

TACKLING CORONAVIRUS (COVID-19)
CONTRIBUTING TO A GLOBAL EFFORT

COVID-19 and Productivity-Enhancing Reallocation in Australia:

Real time evidence from Single Touch Payroll

UNSW CAER Seminar

Dan Andrews*, Elif Bahar and Jonathan Hambur****

24 September 2021

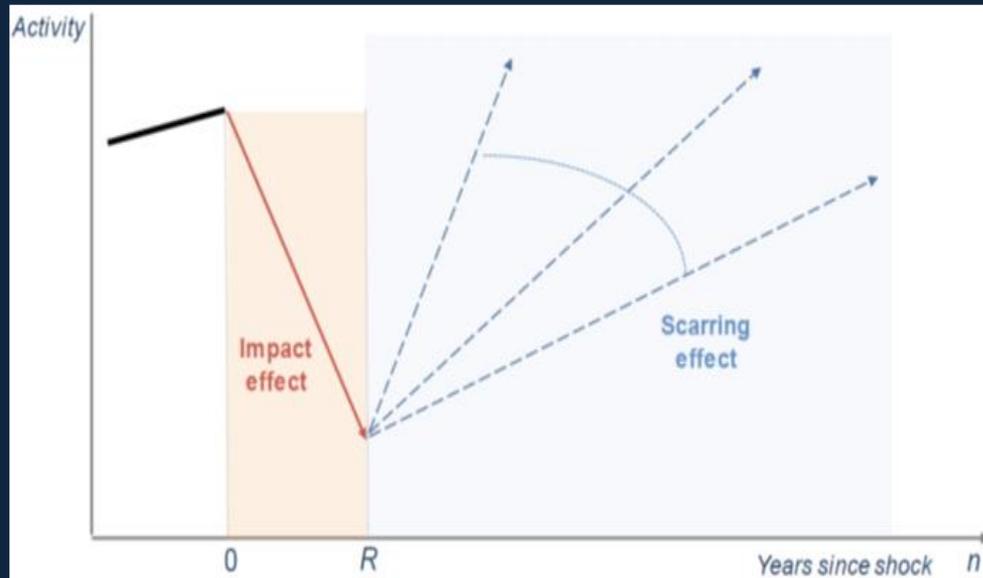
*** OECD Economics Department**

**** Australian Treasury – Macroeconomic Group**

The views expressed in this paper are those of the authors and do not necessarily reflect those of the OECD, the Australian Treasury or the Australian Government.

There are known knowns:

We will be asked about the impact of COVID-19 on potential output within 5 years.



There are known unknowns:

We don't yet know the answer and won't for some time.

Can we ride the real time data wave to understand the potential output impacts of COVID-19 sooner?

How will COVID-19 affect potential output?

POTENTIAL LABOUR		POTENTIAL CAPITAL		POTENTIAL TFP	
Quantity	Quality			Within-firm productivity	Resource reallocation
Death (0)	Less schooling (-)	Obsolescence (-)	ICT investment (+)	Experimentation (+)	Cleansing (+)
Immigration (-)	Scarring (-)	Uncertainty (-)		Firm specific capital (-)	Exit of productive but fragile firms (-)
				Diverted managerial time (-)	Between-sector shifts (+)
				Global knowledge spillovers (-)	

Many channels operate over long horizons, are not directly observable or face data constraints

Reallocation channel is an exception:

- *Feasibility*: can leverage a rich literature if real time employment data can be merged with (pre-crisis) firm productivity
- *Relevance*: COVID-19 has been characterised as a reallocation shock (Barrero et al 2020) but the debate has so far lacked a link with productivity
- *Policy*: potential output losses from recessions lower in environments where policy more readily accommodates reallocation in the aftermath of a shock.



Reallocation: Two key dimensions

Market economies typically exhibit a:

1. High **rate of reallocation**: >20% of jobs are reallocated each year. On average across OECD countries before the GFC:
 - Job creation rate (JC)=12% → 1/4 due to firm entry
 - Job destruction rate (JD)=10% → 1/3 due to firm exit
2. Strong **reallocation-productivity** link:
 - Much scope for reallocation to boost aggregate productivity due to widespread heterogeneity in firm productivity within narrowly defined industries (Syverson 2011)
 - Resources are typically reallocated towards more productive firms. Less productive firms are more likely to contract/exit.
 - Largely a within-sector phenomenon
 - Job destruction entails costs, so we don't want reallocation for its own sake: it needs to be productivity-enhancing.



