



National Land Transport Productivity Framework  
Issues Paper  
August 2016



National Transport Commission



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# Executive summary

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## Key points

- Productivity growth is essential to improving Australians' standard of living.
- Existing transport productivity measurements, while useful, do not adequately support transport related operational and policy decisions when used alone.
- The purpose of this paper is to generate discussion about transport productivity, specifically about how policymakers' decisions can be targeted towards improving land transport productivity in Australia and how we might test this over the long term.

## Context

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Productivity growth – improvements in the efficiency of turning inputs into outputs – is essential to improving Australian's standard of living. Transport is often thought of as an input when measuring productivity across a range of industries. However, as our population grows, the Australian passenger and freight task also continues to grow, therefore it is becoming increasingly important that we can monitor productivity within the transport industry itself to assist with transport and transport-related operational and policy decisions.

The National Transport Commission (NTC) is also currently conducting a project called 'Who moves what where', designed to better inform future planning and policy development in transport by filling gaps in information on passenger and freight movement in Australia. We will shortly release a report that analyses existing data sources and provides an overview of the Australian land transport task, addressing both networks and operators. The report is referenced throughout this paper and will be available in full from the NTC website. 'Who moves what where' and this sister project, the *National Land Transport Productivity Framework*, are designed to improve the strategic transport information available to decision-makers in Australia.

## Issues

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Existing transport productivity measurements, while useful, do not adequately support evidence-based transport policy decisions. Currently there is no productivity framework with performance measures to help ensure Australia is investing wisely in productivity-enhancing reforms (or infrastructure). A transport productivity framework with measures agreed by major partners and stakeholders will allow reforms to be better targeted towards improving productivity in the sector.

Commonly used national productivity measures, such as those developed by the Australian Bureau of Statistics, indicate broad trends in productivity growth but do not factor in the external and qualitative influencers on productivity such as government regulatory changes, technological advances and changes to management practices. Overreliance on quantitative data alone can inhibit strategic decision making. In developing this framework, the NTC aims to take a valuable first step to help decision-makers determine transport policy and investment directions that can have the greatest impact on improving productivity to benefit all Australians.

The purpose of this paper is to generate discussion about transport productivity, specifically about how decision-makers' decisions can be targeted towards improving land transport productivity in Australia and how we might test this over the long term. It will do this by:

1. identifying the current measurements available to measure land transport productivity
2. offering some example outcomes and key performance indicators that transport decision-makers could adopt to collectively measure our impact on land transport productivity.

## Next steps

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The comments received in response to this paper will help support the development of the *National Land Transport Productivity Framework*. Further stakeholder discussions will follow as we progress the development of the plan.

The framework will be put to transport Ministers for consideration in November 2017.

# 1 Context

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## Key points

- The National Transport Commission is developing a high-level productivity framework and supporting materials.
- This paper is seeking stakeholder input to the development of the *National Land Transport Productivity Framework*.
- This project was approved by the Transport and Infrastructure Council in November 2015.

## 1.1 Objectives

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The National Transport Commission (NTC) is seeking your feedback on the development of a framework that can assist decision-makers to improve land transport productivity and, as a result, the living standards of all Australians. This high-level framework will be called the *National Land Transport Productivity Framework*. To assist us in developing the framework, this paper raises some questions and ideas for discussion including:

- whether we should utilise existing productivity measures and/or identify supplementary information to measure transport productivity
- how we can identify the performance indicators against which productivity could be measured and strategies developed
- how we can ensure the framework is suitable for decision-makers to use in developing strategy and action plans to increase productivity in the national land transport sector.

## 1.2 Background

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The NTC, through engagement with both government and industry stakeholders, identified that:

- there are few nationally agreed productivity indicators for transport
- existing information on the productivity of Australia's land transport systems is not sufficiently consistent, coordinated or understood to enable decision-makers to effectively deliver productivity enhancing reform or investments.

We then developed a business case that proposed to develop a productivity framework for land transport to better support decision-makers with improved productivity measures.

In November 2015 the Transport and Infrastructure Council approved the business case for the *National Land Transport Productivity Framework* project to proceed. The business case highlighted that, unlike other policy areas such as road safety, there was no overarching framework to help guide decision making to achieve improved transport productivity. It also outlined possible productivity measures that a productivity framework for land transport could include and how it may be developed into a national land transport strategy with agreed goals, targets and measures.

The NTC commenced preliminary research in 2016 to better understand what transport productivity means. We investigated how it is measured and where there are barriers to and opportunities for governments and industry to improve transport productivity.

This paper incorporates the findings of this preliminary research and identifies important questions to be considered in the development of a user-valued productivity framework.

## 1.3 Consultation

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### Questions to consider

We are asking stakeholders four questions, which are listed at the end of section 4.

### How to submit

Any individual or organisation can make a submission to the NTC. To make an online submission, please visit [www.ntc.gov.au](http://www.ntc.gov.au) and select 'Submissions' from the top navigation menu.

Alternatively, you can mail your comments to: Att: Productivity Framework, National Transport Commission, Level 15/628 Bourke Street, Melbourne VIC 3000.

Submissions will be received until Thursday 6 October 2016.

