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Longitudinal Analysis of Goods Vehicle Traffic Composition in Great Britain Using Matched-Site Road Traffic Counts, 2000–2025

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ABSTRACT

Van traffic has been the fastest-growing part of Britain's road traffic for two decades, and the usual explanation is e-commerce and last-mile delivery. This study tests that story against 5.27 million hourly manual counts from 43,401 sites (2000–2025). Chain-linked indices are built from sites counted in consecutive years, checked against a site fixed-effects model, and used to compare 2019 with 2025 at 2,575 sites counted in both years. Van flows rose 13% over that period while lorry flows fell 5%. The fall was concentrated in rigid lorries, down 16% across all road types, and in London, where lorry traffic fell 31%. Contrary to the last-mile account, van growth was strongest on motorways (+16%) and trunk A-roads (+12%) and weakest on minor roads (+2%). Segmented regression shows van growth slowing from 2.6% a year before the pandemic to under 1% after it, while lorries have declined about 2.7% a year since 2021. Within the lorry fleet, six-axle articulated vehicles grew from 14% of lorries counted in 2000 to 37% in 2025. The evidence points to a freight system splitting into smaller and larger vehicles, with vans increasingly doing inter-urban, not just doorstep, work.

Keywords: light goods vehicles; heavy goods vehicles; road freight; e-commerce; logistics technology

INTRODUCTION

If one statistic captures how British roads have changed this century, it is the rise of the van. Light commercial vehicles travelled 58.8 billion miles in 2025, 10% more than in 2019, while lorries travelled 16.3 billion, 5% fewer (Department for Transport [DfT], 2026a). Cars, for all the talk of post-pandemic change, ended 2025 within a fraction of a percent of their 2019 level. The goods-carrying part of the traffic stream is where the structural change has been.

The explanation most often offered is online retail. Parcels bought online have to be delivered somewhere, and vans do the delivering. Allen et al. (2018) traced this in central London, showing how e-commerce fragments deliveries into many small drops by light goods vehicles. Jaller and Pahwa (2020) and Viu-Roig and Alvarez-Palau (2020) reviewed how last-mile logistics adds vehicle kilometres in cities. The pandemic intensified the pattern by pushing online shopping to new levels, some of which persisted (Mirzanezhad et al., 2024; Tumula et al., 2026). A large engineering literature now works on electrifying vans and on replacing some of them with cargo bikes, robots or parcel lockers (Caggiani et al., 2021; Garus et al., 2024; Lal et al., 2023; Orhan & Wallace, 2025). The national estimates, however, cannot say where van growth is happening, at what time of day, or what is happening to the lorries alongside them. National vehicle-mile figures are themselves modelled from counts and road lengths, and they aggregate across very different roads. If van growth were mainly a last-mile phenomenon, it should be strongest on urban minor roads, where deliveries happen, and in the middle of the day, when they are made. If it reflects something broader (trades and services, inter-urban parcel trunking, or the substitution of small vans for small lorries), the pattern would look different.

This paper uses the DfT's site-level manual counts to look underneath the national totals. Because the sample of counted sites changes from year to year, raw totals are not comparable over time. Every

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comparison is therefore built from sites counted in both of the years being compared. Four questions are addressed:

- How have van, lorry, car and bus flows evolved at matched sites since 2000, and how did each respond to the pandemic?
- On which types of road has van growth been concentrated, and does that pattern fit a last-mile explanation?
- What has happened within the lorry fleet, between rigid and articulated vehicles and across axle classes?
- Has the time-of-day profile of goods traffic shifted since 2019?

The answers complicate the e-commerce story without overturning it. Vans have grown fastest on the strategic road network, not on minor roads. Lorry decline is concentrated in smaller rigid vehicles and in London, while the largest articulated lorries have taken a growing share of heavy traffic. Section 2 reviews the literature, Section 3 sets out the data and methods, Section 4 presents results, and Section 5 discusses their meaning for freight policy and for countries where van-based logistics is still emerging.