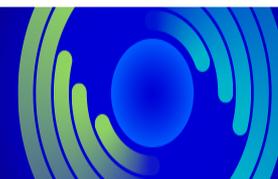
Recessions, reallocation and productivity

Conventional view: recessions provide a fertile breeding ground for restructuring (**cleansing effects**) as markets select (scrap) the most (least) productive firms (Caballero & Hammour 1994). In US recessions:

- 1940s-early 2000s: \uparrow Reallocation [\uparrow JD $>$ \downarrow JC] + strong link with productivity
- GFC: \downarrow Reallocation (\uparrow JD $<$ \downarrow JC) + weaker link with productivity, esp young firms

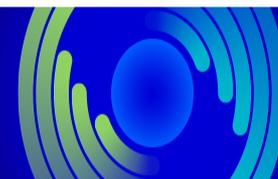
Why might this link between productivity and reallocation weaken?

- **Credit frictions** \rightarrow productive but financially fragile firms to contract/exit (Barlevy 2003) but this may not overturn cleansing (Osotimehin & Pappada 2015)
- Young firms' fragile **learning-by-doing** process gets disrupted (Ouyang 2009)



Did COVID-19 disrupt the Productivity-Enhancing Reallocation process? *An initial exploration*

- **Hypothesis 1**: the COVID-19 shock severely disrupted the typical reallocation process:
 - Exogenous (health) shock and lockdowns affected all firms, regardless of productivity
 - Broad-based access to JRS severed reallocation-productivity link
 - *Prediction*: β [correlation (Δ employment and firm productivity)]=0
- **Hypothesis 2**: reallocation dynamics remained intact
 - COVID-19 forced a wave of experimentation with “novel modes of business, work, consumption and communication” and accelerated digital transformation (Barrero et al 2020; Nadella, 2020).
 - High productivity firms (better managed) more able to accommodate teleworking + adapt business model to social distancing
 - *Prediction*: β [correlation (Δ employment and firm productivity)]>0



COVID-19 and the reallocation-productivity link: empirical evidence is scarce

Suggestive of hypothesis 2 – reallocation-productivity link intact – but key empirical and theoretical weaknesses:

- **UK:** hours worked falls more sharply in 2020-Q2 for firms that had lower productivity (2017-19), based on Survey data (Bloom et al 2021).
- **France & Japan:** fewer failures in 2020 but firm failure-productivity link similar in 2019 and 2020, based on commercial data (Cros et al 2021; Hong & Saito 2021).
- **Italy:** better managed firms expected smaller declines in sales during lockdown; more able to support teleworking? (Lamorgese et al 2021)



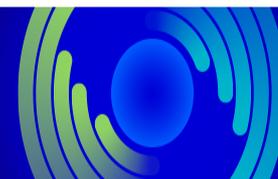
Key results: Productivity and reallocation remained linked

- Reallocation-productivity link remained intact over the course of the pandemic
 - High productivity firms more likely to expand, low productivity firms more likely to contract/exit
- Productive firms were more resilient to the shock:
 - The scarring effects from an indiscriminate shakeout of productive firms – and the associated destruction of firm-specific intangible capital – were avoided.
- Consistent with analysis based on smaller firms in Xero (see Andrews, Charlton and Moore, 2021)
- Timeliness is a significant advance on the GFC



Key results: JobKeeper played a crucial role, but became more distortive

- JobKeeper 1.0 disproportionately shielded productive firms, especially financially fragile ones
 - Reallocation-productivity link was actually *stronger* in local labour markets with higher share of workforce on JK1
- Not the case under JobKeeper 2.0
 - Where more labour transitioned off, it flowed to more productive firms
 - Suggests JobKeeper was becoming more distortive over time as eco recovered
- Australia engineered “Hibernation, not Zombification”:
 - Temporary JRS can protect workers from scarring without significantly distorting firm dynamics
 - But you need an exit strategy: allocative distortions build over time
 - JRS should be temporary and evolve as conditions change
- Aggregate productivity impacts of JK’s introduction and subsequent phase-out were material.

