TransPosition

Driving alone versus riding together - How shared autonomous vehicles can change the way we drive

Peter Davidson
Anabelle Spinoulas
TransPosition

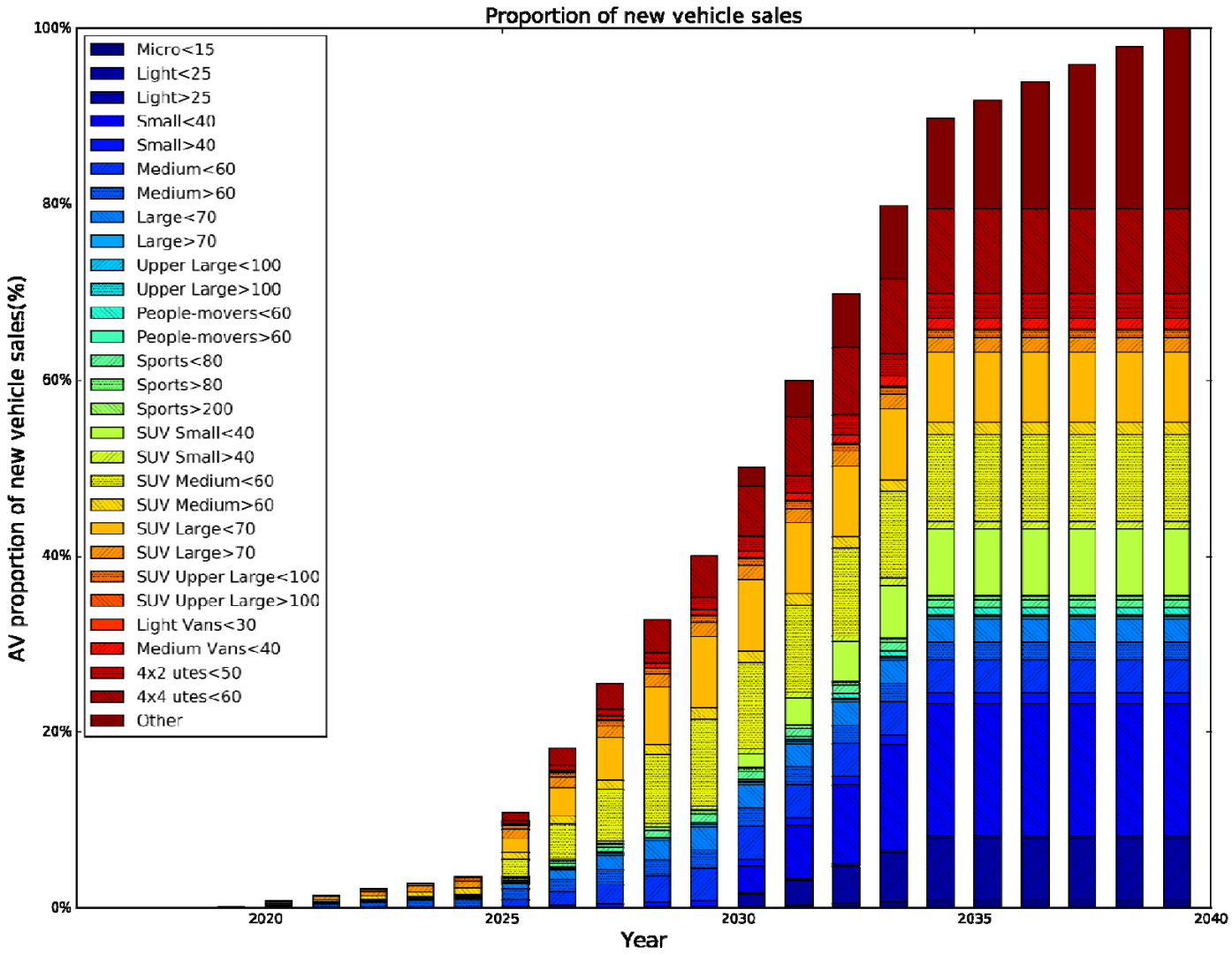
Key topics to cover

- How quickly will they be adopted?
- How can we model AV?
- How will they change our networks?
- What are the effects of shared AV?
- What about Mobility-as-a-Service?
- What are the safety impacts?
- How will they change our cities?
- What are the implications for what we do now?