LITERATURE REVIEW

E-Commerce and the Last Mile

Most research on vans focuses on cities. Allen et al. (2018) showed that parcel carriers in London make many small drops per round, with vans parked at the kerb for much of the working day. Viu-Roig and Alvarez-Palau (2020), reviewing the literature systematically, found broad agreement that e-commerce raises urban freight kilometres, but less agreement on how much, because some shopping trips by car are replaced. Jaller and Pahwa (2020) modelled the net environmental effect and found that it depends on consolidation and on consumer travel. Tsai et al. (2024) reviewed how the pandemic accelerated parcel-locker adoption, which could reduce failed deliveries and van kilometres.

On the supply side, studies have priced and evaluated alternatives to diesel vans. Lal et al. (2023) and Castillo Campo and Álvarez Fernández (2023) assessed electric light commercial vehicles for last-mile fleets. Iwan et al. (2021) tested light electric vehicles in Szczecin, Caggiani et al. (2021) combined e-vans with cargo bikes, and Llorca and Moeckel (2021) simulated urban freight flows to estimate what cargo bikes and electrification could achieve. Garus et al. (2024) compared robots, cargo bikes and vans across 14 European settings, and Galkin et al. (2026) showed how urban form shapes delivery efficiency. All of this work treats van growth as essentially urban.

Lorries, the pandemic and policy

Heavy goods vehicles have received less attention in the post-pandemic literature. Studies of the pandemic shock itself found freight more resilient than passenger travel but uneven across commodities and modes (Gonzalez et al., 2022; Lacka & Supron, 2021; Xie et al., 2024). Work on heavy-vehicle decarbonisation (Rajalehto & Helo, 2025; Rohith et al., 2023) generally assumes a stable heavy fleet. In London, two policies have bitten on lorries in particular: the Ultra Low Emission Zone, whose air-quality effects were modest in its first phase (Ma et al., 2021), and the Direct Vision Standard, which requires safety equipment or better cab visibility for HGVs over 12 tonnes (Frampton & Millington, 2022). Both raise the cost of running older and smaller lorries in the capital.

Working Patterns and Traffic Timing

The pandemic also changed when people travel. Hybrid working reduced weekday commuting and shifted some trips toward the middle of the day and toward other days (Balbontin et al., 2021; Caldarola & Sorrell,

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2022; Hensher et al., 2022; Huang et al., 2023). Residents in some London neighbourhoods also reported driving less where low-traffic schemes were introduced (Goodman et al., 2023). If goods traffic has adjusted its timing to fit around a changed car peak, that should show up in the hourly profile of van and lorry counts.

DATA AND METHODS

Data

The analysis uses the DfT raw count file covering 2000–2025 (DfT, 2026c). Each record is the number of vehicles passing a count point in one direction during one hour, on a single weekday between 07:00 and 19:00, classified into cars and taxis, light goods vehicles (vans, up to 3.5 tonnes), buses and coaches, two-wheeled motor vehicles, pedal cycles and six classes of HGV. The six HGV classes are rigid vehicles with two, three and four or more axles, and articulated vehicles with three or four, five and six or more axles. The file has 5,269,632 hourly records from 43,401 count points.

For each site i, year t and vehicle class v, the mean 12-hour, two-way flow is formed over the D_{it} days on which the site was counted:

$$\bar{q}^{v}_{it} = \frac{1}{D_{it}} \sum_{d=1}^{D_{it}} \sum_{h=7}^{18} \sum_{k \in \{1,2\}} q^{v}_{i,d,h,k} \qquad (1)$$

The sample of sites changes considerably from year to year. Minor roads were counted much more heavily in the benchmark years of 2008–2009 and 2018–2019 (DfT, 2022), and from 2020 the sample fell to around 6,500 sites. Any total over all counted sites would therefore mix real change with changes in the sample. The methods below avoid that.

Chain-linked matched-site index

The main measure is a chain-linked index built from sites counted in consecutive years. For each pair of adjacent years, the set M_t of sites counted in both $t-1$ and t is identified, the ratio of their summed flows is computed, and the ratios are multiplied through:

$$I^{v}_{t} = I^{v}_{t-1} \times \frac{\sum_{i \in M_t} \bar{q}^{v}_{it}}{\sum_{i \in M_t} \bar{q}^{v}_{i,t-1}}, \qquad I^{v}_{2019} = 100 \qquad (2)$$

Because the ratio is of summed flows, busy sites carry more weight, which brings the index closer to a vehicle-kilometre measure. Between 2,270 (2019–2020) and 5,941 (2003–2004) matched sites support each link in the chain.

