University College Cork
Coláiste na hOllscoile Corcaigh

Private Car Transport Energy
Forecasting & Policy Evaluation

Hannah Daly & Dr. Brian P. Ó Gallachóir
Sustainable Energy Research Group
Environmental Research Institute
University College Cork

Motivation

Project the effect of technologically driven measures on stock & energy

Focus: Private Car Transport in Ireland

- Global transport:
  - 2.2% annual growth since 1972
  - 95% oil dependent
  - Issues: emissions and energy security

Overview

1. Context
2. Stock methodology
1. Forecast impact of 3 measures on Irish car fleet
2. Evaluate in terms of 2 EU targets

Context: Irish Cars, Energy & Policy

- Transport energy :
  - 1990 – 2007 181% growth
  - 28% → 43% final energy demand share
  - 1.5% p.a. baseline growth forecast
  - Private car dominated: 43%
  - Fossil fuel dependent

- EU Targets for 2020:
  - *Decision 406/EC/2009* : 20% reduction in non-ETS emissions(2005 baseline)
  - *Directive 2009/28/EC* **(RES-T) :** 10% renewable transport energy

Context: Policies Evaluated

1. 10% Electric Vehicle target

2. EU Mandatory new-car emissions of 130g CO_2/km by 2015

3. Biofuels Obligation Bill: Transport fuel to contain 4% of biofuel by volume from July 2010.

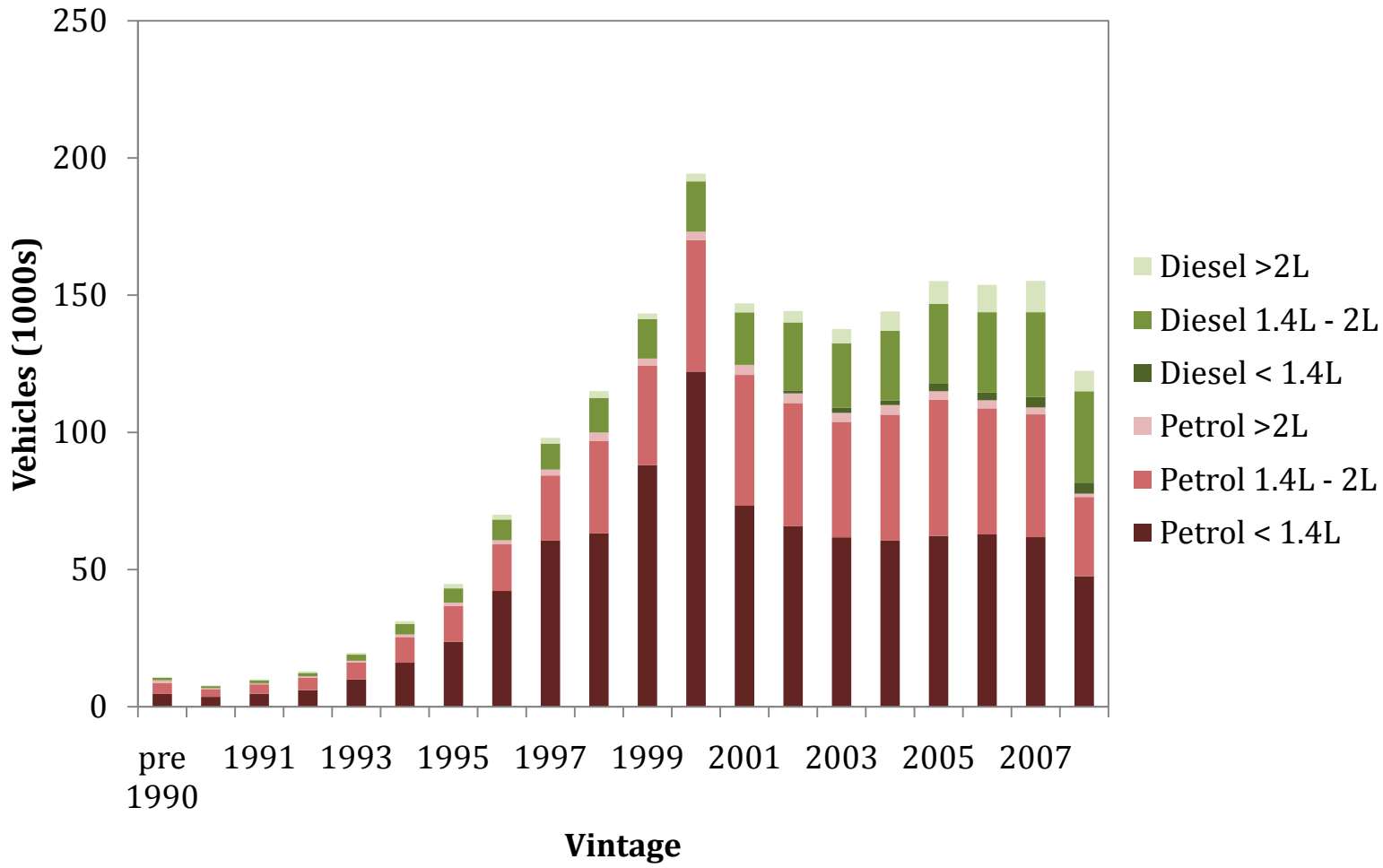
Methodology: Base-Year Stock Model

- **Stock** categorised by *technology* **(C)** and *vintage* **(V)**
- **Mileage** for each category
- **Specific energy consumption (SEC – MJ/km)**

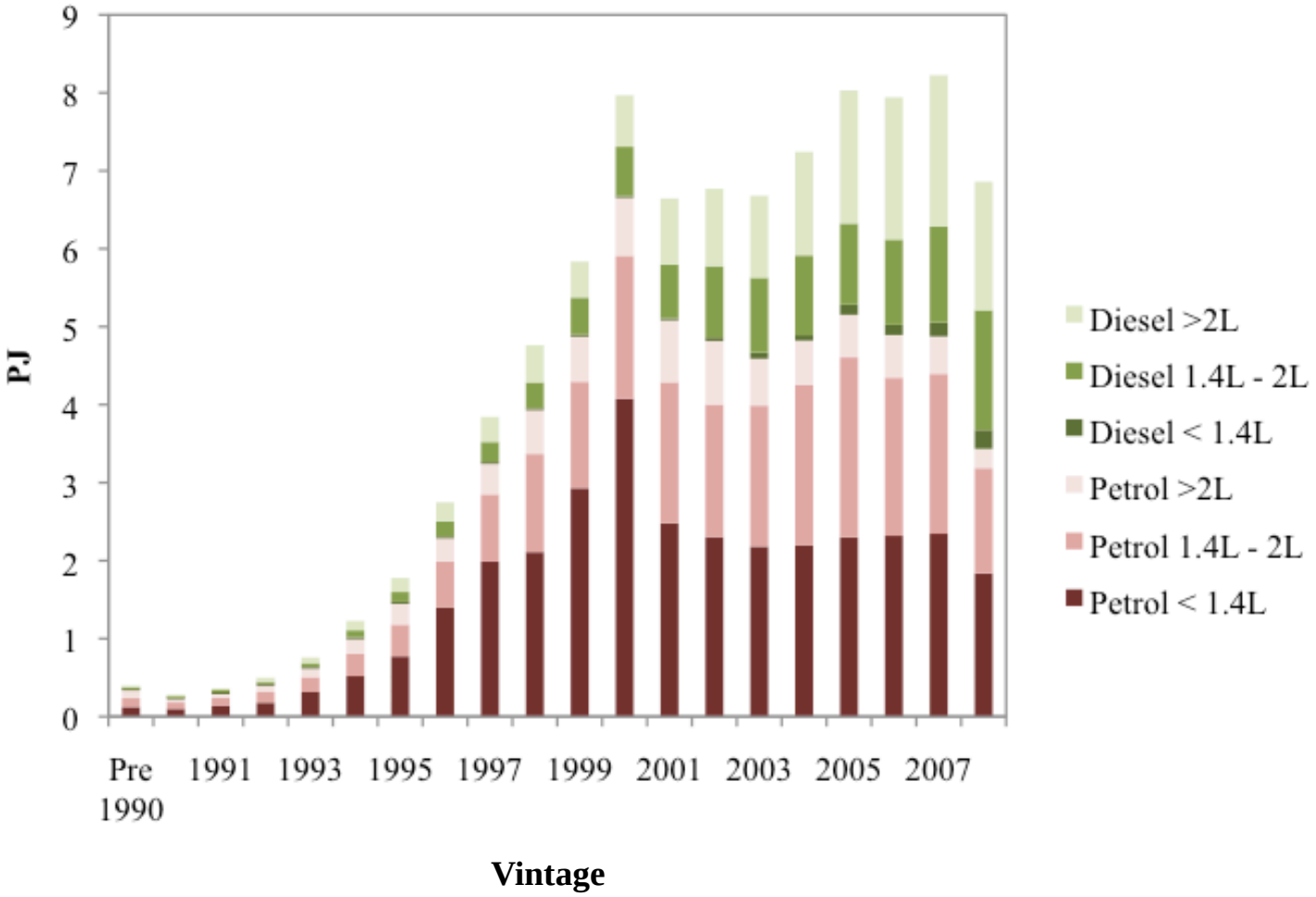
SEC = New-car SEC x "ageing" x "on-road"