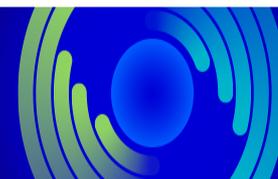


TACKLING CORONAVIRUS (COVID-19)
CONTRIBUTING TO A GLOBAL EFFORT

Real-time data

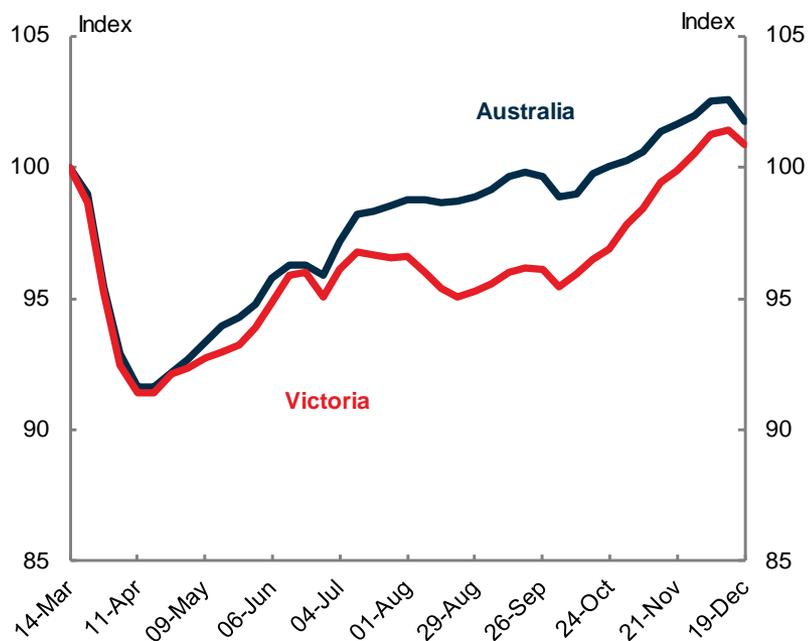
Data

- Set-up dataset for (almost) real-time monitoring
 - Firm-level dataset, allows tracking of firm outcomes over 2020 and early 2021.
 - Merge tax data – Business Income Tax (BIT) and Single Touch Payroll (STP).
- **Labour productivity (in 2018/19):**
 - Defined as: $\log(\text{value added sales per employee})$
 - Value added sales = profit (revenue – non-labour cash expenses) + interest payments + depreciation + wages paid
- **Employment growth rate (in 2020/21):**
 - Defined as: difference between given month and March 2020 headcount, expressed as growth rate (bounded b/w -200 and 200).
 - Calculate for all months Apr 2020 to May 2021 to track outcomes over course of crisis.
- **Currently extending to use TFP (results robust to this)**



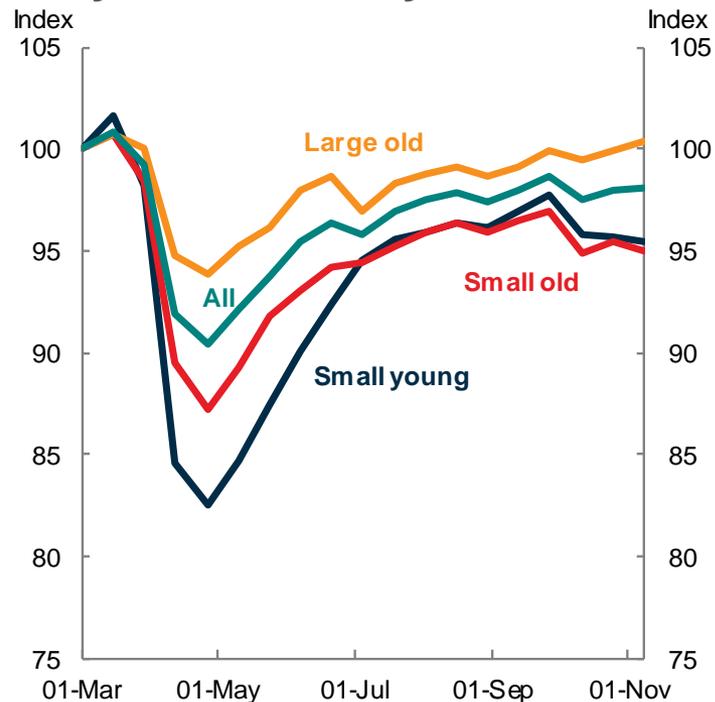
Variation in job loss and subsequent recovery in jobs evident – across regions and firm size/age

Payroll Jobs – Australia vs Victoria

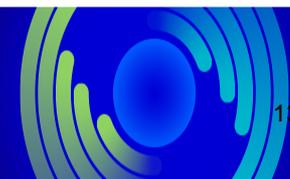


Note: all series indexed to week ending 14 March 2020. Source: ABS Weekly Payrolls.

