The Industry Sources of Australia's Productivity Slowdown

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Overview

- Background

- Methodology

- Empirical results

- Concluding remarks

Background

- Key issues

  – Is there a productivity slowdown and how severe

  – How individual industries contribute to the slowdown

  – Is slowdown cyclical or due to structural change

- The ABS productivity statistics

  – Aggregate labour and MFP statistics

  – Industry level datacube

- Contribution of this study

  – Integrate aggregate productivity statistics with industry level details

  – Quantitative assessments of contributions of individual industries to aggregate productivity performance

Decomposition of ALP
(Stiroh 2002)

- Aggregate output growth

$$\Delta \ln V = \sum_i w_i \Delta \ln V_i$$

- Industry gross output

$$\Delta \ln Y_i = (1 - v_{x,i}) \Delta \ln V_i + v_{x,i} \Delta \ln X_i$$

- Decomposition of ALP

$$\Delta \ln ALP = \sum_i w_i \Delta \ln LP_i^Y - \left[\sum_i m_i (\Delta \ln M_i - \Delta \ln Y_i) \right] + \sum_i (w_i - h_i) \Delta \ln H_i$$

Industry Contributions to Aggregate Productivity Growth (Timmer et al. 2010)

- Industry labour productivity

$$\Delta\ln LP_i^v = s_{ik}\Delta\ln k_i + s_{il}\Delta\ln LQ_i + MFP_i^v$$

- Contribution of capital deepening

$$LPcon_i^k = w_i s_{ik}\Delta\ln k_i$$

- Contribution of labour quality

$$LPcon_i^{LQ} = w_i s_{iL}\Delta\ln LQ_i$$

- Contribution of MFP

$$LPcon_i^{MFP} = w_i MFP_i^v$$

Data

- ABS Industry MFP datacube

- Confined to 12 industries

- Cover the period 1994-95 to 2009-10

  - Two sub-periods: 1994-95 to 2003-2004 and 2003-04 to 2009-10

- Separate measures of IT capital assets

- Measures of quality adjusted labour input at industry level

Industry Sources of Aggregate Labour Productivity Growth

	1994-95 to 2003-04	2003-04 to 2009-10	1994-95 to 2009-10	2003-04 to 2009-10 less 1994-95 to 2003-04
Aggregate labour productivity growth	**3.20**	**1.84**	**2.53**	**-1.36**
Decomposition using gross output productivity				
Weighted $\Delta \ln(LP_i^Y)$	2.92	1.08	2.00	-1.85
Material reallocation	-0.36	0.00	-0.25	0.36
Hours reallocation	-0.09	0.76	0.29	0.85
Decomposition using value added productivity				
Weighted $\Delta \ln(LP_i^V)$	3.29	1.08	2.24	-2.21
Hours reallocation	-0.09	0.76	0.29	0.85
Contribution of industry weighted				
IT capital per hour	0.75	0.55	0.65	-0.20
Non-IT capital per hour	0.75	0.67	0.71	-0.08
Labour composition	0.24	0.20	0.23	-0.05
Multi-factor productivity	1.54	-0.34	0.66	-1.88

Notes: All figures are average annual percentages. The weights used to calculate the direct industry contributions are industry shares in aggregate nominal value added. IT capital includes computer software and computers.

Industry Decomposition of Aggregate Labour Productivity Growth
1994-95 to 2003-04