Where possible, you should provide evidence, such as data and documents, to support your views. Unless you clearly ask us not to, we will publish all submissions online. However, we will not publish submissions that contain defamatory or offensive content.

The *Freedom of Information Act 1982 (Cwlth)* applies to the NTC.

## 2 Why create the National Land Transport Productivity Framework?

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### Key points

- The purpose of the *National Land Transport Productivity Framework* is to support transport decision-makers to influence positive transport productivity growth and to measure our impact over time.
- Governments, commercial transport operators/users, public transport operators/users and private transport users all make decisions, individually or as a group, that impact on productivity.
- This project is focused on decision-makers who influence nationally significant investment, policy and reform decisions about land transport productivity.

### 2.1 Who will it guide?

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Governments, commercial transport operators/users, public transport operators/users and private transport users all make decisions, individually or as a group, that impact on productivity. The scope of this project is focused on government policymakers who influence nationally significant investment and reform decisions about land transport productivity. However, the framework will importantly also provide a useful tool to facilitate better, more informed discussion between government, industry and the community about transport decisions – for example, businesses choosing whether to invest in networks or upgrade infrastructure, or transport operators deciding whether to upgrade their vehicle fleets or retrofit their existing fleet with new technology based on current and expected growth. One of the objectives of the proposed framework is to create a common language and shared understanding of transport productivity. For that reason, it is important that we engage with stakeholders as widely as possible.

### 2.2 What sorts of decisions will it influence?

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Good decisions on improving transport productivity need to have a strong evidence base. Data quality and availability does not always allow this, but a lack of exact data should not prevent us from making informed decisions. As well as this project, the NTC is concurrently undertaking a project called 'Who moves what where', designed to better inform future planning and policy development in transport by filling gaps in information on passenger and freight movement in Australia. We will shortly release a report that analyses existing data sources and provides an overview of the Australian land transport task, addressing both networks and operators.

This project will draw on information from 'Who moves what where', as well as the results of research and consultation about productivity issues, in order to build a framework for transport decision-makers to align their assessment about the impact of their potential decisions on transport productivity. These could include decisions in the following areas.

#### **Laws and regulations**

Transport laws and regulations are generally focussed on promoting safety, asset protection and fair market competition. These laws can have either positive or negative impacts on productivity. Laws and regulations generally restrain productivity by regulating business or private behaviours (that have natural incentives to be productive) – regulatory reform may focus, for example, on removing some of these barriers to productivity.

#### **Investments**

Decision-makers in the public and private sectors make allocative decisions about how and where to invest in infrastructure (that is, maintain existing infrastructure or building new infrastructure). For example, governments can fully fund, build and operate transport infrastructure or they may do any or all of these in partnership with industry. Investment decisions impact on productivity by delivering appropriate asset quality standards, maintaining/building new capacity, and improving access to jobs, education and leisure activities (which are valued by users).

**Operations**

Fleet and traffic management decisions can positively or negatively affect productivity. Productivity-enhancing examples include using freeway on-ramp signalling to improve traffic flow, and tram prioritisation signalling. Operations that may inhibit productivity would involve closing lanes or replacing trains with buses to allow for road or rail asset maintenance operations.

**Access and network usage**

Access decisions balance asset protection, safety and community amenity objectives against productivity. Access conditions control who may use assets, what vehicles are used where and, sometimes, when they can operate.

## 3 Productivity explained

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### Key points

- Productivity relates to the efficiency of transforming inputs (buildings, machinery, equipment, land and employees) into outputs (a product or service that results from the productive process).
- Productivity growth is the difference between the growth of outputs and the growth of inputs.
- There are several ways to measure productivity; however, 'multifactor productivity' is usually considered to be the most comprehensive because it takes into account the use of both the major inputs – labour and capital.

### 3.1 What is productivity?

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Productivity is a relatively simple concept that relates to the efficiency of transforming inputs, such as capital and labour, into outputs. Although productivity is a straightforward concept, it tends to get mired in confusion and misunderstanding in public discussions. One reason is that productivity can be defined and measured in different ways. Businesspeople, for example, tend to take a financial view based on revenue, profit or cost per unit of input. Engineers, on the other hand, might take a technical view of the capacity of plant or machinery to generate output. Economists tend to think of productivity growth as advances in technology or production knowledge.

For policy purposes – and the view taken in this project – productivity is best thought of as the efficiency of production, as measured by the rate at which quantities of inputs to production are turned into quantities of outputs of goods and services. Put simply, productivity is the ratio of output produced to inputs used over a period of time.

Production inputs can be provided by labour and capital (assets such as buildings, machinery/equipment and land) and can include purchased materials/components, energy and services. Productivity increases if more outputs can be produced using the same inputs.

The generic productivity equation is:

$$\text{Productivity} = \frac{\text{Output}}{\text{Input}}$$

Productivity can be defined for an individual entity, for an industry or sector of the economy, or for the economy as a whole.

#### Inputs and outputs

Inputs are the resources that go into producing goods or services. Virtually all productive processes of goods or services will involve the use of labour and capital inputs. Labour inputs can be measured by the volume of hours worked or by the value of those worked hours (wages). Capital inputs are generally measured by the value of capital used.

Labour and capital inputs are used in productive processes but are not exhausted by them. Intermediate inputs – such as energy, materials and services – are consumed or exhausted during productive processes.