Payroll Jobs – by Firm Size

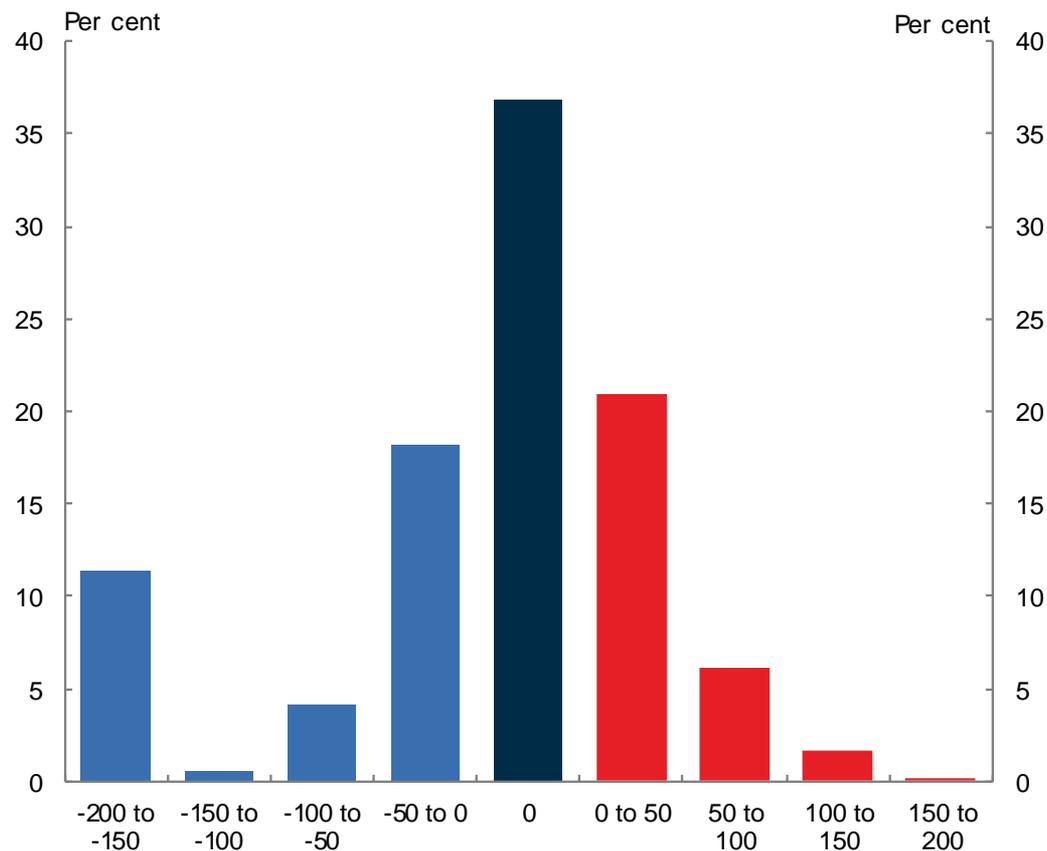


Note: all series indexed to week ending 14 March. Small 1-199 employees. Young 0-5 years. 2020. Source: Treasury analysis of STP data



Variation in employment growth still present

Distribution of firms' employment growth rates (March to December)



Note: employment growth is bounded between -200 and 200 such that firm exiting market has growth rate of -200. We do not analyse dynamics amongst newly entering firms.



TACKLING CORONAVIRUS (COVID-19)
CONTRIBUTING TO A GLOBAL EFFORT

Baseline results

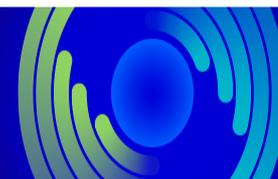
Baseline regression model

$$E_{isr} = \alpha + \beta LP_{isr} + X_{isr} + \rho_{sr} + \varepsilon_{isr}$$

- E is either: *i*) cumulative change in **employment**, or *ii*) **firm exit** probability (in firm i , industry s and region r).
- LP is pre-crisis firm-level log labour productivity
- X includes pre-crisis firm size and firm age dummies
- ρ are fixed effects: industry & region or industry*region

Expectations?