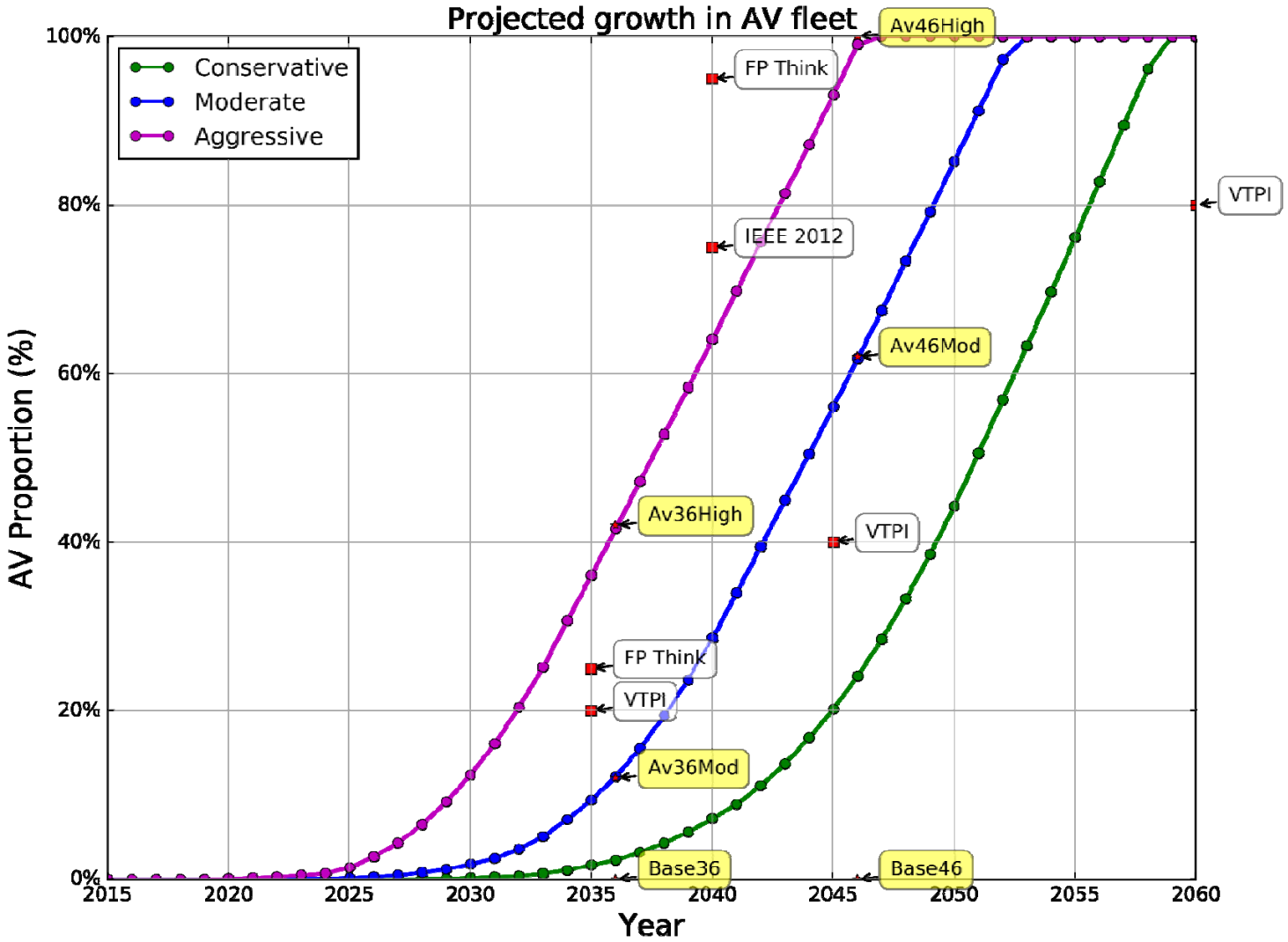
How quickly will they be adopted?