Outputs are the result of productive processes. In general, outputs are measured in terms of volume (of goods produced or services delivered) or value-added.

#### Productivity growth

Most of the discussion and interest in productivity is about changes in productivity over time or productivity growth because productivity growth is one of the most important means to achieve sustainable, long-term economic growth.

Productivity growth is the difference between the growth of outputs and the growth of inputs:

*Productivity growth = Output growth – input growth*

For the purposes of this project, we have adopted the multifactor productivity (MFP) measurement. A more detailed technical discussion of the types of productivity measurement and the reason for our choice is included at Appendix A. An explanation of how the Australian Bureau of Statistics (ABS) currently measures MFP is included at Appendix B.

## **3.2 Why is productivity important in transport?**

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Productivity growth means that a nation generates more output. Importantly, more output also means more income. Productivity determines a nation's ability to harness its physical and human resources not only to produce goods and services but also to generate income and improve its standard of living. Improving national living standards and wellbeing is a key policy goal of governments. Productivity growth can directly improve the material wellbeing of individuals, as well as the competitiveness and profitability of businesses by:

- lowering relative prices for consumers, which in effect increases purchasing power
- raising real wages for workers
- lowering unit costs and raising profits for businesses
- raising tax revenues for governments, which can be spent on public services (DIISRTE, 2013)

Ideally, the transport industry connects Australia by moving people and freight to where they're needed, at the time they're needed, with minimal cost, time and energy consumption and maximum safety. In today's global economy this requires a national response and level of interoperability and visibility across both modes and jurisdictions.

The transport and logistics industry was estimated to account for 8.6 per cent of GDP in 2013, contributing \$131.6 billion to the Australian economy (Transport and Logistics Industry Skills Council, 2015). The domestic freight task in Australia has grown by 50 per cent over the past 10 years and is forecast to grow by another 26 per cent in the coming 10 years. The domestic passenger task has grown by 9.9 per cent over the past 10 years and is expected to continue in this direction (NTC, 2016).

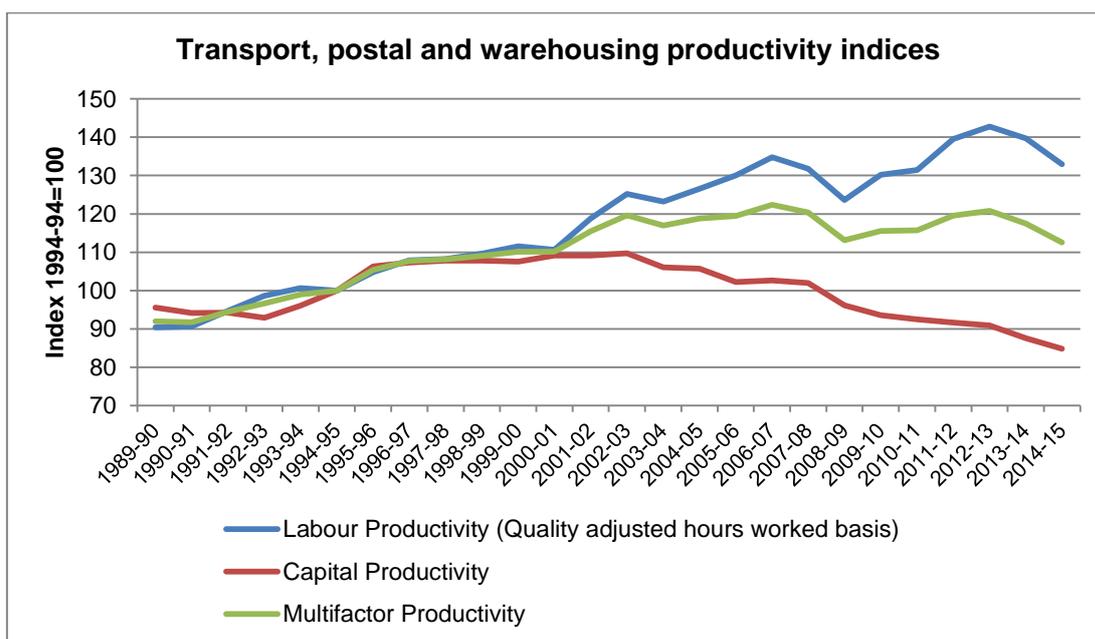
Comparative information on the performance of transport operators could contribute to the wellbeing of the entire transport and logistics supply chain by encouraging improvements in the services they provide, particularly their cost-effectiveness. Customers across the supply chain currently have limited means of gathering information about operator performance in order to choose their service provider. Key reasons for collecting and analysing performance information are to:

- provide meaningful information to supply chain partners and potential partners and other stakeholders
- encourage participation and engagement in jurisdictional regulatory processes and to ensure adequate policy/regulatory settings with minimal red tape
- identify high-performing operators
- enable operators to learn from peers that are delivering their services more efficiently
- generate additional incentives for operators to improve their efficiency.

In addition to being useful for stakeholders, the performance information is relevant to the assessment of any new reform proposals under consideration by the Transport and Infrastructure Senior Officials' Committee.

Figure 1, using the ABS's Transport and Postal and Warehousing industry-level data, shows the trends and relationships between labour productivity, capital productivity and MFP in the transport industry over time.