Fixed-Effects Index

As a check, a two-way fixed-effects model is estimated at the site-day level for each vehicle class:

$$\ln(1 + q^{v}_{idt}) = \alpha_i + \gamma_t + \mu_{m(d)} + \varepsilon_{idt} \qquad (3)$$

where α_i is a site effect, γ_t a year effect and $\mu_{m(d)}$ a month-of-count effect. The year effects, expressed as $100\exp(\gamma_t - \gamma_{2019})$, form an index of the typical site's flow, unweighted by size. Where the two indices diverge, the divergence itself is informative: it shows whether change is concentrated at busy or quiet sites. The model was estimated by sparse least squares on 222,100 site-days.

Segmented Regression

To describe how trends changed around the pandemic, a segmented (interrupted) time-series model is fitted to the log chain index for 2010–2025 (Lopez Bernal et al., 2017):

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$$\ln I_t = \beta_0 + \beta_1(t - 2010) + \beta_2 C_t + \beta_3 P_t + \beta_4 P_t(t - 2020) + u_t \qquad (4)$$

where C_t marks 2020 alone, P_t marks the years from 2021 onward, β_1 is the pre-pandemic annual growth rate, β_3 any lasting level shift and β_4 the change in slope. The post-pandemic growth rate is $\beta_1 + \beta_4$. Standard errors use the Newey and West (1987) estimator with two lags. With 16 annual points, these models describe the series rather than test causal hypotheses.

Matched Comparison and Decomposition, 2019–2025

The direct comparison between 2019 and 2025 uses the 2,575 sites counted in both years and breaks the change down by road category, region, London versus the rest of Britain, and vehicle class. To show which vehicle classes drove the change in total motor traffic, the change is decomposed into class contributions:

$$\Delta_v = 100 \times \frac{\sum_i \left(\bar{q}^{v}_{i,2025} - \bar{q}^{v}_{i,2019}\right)}{\sum_i \bar{q}^{all}_{i,2019}}, \qquad \sum_v \Delta_v = 100 \times \left(\frac{\sum_i \bar{q}^{all}_{i,2025}}{\sum_i \bar{q}^{all}_{i,2019}} - 1\right) \qquad (5)$$

Finally, hourly profiles (each hour's share of the 12-hour total) are compared for cars, vans and lorries at the same matched sites, and the composition of HGVs by axle class is tracked across all counts.

RESULTS

Long-Run Trends

Figure 1 shows the chain-linked indices with the fixed-effects indices overlaid. Van flows grew steadily throughout, from 71% of their 2019 level in 2000 to 100 in 2019 and 113 by 2025. Car flows were nearly flat for two decades: 95 in 2000, 100 in 2019, 99 in 2025. Lorry flows drifted down after the 2008 recession, recovered to about 100 by 2016 and held there until 2019. They are now at 95. Bus and coach flows fell almost continuously, from 141 in 2000 to 79 in 2025.