$$Energy_T = \sum_{C,V} Stock_{T,C,V} * Mileage_{T,C,V} * SEC_{T,C,V}$$

2008 Stock Profile

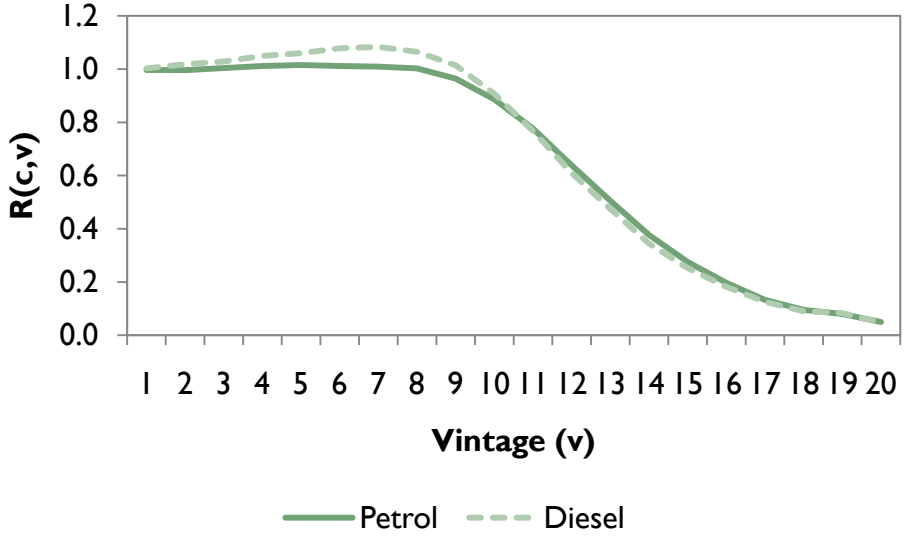


2008 Energy Profile



Methodology: Baseline Input [1]

- Scrappage & import rates: From historical analysis



- New-car SEC and sales profile as 2009
- *Activity demand (km/year) and new-car sales are driven by GNP and fuel price: Top-Down analysis*