Industry	Direct effect (GO labour productivity) $w_i \Delta \ln ALP_i^Y$	Material reallocation $m_i(\Delta \ln M_i - \Delta \ln Y_i)$	Direct effect (VA labour productivity) $w_i \Delta \ln ALP_i^V$	Labour hour reallocation $c_i \Delta \ln H_i$	Aggregate labour productivity growth
A Agriculture, Forestry and Fishing	0.28	-0.09	0.38	0.04	0.41
B Mining	0.09	-0.05	0.13	0.05	0.18
C Manufacturing	0.74	0.08	0.65	0.00	0.66
D Electricity, Gas, Water and Waste Services	0.06	-0.01	0.07	-0.01	0.07
E Construction	0.11	-0.09	0.20	-0.08	0.12
F Wholesale Trade	0.39	0.08	0.32	0.00	0.32
G Retail Trade	0.05	-0.18	0.23	-0.12	0.10
H Accommodation and Food Services	0.13	0.04	0.09	-0.08	0.01
I Transport, Postal and Warehousing	0.13	-0.10	0.22	0.00	0.22
J Information, Media and Telecommunication	0.30	0.04	0.27	0.03	0.29
K Financial and Insurance Services	0.61	-0.08	0.69	0.10	0.79
R Arts and Recreation Services	0.03	0.00	0.03	-0.01	0.02
12 industries	**2.92**	**-0.36**	**3.29**	**-0.09**	**3.20**

Notes: All figures are average annual percentages. GO stands for gross output; VA stands for value added. c_i is the difference between an industry's share in aggregate value added and its share in aggregate labour hours. m_i is the two-period moving average ratio of nominal industry intermediate inputs to nominal aggregate value added. Contributions to labour productivity may not sum to totals due to rounding errors.

Industry Decomposition of Aggregate Labour Productivity Growth
2003-04 to 2009-10

Industry	Direct effect (GO labour productivity) $w_i \Delta \ln ALP_i^Y$	Material reallocation $m_i(\Delta \ln M_i - \Delta \ln Y_i)$	Direct effect (VA labour productivity) $w_i \Delta \ln ALP_i^V$	Labour hour reallocation $c_i \Delta \ln H_i$	Aggregate labour productivity growth
A Agriculture, Forestry and Fishing	0.17	-0.10	0.27	0.00	0.26
B Mining	-0.59	0.03	-0.62	0.78	0.15
C Manufacturing	0.55	0.28	0.27	0.02	0.29
D Electricity, Gas, Water and Waste Services	-0.19	-0.01	-0.19	0.13	-0.06
E Construction	0.12	0.07	0.04	-0.18	-0.14
F Wholesale Trade	0.17	0.04	0.13	0.01	0.14
G Retail Trade	0.11	-0.12	0.23	-0.05	0.18
H Accommodation and Food Services	0.00	0.00	0.00	-0.06	-0.07
I Transport, Postal and Warehousing	0.08	0.01	0.06	-0.01	0.05
J Information, Media and Telecommunication	0.23	-0.03	0.27	-0.02	0.25
K Financial and Insurance Services	0.43	-0.17	0.61	0.19	0.79
R Arts and Recreation Services	0.02	0.00	0.02	-0.03	-0.01
12 industries	**1.08**	**0.00**	**1.08**	**0.76**	**1.84**

Notes: All figures are average annual percentages. GO stands for gross output; VA stands for value added. c_i is the difference between an industry's share in aggregate value added and its share in aggregate labour hours. m_i is the two-period moving average ratio of nominal industry intermediate inputs to nominal aggregate value added. Contributions to labour productivity may not sum to totals due to rounding errors.

Contribution of IT Capital Deepening

	1994-95 to 2003-04	2003-04 to 2009-10	1994-95 to 2009-10	2003-04 to 2009-10 less 1994-95 to 2003-04
12 industries	**0.749**	**0.550**	**0.649**	**-0.198**
Contribution of:				
A Agriculture, Forestry and Fishing	0.006	0.003	0.005	-0.003
B Mining	0.020	0.011	0.016	-0.010
C Manufacturing	0.134	0.090	0.111	-0.044
D Electricity, Gas, Water and Waste Services	0.043	0.020	0.032	-0.024
E Construction	0.034	0.032	0.033	-0.002
F Wholesale Trade	0.064	0.066	0.063	0.002
G Retail Trade	0.053	0.055	0.052	0.003
H Accommodation and Food Services	0.009	0.010	0.009	0.001
I Transport, Postal and Warehousing	0.025	0.030	0.027	0.005
J Information, Media and Telecommunication	0.097	0.044	0.073	-0.053
K Financial and Insurance Services	0.251	0.181	0.218	-0.070
R Arts and Recreation Services	0.012	0.009	0.011	-0.004

Notes: All figures are average annual percentages. The contributions are share-weighted growth rates.