TransPosition

AV % of new sales – Aggressive



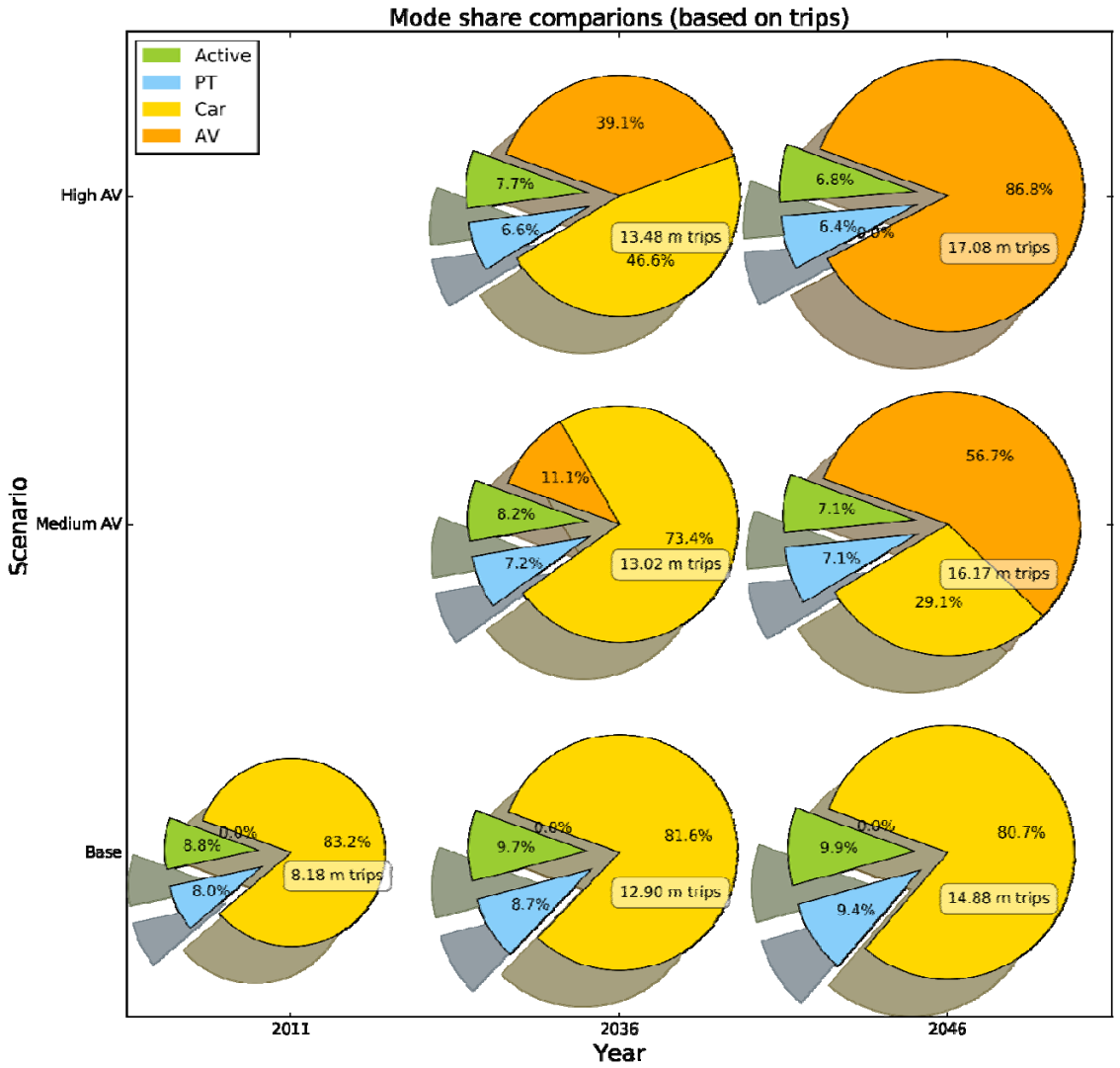
Projected growth in AV fleet



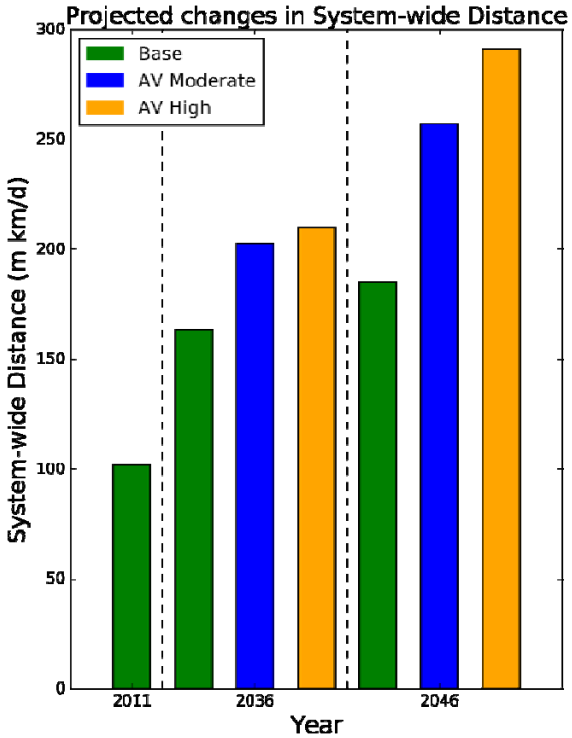
Assumptions

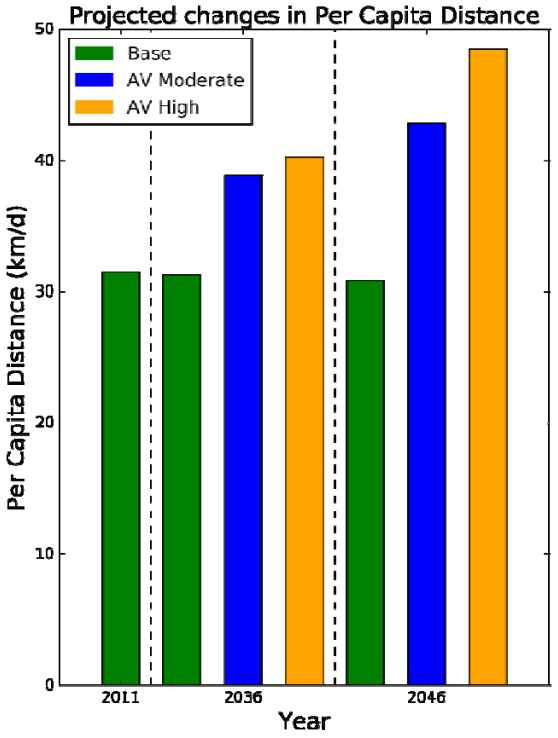
Name	AV Share	Value of Time	Trips	Veh op cost	Speed	Capacity	Int Delays	Shared AV	Multi Shared
Base 11	0%	-	-	-	-	-	-	-	-
Base 36	0%	-	-	-	-	-	-	-	-
Av36 Mod	12%	0.75 - 1.00	10%	0.5 - 0.75	-	5%	-	-	
Av36 High	42%	0.75 - 1.00	10%	0.5 - 0.75	-	5%	0.94	-	-
Base 46	0%	-	-	-	-	-	-	-	-
Av46 Mod	62%	0.60 - 1.00	15%	0.5 - 0.75	12%	12%	0.90	-	-
Av46 High	100%	0.60 - 1.00	15%	0.5 - 0.5	20%	20%	0.75	-	-
Av46 High Shared	100%	0.60 - 1.00	10%	0.5 - 0.5	20%	20%	0.75	70%	-
Av46 High Multi Shared	100%	0.75 - 1.25	15%	0.5 - 0.5	20%	20%	0.75	40%	30%