Figure 1: Productivity trends in transport, postal and warehousing over time



Source: ABS 2015c

The chart in Figure 1 shows that MFP growth for transport, postal and warehousing has slowed since 2002–03 and has declined since 2012–13. The limitation of using the MFP measurement alone is that it is not equipped to explain the reason for any decline or growth in productivity. It is possible that the main reason for the slowing is capital deepening (the amount of capital per worker), together with large increases in public road and rail investment since 2007–08. MFP grew between 2008–09 and 2011–12, probably due to significant increases in labour productivity (BITRE, 2014). However, since 2012–13 labour productivity has also declined, accelerating the decline in MFP. Figure 2 shows how MFP has changed across five productivity cycles since 1989–90.

Figure 2: Multifactor productivity trends since 1989–90

Industry MFP, 1989-90 to 2014-15 <sup>a</sup>							
Per cent per year	1989-90 to	1993-94 to	1998-99 to	2003-04 to	2007-08 to	2007-08 to	1989-90 to
	1993-94	1998-99	2003-04	2007-08	2014-15	2014-15	2014-15
Agriculture, forestry and fishing	3.4	3.8	3.5	-0.9	2.6	2.6	2.6
Mining	2.1	0.4	-0.2	-3.8	-4.1	-1.4	-1.4
Manufacturing	0.7	0.9	1.0	-1.2	-0.1	0.3	0.3
Electricity, gas, water and waste services	2.8	1.9	-2.2	-4.9	-2.8	-1.2	-1.2
Construction	0.3	2.8	1.0	0.9	0.9	1.2	1.2
Wholesale trade	-2.0	5.3	3.1	-0.1	1.5	1.8	1.8
Retail trade	2.0	2.3	2.0	0.4	1.7	1.7	1.7
Accommodation and food services	-0.7	2.0	1.0	0.6	0.1	0.6	0.6
<b>Transport, postal and warehousing</b>	<b>2.1</b>	<b>2.2</b>	<b>1.6</b>	<b>0.9</b>	<b>-0.8</b>	<b>1.0</b>	<b>1.0</b>
Information, media and telecommunications	5.1	3.1	-1.1	0.1	0.5	1.4	1.4
Financial and insurance services	4.5	2.3	0.7	3.7	1.4	2.3	2.3
Arts and recreation services	-0.7	-1.7	0.9	-1.6	0.1	-0.5	-0.5
<b>Market sector</b>	<b>1.2</b>	<b>2.6</b>	<b>1.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.9</b>	<b>0.9</b>

<sup>a</sup> Figures in this table are average annual growth rates. Periods defined according to productivity cycles.

Sources: Productivity Commission estimates based on ABS (*Estimates of Industry Multifactor Productivity, 2014-15*, Cat. no. 5260.0.55.002, December 2015).

# 4 How could transport productivity be measured?

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## Key points

- Australia's prosperity and community liveability is enhanced by the movement of people and goods.
- Reliance on MFP alone won't provide decision-makers with actionable intelligence to make better decisions.
- Australia may be able to adapt relevant parts of existing international survey methodologies to consult relevant parties in the land-based transport system about agreed performance indicators.

## 4.1 Looking at the big picture – what are we trying to achieve?

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Measuring productivity goes to the heart of the role of the NTC. Our stated mission is to champion and facilitate changes that improve productivity, safety and environmental outcomes. This is because, as our vision realises, Australia's prosperity and community liveability is enhanced by the movement of people and goods. Improving transport productivity is one of our strategic goals, but we need to be able to measure it to know we are having an impact.

Reliance on MFP alone won't provide decision-makers with actionable intelligence to make better decisions. The measurement cannot be disaggregated or analysed to determine the cause and effect of interventions or market shifts. To disaggregate the measurements would potentially result in reliability and confidentiality issues. The measurement is also backward looking and makes no forward projections to use in planning and investment decision making. In order to enhance the meaning of the MFP measurement, we believe it will be necessary to define a range of other transport productivity indicators – both quantitative and qualitative – and collect information about them to supplement MFP.

Poor policy decisions and outcomes can arise if we lose sight of the ultimate objective of raising living standards (Productivity Commission, 2009). The notion of living standards goes well beyond economic growth. It includes access to opportunities, quality healthcare and education, meaningful employment, a safe and engaging family and community life, a diverse natural environment, and other factors that contribute to society's happiness, fulfilment and wellbeing. These create the context and reason for achieving productivity growth as we think about policy directions.

Government and the private sector need to understand the impact of our decisions on productivity in order to identify areas for improvement and to formulate evidence-based, targeted strategies. We have proposed that a productive transport sector means that Australia is better connected through the movement of people and freight to the places they are needed, at the time they're needed, with minimal cost, congestion and energy consumption and maximum safety.

## 4.2 How are others doing it?

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One existing productivity framework model to consider is the World Bank's Logistics Performance Index (LPI). According to the World Bank, examining the time and costs associated with logistics processes – port processing, customs clearance, transport and the like – is a starting point to measure the performance of supply chains. But even when complete, this information cannot be easily aggregated, and many critical elements of good logistics – such as process transparency and service quality, predictability and reliability – cannot be assessed using only time and cost information.