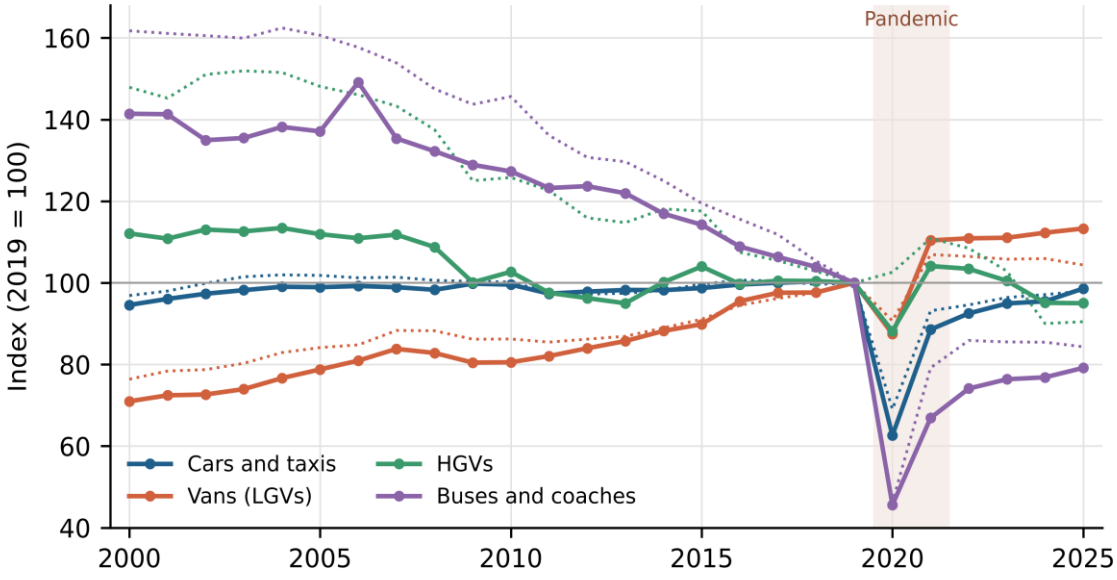


Figure 1. Matched-site indices of 12-hour weekday flow by vehicle class, 2000–2025 (2019 = 100). Solid lines are chain-linked indices from sites counted in consecutive years; dotted lines are year effects from a site fixed-effects model with month controls.

The pandemic year separates the classes sharply. In 2020, car flows at matched sites fell to 63% of their 2019 level, while vans fell only to 88% and lorries to 88%. By 2021, vans were already 10% above their 2019 level, earlier than any other class. Lorries briefly exceeded 2019 levels in 2021–2022 before falling back.

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The fixed-effects index agrees with the chain index on vans and cars but tells a sharper story about lorries. On the fixed-effects measure, lorry flows at the typical site in 2000 were 48% above their 2019 level, against 12% on the flow-weighted chain index. The difference arises because lorry traffic has drained away from quiet roads much faster than from busy ones. A site with 50 lorries a day in 2000 was far more likely to have lost most of them than a motorway carrying 10,000.

Where Van Growth Happened

If vans were growing mainly because of doorstep deliveries, their share of traffic should have risen most on minor roads. Figure 2 shows the opposite. Between 2000 and 2019, the van share rose from 12.0% to 16.8% of motor vehicles on trunk motorways and from 12.7% to 16.7% on trunk A-roads, but only from 11.2% to 13.1% on minor roads. The pandemic exaggerated the pattern: in 2020 vans made up 22.6% of motorway traffic. In 2025, the van share stood at 19.6% on trunk motorways and 18.7% on trunk A-roads, against 13.2% on minor roads.

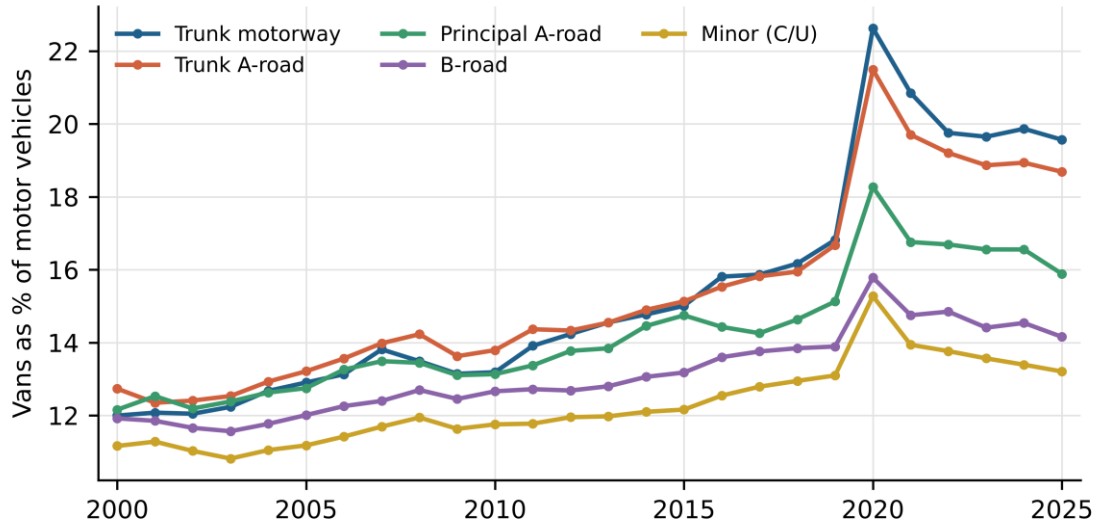


Figure 2. Vans as a share of all motor vehicles counted, by road category, 2000–2025.

