likely to be, at least in part, due to a causal effect of prices on thefts. However, these results only provide an indication of what would happen in response to a change in prices if everything else remained constant. To understand the relationship between thefts and a broader range of economic factors, we now turn to the ECM.

Medium-term association between petrol thefts, petrol prices and other economic conditions

We estimate the baseline ECM from September 2016 to June 2025.[12] The results are presented in Table 3. As expected, the medium-term relationship between the level of petrol thefts and petrol prices is positive and statistically significant. Holding everything else in the model constant, this suggests that a world with a 1% higher level of petrol prices would have an almost 1% higher level of thefts. However, the elasticities on living costs, wages and population are much larger, suggesting a stronger relationship in the medium term. This result is intuitive, as we would expect that a 1% higher level of living costs would have a bigger effect on an individual's budget than petrol prices being 1% higher. The significant inverse relationship between wages and thefts is also consistent with this logic. The size of the estimated population coefficient is particularly large (a 1% higher population is associated with a level of thefts that is over 17% higher), and could be capturing other unobserved changes over time that are not included in the model (for example, changes to urbanisation or other time trends). It may also reflect differences in population growth in regional NSW and Greater Sydney over a time where thefts in regional NSW have risen by more than in Sydney.

Table 3. Medium-term petrol theft relationships with petrol prices and other economic conditions, September 2016 – June 2025 (Equation 4)

Petrol prices (α_1)	0.943***
	(0.139)
Living costs (α_2)	6.508***
	(0.581)
Wages (α_3)	-16.345***
	(1.680)
Population (α_4)	17.602***
	(3.834)
Constant (α_0)	-226.444***
	(53.218)
Observations	106
R^2	0.802
Adjusted R^2	0.795

Notes: Standard errors in parentheses. *** Significant at the 1% level. ** Significant at the 5% level. * Significant at the 10% level.

The short-run estimates are presented in Table 4. The baseline model includes the same variables as the medium-term specification (petrol prices, living costs, wages and population) and is reported in Column 1. Columns 2-5 report the results for alternative specifications with a range of additional controls. Across all specifications, petrol prices are associated with a statistically significant increase in thefts of around 1%. Under the baseline specification, this is the only significant factor, aside from population, which is weakly significant. This suggests that short-term fluctuations in living costs and wages do not have an impact on thefts. This may be because these factors take a longer time to flow through to theft behaviour. If changes in living costs and wages also take longer to create budget pressure, it is reasonable to expect that short-term changes would not have an effect. In all specifications, the speed of adjustment term is significant and negative. This indicates that between 39% and 46% of the gap between the theft level after the shock and its medium-term level closes each month.

12 We also run the model over a longer time period as a robustness check using alternative fuel price data. These results are reported in Appendix B.

These results are broadly robust to the additional controls included in Models 2-5. However, the pandemic and associated lockdowns played an important role in the relationship between petrol thefts and economic factors. Consistent with the reduced opportunity for theft (and potentially reduced petrol demand owing to less driving), thefts were lower during lockdown periods. In addition to this, the adjustment of thefts back to equilibrium was faster when lockdowns were in place, as indicated by the larger magnitude of the γ_0 coefficients after controlling for lockdowns.[13] By contrast, the coefficient on the unemployment rate, included in Models 2 and 5, is small and not statistically significant. This suggests that short-term changes in the unemployment rate have little relationship with petrol thefts.