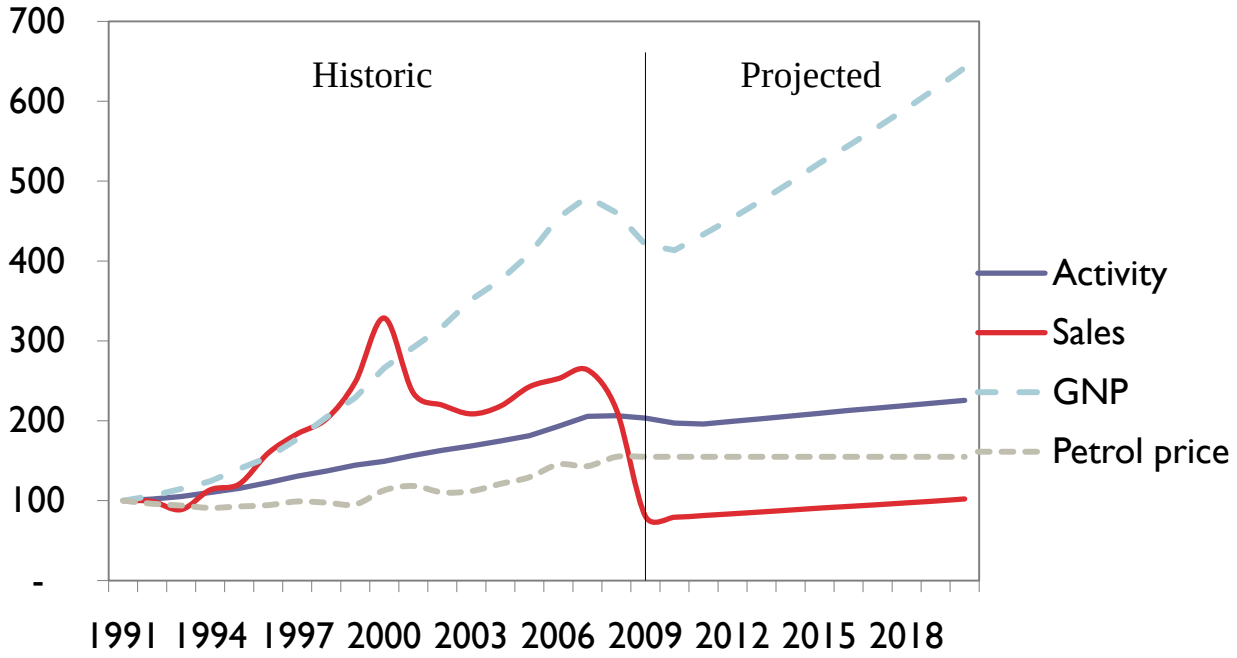
Methodology: Baseline Input [2]

