THE IMPACT OF PLANNED TRAFFIC MEASURES ON DUBLIN CITY CENTRE: AN INTERNATIONAL PERSPECTIVE

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Abstract

Traffic patterns in the city centre of Dublin will soon be subject to major changes envisaged in the "Dublin City Centre Transport Study", published by Dublin City Council and National Transport Authority (NTA) in 2015-2016 [1]. The planned measures aim at prioritising public transport and improving the public realm within the city centre. They include Luas Cross City (in operation from late 2017), College Green pedestrianisation, designating public transport only streets, limiting turns available to private vehicles at certain junctions and creating additional bus lanes.

Most of the concerns that have been expressed to date regarding the new traffic arrangements relate to the impact of the scheme on car traffic and the resulting effect on retail activity in the city centre. In particular:

a) The plans have an explicit goal of reducing the presence of private cars in the city centre. A potential negative effect could be an increased congestion, both on streets covered by the scheme (as they would have a reduced capacity compared to today) as well as on those not covered by the scheme (as the car traffic could shift to nearby streets).
b) Customers using private car to access the city centre are deemed to be more valuable for the businesses than customers arriving by public transport.
c) Based on the above premises, reduced car access to the city centre may be expected to have a negative impact on the city centre's retail activity.

The paper considers the potential negative implications for Dublin City Centre from an international perspective. Using the evidence from similar schemes implemented in comparable cities across the world as well as referring to the local experience, the analysis examines:

a) The effect of reduced capacity for private cars on traffic volumes both within and outside the area covered by a scheme. From this perspective, the phenomenon of traffic evaporation is of particular relevance.
b) The relationship between mode of travelling and average spend in shops and other commercial units.
c) The impact of traffic rearrangement on turnover of businesses located in the area subject to such a scheme.

Based on the above data, the paper attempts to predict the impact of new traffic measures on retail turnover in Dublin City Centre. As such, it builds on the "Retail Impact Assessment" report published by NTA in August 2016 [2] by applying predictive modelling, using parameters based on comparable international experience, in order to calculate the expected financial consequences for the city centre's economy.

Examples of recent experience

Fortunately, there is a wealth of examples of similar traffic management schemes from various cities, countries and continents, a selection of which is described below. The most relevant conclusion from those examples is that public transport priority and traffic restrictions measures can be successful in cities of a similar scale to Dublin and which also suffer from a shortage of metro-style rapid transit infrastructure (with exclusive right-of-way, typically rail-based).

Birmingham (UK): in 2016 a tram line extension into the core city centre required closing the main shopping street (Corporation Street) to vehicular traffic. Prior to that, the two-lane one-way street was a major bus corridor in a narrow street, busy with both pedestrian and bus/taxi traffic, similar to Dublin's Suffolk Street [3].

Ljubljana (Slovenia): in 2015 the middle section (around 1/3 of the total length) of a major city centre artery (Slovenska cesta) was closed for car traffic, becoming a shared space between public transport (one lane in each direction for buses/taxis) and pedestrians, with road surface virtually level with the footpath. The remainder of the road still has two lanes in each direction for general traffic [4,5].

Edinburgh (UK): in 2014 a tram line construction necessitated reducing the number of lanes from two to one on major city centre streets, in some cases shared tram and bus/taxi lanes were introduced (*e.g.* on Princes Street) [6]. This is similar to the planned arrangement for the shared Luas and bus carriageway at College Green, in front of Trinity College.

Katowice (Poland): in 2014 a major shopping street (Ulica 3 Maja) and in 2017 a central square (Rynek) were pedestrianised with trams as the only allowed mode of transport, forming a link with the previously pedestrianised areas around the main railway station. This conversion improved the quality of the major tram interchange located at the square, where walking to a different stop previously required crossing multiple sets of traffic lights [7].