Mode Share Impacts

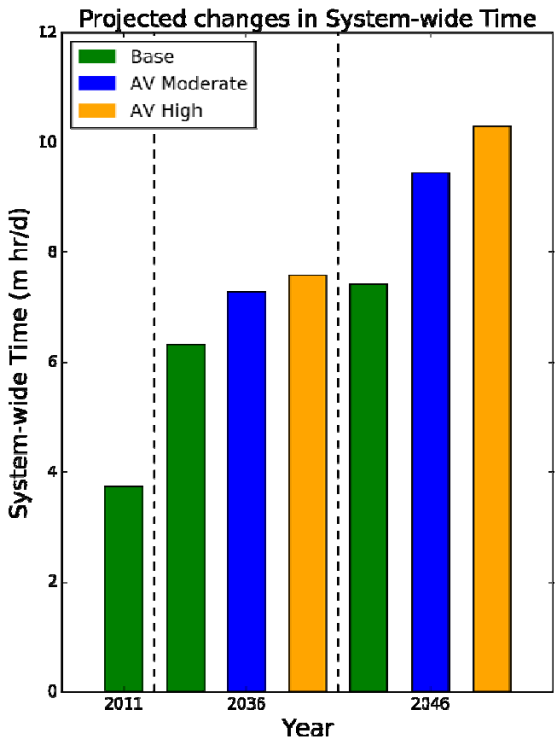


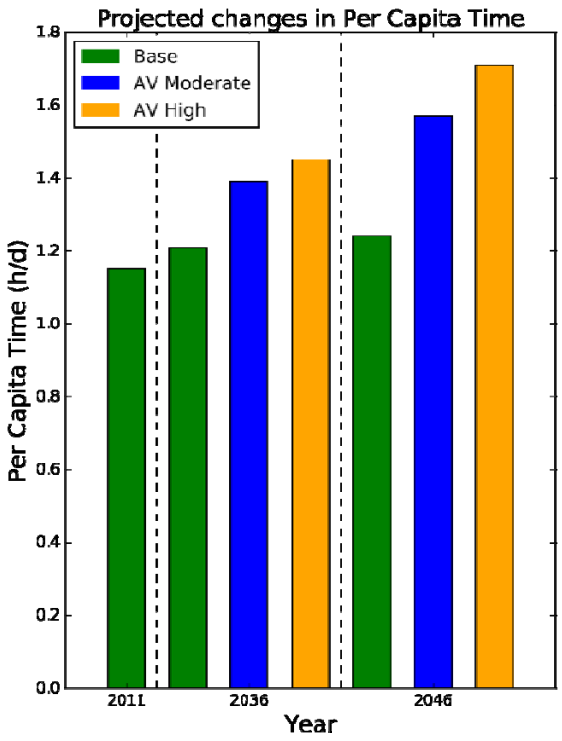
Changes in distance travelled





Changes in Time Spent travelling





What are the effects of Shared Autonomous Vehicles

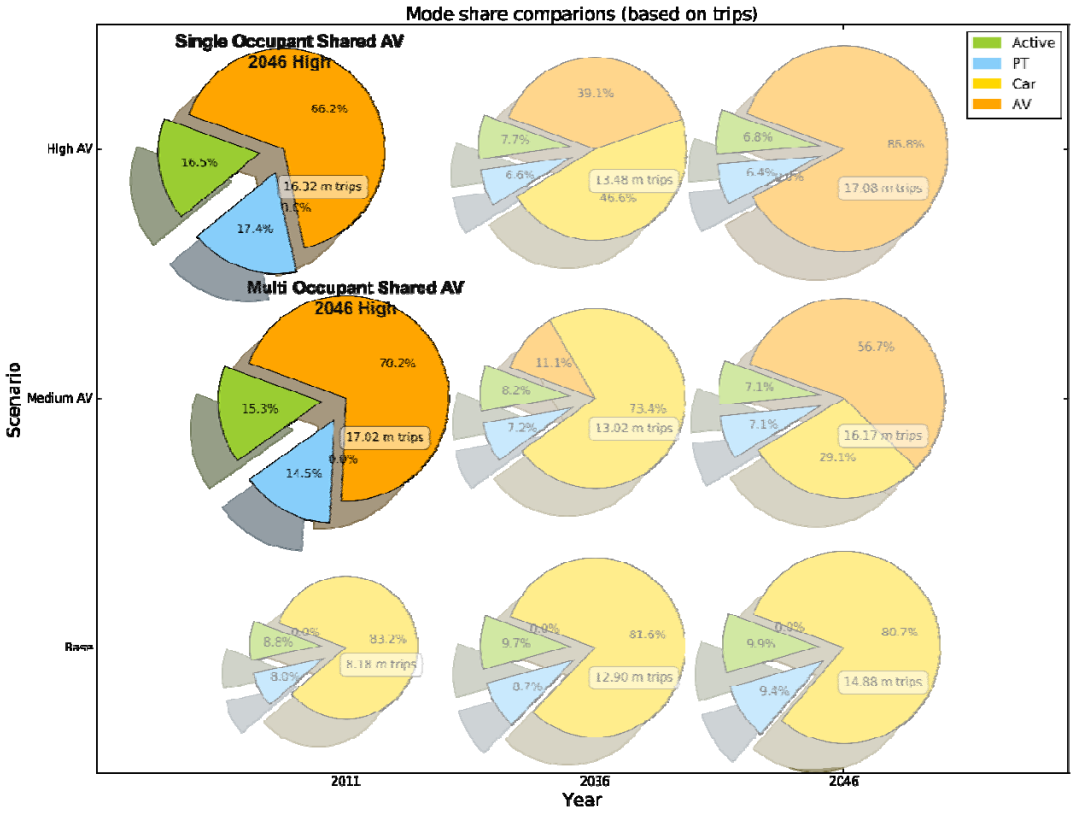
TransPosition

Behavioural Response to Shared AVs

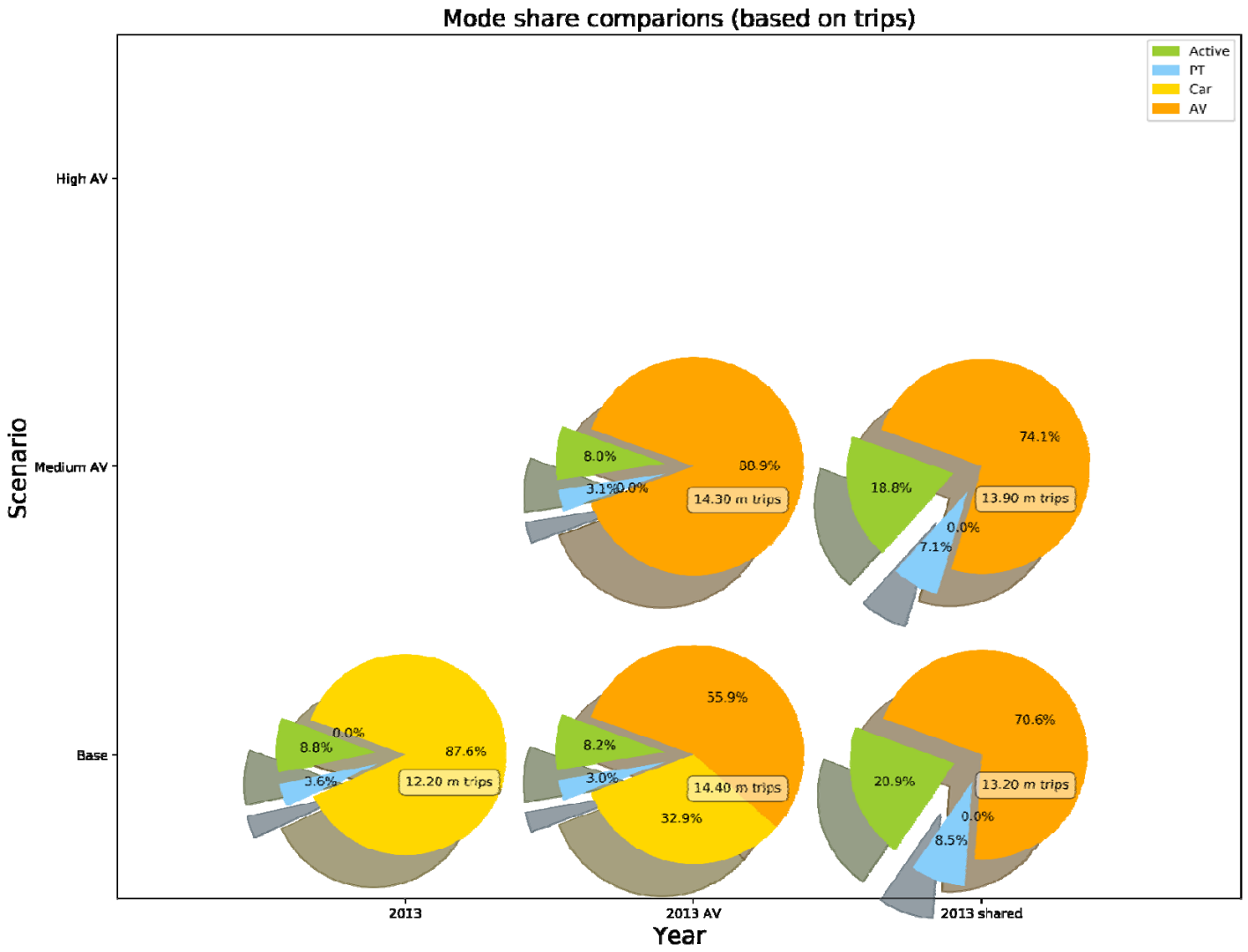
- Change from an up front model (buy a car, annual registration and insurance) to a pay-as-you-go model