Reference Activity Demand

1. Activity: km/year
2. Sales: cars/year

Calculate income and price elasticities

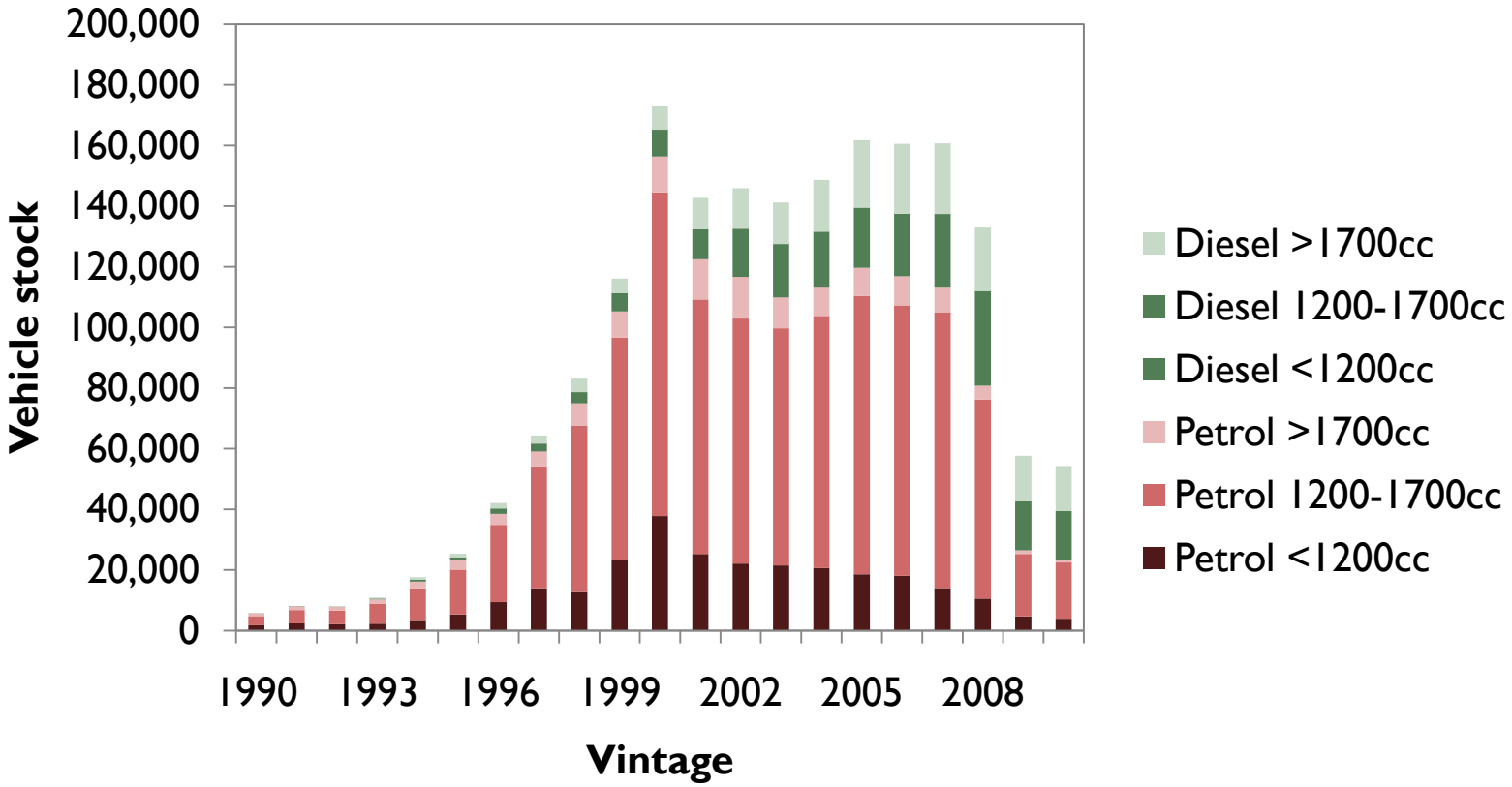
Use elasticities and GDP, fuel price forecasts to forecast demand



	Activity	*Sales*
Fuel price elasticity (PE)	-0.1	-0.80
Income elasticity (IE)	0.35	0.78