Table 4. Short-run petrol theft elasticities to changes in petrol prices and other economic conditions, September 2016 – June 2025 (Equation 7)

	(1)	(2)	(3)	(4)	(5)
Petrol prices (β_1)	1.112***	1.031***	1.038***	1.035***	1.989***
	(0.210)	(0.216)	(0.190)	(0.194)	(0.202)
Living costs (β_2)	1.962	1.943	1.052	1.037	1.04
	(1.599)	(1.587)	(1.456)	(1.477)	(1.479)
Wages (β_3)	-8.608	-11.132	-9.359	-9.314	-10.519
	(8.981)	(9.052)	(8.108)	(8.173)	(8.300)
Population (β_4)	28.610*	30.513*	3.196	3.321	5.332
	(17.190)	(17.100)	(16.377)	(16.553)	(16.735)
γ_0	-0.387***	-0.407***	-0.457***	-0.454***	-0.457***
	(0.085)	(0.085)	(0.078)	(0.091)	(0.091)
Unemployment rate		-0.075			-0.038
		(0.047)			(0.044)
Lockdowns in place			-0.189***	-0.189***	-0.183***
			(0.039)	(0.040)	(0.040)
Lockdowns x error correction term				-0.013	-0.030
				(0.183)	(0.184)
Constant (α_0)	-0.016	-0.013	0.027	0.027	0.027
	(0.020)	(0.020)	(0.020)	(0.020)	(0.020)
Observations	105	105	105	105	105
R^2	0.395	0.411	0.512	0.512	0.516
Adjusted R^2	0.364	0.374	0.482	0.477	0.475

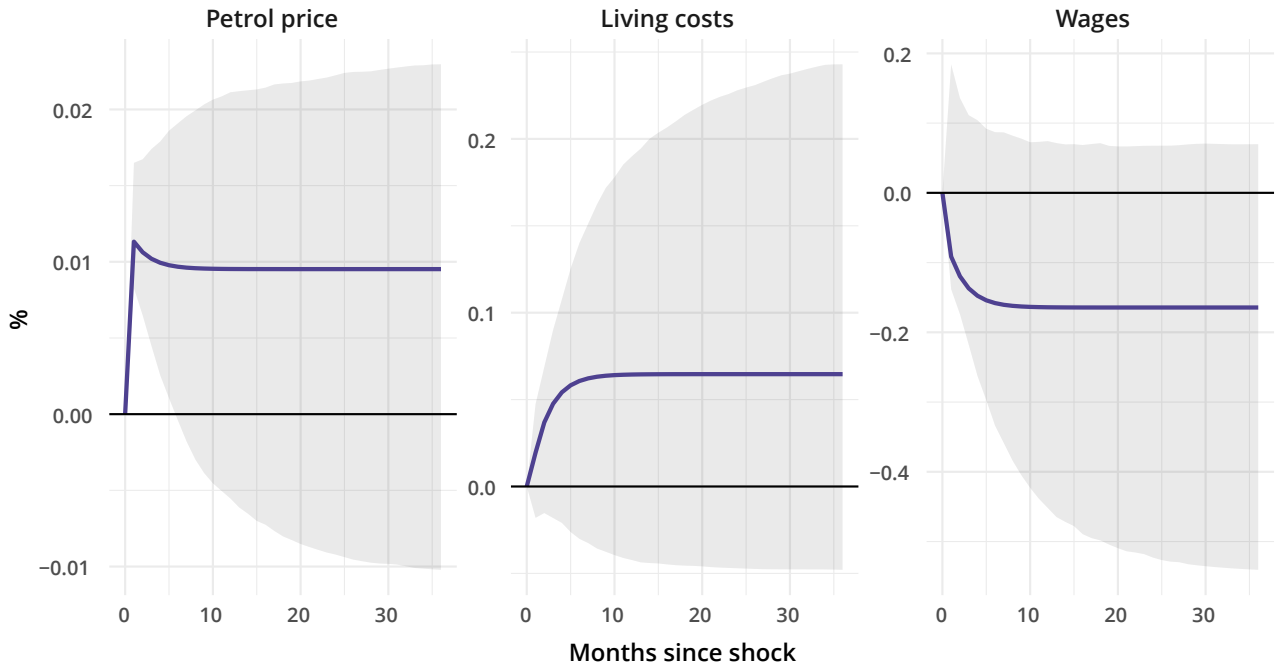
Notes: Standard errors in parentheses. ***Significant at the 1% level. **Significant at the 5% level. *Significant at the 10% level.