- Lower annual cost, but higher trip cost (for most trips)
- For modelling, assume that people make travel choices based on marginal costs
- This may overstate the impact of shared AV
  - If people only consider annualised costs then they will do more travel

TransPosition

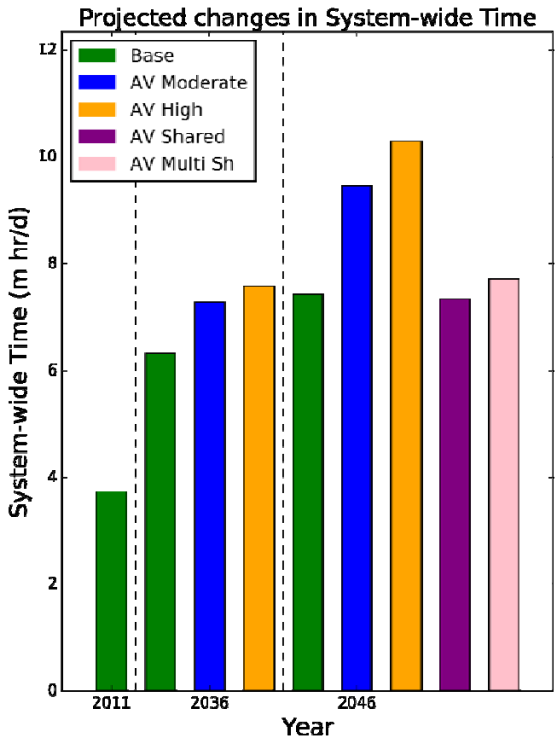
Effects of shared Autonomous AVs on mode share

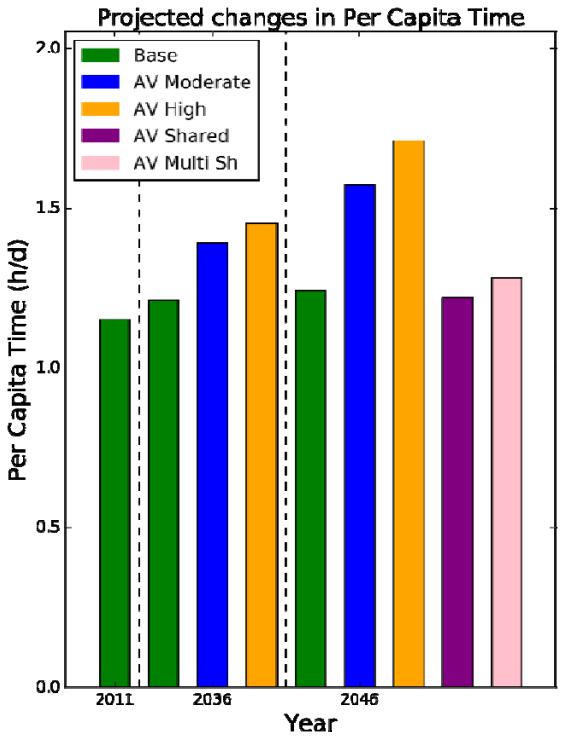


Mode Share – New Zealand (Preliminary)