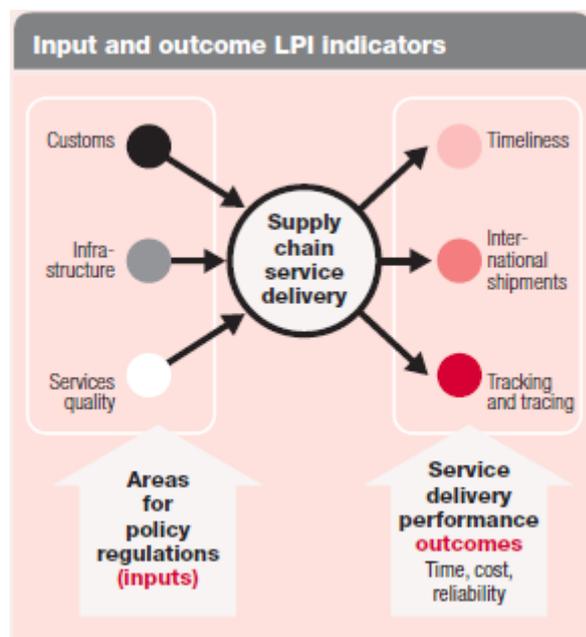
The LPI (see Figure 3) supplements this information by providing an interactive benchmarking tool to help countries identify the challenges and opportunities they face and what they can do to improve their performance. The 2014 LPI allows for comparisons (rankings) across 160 countries. It is based on worldwide surveys of 1,000 global freight forwarders and express carriers to assess the efficiency of trade logistics. The survey is conducted every two years, providing feedback on the logistics 'friendliness' of the countries in which they operate and those with which they trade.

The survey collects information via an online survey for satisfaction against six factors rated from 'very low' (1) to 'very high' (5):

- the efficiency of customs and border clearance
- the quality of trade and transport infrastructure
- the ease of arranging competitively priced shipments
- the competence and quality of logistics services
- the ability to track and trace consignments
- the frequency with which shipments reach consignees within scheduled or expected delivery times.

There is also a set of questions related to the domestic level – that is, respondents answer a set of questions related to the country in which they work. For example, they can describe port charges in their country as 'very high', 'high', 'average', 'low' or 'very low'. The responses are then weighted according to a range of factors, including the income level of their country and the weighting of the indicator, and a score out of 5 is calculated for each country. The full methodology can be found at: <https://wb-lpi-media.s3.amazonaws.com/LPI%20Methodology.pdf>.

**Figure 3: Logistics Performance Index input and outcome indicators**



The LPI consists of both qualitative and quantitative measures and assesses performance along the logistics supply chain within a country. It also offers an assessment of the markets the operators surveyed operate within, which creates incentive and benefit to participation.

While limited to identifying trade logistical issues faced by individual countries, the structure of the index and the methodology it uses to collect and assess data could be useful in developing a framework and measures for improving transport productivity at the national level in Australia.

The World Bank is not alone in conducting such a survey to measure productivity. The US Census Bureau and the US Bureau of Transport Statistics partner to conduct five-yearly surveys as well. The US Commodity Flow Survey (CFS) assesses the demand for transportation facilities/services, energy use, safety risk and environmental concerns. It is the primary source of national and state-level data on domestic freight shipments by American establishments in mining, manufacturing, wholesale, auxiliaries and selected retail and services trade industries. Data are provided on the types, origins and destinations, values, weights, modes of transport, distance shipped and ton-miles of commodities shipped. It provides a modal picture of national freight flows and represents the only publicly available source of commodity flow data for the highway mode. The sampling and methodology is more complex than the LPI measurement. It may be prudent to start with a simple 'LPI-style' survey structure and, if that proves successful, build in further complexity at a later stage.

The 'Who moves what where' project identified surveys as a potential way to fill existing industry information gaps. As seen in the United States, survey results can be used by policymakers and transport planners, business owners, private researchers and analysts for analysing trends in the movement of goods, mapping spatial patterns of commodity and vehicle flows, forecasting demands for the movement of goods and determining needs for associated infrastructure and equipment.

Australia may be able to adapt relevant parts of the survey methodologies of the LPI and the CFS to survey relevant parties in the land-based transport system about agreed performance indicators. Such information could show improvements (or otherwise) in the agreed performance measures and could be used to supplement the existing MFP measurement.

### 4.3 Establishing and collecting information on productivity indicators

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In theory, productivity measures can be applied at any scale – for example, at the national, state, industry or organisation level. We believe that 'starting small' will deliver the best results, be manageable to implement and participate in and be scalable as the maturity of the process grows. Given that 'Who moves what where' identified the most significant information gaps in the freight (as opposed to passenger) sector, we believe this would be a good starting point at which to base the indicators, with opportunity to expand in future.

A productivity-related survey of freight industry operators could be an effective way of collecting this data. It could be limited to a small number of primary metrics to keep the process manageable for respondents and cost-effective for administrators. Further topical or required investigations could be added for a particular year, or could be collected from a smaller sub-set of the industry sample, for example.

From a transport perspective, perhaps the simplest measure of output per operator is tonne-kilometres travelled. As noted above, this can be overly simplistic, so perhaps an alternative would be to try to look at value-based measures such as the value of goods transported; however, this may not necessarily be representative of improved productivity by transport per se.