The medium-term coefficients (Table 3) and short-term elasticities (Table 4, Model 1) can be used to predict the theft response to various permanent shocks (i.e. an impulse response, Figure 7).[14] Following a 1% increase in petrol prices, theft immediately rises by just over 1%. It does not increase after that, consistent with a rapid adjustment to the new equilibrium. By contrast, a 1% increase in living costs leads to a similar sized increase in thefts in the first month, and continual increases for the next few months, before thefts reach their steady state level at over 6% after 5 months. This is consistent with living costs having a less obvious immediate impact and taking time to flow through to budgets, but playing a larger role in overall expenses. The impulse response from a rise in wages is similar to a fall in living costs, with a large immediate drop in thefts, which continue to fall to be more than 16% lower. Since these responses estimate the change holding all else constant, including costs, this can be thought of as the response to a real rise in wages (in other words, individuals have more purchasing power). However, other than the initial response to an increase in petrol prices, the estimated responses are not statistically significant, likely reflecting the relatively short estimation period and small sample size. As such, they should be interpreted as suggestive of the direction and timing of the response, rather than precise magnitudes.

13 Given the reduced opportunity for theft during lockdowns, this may reflect thefts being more random, and less responsive to economic factors. This estimate may also be due to the lower levels of, and smaller increases in, thefts following economic shocks during this time.

14 Impulse response functions are estimated by residual bootstrapping.

Figure 7. Predicted theft response to a 1% increase in:



Shaded area indicates pointwise 95% bootstrap confidence interval

Sources: ABS, BOCSAR, FuelCheck

DISCUSSION

This bulletin examines explanations for the recent rise in petrol thefts in NSW, considering whether petrol prices causally affect petrol thefts and how thefts relate to other economic conditions over time. We use three complementary methods – TWFE, IV and an ECM – to consider both short-run causal responses and associations in levels. We find that increases in petrol prices cause increases in petrol thefts. However, over the medium term, thefts are more closely associated with living costs and wages.

Leveraging high-frequency variation in petrol prices in a TWFE estimation finds no evidence to support an immediate theft response to changing prices. This may reflect both a lack of statistical power, and that thefts may require some amount of planning in advance. By comparison, the IV estimation finds causal evidence that increases in petrol prices, all else being equal, lead to higher petrol thefts, supporting the correlations found in previous research. A 1% increase in petrol prices is associated with a 3% cumulative increase in theft incidents. This may suggest that when there are unexpected and isolated jumps in petrol prices (for example in response to exogenous commodity price shocks), it could be useful to anticipate a corresponding rise in thefts and potentially implement prevention measures in anticipation.

The ECM estimation also demonstrates that petrol prices are not the only factor to consider when understanding trends in petrol thefts. Though historically there has been a very strong correlation between prices and thefts, we find that other macroeconomic trends are likely to be more important in determining the level of theft. The level of petrol theft is positively associated with the level of petrol prices, living costs and the population, and negatively associated with wage levels. The larger magnitude of these other factors relative to petrol prices suggests that they have a stronger correlation with thefts. This may explain the recent increases in thefts, which have taken place over a period of low petrol price growth and relatively high increases in living costs. These results describe historical associations rather than causal relationships, and there may be other factors driving trends in theft over time. As such, it is not possible to definitively explain the reasons for these relationships without further research. However, these results are consistent with the idea that budgetary pressures may play a role.

Finally, it is important to note that theft behaviour (and decision making more generally) is complex, and prices and other economic influences are unlikely to be the only factors influencing individuals' theft decisions. This bulletin does not attempt to explain all the determinants of petrol theft. However, to the extent that theft decisions are based on weighing up expected costs and benefits, this research suggests that changes in the balance between these two are associated with changes in theft behaviour. Given this, it may also be useful to apply the approaches used in this bulletin to other acquisitive crime types such as retail theft, which could be affected by changing goods prices, living costs and other economic conditions in a similar way to petrol theft.