Nantes (France): in 2013 one of the main through streets on east-west axis in the city centre (Cours Franklin Roosevelt) was closed down completely and converted to a linear park, expanding an existing one. The traffic was relocated to a parallel road of one lane in each direction; access to car parks was maintained by new entrances from nearby streets [8]. The concept behind this scheme could be seen as a more adventurous version of Dublin's efforts to shift the traffic from the core city centre to circular roads and M50.

Dublin itself also has a long history of successful traffic management schemes, examples include Grafton Street and Henry Street pedestrianisations, removal of general traffic from Harcourt Street and Abbey Street with the introduction of Luas or five bus gates in operation in the city centre today. These schemes made a significant change to the way these streets look and function every day [9].

One of the key conclusions from all of the above schemes has been appropriately summarised by the "Evidence" project [10]: *"Road closures do not cause 'traffic chaos' as critics often fear; drivers adapt their behaviour in ways (...) which avoid the worst consequences of congestion."* From the perspective of impact on the local economy, an interesting observation was made by Hass-Klau [11]: "*[Retailers] virtually never campaign for the abandonment of a scheme once it has come into operation. It is notable that, once a scheme has been put in place, traders are often the main people to voice a desire to extend its boundaries or period of operation."* The impact of such measures on traffic volumes and retail turnover will be examined in more detail in the following sections.

Impact on traffic volumes

In a slight contrast to the cases mentioned above, one of the most frequently debated examples of traffic reduction measures is not related to reducing the road space available to general traffic but to road pricing. The congestion charge in London (UK) has proven to be successful in reducing the traffic volumes in central London by 14% over 12 years since its introduction, at a rate of approx. 1.3% per annum [12]. Importantly, this did not result in traffic spilling onto areas outside of the congestion charge zone, where a decrease of 8% was observed during the same period. Likewise, the traffic in the entire Greater London Area fell by 8%. These figures imply that, on its own, the need to pay in order to drive into the core city centre results in a 6% reduction in traffic levels.

A similar long-term trend was observed in Nuremberg (Germany) where the historic city centre has been pedestrianised (see the next section for more details). The traffic levels

inside the outer ring road were dropping steadily over 12 years after the scheme was implemented with a 9% overall reduction, at a rate of just under 1% per annum [13].

In San Francisco (USA) two elevated city centre motorways: the Embarcadero Freeway and the Central Freeway were demolished and replaced by surface boulevards, integrated with the local street network. The combined effect was a 7% reduction of traffic volume in the entire area, including surrounding streets, over a period of 11 years, giving a fall of 0.6% per annum [14].

Two key conclusions for Dublin arising from these long-term, city-wide figures are:

- Patience is a virtue. After an adjustment period of c. two months, the traffic adjusts to the new conditions and drops below the pre-implementation levels.
- Lack of a 'yo-yo effect'. The decreasing trend could continue for decades, subject to a consistent transport policy.

Traffic evaporation

The three cases mentioned above have already alluded to a phenomenon known as 'traffic evaporation' or 'disappearing traffic'. Traffic management schemes typically include road space reallocation, which means a reduced capacity for car traffic. In the worst-case scenario no adjustment takes place and the same amount of cars appears on streets with reduced capacity, resulting in unchanged volumes, longer journey times and increased congestion. Such an occurrence is very rare in practice and typically the traffic volumes fall once the road capacity is reduced.

The real question is therefore whether the traffic merely shifts to nearby streets, causing congestion there. At a first glance this might appear to be the most likely scenario; however the experience of numerous cities points to the displaced traffic 'disappearing' or 'evaporating', *i.e.* not appearing on adjacent streets or within a broader area.

The figures quoted earlier for decreasing traffic over entire cities challenge the assumption that the overall volumes would remain unchanged and therefore the congestion would be transferred to parallel streets. When taking a closer look at particular streets that were subjected to a traffic management scheme and their immediate surroundings, we find an even stronger confirmation of this tendency.