Shares can move because other vehicles change, so Table 1 and Figure 3 give the matched changes in flow directly.

Table 1. Change in 12-hour weekday flow at sites counted in both 2019 and 2025, by road category (%)

Road category	Sites	Cars	Vans	HGVs	Rigid	Artic.	Buses	All
Trunk motorway	201	−2.8	+16.0	−5.0	−15.4	+0.9	−15.2	+0.1
Trunk A-road	320	−0.5	+12.3	−9.0	−15.9	−3.2	−7.0	+1.0
Principal A-road	164	−2.7	+8.5	−15.5	−21.7	−4.9	−13.8	−1.6
B-road	295	−0.6	+3.5	−11.8	−14.0	−5.4	−14.5	−0.2
Minor (C/unclassified)	1,589	−0.9	+1.9	−13.9	−15.9	−6.0	−17.4	−0.7
London	152	−5.7	+6.0	−31.4	−40.5	−9.4	−10.5	−5.2
Rest of Great Britain	2,423	−1.4	+13.2	−5.4	−12.6	−0.5	−13.6	+0.7

Note. Changes are ratios of summed flows at matched sites. Cars = cars and taxis; HGVs = all heavy goods

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vehicles; Rigid and Artic. = rigid and articulated HGVs; Buses = buses and coaches; All = all motor vehicles. Six principal-motorway sites are omitted from the road-category rows.

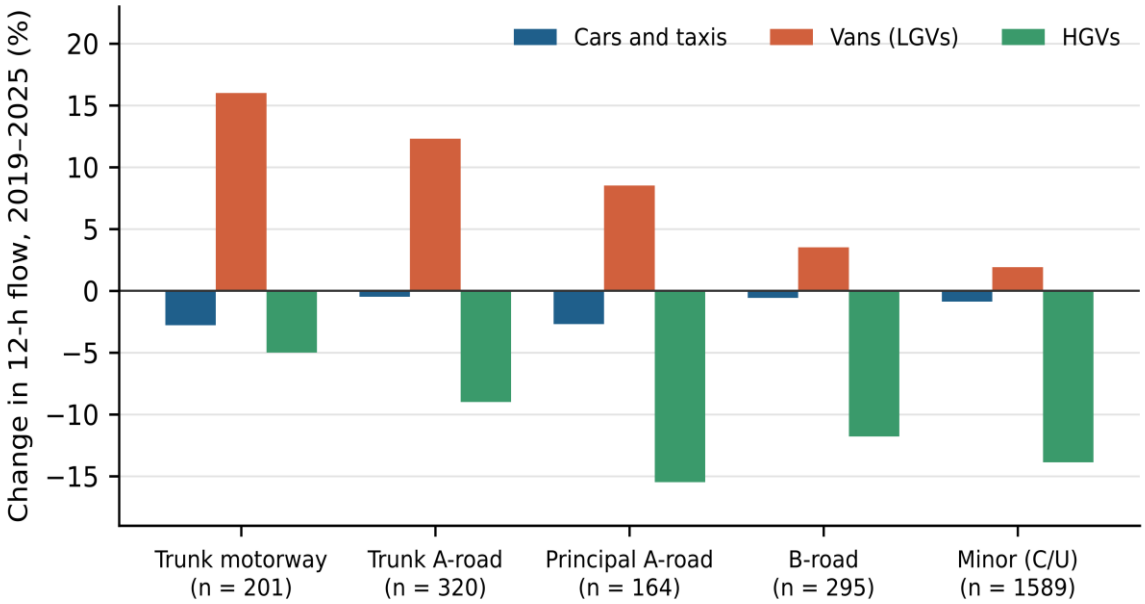


Figure 3. Change in 12-hour weekday flow between 2019 and 2025 at matched sites, by road category and vehicle class.