Additionally, it is important to distinguish between improved 'efficiency' and increased 'activity'. For example, shifting bananas from Townsville to Cairns via Melbourne is high activity and will produce an increase in tonne-kilometres, but it is inefficient and should perhaps be counted as a reduction in real productivity.

To use another example, if the prices of all commodities being transported doubled, the 'value' of the goods transported would also double (assuming all other factors remain constant), but this would not be reflective of improved productivity if the same quantity/volume was being transported.

Another consideration is that the questions need to be accessible and answerable by operators from multinational corporations through to owner-operators. Some potential high-level quantitative output indicators over a 12-month period might include:

- tonnes moved per driver
- tonnes moved per vehicle.

Quantitative input indicators could include:

- number of employees and full/part-time split
- hours worked (volume)
- wage costs of the labour (value)
- total fuel costs (value).

In addition, during the business case development, stakeholders told us about some of the qualitative indicators they think should be considered. These could potentially be included in the way the LPI asks questions. For example, the level of industry satisfaction with:

- level of regulation
- journey time reliability
- infrastructure quality
- ability to track and trace consignments
- port turnaround times.

## 4.4 How can we assess and report on our impact on transport productivity?

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Implementation of a framework should result in the ability to target decision making and planning to improve transport productivity performance. We believe it should:

- facilitate a nationally consistent assessment
- include contributions from small, medium and large size freight operators
- ensure accountability and transparency
- be cost-effective.

The measurement and attribution of outcomes-based key performance indicators can be difficult, and it may take time to establish a pattern from which improvements in performance (or areas for improvement) can be identified. For some, this may mean a period of time between the introduction of the framework and a clear assessment over time of the stated objectives. However, in time, reporting will enable measurement and public education about outcomes, rather than simply reporting against outputs.

The information discussed in section 4.3 could be collected from a sample of the Australian land transport industry to form part of the *National Land Transport Productivity Framework*. This would allow the NTC to compile a national land transport productivity snapshot report based on the survey results, together with the MFP measurement, to provide valuable intelligence across government and industry and allow us to identify strategic areas for improvement.

Quantitative data should be complemented with qualitative information to describe actions taken to influence transport productivity. For example, in future it could be useful to collect information from land transport businesses about indicators that are external to transport but have an impact on market behaviour including:

- advances in and use of technologies
- new management techniques and production processes
- additional workforce skills and policies designed to motivate, better deploy and retain staff
- the nature and quality of infrastructure and networks
- openness to trade and investment and the availability of finance
- how responsive the allocation of resources is across businesses and industries to changes in market conditions
- economies of scale
- natural events
- government regulations – too little, too much or the wrong type
- incentives for innovation.

For an industry survey to be viable, the benefits of collecting the information would need to be balanced against the costs and time burden on both government and industry. The process would need to be:

- valuable for both industry and government
- clear and unambiguous
- simple and relevant
- scalable across modes and jurisdictions
- quantified using existing and reliable information
- suitable for use in developing a future productivity strategy.

### Frequency

The NTC believes a snapshot summary of the indicators discussed in section 4.3 could be provided annually, using an industry survey to inform the report. The external indicators discussed within section 4.4 could be a second stage addition, or perhaps a more infrequent addition to the annual report.

## Questions:

### 1. What should be included?

1.1 Do you agree with the high-level indicators below strike a balance between simplicity and sufficient detail to provide meaningful information about productivity to assist transport decision-makers?

- tonnes moved per driver
- tonnes moved per vehicle
- number of employees and full/part-time split
- hours worked (volume)
- wage costs of the labour (value)
- total fuel costs (value).
- level of regulation
- journey time reliability
- infrastructure quality
- ability to track and trace consignments
- port turnaround times.

1.2 Do you believe the indicators below are appropriate and should be included? Should they be reported on every time along with the 'main' indicators above?

- advances in and use of technologies
- new management techniques and production processes
- additional workforce skills and policies designed to motivate, better deploy and retain staff
- the nature and quality of infrastructure and networks
- openness to trade and investment and the availability of finance
- how responsive the allocation of resources is across businesses and industries to changes in market conditions
- economies of scale
- natural events
- incentives for innovation.

### 2. What gaps are there?

2.1 Are there other indicators we should consider as a starting point in the framework, noting that they can be expanded upon in future?

### 3. How should the results be collected, presented and maintained?

3.1 Do you agree that a simple industry survey would be beneficial and scalable for collecting industry information against the indicators? Would this sufficiently supplement the current MFP to measure land transport productivity in Australia? If so, what kinds of operators should we ensure are included in the survey sampling? What format (online, phone, paper) should an industry survey take?

3.2 If you don't agree a survey is appropriate, in what other ways do you think this information could be collected?

3.3 Who is best placed to design the detail of the National Land Transport Productivity Framework and any associated survey methodology? Is it preferable to have the framework designed by a government, industry or independent/academic institution?

### 4. How would you use the productivity framework?

4.1 Would an annual 'productivity snapshot' report provide suitable frequency to balance information needs with the administrative burden of collecting/reporting the results?