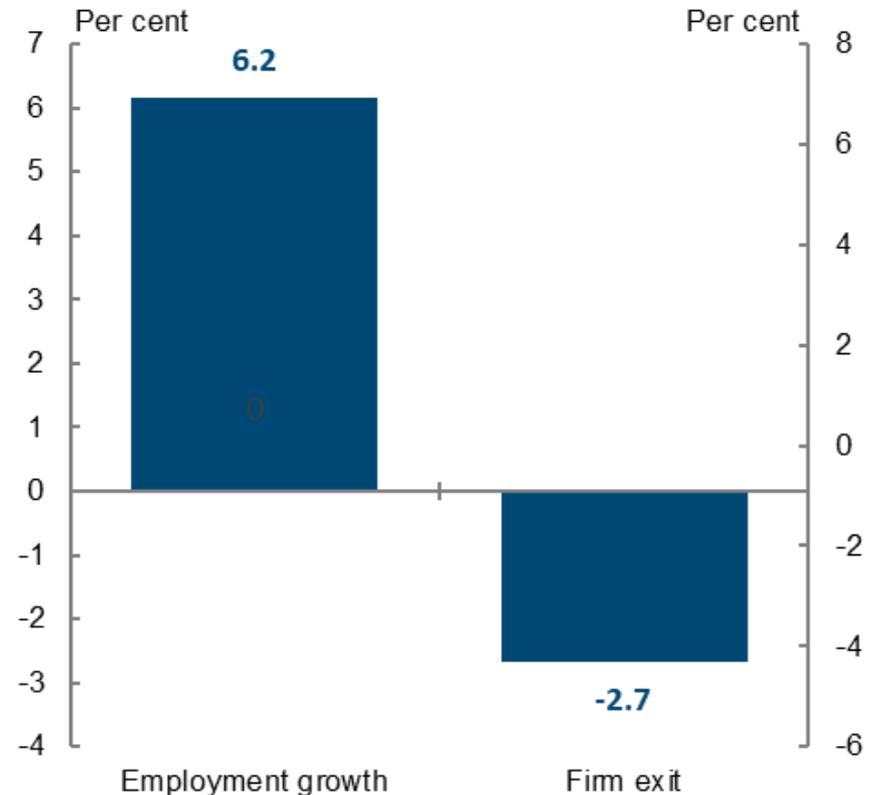
- $\beta=0$ → reallocation-productivity link **distorted** by pandemic
- $\beta>0$ (employment) or $\beta<0$ (exit) → within-industry labour reallocation is **productivity-enhancing**



Higher productivity firms are more resilient

- High productivity firms **more likely to expand**.
- High productivity firms **less likely to exit**.
- Evidence that link between labour reallocation and productivity not distorted, still intact during crisis.
 - Labour flowing towards more productive uses.

Estimated employment growth and exit gaps between high and low productivity firms, March to December



Note: bars chart estimated standardised regression coefficients. High/low productivity firm is +/- 1 sd above the industry mean.

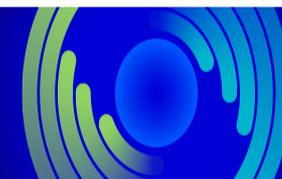


Statistically significant labour reallocation towards firms in top productivity quartiles

Baseline results to December

	A: Change in employment		B: Probability of firm exit	
	(1)	(2)	(3)	(4)
Labour productivity _{isr}	2.568*** (0.160)		-0.0149*** (0.00100)	
Labour productivityQ2 _{isr}		4.691*** (0.372)		-0.0271*** (0.00163)
Labour productivityQ3 _{isr}		6.589*** (0.373)		-0.0392*** (0.00220)
Labour productivityQ4 _{isr}		7.241*** (0.521)		-0.0413*** (0.00305)
Constant	-45.36*** (1.661)	-23.23*** (0.276)	0.306*** (0.0104)	0.178*** (0.00156)
Fixed effects				
Firm size	Yes	Yes	Yes	Yes
Firm age	Yes	Yes	Yes	Yes
Industry x State FE	Yes	Yes	Yes	Yes
Number of obs	403693	403693	492477	492477
Adjusted Rsquared	0.0272	0.0271	0.0632	0.0630

Note: clustered standard errors in parentheses. * p<0.05 ** p<0.01 *** p<0.001



Motivation for heterogeneity – cleansing vs sully/scarring effects?