The gradient is unmistakable. Van flows rose 16% on trunk motorways, 12% on trunk A-roads, 9% on principal A-roads, 4% on B-roads and 2% on minor roads. The same gradient appears in the pre-pandemic decade: matched van growth between 2010 and 2019 was 38% on trunk motorways, 31% on trunk A-roads and 13% on minor roads. Van growth has been, and remains, a phenomenon of the strategic network.

London stands apart. Van flows in the capital grew only 6%, less than half the rate elsewhere, despite London's high density of online deliveries. This is consistent with saturation in the urban core and with the congestion and emission charges that raise the cost of every van trip in the capital.

Across regions, van growth between 2019 and 2025 ranged from 6% in London to 18% in the South West, and every other region fell between 9% and 18%. Lorry change ranged from +0.3% in the East Midlands, home to much of the Midlands "golden triangle" of distribution centres, to −12% in Scotland and −31% in London.

What Drove the change in Total Traffic

At the 2,575 matched sites, total motor traffic was essentially the same in 2025 as in 2019 (+0.1%). The decomposition in Equation (5) shows that this stability conceals offsetting movements. Vans added 2.05 percentage points to total flow, while cars subtracted 1.31, lorries 0.61 and buses 0.06. Put simply, the growth in vans has entirely replaced the traffic lost from cars, lorries and buses combined.

Trend Breaks Around the Pandemic

Table 2 reports the segmented regressions. Before the pandemic, van flows grew at about 2.6% a year (β_1 = 0.026, SE 0.001), car flows by only 0.25% a year, and lorry flows not significantly at all. After 2020, the van slope fell by 1.9 percentage points a year, leaving post-pandemic growth of roughly 0.7% a year. That growth started from a higher level, since the series jumped by about 5.5% between the pre-pandemic trend and 2021. Lorries show a similar one-off rise in 2021 followed by a decline of about 2.7% a year ($\beta_1 + \beta_4$ = 0.002 − 0.029). Car flows dropped well below trend in 2021 and have since been recovering at about 2.5% a year.

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Table 2. Segmented regression of the log chain-linked index, 2010–2025

Parameter	Cars and taxis	Vans	HGVs
Pre-2020 slope, β_1	0.0025 (0.0008)**	0.0258 (0.0010)***	0.0022 (0.0024)
2020 shock, β_2	−0.471 (0.004)***	−0.169 (0.008)***	−0.134 (0.009)***
Post-2020 level shift, β_3	−0.140 (0.008)***	0.055 (0.008)***	0.067 (0.011)***
Post-2020 slope change, β_4	0.0221 (0.0022)***	−0.0193 (0.0011)***	−0.0289 (0.0034)***
Implied post-2020 slope, $\beta_1 + \beta_4$	0.025	0.007	−0.027
R^2	0.996	0.994	0.749

Note. Newey–West standard errors (two lags) in parentheses. ** p < .01, *** p < .001. Sixteen annual observations; coefficients describe the series and should not be read as causal effects.

The van result deserves emphasis. A naïve look at 2019–2025 suggests booming van traffic. The segmented model says something more nuanced: vans rose quickly and early in the pandemic, and they have grown only slowly since. Much of what looks like a post-pandemic van boom was a step change in 2020–2021 that has not been repeated.

Inside the Lorry Fleet

The fall in lorry traffic was not spread evenly across vehicle types. At matched sites, rigid lorries declined between 14% and 22% on every road type between 2019 and 2025. Articulated lorries held steady on motorways (+0.9%) and fell by 3–6% elsewhere (Table 1). In London, rigid lorry flows fell by 40%.

Over the longer run, Figure 4 shows a steady shift toward the largest vehicles. Articulated vehicles made up 46% of HGVs counted in 2000 and 59% in 2025, and the share of six-axle articulated vehicles alone rose from 14% to 37%. Some of the year-to-year noise reflects the changing sample of sites, but the direction is consistent. One caution applies here: enumerators find axle counting difficult in heavy traffic, and the DfT intends to replace the six axle classes with a simple rigid/articulated split from 2028 (DfT, 2026b). Composition series of this kind will not be available from manual counts after that.