Contribution of Non-IT Capital Deepening

	1994-95 to 2003-04	2003-04 to 2009-10	1994-95 to 2009-10	2003-04 to 2009-10 less 1994-95 to 2003-04
12 industries	**0.751**	**0.673**	**0.713**	**-0.079**
Contribution of:				
A Agriculture, Forestry and Fishing	0.062	0.053	0.055	-0.009
B Mining	0.136	-0.067	0.069	-0.203
C Manufacturing	0.249	0.343	0.269	0.093
D Electricity, Gas, Water and Waste Services	0.050	-0.029	0.016	-0.079
E Construction	-0.035	0.005	-0.007	0.040
F Wholesale Trade	0.064	0.084	0.068	0.019
G Retail Trade	0.022	0.057	0.036	0.035
H Accommodation and Food Services	0.016	0.018	0.017	0.002
I Transport, Postal and Warehousing	0.031	0.079	0.054	0.048
J Information, Media and Telecommunication	0.133	0.191	0.150	0.058
K Financial and Insurance Services	0.005	-0.062	-0.025	-0.067
R Arts and Recreation Services	0.017	0.002	0.009	-0.015

Notes: All figures are average annual percentages. The contributions are share-weighted growth rates.

Contribution of Labour Quality Growth

	1994-95 to 2003-04	2003-04 to 2009-10	1994-95 to 2009-10	2003-04 to 2009-10 less 1994-95 to 2003-04
12 industries	**0.244**	**0.196**	**0.225**	**-0.049**
Contribution of:				
A Agriculture, Forestry and Fishing	0.009	0.004	0.007	-0.004
B Mining	0.008	0.000	0.005	-0.008
C Manufacturing	0.066	0.042	0.056	-0.024
D Electricity, Gas, Water and Waste Services	0.010	0.003	0.007	-0.007
E Construction	0.012	-0.001	0.007	-0.013
F Wholesale Trade	0.024	0.034	0.028	0.010
G Retail Trade	0.016	0.017	0.016	0.001
H Accommodation and Food Services	0.005	0.006	0.005	0.001
I Transport, Postal and Warehousing	0.019	0.011	0.016	-0.008
J Information, Media and Telecommunication	0.012	0.010	0.011	-0.002
K Financial and Insurance Services	0.061	0.068	0.064	0.007
R Arts and Recreation Services	0.004	0.002	0.003	-0.002