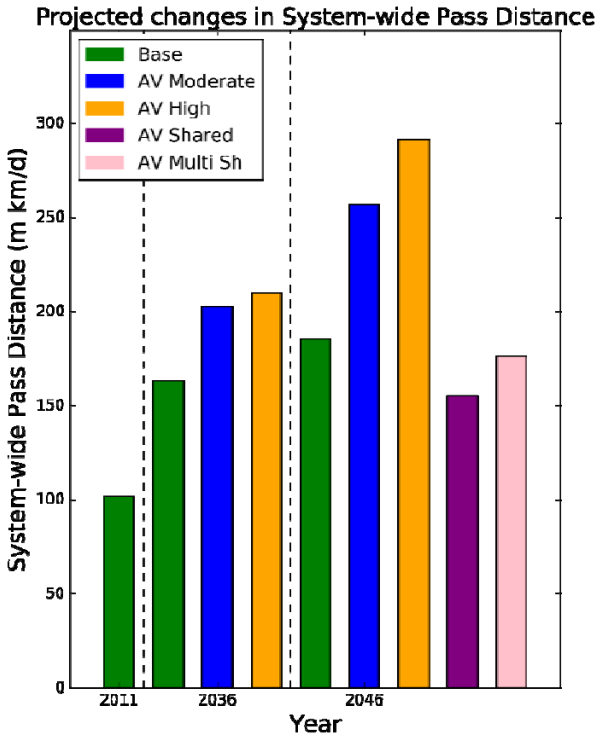


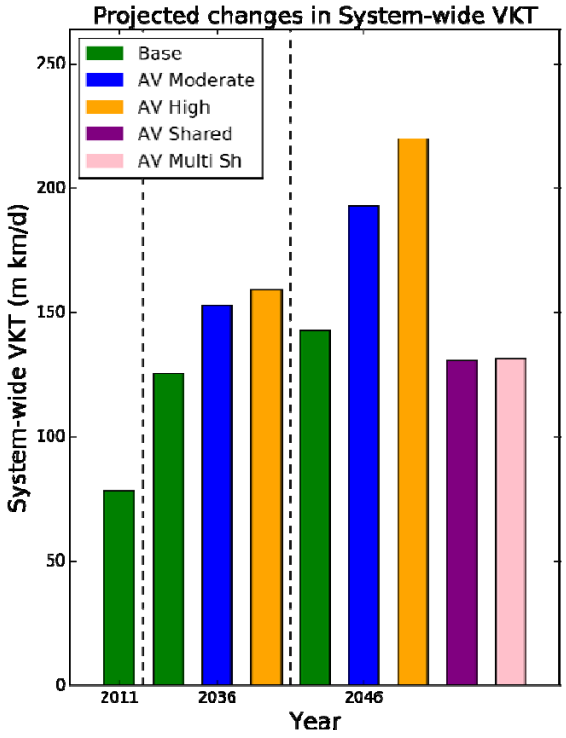
Changes in Time Spent travelling





Changes in distance travelled (PKT vs VKT)





New Zealand Impacts (very preliminary results)

- Privately owned AV (high case):
  - 20% more trips, 40% more hours, 60% more VKT
  - 60% higher aggregate accessibility
- Share ownership AV
  - 13% fewer trip, 30% less travel time, 25% less VKT
  - 25% drop in utility – save $10/day on ownership means increase in utility in city, but drop in rural areas
  - Shared ownership assumptions not reasonable for whole country
- Multi-occupant shared AV
  - 5% fewer trips, 18% less travel time, 10% less VKT
  - 5% drop in utility – again assumptions are not right for rural areas
- NOTE: Have not included all PT – only Auckland PT has been included

Mobility-as-a-Service

- Privately owned AVs reduce the use of PT
- Shared AVs increase PT
- Incorporating shared AVs within a multi-modal trip - PT becomes more attractive
- But also improves the use of the PT network – can drive at both ends
- Increased car access to PT, drop in walk access
- Increasing MaaS increases PT mode share
- Better use of line haul PT than a private AV