In Copenhagen (Denmark) two short sections amounting to 13% of the length of a busy city centre street (Nørrebrogade) were converted to bus gates. Such a relatively minor change in road capacity was sufficient to achieve a traffic reduction by 40-50% on the remainder of the street and by 7% (15,000 less trips per day) in the entire local area [15]. One of the consequences of the scheme was an elimination of a straight-line access to one of the bridges (Dronning Louises Bro) leading to the historical city centre. As expected, the traffic volume on this bridge went down by 48%; more importantly, 2.4% of the traffic originally using that bridge was not found on any of the adjacent bridges. It is hence deemed to have disappeared.

In Southampton (UK) the city centre area was subject to traffic restrictions, including a pedestrianisation of 200 metres of a major shopping street (Above Bar Street). As a result, the traffic on all streets with restrictions dropped by 2,200 vehicles per day, measured over four years. On alternative routes the traffic not only decreased but it fell by an even larger amount of 2,400 vehicles per day. It is an exact opposite of the displacement assumption whereby an equivalent increase in traffic (and congestion) on alternative routes would be expected. The total reduction of 4,600 vehicles per day amounts to 87% of the traffic originally observed on the streets subject to the scheme (5,300 vehicles per day) [16].

In Nuremberg (Germany) the traffic restrictions in the historic city centre included pedestrianisation of the central square (Rathausplatz), which experienced 24,600 vehicles passing through it each day prior to closure. It appeared unlikely that such a large volume of traffic could either fit into nearby streets or evaporate, yet this is exactly what has been observed. While the traffic on the square itself went down to zero (naturally), the daily volumes on nearby streets went up by only 3,400 vehicles one year later and went down by

11,500 vehicles five years later. The combined traffic reduction of 36,100 vehicles per day implies that more than 100% (as much as 147%, in fact) of the traffic from the closed central square has evaporated [16]. Figures quoted earlier for the entire city of Nuremberg show that the streets located further away from the historic city centre have not suffered from increased traffic levels either (in aggregate traffic fell by 9% over 12 years).

A paper by Cairns et al. [16] contains a comprehensive summary of these and numerous other cases of traffic restrictions and calculates a traffic change ratio for each of them. Similarly to the cases presented above, the ratio is defined as the total change in traffic on streets subject to a scheme and on alternative routes, divided by the original volume of traffic on streets subject to a scheme.

Within all the cases analysed, there were 33 where the restrictions were permanent and due to either measures to enhance the public realm in a city centre (including pedestrianisation) or introduction of bus lanes. 94% of such schemes proved to be successful in reducing the traffic on the streets covered by a scheme. In 83% of cases traffic volumes were either reduced both within and outside the area under a scheme or the increase outside was much smaller than the decrease on impacted streets, leading to an overall traffic reduction.

As we have seen in the examples above, the scale of reductions varies widely due to different specifics of each scheme. The median ratio of traffic change was -11%, suggesting that typically this proportion of the original traffic is not found either on streets subject to a scheme or on adjacent ones. In the Dublin context, this figure would imply **c. 5,500 less cars** crossing the canals each morning.

The rationale for traffic evaporation has been explained by pointing to complex ways in which people react to changes in road conditions. Short-term responses include "*rerouting or retiming of their trips, (...) changing their mode of travel, choosing to visit alternative destinations, changing the frequency of their journey, consolidating trips for different purposes, altering the allocation of tasks within a household to enable more efficient trip-making, car-sharing, or no longer making journeys (e.g. by working from home occasionally). Longer-term responses include changes in job location, changes in household location and changes in developers' choice of location for new development. (...) It is these cases where conventional assumptions about behavioural change are likely to be most inappropriate."* [16]

The key conclusion for Dublin from the evidence on traffic evaporation would be that it seems very unlikely for a vast amount of car traffic to be found in streets immediately next to the ones subject to planned traffic management measures [17]. While *e.g.* Blackhall Place or Brunswick Street may experience a temporary increase in traffic volumes over the first few weeks after the scheme implementation, they can be expected to benefit from reduced levels of traffic in the medium and long term, meaning less traffic that they experience today.