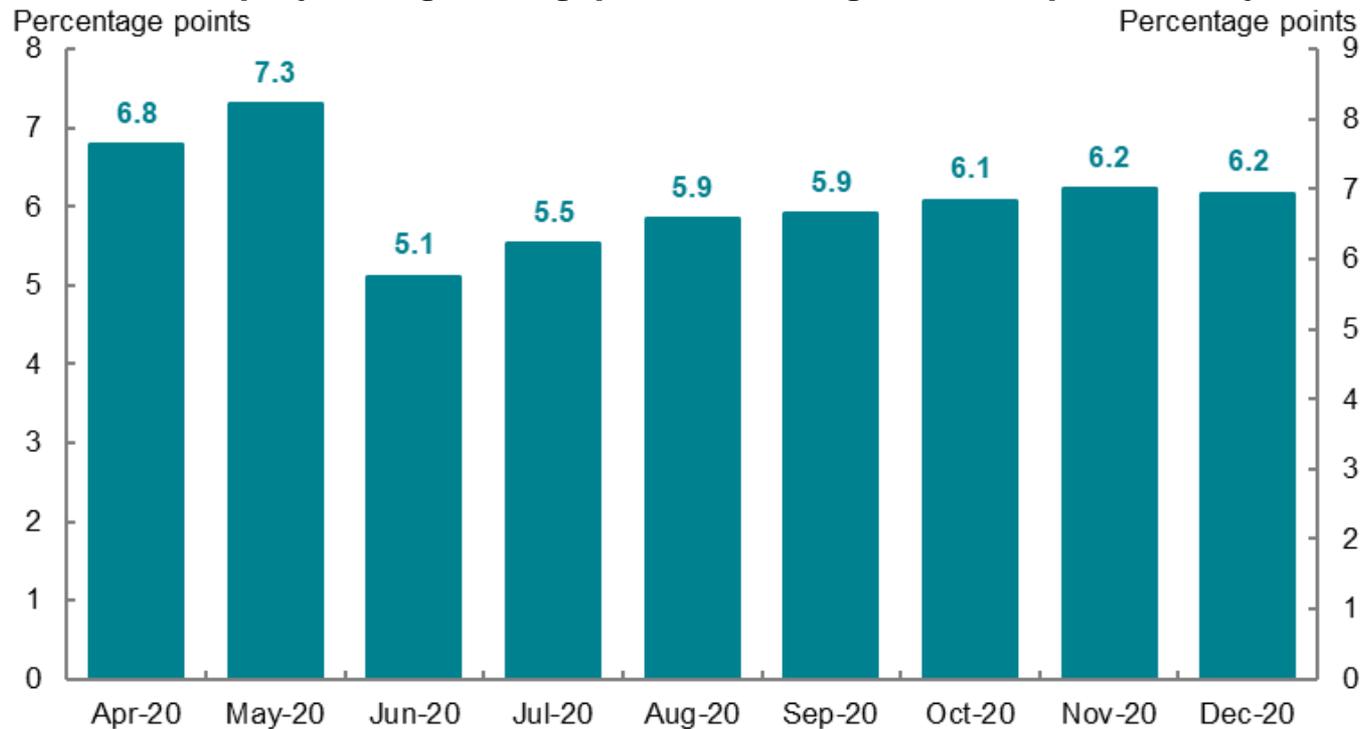
- Earlier evidence of recessions having cleansing effects.
 - Recessions can spur firm restructuring & worker movement across firms.
- But, evidence for GFC was towards scarring effect – firm exit was function of financial constraints instead of productivity.
- COVID? Health-based, unique shock. Want to indirectly test whether results indicate cleansing effect.
 - Do firms with greater exposure to shock exhibit more productive reallocation?
 - Test this by looking at different time periods, locations and sectors that we know were hard-hit.