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APPENDIX A: IV ESTIMATION MONTHLY RESULTS

Table A1. Change in thefts following 1% petrol price increase

Months since price change	% change
0	1.630*** (0.335)
1	1.560*** (0.395)
2	0.100 (0.382)
3	-0.286 (0.381)
4	-0.165 (0.381)
5	-0.133 (0.383)
6	-0.595 (0.376)
7	-0.163 (0.387)
8	0.431 (0.382)
9	0.178 (0.392)
10	0.151 (0.391)
11	0.004 (0.391)

Notes: Standard errors in parentheses. ***Significant at the 1% level. **Significant at the 5% level. *Significant at the 10% level.

APPENDIX B: ECM RESULTS WITH LONGER-RUN DATA

To assess the sensitivity of the ECM results to the choice of time period and petrol price measure, we run three robustness tests. The petrol price data from FuelCheck is only available to September 2016, so for a longer-run model we use petrol price inflation from the ABS. To ensure a fair comparison, we first rerun the main specification (i.e. from September 2016 to June 2025) with fuel price inflation. Subsequently, we run the ECM using data from September 2004 to June 2025 with fuel price inflation.

Rerunning the baseline ECM using petrol price inflation rather than petrol prices produces similar results to the main specification when run with a different measure of petrol prices over the same time period produces similar results (Table B1, Column 2).

Extending the model back to 2004 produces different results. The magnitude of the coefficients on petrol prices, living costs and wages are all smaller, and the coefficient for population is negative. This suggests that the relationship between these variables has changed over time.

Our preferred specification is to use 2016 to 2025 for two reasons. First, the data is consistent with the TWFE and IV estimations. Second, this period only includes more recent events, while the longer time span includes events like the mining boom and the GFC, during which time the relationship between macroeconomic factors and thefts may have been very different to present. Overall, these results suggests that the relationships between thefts and other factors change over time, and that caution should be taken when generalising the main results to earlier periods.

Table B1: Medium-term relationships with alternative price data

	(1) Sep 2016 – Jun 2025	(2) Sep 2016 – Jun 2025	(3) Sep 2004 – Jun 2025
Petrol prices	0.943*** (0.139)		
Petrol price inflation		0.978*** (0.171)	0.440*** (0.137)
Living costs	6.508*** (0.581)	6.937*** (0.594)	3.543*** (0.483)
Wages	-16.345*** (1.680)	-16.502*** (1.797)	-1.326 (0.822)
Population	17.602*** (3.834)	16.257*** (3.998)	-3.132*** (1.542)
Constant	-226.444*** (53.218)	-206.027*** (55.391)	45.403*** (21.061)
Observations	106	106	244
R^2	0.802	0.783	0.512

Notes: Standard errors in parentheses. ***Significant at the 1% level. **Significant at the 5% level. *Significant at the 10% level.

Table B2: Short-run responses with alternative price data

	(1) Sep 2016 – Jun 2025	(2) Sep 2016 – Jun 2025	(3) Sep 2004 – Jun 2025
Petrol prices	1.122*** (0.210)		
Petrol price inflation		2.071*** (0.568)	1.711*** (0.330)
Living costs	1.962 (1.599)	1.207 (1.608)	0.734 (1.178)
Wages	-8.608 (8.981)	-11.929 (8.666)	-14.292*** (5.340)
Population	28.610* (17.190)	16.678 (18.394)	32.673** (13.392)
Speed of adjustment	-0.387*** (0.085)	-0.416*** (0.098)	-0.267*** (0.041)
Lockdowns in place		-0.175*** (0.044)	-0.219*** (0.044)
Lockdowns x error correction term		-0.222 (0.190)	-0.290** (0.135)
Constant	-0.016 (0.020)	0.012 (0.023)	0.004 (0.015)
Observations	105	105	243
R^2	0.395	0.446	0.345

Notes: Standard errors in parentheses. ***Significant at the 1% level. **Significant at the 5% level. *Significant at the 10% level.

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