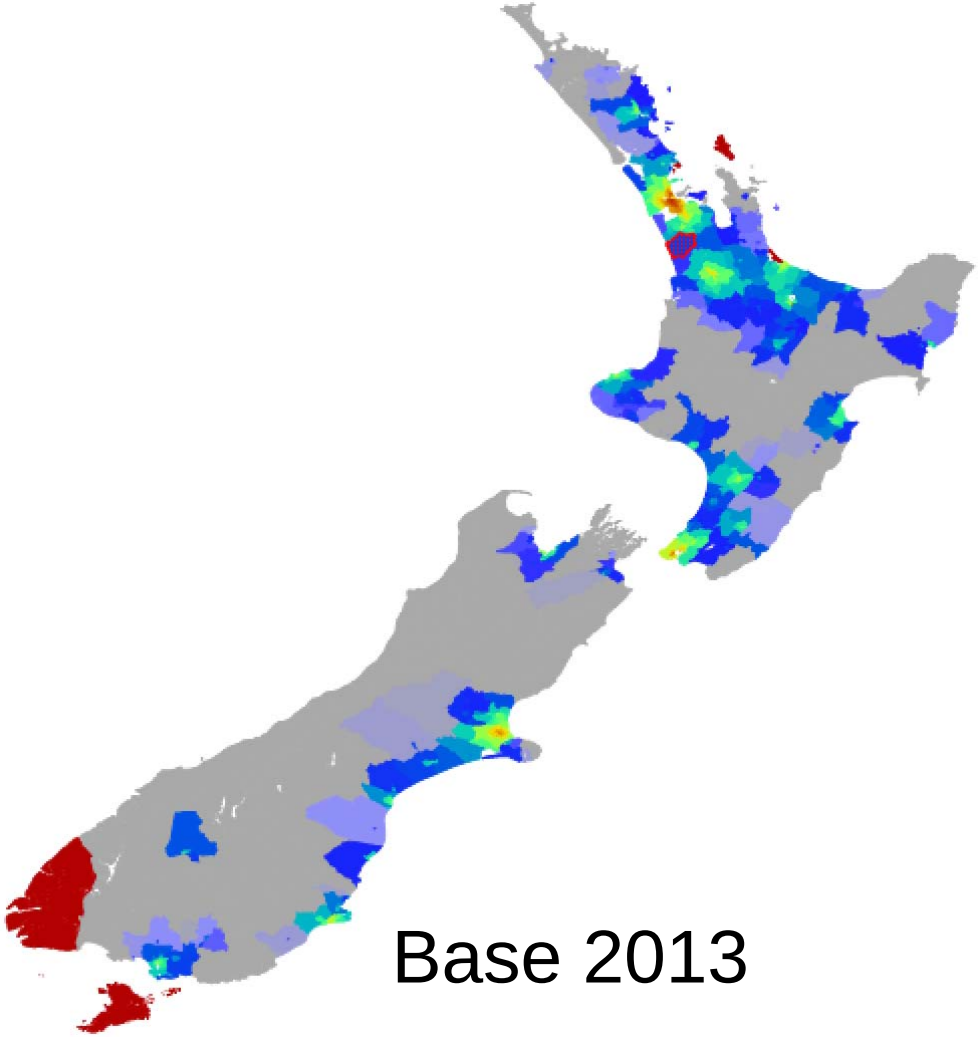
Safety Implications

Scenario	Compared with	Change in Fatalities	Change in Other Crashes	Total cost change ($m)
Base36	Base_11	58%	58%	$2,280
Av36Mod	Base_36	16%	16%	$644
Av36High	Base_36	-14%	-17%	- $635
Base46	Base_11	78%	78%	$3,056
Av46Mod	Base_46	-33%	-38%	- $1,457
Av46High	Base_46	-67%	-74%	- $2,872
Av46HighShared	Base_46	-88%	-91%	- $3,538
Av46HighMultiShared	Base_46	-87%	-90%	- $3,499

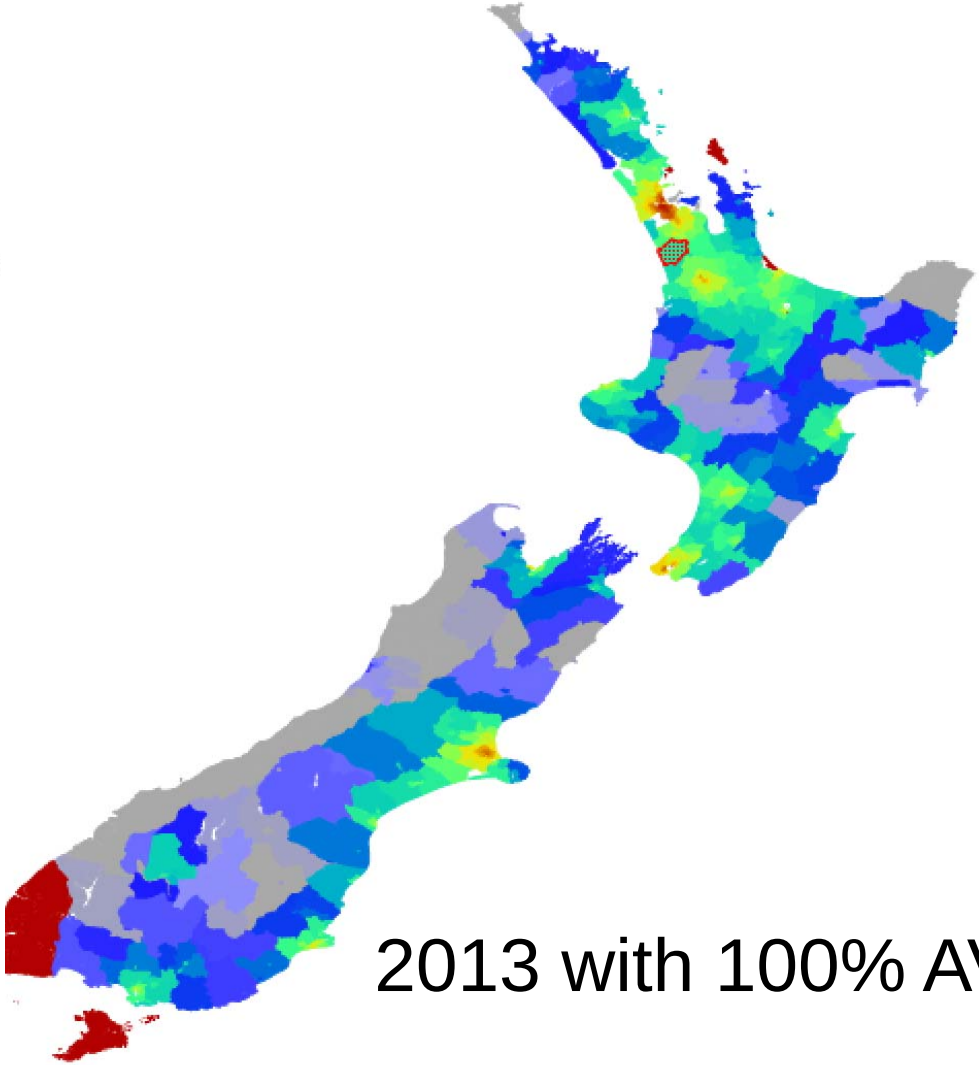
TransPosition

How will AV Change development patterns?