4.2 What activities would you use the results of the productivity framework to inform or influence?

# Appendix A: Productivity measures explained

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Productivity measures, such as those published by the Australian Bureau of Statistics (ABS) and used in policy discussions, are quantity- or volume-based. This means any effects of price inflation are stripped out.

Productivity growth is cyclical – hence comparisons of productivity growth should be made between averages across productivity cycles and caveats should be placed on comparisons across industries and, particularly, countries. Estimates of productivity growth can vary substantially from year to year and therefore it is important not to emphasise an estimate for a single year (Shah & Long, 2013).

While productivity statistics aim to measure technical progress or the efficiency of production, in practice they measure the difference between the growth in the volume of output and the growth in the volume of inputs, which reflects more than just technical progress (BITRE, 2014).

Productivity growth is sometimes referred to as a 'black box' because it is a measure of the residual or what is left over after changes in inputs (labour, capital and whatever else) have been used to explain changes in output. For instance, if labour and capital inputs both increase by 10 per cent but output increases by 12 per cent, then the difference is considered an increase in productivity, assuming no other inputs have changed (Shah & Long, 2013).

There are several productivity measures, which differ according to the input(s) chosen:

- Labour productivity is the ratio of output produced to the amount of labour used (usually the total number of hours worked).
- Capital productivity is the ratio of output to capital used.
- MFP is the ratio of output produced to the amount of both labour and capital used.

These different efficiency measures are all useful in different contexts. MFP, however, is usually considered to be more comprehensive because it takes into account the use of both the major inputs – labour and capital.

## What is labour productivity?

Labour productivity is defined as a ratio of a measure of output to labour input – that is, output per unit of labour. Put more simply, labour productivity is the amount of output produced by an hour of paid work. An increase in labour productivity means that more output is being produced per hour of work (ABS). For instance, labour productivity can increase due to either increases in the capital services used per hour of labour (capital deepening) or due to real improvements (for example, shifting from a semitrailer to a B-double combination, which can carry more volume per trip) (Shah & Long 2013).

$$\text{Labour Productivity (LP)} = \frac{\text{Output}}{\text{Labour(hours)}}$$

While the ABS produces national and industry-level measures of both labour and capital productivity, where data is available, they can also be scaled down for examination at more granular levels such as at the organisational level.

## What is capital productivity and capital deepening?

Capital productivity is defined as a ratio of a measure of output to capital input – that is, output per unit of capital. Changes in this ratio can also reflect technological changes and changes in other factor inputs (such as labour).

Capital deepening refers to changes in the capital to labour ratio. Increased capital deepening means that, on average, each unit of labour has more capital to work with to produce output so is an indicator of ability to augment labour. Labour saving practices, such as automation of production, will result in increased capital deepening, which is often associated with a decline in capital productivity. Growth in capital deepening is an important driver (alongside MFP) of labour productivity growth. It may not be very useful to interpret declines in capital productivity in isolation

since declines in capital productivity can be more than offset by gains in labour productivity (resulting in MFP growth).

### **What is multifactor productivity?**

The Productivity Commission notes that the 'ABS's aggregate multifactor productivity is the measure that comes closest to the underlying concept of productivity – that is, the efficiency of producers in producing output using both labour and capital' (Productivity Commission, 2015).

$$\text{Multifactor Productivity (MFP)} = \frac{\text{Output}}{\text{Combined labour \& capital input}}$$

In effect, MFP is the unaccounted level of output when labour and capital inputs are accounted for in the production of the outputs. What is left (in the unaccounted level of output) is the improvement (or decline) in productivity.

### **So which one should we use?**

As explained above, there are three commonly accepted quantitative measurements of productivity. These different efficiency measures are all useful in different contexts. MFP, however, is usually considered to be more comprehensive because it takes into account the use of both the major inputs – labour and capital. MFP measures offer more comprehensive explanations to the sources of output growth. Specifically, MFP statistics are designed to inform how much economic growth originates from productivity growth (increased outputs from the same quantity of inputs) and how much from increased inputs (increased outputs from more capital goods or additional working hours). MFP, therefore, is most commonly used in rigorous productivity analysis (ABS, 2015b).

The interpretation of any productivity measure needs to be treated with caution.

The measurement of MFP growth reflects the influence of all the other factors that determine how effectively labour and capital combine to produce output.

Labour productivity growth is affected by all the same factors that affect MFP growth *plus* the amount of capital that is available per worker (because capital is not included in the measure of inputs). This means labour productivity growth is often portrayed as a combination of capital deepening (essentially increases in the capital-labour ratio) and MFP growth (improvements in general production efficiency).

For example, labour productivity improves if workers are given machinery and equipment over hand tools (capital deepening) and if the capital tied up in a plant or factory is more fully utilised through the introduction of work shifts (MFP growth).

Labour productivity growth is an indicator of a lot more than just how hard and effectively workers are applying themselves to their appointed tasks. Productivity growth at the organisational level comes from innovation, doing something different, or introducing a new and better way to produce the organisation's outputs or produce new and better-quality products. It is not always necessary to invent in order to innovate. Existing innovations that were invented by others can be adopted or adapted to suit the organisation's needs.

Some think of productivity as making do with less or working harder. That can happen in some situations in the short term. But working smarter, rather than working harder, does much more to improve productivity over the long term. The use of computers and other sophisticated equipment, for example, mean today's workers produce a lot more output in a day than those a decade or a generation ago.