Baseline: 2010 Stock Profile

$$stock_{c,v} = stock_{c,v-1} * R(c,v)$$



Baseline: Energy Calculation

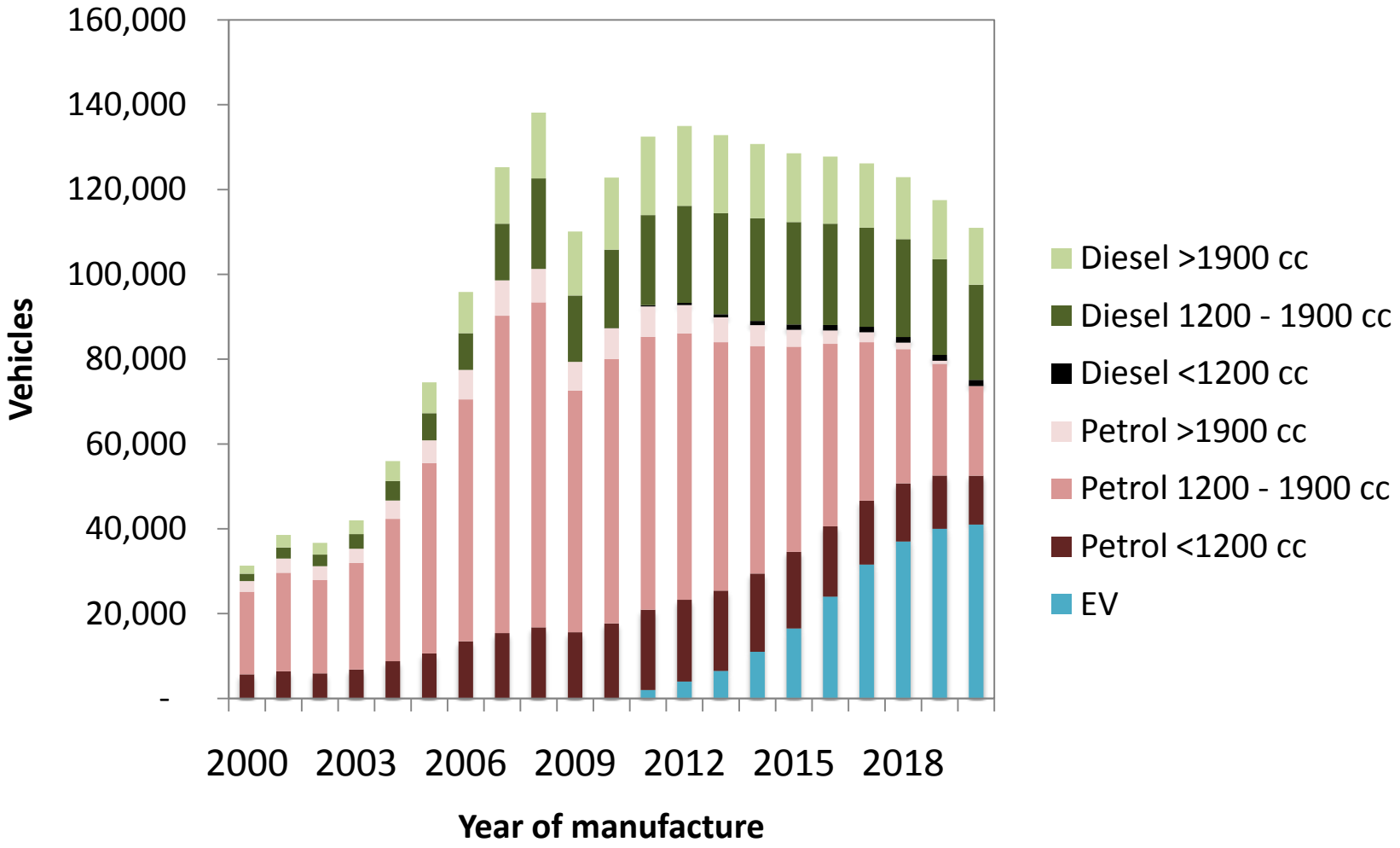
- **Mileage** in each category more complicated: Reflects trends over categories and vintages, but corrected for total projected vehicle kilometres (see full paper)