Mode of travelling and average spend

Assuming the traffic levels will indeed go down once the current proposals are in operation (as per the previous section), we can now turn to the next question: is it good news for the city centre economy? Customers using private cars to access the city centre are often seen as more valuable for the businesses than customers arriving by public transport. The studies analysed below suggest that the opposite is the case.

Four studies that examine the relationship between the mode of travel and the average spend in shops, restaurants etc. in various cities have been identified: two for Dublin (one by DIT [18] and one carried out by Millward Brown on behalf of NTA in 2014 [19]), one for London [20] and one for Toronto (Canada) [21]. Additionally, for modal share data, the 2016 research by Millward Brown on behalf of NTA [22] was included in the analysis. While absolute numbers tend to vary between studies and locations, the relationship between generated turnover and the mode of transport is consistent across all of them.

As we can see in Table 1 below, public transport brings much more customers (modal share) and much more revenue (revenue share) to city centre retail outlets than individual motorised transport. Public transport is also a larger contributor than walking and cycling, which have a combined contribution of between 17% and 30% to the modal share and between 18% and 36% to the revenue share (these modes have been omitted from the tables below in the interest of clarity).

Table 1: Modal share and revenue share (summary of studies)

	Modal share		Revenue share	
	Car	Public transport	Car	Public transport
Minimum	10%	56%	8%	51%
Maximum	20%	65%	19%	72%

The above figures may appear to be counterintuitive when compared to reports of car users having the highest average spend across all modes and the revenue share of the car being over 30%. This apparent paradox is explained by two factors:

- Public transport users visit the city centre more frequently than car users.
- There are much more public transport users than car users visiting the city centre.

Omitting any of these factors could result in skewed figures and, as a result, may lead to misleading conclusions [23].

Table 2 below explores this relationship in more detail. It shows that for a public transport user the average spend per person per visit is indeed c. 20% to 40% lower than for a car user. However, each public transport user makes approx. 40% to 50% more visits in the city centre. After combining these two figures, we get a roughly similar average spend per person per month (mean difference across the four studies was 5%). In line with Table 1 above, there is 3 to 4 times more visitors arriving in the city centre by public transport (roughly 60% to 15% in terms of modal share, when compared to the car). As a result, the monthly spend arising from public transport is 3 to 4 times larger than the monthly spend that can be attributed to the car.

Table 2: Relative contribution of public transport to the turnover of city centre businesses, compared to the car (summary of studies)

	Average spend per visit	Number of visits per month	Monthly spend per person	Number of visitors	Monthly spend per mode
Minimum	-44%	37%	-18%	3	3
Maximum	-19%	50%	13%	4	4

The key conclusion is that high quality public transport links (*e.g.* a high frequency and reliable bus corridor) to a shop will bring it **3 to 4 times more cash** than high quality individual transport links (*e.g.* a wide street and a large car park). Specifically for Dublin, even in the worst-case scenario, assuming that no car user will change their mode of travelling and that they will all switch to other locations for shopping (*e.g.* to suburban shopping centres), each Euro lost is more than compensated by 3 to 4 Euro gained from additional public transport users.

Modal shift

As we have seen in the previous section, car users make less visits to the city centre and spend more on each visit while public transport users make more frequent visits and spend less on each of them. It can be argued that the cause of these differences is not the mode of transport itself but the ease of access to the city centre it offers. Therefore, the ease of access determines the value that a given transport mode provides to the local economy.

The phenomenon of modal shift supports this statement: car users and public transport are not distinctive groups of people; residents are able to adjust their behaviour to a change in transport provision and infrastructure (as we have seen in the section on traffic evaporation above) and this adjustment frequently takes form of shifting to a different mode of transport.

The impact of congestion charge on traffic volumes in central London was already shown earlier and it suggested that the car users did not shift elsewhere as the traffic volumes in outer London were decreasing at the same time [12]. The same conclusion could be made based on modal share evolution: the car fell from 10% to 7% during the first five years after the introduction of the congestion charge while rail (excluding Underground) went up from 42% to 44% over the same period [24]. It would appear that most of the reduction in car journeys came from car users changing their mode of travel, as opposed to changing their destination.