During times of greater economic shock → more productive reallocation

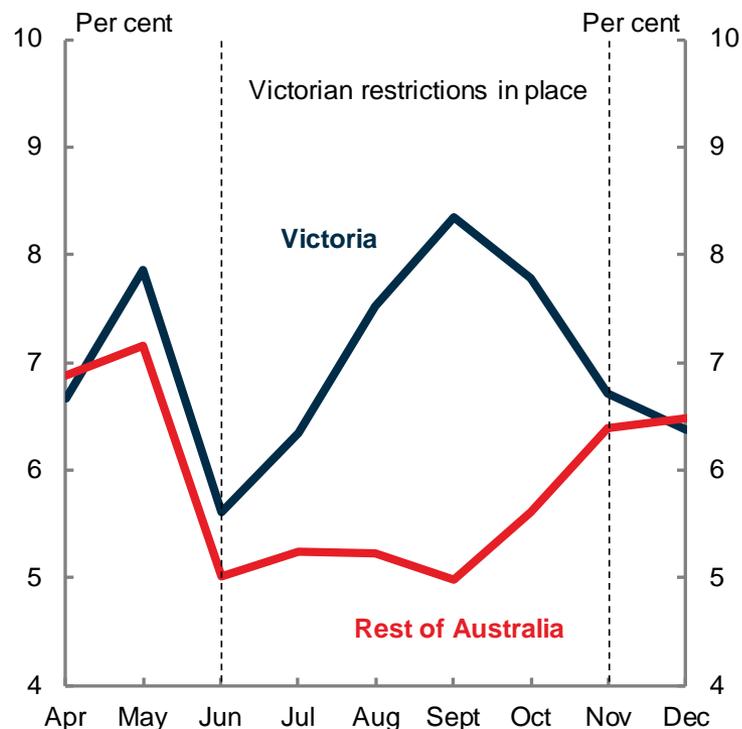
- Productivity-enhancing reallocation strong when economic activity weak (i.e. April-May 2020) – indication of cleansing effect.

Estimated employment growth gaps between high and low productivity firms



Victoria vs Rest of Australia

Estimated employment growth gaps between high and low productivity firms, Victoria vs rest of Australia



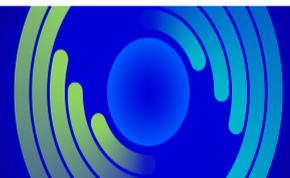
Note: charts estimated standardised regression coefficients separately for Victoria and rest of Australia. High/low productivity firm is +/- 1 sd above the industry mean.

- More productivity-enhancing labour reallocation in **Victoria**, where restrictions and economic shock has been stronger.
- Productive firms even more resilient during peak of Victorians restrictions.



Are the results by firm size consistent with the cleansing hypothesis?

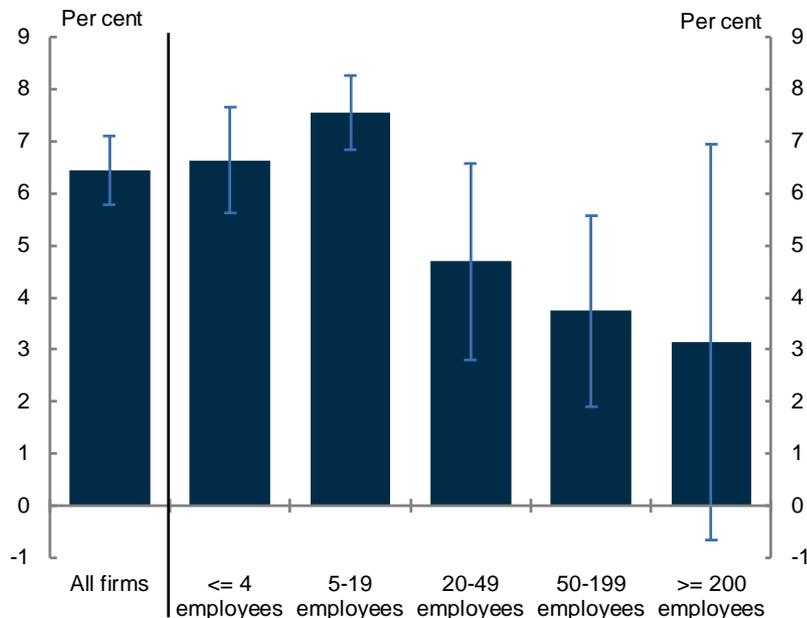
- Small firms got hit worse by shock (see earlier chart on payroll jobs decline).
- Small firms are drivers of future growth – it's important for productive dynamics to hold amongst this sample.
- Previous literature shown smaller firms more responsive in normal times.
- But they have more credit constraints → could see less correlation b/w productivity and outcome during recession (smaller firms in general less able to weather shock).