$$Energy_T = \sum_{C,V} Stock_{T,C,V} * Mileage_{T,C,V} * SEC_{T,C,V}$$

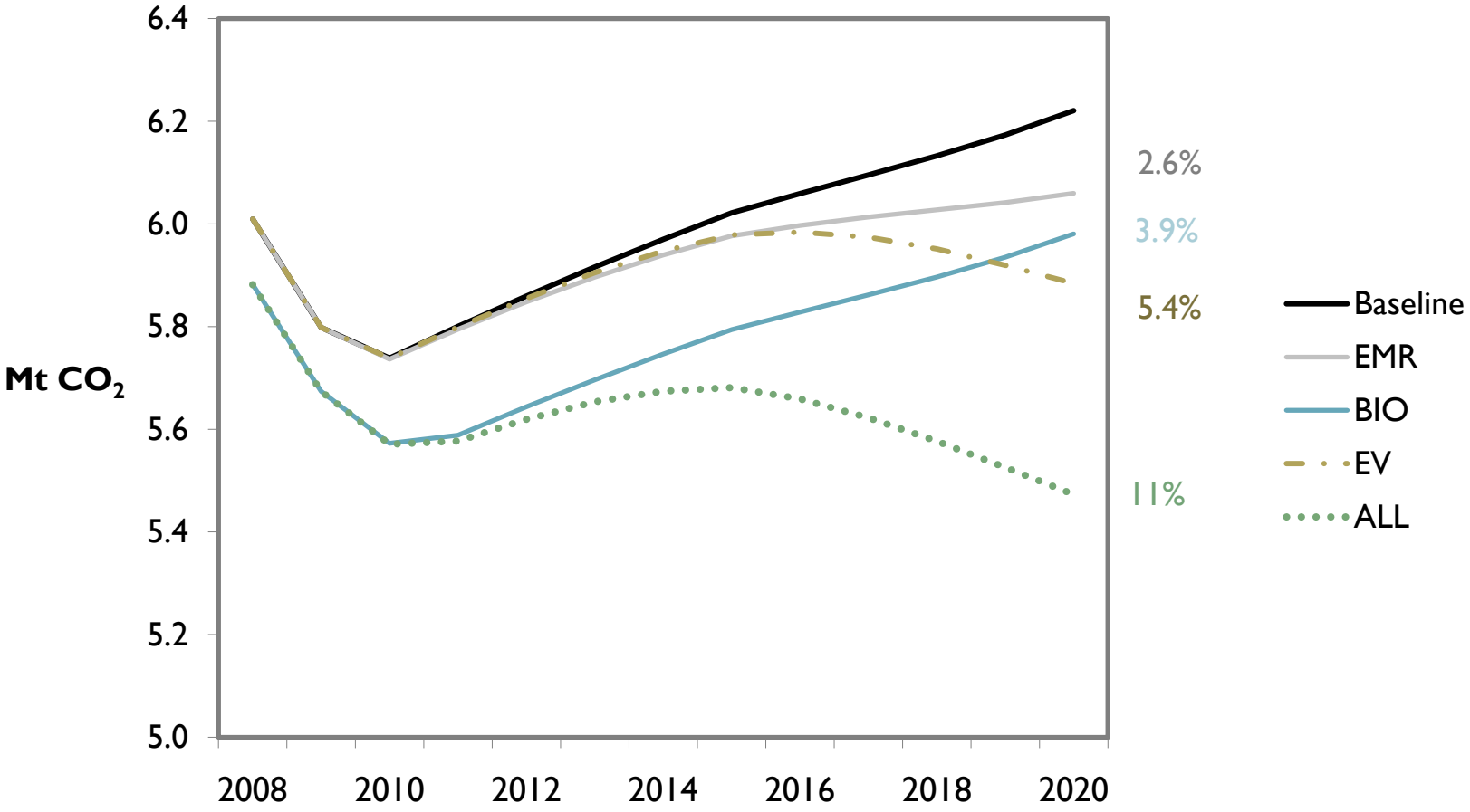
Scenario assumptions

1. **10% EV Target - *EV***
   - Displaces ICE evenly over categories and mileage
   - .95MJ/km on-road efficiency: 26 kWh/100km
   - 40% renewable electricity by 2020
2. **EU Emissions Reg – *EMR***
   - New-Car SEC 1.9MJ/km by 2015 – 130gCO_2/km
   - Comes from technology improvement and purchasing trends
3. **Biofuels Blending – *BIO***
   - 4% Biofuel mix (vol) by July 2010
   - Implies 2.6% by energy
   - Assumed 4% bioethanol in petrol and 4% biodiesel in diesel