In the Dublin context, both the 2016 study by RedC [25] as well as the 2016 study by Millward Brown [22] show that the difference between residents using public transport regularly and those who used it at least once (main mode versus secondary mode) is approx. 30%. This number shows the scale of the potential for modal shift in the capital. While it seems unlikely that all of these 30% will change their mode of transport as a result of the planned changes, projections and targets published in the "Dublin City Centre Transport Study" [1] imply that a 5% to 7% shift in favour of public transport is realistic over the medium term. These figures are applied to turnover modelling under the modal shift approach (described in more detail in the modelling section later).

The conclusion would be that the best way to maximise revenue for retailers is to maximise the number of people who can access a given area easily, rather than those who can access it using a particular mode. From this perspective, concentrating on the mode of travel as the key revenue driver does not appear to be justified, albeit it is a fairly popular view: "*(...) the retail sector are extremely concerned that putting in place any restrictions which would make shopping by car in the city centre less convenient would have severe consequences for turnover and employment in the sector."* [1]

If we define the retailer's goal as maximising the revenue, as opposed to maximising the revenue from car borne shoppers, the most desirable mode of transport is the one that gives the easiest access to the largest number of people. And the mode that can bring the biggest number of customers to a shop's doorstep is public transport, with a Bus Rapid Transit (BRT) lane carrying up to 20,000 people per hour and a mixed traffic lane carrying up to 2,000 people per hour [26]. Therefore, public transport can be deemed as the most pro-business mode of urban mobility.

Looking at the figures above and considering its implications for retail revenues discussed earlier, a radical approach could be justified: instead of making a business case for public transport priority measures, a business case for the status quo of heavily congested mixed traffic lanes would be much more appropriate (and, arguably, it would be quite difficult to make such a case). Application of this perspective and specific consequences for Dublin's city centre retail activity will be covered in the modelling section later, under the road space reallocation approach.

We might also consider the capacity of a mixed traffic lane used by cars of 2,000 people per hour shown above in the context of limited road space in Dublin City Centre and the demand for travel into it. According to the Canal Cordon Report, during the morning peak on average there are over 67,000 journeys made per hour into the city centre [27] and this figure is expected to grow to 75,000 by 2023 [1].

The sheer volume of the current demand, let alone projected increases, shows that a car-based solution will only be able to meet a relatively small portion of this demand and a significant surplus demand will need to be catered for by other means of transport. In particular, we need to bear in mind that the 2,000 figure quoted above assumes each car has all seats taken. After adjusting for the predominance of single occupancy cars in Dublin, this figure would be closer to 600 people per hour versus 20,000 people for a BRT lane that will soon replace some of the mixed traffic lanes in Dublin City Centre.

Impact on retail turnover

The argument made above is based on an indirect link between traffic restrictions and retail turnover via the spending patterns of car and public transport users as well as the potential for the former group switching to the latter. International research has also been carried out to investigate a direct relationship between traffic management schemes and the local economy.

As a useful framework for interpreting the results, we can start from the following premise: in any circumstances, some businesses flourish while others deteriorate – this is natural in a free market economy. A traffic management scheme is positive for the local businesses when the number of them experiencing a benefit is higher than the number of those experiencing a loss.

In particular, outperforming the control group (shops from a nearby, similar street) or the benchmark (the general trend observed in the same city over the same period) is deemed to confirm the positive impact of a given scheme. Under this approach, the main conclusion from the evidence has been described in the seminal paper by Hass-Klau: "*shops on pedestrianised streets tend to benefit, whereas those on trafficked streets nearby tend to suffer*." [11]

The paper in question shows that there is an added value arising from being located in a traffic-calmed area. In fact, 40% more businesses will experience turnover increase thanks to its location in such an area, compared to a different part of the city centre over the same period. Specifically for Dublin, this means that the measures proposed by Dublin City Council and the NTA will allow more retailers to experience the benefits of the currently booming economy. The likelihood of such a scenario is reinforced by one of the findings of the "Retail Impact Assessment" report, which shows that significantly more people will increase the frequency of their visits in the city centre than will reduce it. The net gain of visits in the city centre is expected to be 27% [2].

