Reply to referee number 2.

Thank you very much for your comments. I tried to incorporate them as much as possible in the revised version of the paper.

Here is what I have done and why:

General comments:

- All diagrams are now better labelled and explained
- English has been checked by a mother language American
- Appendix A has been moved in the main text

Detailed comments:

p1. I left the statement from the Infrastructure Minister. I agree that the Minister's comment is more apropos of a proposed minimum speed limit for the middle lane. However, this is what the Minister said in order to welcome the new rule.

p3. The description of bottleneck models and car following theory has been modified according to your suggestions.

p4. 'Behaviouristic' has been replaced with 'Mechanistic'

p5. The discussion on traffic flow is not necessary and thus has been removed

p6. With respect to the distinction between continuous time and discrete time simulation there is some confusion in the literature, also due to the fact that these concepts are used in different, often poorly connected, fields. Some (mainly in the economics literature) talk, as you seem to prefer, of a continuous-time event-driven model when the event history for each micro-unit — that is, the timing of different types of events – is simulated. In general, a random process is assumed to generate the events being considered, with the probability density for experiencing an event at a given point in time depending on a set of explanatory variables.
Conversely, according to this view, in discrete-time models only the outcomes for discrete time periods are considered and no reference is made to the timing of events within a period. As an additional simplification, all events are often assumed to occur at only discrete points in time and the time intervals in between are not considered explicitly in the model. Thus, an aggregation over time is applied, resulting in a loss of information about the event history within the time period.

On the other hand, especially in the computer science literature, it is very common to define a simulation as cast in continuous time when the time interval between two subsequent observations of the system does not depend on the events being simulated. Consider as an example the case of an arrival process. Suppose the first event happens at time 1'12''; the second at time 1'25'' and the third at time 2'05''. Suppose also that the system is observed (i.e. simulated) every minute. Then, nothing happens in the first period of the simulation, there are 2 events (and we do not know their sequence) in the second period and 1 event in the third.
Conversely, according to this view, when considering a discrete-time simulation the events are scheduled according to their exact timing. So, the first time interval ends with the first event (it thus lasts for 1'12''). The second time interval is much shorter

(just 13 seconds), while the third time interval is 40 seconds long. This definition has some appeal because when we have to deal with continuous variables (as a constant stream of fluid passing through a pipe, or the movement of vehicles) it looks more appropriate to observe (i.e. simulate) the system at constant time intervals, which according to this view is regarded as continuous time modelling (of course it could also be possible to refer to discrete events such as a car approaching the leading vehicle).

I do not have any preference on the definition to adopt. However, since the audience is likely to have a reaction similar to yours, I have switched to the first definition.

p7. I added a section devoted to this (section 7).

p8. That was a typing error: a higher cell length (greater distance between vehicles) allows for a *smaller* vehicle flux, as depicted in the figures. It is now corrected

p9. Conditioning on desired travel speed when discussing average speed and speed variance has been introduced

p11. The admittedly obscure phrase “Cell length is now randomly chosen” has been replaced by “To avoid the risk of the results being driven by the particular size of the cell lengths considered, cell length is now randomly chosen for each run between 30 and 70 meters”

p11bis. This is clearly stated in section 3.3: <<The *Slow Right* rule bans slow vehicles from the left lane, and fast vehicles from the right lane. As already mentioned, it approximately states: ``If you're slow, keep on the right lane and move on the middle lane only in order to pass a slower vehicle in front of you; if you're not slow, keep on the middle lane and move on the left lane only in order to pass a slower vehicle in front of you''. The *All Right* rule does not distinguish between slow and fast vehicles. It prescribes: ``Always keep on the further right lane available; move left only in order to pass a slower vehicle in front of you''>>. However, I changed the phrase in order to make it clearer

p12. The apparent sudden reduction in performance of travel under the *Slow Right* rule when s_{slow} reaches 130 km/h is easily explained. Desired travel speed is distributed uniformly between 80 and 160 km/h. However, the existence of a speed limit at 130 km/h modifies this distribution, by constraining all vehicles with a desired travel speed beyond 130 km/h to behave like they had a desired speed of exactly 130 km/h. When s_{slow} is set at 129 km/h, the left lane can still be used by all vehicles with a desired travel speed of 130 km/h or higher, i.e. by 37.5 % of all vehicles. However, when s_{slow} is set to 130 km/h, all vehicles are considered to be slow, and the left lane cannot be used anymore. The 3-lane motorway actually shrinks to 2 lanes only, and the average speed falls accordingly

p16. Your suggestion has been incorporated in the text

p18. The simulation developed in the paper is not aimed at reproducing *real* traffic patterns. Rather, it is meant to provide a simple framework for testing, mainly at a theoretical level, *how the macro behavior of traffic is affected by a change in the micro* *rules governing the behavior of individual cars* (as you said). Relying on strongly simplified assumptions, the model is not a good candidate for calibration or estimation. However, the parameters of the model are such that *realistic* values for average speed and traffic density are obtained. This has been pointed out in the introduction. The issue of empirical testing of the results of the model is also raised again in the conclusions. I suggest that it should be possible to look at the correlation between (average) speed and the accident rate with the old and the new regime, in order to provide a test of the results

p19. I agree but leave it for future extensions. Severity could be a function of speed of the collided vehicles.

p.23. I added a short discussion of the Rotemberg article in section 2. Thank you for having provided this very interesting reference.