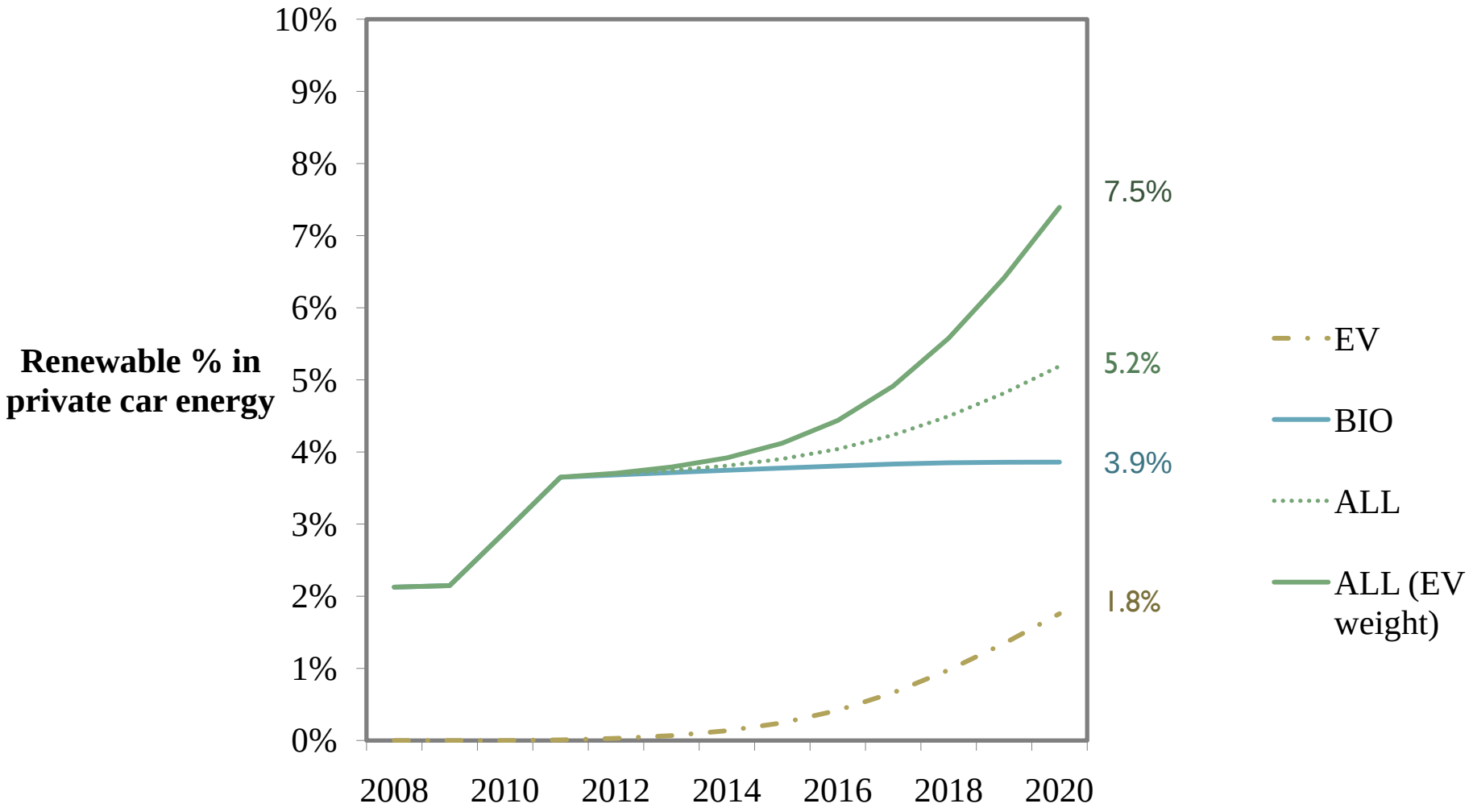
2020 Stock Profile: EV+EMR



Result: Private Car CO_2 Emissions



Result: RES-T


Renewable % in private car energy
10%
9%
8%
7%
6%
5%
4%
3%
2%
1%
0%
2008
2010
2012
2014
2016
2018
2020
7.5%
5.2%
3.9%
1.8%
EV
BIO
ALL
ALL (EV weight)

Results: 2020 Targets

- EPA "With Measures" emissions forecast: 50 Mt CO_2 – 34% above target
- Baseline private car emissions: 6.7 Mt CO_2

=> Baseline Private car share: 13.4%

Scenario	*CO_2 Impact % (cars)*	*CO_2 Impact % (non-ETS)*	*Renewable % (cars)*	*RES-T Impact %*
EV	-5.4	-0.72	1.8	*1.3**
EMR	-1.6	-0.35	-	-
BIO	-3.9	-0.52	3.9	1.4
All	-11.0	-1.5	7.5	4*

Target: -34%

Target: 10%

* 2.5 renewable elec weight

Issues & Further Work

- Generalized assumptions: potential for scenario analysis and econometric work

- **Further policies:**
  - Biofuels likely to fill the remainder to 10% REST
  - New-car target 95gCO_2/km

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h.e.daly@student.ucc.ie