Notes: All figures are average annual percentages. The contributions are share-weighted growth rates.
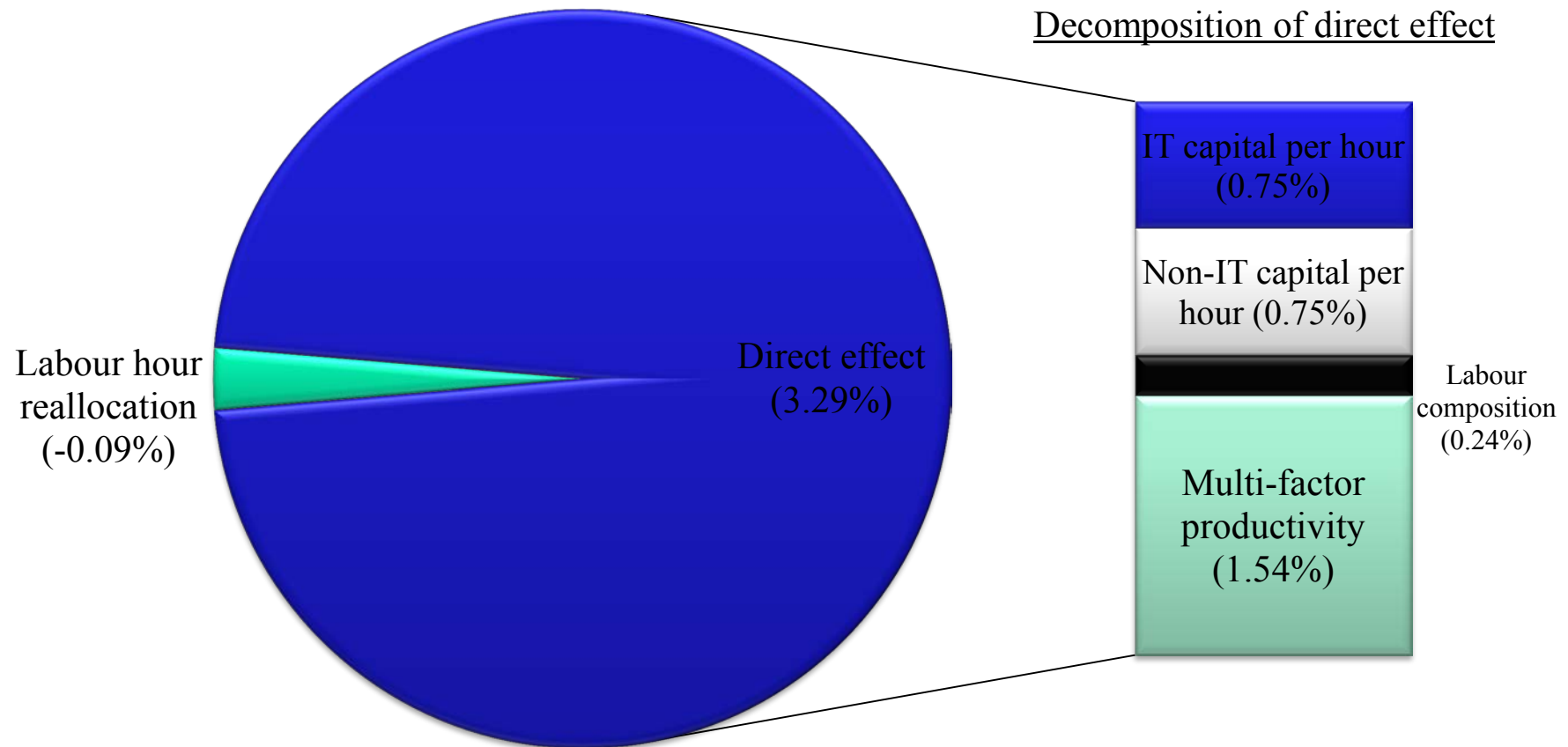
Contribution of Industry MFP Growth

	1994-95 to 2003-04	2003-04 to 2009-10	1994-95 to 2009-10	2003-04 to 2009-10 less 1994-95 to 2003-04
Domar-Weighted MFP	**1.540**	**-0.342**	**0.657**	**-1.882**
Contributions				
A Agriculture, Forestry and Fishing	0.298	0.205	0.195	-0.093
B Mining	-0.032	-0.565	-0.242	-0.533
C Manufacturing	0.206	-0.207	0.015	-0.413
D Electricity, Gas, Water and Waste Services	-0.030	-0.178	-0.089	-0.148
E Construction	0.191	0.006	0.126	-0.185
F Wholesale Trade	0.167	-0.054	0.074	-0.221
G Retail Trade	0.137	0.102	0.109	-0.036
H Accommodation and Food Services	0.061	-0.038	0.019	-0.099
I Transport, Postal and Warehousing	0.148	-0.057	0.076	-0.205
J Information, Media and Telecommunication	0.024	0.024	0.014	0.000
K Financial and Insurance Services	0.372	0.418	0.364	0.046
R Arts and Recreation Services	-0.002	0.003	-0.005	0.005

Notes: All figures are average annual percentages.