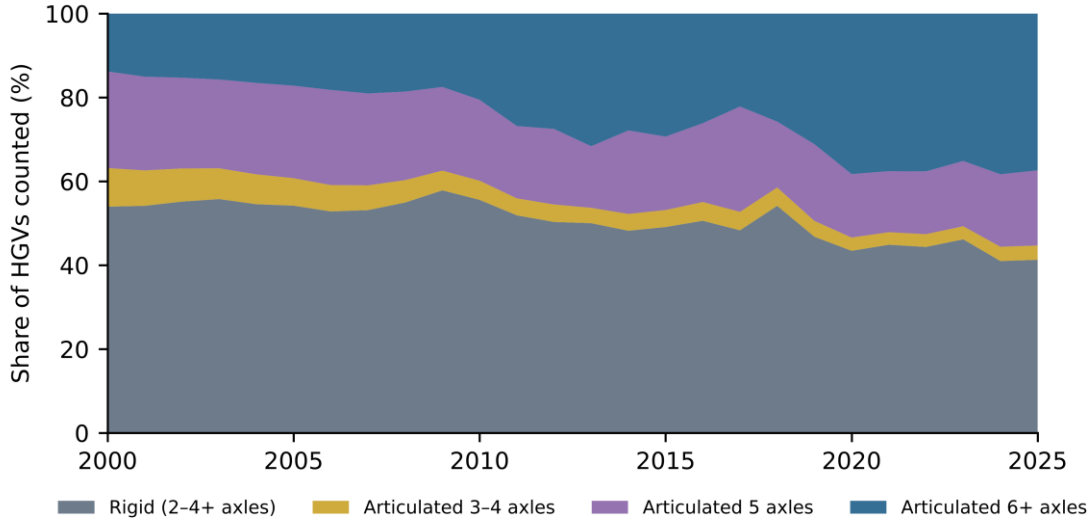


Figure 4. Composition of heavy goods vehicles counted by axle configuration, 2000–2025 (all counted sites).

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Time of Day

Figure 5 compares hourly profiles at the matched sites. Cars moved toward the middle of the day: the 07:00 hour's share of daily car traffic fell from 9.2% to 8.7% and midday hours gained. Vans moved the other way, toward the morning. The 07:00–09:00 share of van traffic rose from 19.8% to 20.6%, and the share after 16:00 fell from 21.9% to 20.7%. Lorries shifted slightly earlier too. One reading is that goods operators are taking advantage of a lighter early-morning car peak to get on the road sooner, a pattern consistent with hybrid working thinning out commuter traffic (Caldarola & Sorrell, 2022; Hensher et al., 2022). Van traffic also became more concentrated in Monday-to-Thursday working days: in 2025 vans made up 17.4–17.6% of traffic on Mondays to Thursdays and 16.6% on Fridays.

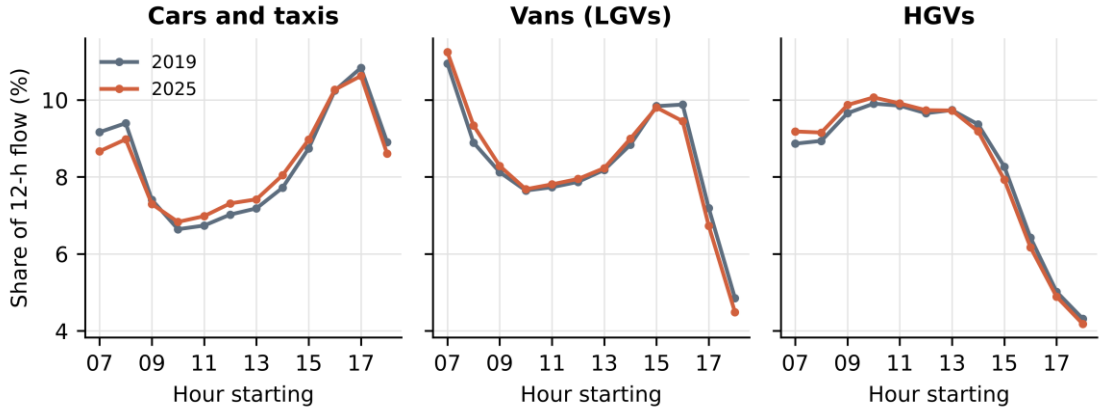


Figure 5. Hourly share of 12-hour flow for cars, vans and HGVs at sites counted in both 2019 and 2025.