Productivity also depends on organisational and industry dynamics – the entry and exit of businesses in an industry and their relative growth and decline. There is a range in productivity levels across organisations, even within the same industry. For example, if higher-productivity businesses grow or enter more rapidly than lower-productivity businesses decline or exit, the average productivity of the industry as a whole will increase.

The same applies to the relative growth and decline of industries as a proportion of the total economy. National productivity can increase or decrease depending on the relative growth of higher- and lower-productivity industries. The importance of considering both quantitative and qualitative measures is discussed in section 4 of this paper.

# Appendix B: The ABS MFP measurement

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The Australian Bureau of Statistics prepares industry-level indices for various industry sectors, including one for the transport, warehousing and postal sector. This provides some information about the changes in productivity growth in the sector. However, because the measure on the one hand includes inputs and outputs of non-land transport activities and on the other does not factor inputs and outputs from certain relevant land transport activities, its use in guiding policy and business decisions without additional information presents challenges. The current measurement also focuses on the hire and reward sector of the freight industry and does not factor in the ancillary sector.

## Methodology

The methods the ABS uses in compiling productivity statistics align with international best practice as implemented by most OECD countries. The ABS MFP statistics are compiled on the basis of the standard growth accounting framework, which is widely adopted by leading statistical agencies and recommended by the OECD (ABS, 2015c). The ABS includes the following list of assets in its capital inputs when analysing multifactor productivity:

1. six types of machinery and equipment:
  - computers and computer peripherals
  - electronic and electrical machinery and communications equipment
  - industrial machinery and equipment
  - motor vehicles
  - other transport equipment; and other plant and equipment
  - buildings and structures other than dwellings
2. livestock
3. three types of intangible fixed assets:
  - artistic originals
  - mineral exploration
  - computer software
4. inventories
5. land
6. Intermediate purchases (inputs purchased from other suppliers), for example:
  - fuel costs
  - electricity/diesel costs (for trains)
  - materials (tyres, spare parts, etc.)
  - purchased services (repairs, pilot vehicles, etc.)
  - business-level measurements.

A detailed methodology for the measurement is explained in Chapter 19 of the ABS's *Australian System of National Accounts Concepts, Sources and Methods Australia 2015* document.

The ABS produces estimates of national labour productivity, capital productivity and MFP for the transport and postal and warehousing industry sector. These estimates are calculated as real GDP or gross value added per unit of labour (by hours worked or quality-adjusted hours worked), capital (by IT-capital, or non-IT capital values) or the combination of both (in the case of MFP).

The ABS measures transport outputs:

*... by the amounts receivable for transporting goods or persons. That is, the transporting from one location to another is a process of production and is referred to as a transport margin that adds to the usefulness of a good by changing its location. The main output of transport is the value of the service provided in making goods available and accessible to purchasers. The value of the service is equal to the trade margins realised on the goods sold. (ABS, 2015a)*

### **Limitations of national industry-level productivity estimates**

There are a number of reasons to be cautious about using the national industry-level productivity estimates:

- Industry definitions include activities outside of the land transport task.
- Industry definitions do not include ancillary freight in the road sector.
- Private transport use is not currently included in the industry definition.

The ABS uses the standard Australia and New Zealand School of Government's Institute for Governance (ANZIG) industry definitions to collect the national accounts data that are the source of its productivity estimates. The ANZIG Transport, Postal and Warehousing Division includes organisations mainly engaged in providing transportation of passengers and freight by road, rail, water or air, as well as other transportation activities such as postal services, pipeline transport and scenic and sightseeing transport. It also contains organisations mainly engaged in providing goods for warehousing and storage activities and support services for the transportation of passengers and freight, such as stevedoring services, harbour services, navigation services, airport operations and customs agency services (Long & Shah, 2013). Clearly, many of the activities measured go beyond relevant land transport activities.

Further to this, the activities of 'ancillary road fleet' operators (those who operate their own fleet of vehicles to support or distribute the product of a core business) are not included. Additionally, only 32 per cent of all road transport operational costs are captured in the transport, postal and warehousing industry sector – the remaining costs were attributed across other market sectors (BITRE, 2014).

The transport sector MFP provides interesting information about changes in productivity growth in the sector. Because the measure includes, on the one hand, inputs and outputs of non-land transport activities and, on the other hand, excludes inputs and outputs from certain relevant land transport activities, its use as a high-level measure for guiding policy and strategy decisions for the land transport sector presents challenges. At the same time, the transport sector MFP growth index does provide a single measure of productivity that could be used as a high-level outcome measure to assess efforts to improve productivity in the sector.

Policymakers would need to take care in interpreting MFP as a stand-alone measure and using it as a basis to develop policy directions. It could become a more meaningful measurement if supplemented with a qualitative component. Section 4 of this paper talks more about this.

# Glossary

Term	Definition
Labour productivity	The amount of output produced by an hour of paid work.
Capital productivity	A ratio measure of output to capital input – that is, output per unit of capital.
Multifactor productivity	Value-adding output produced per unit of combined inputs of labour and capital.
Tonne-kilometre	A unit of measure of freight transport that represents the transport of one tonne of goods by a given transport mode over a distance of one kilometre.

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