Growth Accounting Results for Aggregate Labour Productivity
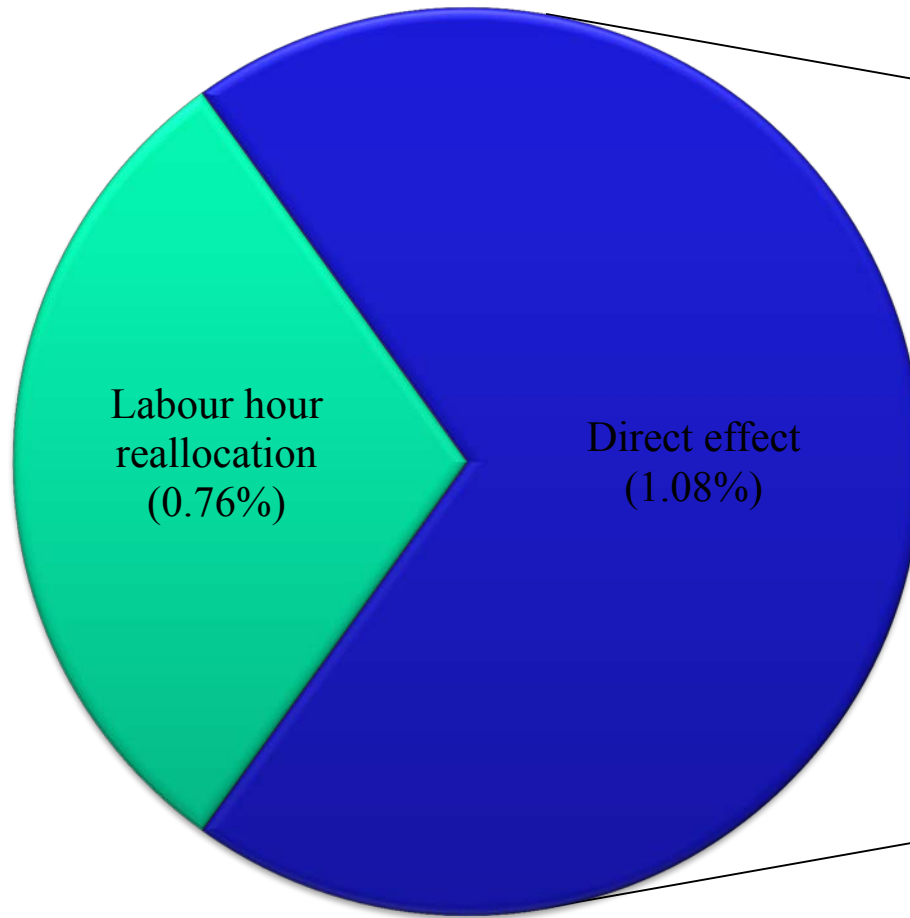## Decomposition using value added productivity, from 1994-95 to 2003-04

Decomposition of aggregate
labour productivity growth (3.20%)

Decomposition of direct effect

Labour hour reallocation (-0.09%)

Direct effect (3.29%)

IT capital per hour (0.75%)

Non-IT capital per hour (0.75%)

Labour composition (0.24%)

Multi-factor productivity (1.54%)

Growth Accounting Results for Aggregate Labour Productivity
Decomposition using value added productivity, from 2003-04 to 2009-10

Decomposition of aggregate
labour productivity growth (1.84%)

Decomposition of direct effect

Labour hour reallocation (0.76%)

Direct effect (1.08%)

IT capital per hour (0.55%)

Non-IT capital per hour (0.67%)

Labour composition (0.2%)

Multi-factor productivity (-0.34%)

Concluding Remarks

- The impact on aggregate productivity of the mining boom and structural change is significant. The shift to high-productivity-level mining industry accounted for more than 40% of ALP growth

- IT capital deepening played a significant role in Australia's productivity surge for the period between mid 1990s and early 2000s.

- The role of human capital in productivity growth has been limited in Australia

- MFP has been the dominant driver of labour productivity growth, and recent poor MFP performance is attributable to Mining, Manufacturing, and Utility industries

- Looming positive signs of productivity outlook

    - Mining projects will deliver outputs

    - Innovative efforts by mining companies will bear fruits