Road Freight Growth exceeds RGDP Growth

Indexed data (1997 = 100)

Year


HVKm  RGDP
Road Freight Growth vs RGDP Growth
Basic Model Structure

\[
\frac{dHV_{km}}{HV_{km}} = \alpha \cdot \frac{dRDGP}{RGDP}
\]

Integrating and rearranging

\[
HV_{km} = k \cdot RGDP^\alpha
\]

Best fit \( \alpha = 1.31 \). \( r^2 = 0.997 \)
Road Freight Movements vs RGDP

Heavy vehicle kms travelled (millions)

RGDP ($ billion)
Road Freight Growth Trends

- Road freight growth is correlated to RGDP growth but is about 30% higher
- The additional growth is not the result of modal shifts from rail and coastal shipping
- Similar growth relationships have been observed in Europe and Australia but other countries such as the USA have less
- If RGDP growth continues at historical rates and nothing else changes, road freight volumes will double every 18 years
- Over the last 10 years RGDP has grown by 37.5% (3.2% p.a.) and road freight has grown by 52% (4.3% p.a.)
NZ Transport Strategy Predictions

- Total freight will increase by 120% by 2040
- Road freight by 60%, rail freight by 190%, coastal shipping by 270%
- Different assumptions – NZTS assumes
  - RGDP growth to 2020 will be 36%, in 2020-30 it will be 19% and in 2030-40 it will be 18%
  - Some decoupling will occur. Freight growth will be 3% p.a. to 2020, 2.2% p.a. to 2030 and 2% p.a. to 2040
Modelling Framework

• General framework – can be applied to whole economy, or to a sector, or region
• Aim to explain the mechanisms by which freight growth exceeds RGDP growth
• Identify the factors that drive these mechanisms
Basic Formulation

\[ \frac{dF}{F} = \frac{dRGDP}{RGDP} - \frac{dv}{v} + \frac{dFI}{FI} \]

where

F is the freight volume
RGDP is the real gross domestic product
v is the value added per unit of output
FI is the freight intensity (freight per unit output)
Freight Intensity

Suppose there are P tonnes of output that transported an average of \( s_1 \) kms.
For each tonne of output, \( \alpha_2 \) tonnes of intermediate products travel an average of \( s_2 \) kms and \( \alpha_3 \) tonnes of raw materials travel an average distance of \( s_3 \) kms.

The total amount of freight, \( F \), in tonnes-km is given by:
\[
F = P \cdot (\alpha_1 s_1 + \alpha_2 s_2 + \alpha_3 s_3 )
\]

Freight intensity (FI) is defined as:
\[
FI = \sum_i \alpha_i s_i
\]

Can refine further by separating, international (\( j = 1 \)), inter-regional (\( j = 2 \)), and intra-regional (\( j = 3 \)) components

\[
FI = \sum_{i,j} \alpha_{ij} s_{ij}
\]
Example - Dairy Industry

• $\alpha$ values

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• Distance, $s$ values

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Example - Dairy Industry

- Contribution to Freight Intensity

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- The industry is introducing technology to reduce the freight intensity of the inputs
Sectoral GDP Growth
GDP of Service Industry Components
Transport RGDP/Truck-km
Conclusions

• Simple model relating road freight growth to RGDP growth provides a good fit and show that road freight is growing over 30% faster than RGDP
• A new modelling framework has been developed which describe the mechanisms by which freight grows faster than RGDP. This is being fitted to data for different sectors and for the whole economy
• Work is proceeding to develop relationships between driving factors and the models parameters
• Main issue is the availability of some historical time series data
Conclusions

• A review of the RGDP data by sector indicates that the multiplier for the transport intensive sectors is significantly higher than 30%
• Transport RGDP/truck km is declining indicating reduced revenues per vehicle-km.