As one would expect, there can be an adjustment period, including infrastructure works, until the residents get used to the new traffic arrangements and it may last for up to a year, although the evidence in this regard is mixed. A study of the impact of congestion charge in London found that there was an average decline of 6.9% of sales value in the first year [28]. However, this does not necessarily have to be the case: an equivalent research for Stockholm (Sweden) found "*no statistically significant negative effects on retail revenues"* during or after the congestion charge trial [29]. The example of Washington (USA) shows that sales on a traffic-calmed street have increased by 2% more than for the entire city in the first year after implementation of the new road layout [30].

One has to bear in mind that in addition to increased revenue, an improvement in the popularity of an area also increases the costs, in particular the rental value of commercial properties. This can be seen as a share of the additional revenue that ends up being transferred to landlords, with the rest remaining with the retailers as their profit – assuming the property is rented (in case of owner-occupied shops, all the additional revenue remains with the shop owner). Importantly, the evidence available shows that there is a consistent growth in the rental value over the short, medium and long term horizons.

A research on UK towns found that the average increase in rents in the first year after pedestrianisation was 1% above the figure for the entire country [11]. While this appears to be a marginal surplus, it confirms that there is an additional value arising from the location in an area with reduced vehicular traffic and that it may transpire quite quickly.

A methodologically robust study from Hong Kong (China) estimated that after adjusting for a number of factors like building age, shop size or frontage width, the rents on a pedestrianised street were going up by 2% more per annum over seven years, compared to a nearby street that was subject to some traffic calming but remained open for regular traffic [31].

A long-term trend observed in Portland (USA) over nearly 30 years was a steady growth of property values at 4% per annum in an area where a motorway running through the city centre along the river was replaced by a waterfront park and mixed-use developments [14].

Taking both revenue increases and rent increases into consideration, it turns out that the net impact on retail profits is still significantly positive. 18% more businesses can expect a profit increase in an area with traffic restrictions than elsewhere in the city centre [11]. This means that whatever the trend is across the whole city centre (positive for Dublin at present), it is more positive in an area subject to a traffic management scheme; the shops and restaurants located there tend to outperform the benchmark by a noticeable margin.

Parking spaces provision

Another aspect of the scheme envisaged for the Dublin City Centre is related to parking. One of the concerns raised during the consultation process related to access to city centre car parks after the road space is reallocated; additionally, the scheme envisages removal of some on-street parking. Several pieces of research have been completed on the relationship between retail turnover and parking (availability and price). The conclusion appears to be that there is no relationship between the two and retail turnover is much more heavily determined by the attractiveness of the shop's offering and other factors.

An analysis of Dutch cities showed that "*there is no statistical relationship between parking capacity and turnover*". In fact, in 27% of cases there was a positive economic effect of parking restrictions and a neutral effect for the remaining 73%; this relationship is statistically insignificant [32]. A research on London's parking provision and economic prosperity reached the very same conclusion of an extremely weak relationship. *"Other, much more important variables than parking provision are likely to be responsible for the differences in economic variability between London's centres."* [33] A report on Vienna's (Austria) parking restrictions commented that *"evidence on a direct negative correlation of turnover (...) and the implementation of parking policy in Vienna could not be proven"* [34].

The Dutch study quoted above has also pointed out to an interesting and frequently overlooked phenomenon. It was able to prove that a basic economic relationship between demand and pricing holds for parking as well: the more expensive the parking place, the higher the shop's revenue per square meter of sales floor. The explanation could be that the high revenue *"corresponds to the most attractive shopping areas, those that attract most customers. In these shopping areas customers compete for parking that (...) is always a scarce good and, ergo, can be charged."* [32] One can easily extend this view to any constraints on parking when using a standard "value of time" modelling approach, e.g. reduced number of spaces means more time spent looking for a vacant space or the need to park further away from the destination.