DISCUSSION

Rethinking the Van Story

The finding that van growth is concentrated on motorways and trunk roads does not mean e-commerce is irrelevant. Parcels travel from fulfilment centres to delivery depots and from depots to neighbourhoods before they reach a doorstep, and much of that journey is now by van rather than lorry. Trades and services, a large and often overlooked user of vans, travel between towns as much as within them. Tax and licensing rules also favour vans: a vehicle up to 3.5 tonnes can be driven on a car licence and escapes the operator licensing and tachograph rules that apply to lorries. That creates an incentive to move loads into vans that would once have gone in small rigid lorries. The simultaneous decline of rigid lorries and rise of vans on the strategic network is what this substitution would produce.

The policy implication is that van growth cannot be managed only through urban last-mile measures. Cargo bikes, parcel lockers and micro-hubs (Garus et al., 2024; Llorca & Moeckel, 2021; Orhan & Wallace, 2025) address the final kilometres, but most of the growth in van mileage, judging by where it is counted, happens long before that. Electrifying vans (Castillo Campo & Álvarez Fernández, 2023; Lal et al., 2023) would address emissions wherever the mileage occurs, which may make it the more important lever.

A Polarising Freight Fleet

At the heavy end, the fleet is polarising. Small rigid lorries are being squeezed from below by vans and from above by larger articulated vehicles. London's 40% fall in rigid lorry flows is much larger than the rest of Britain's 13%, which is consistent with the combined pressure of the Direct Vision Standard, emission charging and kerbside restrictions (Frampton & Millington, 2022; Ma et al., 2021). The data cannot separate these causes, but the timing and scale suggest that London policy has had real effects on vehicle choice. The obvious risk is that loads which might have been carried by one rigid lorry are now carried by two or three vans, with more vehicle kilometres and more kerbside demand. Whether that has happened needs operator-level data that traffic counts cannot supply.

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Lessons for Emerging Logistics Markets

For countries such as Nigeria, where informal logistics, motorcycles and tricycles carry much of the urban last mile and van fleets are growing quickly, the British experience offers a preview. Van growth there is likely to follow e-commerce, but the British evidence suggests that the larger effect may be on inter-urban corridors, as small operators substitute vans for trucks. Monitoring programmes that classify vehicles at roadside counts, as Britain has done for decades, are the only way to see such a shift as it happens. Their design should keep a clear distinction between light and heavy goods vehicles, even if detailed axle classes prove impractical.

LIMITATIONS

The counts cover weekdays between 07:00 and 19:00 and mostly March to October. Night-time freight, which is heavily weighted toward articulated lorries, and weekend van use are invisible. Vans are classified by appearance, so the counts cannot tell a parcel van from a builder's van or a privately used vehicle. Matched-site comparisons remove sample changes but rely on the matched sites being representative. The 2,575 sites counted in both 2019 and 2025 are dominated by minor roads, which is why results are reported by road category rather than as a single national figure. Encouragingly, the matched-site changes (vans +13%, lorries −5%, cars −1.4%) sit close to the DfT's modelled national totals (vans +10.0%, lorries −5.1%, cars −0.2%; DfT, 2026a). Finally, the segmented regressions use only 16 annual points, and their standard errors should be read as descriptive.

CONCLUSION

Britain's road goods traffic has changed shape. Vans now carry a larger share of traffic on every type of road, but the growth is concentrated on motorways and trunk roads, not on the minor streets where deliveries end. Lorry traffic is falling, almost entirely among smaller rigid vehicles and most sharply in London, while large articulated lorries take a growing share of what remains. Van growth slowed sharply after its pandemic jump. Together, these patterns describe a freight system dividing into small and large vehicles, with the van doing far more inter-urban work than the last-mile narrative suggests. Policies aimed at van traffic need to look beyond the city centre.

Data Availability

The raw count data are published by the Department for Transport under the Open Government Licence v3.0 at https://roadtraffic.dft.gov.uk/downloads. Analysis code is available from the author on request.

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