Accessibility comparison

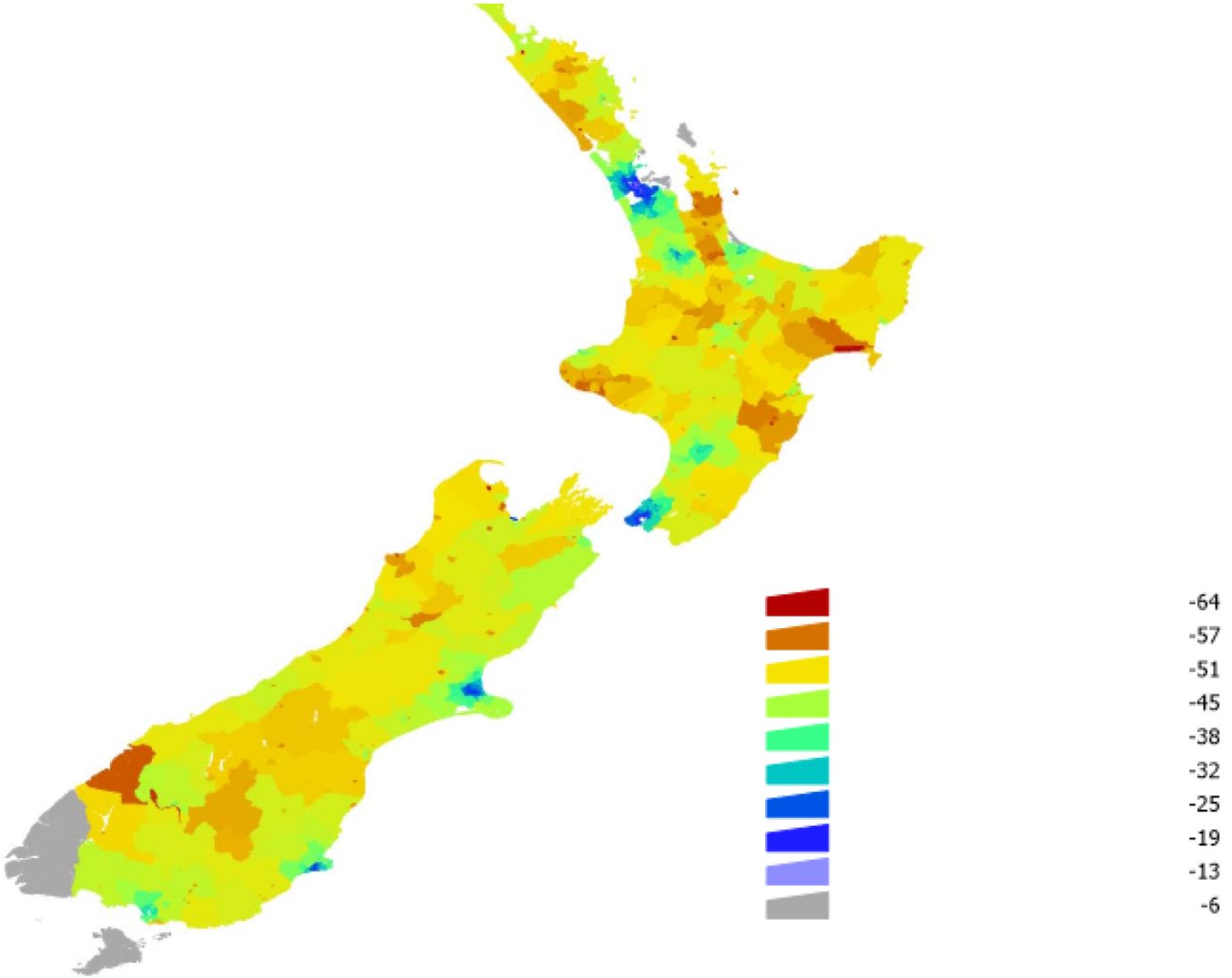


Base 2013



2013 with 100% AV

Differential effects of autonomy (High case)



TransPosition

What are the implications for what we do now?

TransPosition

Overall consequences

Operate AV as improved private cars

↓

Big problems!

100% AV

↓

Capacity + speed improves

Mitigate extra demand

100% AV with shared AVs

↓

Better operations

Reduced demand

TransPosition

Recommendations

- Minimise transition period – resolve law + liability, AV lanes, full AV
- Update current planning to reflect AV and uncertainty
  - Infrastructure – shorter benefits streams, need for flexibility
  - Land use – changing patterns, more sprawl, reclaim space
- Investigate road pricing, operational management

TransPosition

Recommendations (cont)

- Support Mobility-as-a-Service and integrate with PT
- Set lower car ownership as key policy goal (reduced focus on mode)
- Maintain commitment to PT, but consider long term plans
- More planning, analysis and data collection
- Work out clear policy on privacy and data ownership
- Right to travel (Mobility as a utility)
- Identify new risks (e.g. hacking, systemic failure, collusion)

TransPosition