The policy conclusion relevant for Dublin would be that introducing parking restrictions not only does not reduce the turnover but can actually support retail businesses, assuming they are deemed to be of high quality by the consumers.

Predicting the economic impact

Finally, we turn to predictive modelling in order to estimate the expected impact of the new traffic measures on Dublin City Centre's economy, expressed as a change in total revenue. In total three models were built, using some of the data quoted above as parameters.

1) The direct impact approach.

Two sources were used to inform the direct impact on retail revenue from traffic restriction schemes: Dublin's "Retail Impact Assessment" quoted earlier [2] and a meta-study by T. Whitehead et al. summarising 22 cases [35]. An estimate of annual Dublin City Centre retail turnover used in the calculations was €3,277m, based on "Retail Strategy for Greater Dublin Area" [36] adjusted for the latest retail sales and inflation indices. Under this approach the result is **a gain** of between **€441m** (lower bound) and **€557m** (upper bound) per annum.

2) The modal shift approach.

"Dublin City Centre Transport Study" [1] includes projections of c. 40,000 additional journeys into the city centre each morning as well as a target of significant modal shift from cars (13% less in relative terms) to public transport (7% more) and cycling (10% more). This means a significant increase in the absolute volume of public transport journeys (a bigger share of a larger total) by 2023: up 26% from 2016 levels. At the same time, the volume for car journeys is planned to decrease by 30% from 2016 levels. The traffic management measures envisaged in the Study are a critical step towards achieving these targets.

These figures were used in order to estimate the volume and modal share of journeys to city centre and were combined with the revenue amounts generated by each mode as per two Dublin studies [18,19] presented in more detail in the section on mode of travelling and average spend earlier. The revenue share of the car is expected to fall by between 4% and 7% and the share of public transport is expected to increase by between 8% and 12%. The estimated impact under this approach is **a gain** between **€464m** (lower bound) and **€820m** (upper bound) per annum.

3) The road space reallocation approach.

As we have seen earlier in the section on modal shift, there is a significant disproportion between the amount of potential customers brought to the city centre by cars in a mixed traffic lane and by a bus (either in mixed traffic or in a dedicated lane). In order to facilitate the predicted growth in public transport journeys, the Dublin City Centre scheme will reallocate some of the road space from general traffic (car) lanes to BRT lanes or regular bus lanes.

It is assumed that, likewise, the revenue associated with these general traffic lanes will be replaced with revenue from additional BRT/bus lane capacity. Under this approach the revenue share of the car is expected to fall by between 6% and 7% and the share of public transport is expected to increase by approx. 13%. The estimated impact is **a gain** between **€402m** (lower bound) and **€590m** (upper bound) per annum.

After aggregating the modeling results in order to arrive at a single figure we get **€546m of an additional annual turnover** expected to result from the planned traffic management measures. This represents a 17% increase from the current (2016) levels and presents a much brighter picture than estimates of *"a 20% decline in turnover with subsequent loss of jobs"* expressed by the retailers during the consultation phase of the "Dublin City Centre Transport Study" [1]. In fact, the results above suggest that a 20% increase, with subsequent creation of jobs, is much more likely to happen than a 20% decrease.

Summary

The evidence based on international research applied to the planned traffic management measures in Dublin City Centre suggests that the following is likely to happen once the scheme is implemented:

- After c. two months the overall traffic in the city centre will adjust to the new conditions and drop below the pre-implementation levels.
- Traffic will either marginally increase or decrease on streets immediately next to the ones subject to the scheme ('traffic evaporation').
- There will be c. 5,500 less cars crossing the canals each morning.
- The benefits of the growing Dublin economy will be experienced by more businesses.
- Parking restrictions will not have a negative impact on retail turnover.
- If no modal shift occurs, public transport will continue to generate 3 to 4 times more revenue than the car.
- In the most likely scenario, a modal shift of 5% to 7% will change the revenue share of each mode further in favour of public transport and will generate a net benefit of **€546m** of an additional annual turnover for Dublin City Centre economy.

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