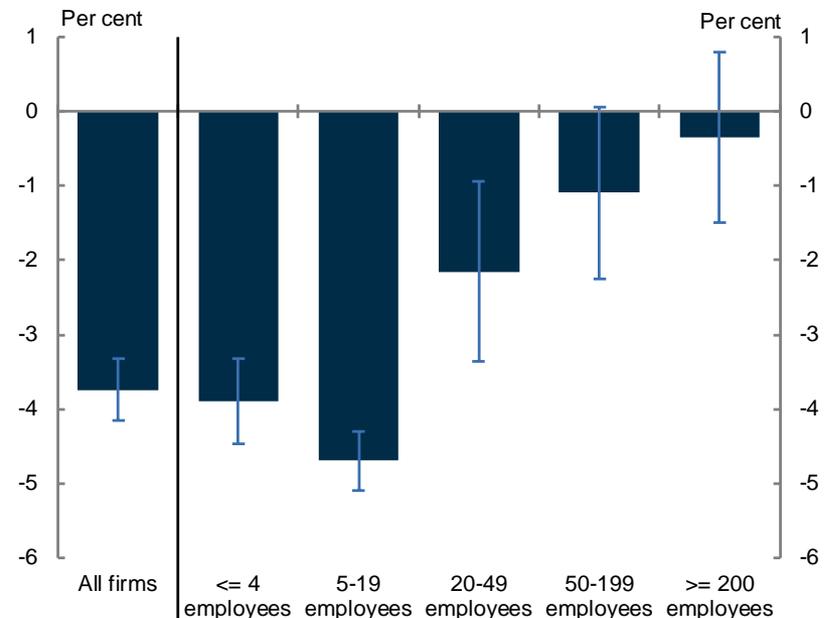
Reallocation-productivity link stronger amongst small firms

$$\Delta E_{isr} = \alpha + \beta LP_{isr} * Size_{isr} + X_{isr} + \rho_{sr} + \varepsilon_{isr}$$

Growth differentials, by firm size



Exit gaps, by firm size



Note: bars chart estimated standardised regression coefficients. High/low productivity firm is +/- 1 sd above the industry mean. Error bars are 95% confidence intervals.



TACKLING CORONAVIRUS (COVID-19)
CONTRIBUTING TO A GLOBAL EFFORT

The role of JobKeeper

The role of JobKeeper

- We extend the baseline model:

$$\Delta E_{isr} = \alpha + \beta_1 LP_{isr} + \beta_2 LP_{isr} * JKEsh_{sr} + \delta_1 LP_{isr} * Cycle_{sr} + X_{isr} + \rho_{sr} + \varepsilon_{isr}$$

- $JKEsh_{sr}$ share of workers on JobKeeper in the industry*state
- $\beta_2 > 0$ (< 0) there was a stronger (weaker) link between growth and productivity in industries that used JobKeeper more intensively
 - The between high and low productivity firms was larger (smaller)
- $Cycle_{sr}$ LFS employment growth in the industry*state
 - Allows us to capture counter-cyclicality of reallocation and JK use



Cumulative change in firm-level employment

	From Mar-20 until:		
<i>Start date:</i>	Nov-20	Aug-20	May-20
<i>End date:</i>	(1)	(2)	(3)
Productivity and JobKeeper			
Labour productivity _{isr}	2.622*** (0.129)	2.163*** (0.118)	2.765*** (0.118)
Labour productivity _{isr} x JK Esh _{sr}	0.0263*** (0.00687)		
Labour productivity _{isr} x JK-1 Esh _{sr}		0.0285*** (0.00621)	0.0395*** (0.0064)
Labour productivity _{isr} x (JK-1 Esh _{sr} /less JK-2 Esh _{sr})			
Labour productivity _{isr} x JK-2 Esh _{sr}			
Cyclical controls			
Labour productivity _{isr} x ΔEmp _{sr} (Feb-20 to end date)	-0.00247 (0.00428)	-0.0206*** (0.00470)	-0.0129** (0.00424)
Labour productivity _{isr} x ΔEmp _{sr} (Aug-20 to end date)			
Fixed Effects			
Industry x State	Yes	Yes	Yes
Firm Size Class	Yes	Yes	Yes
Firm Age Class	Yes	Yes	Yes
Number of observations	381781	383640	386562
Adjusted R-squared	0.0259	0.0255	0.0644

Note: errors clustered at the state*industry level.

- Counter-cyclical relationship between employment growth and productivity, 'cleansing' hypothesis
- Stronger link between productivity and growth where more JK used more intensively
 - Did this change over time?



Cumulative change in firm-level employment

	<i>Start date:</i> <i>End date:</i>				
	<i>From Mar-20 until:</i>			<i>From Sept-20 until</i>	
	Nov-20	Aug-20	May-20	Nov-20	
	(1)	(2)	(3)	(4)	(5)
Productivity and JobKeeper					
Labour productivity _{isr}	2.622*** (0.129)	2.163*** (0.118)	2.765*** (0.118)	0.823*** (0.120)	0.823*** (0.120)
Labour productivity _{isr} x JK Esh _{sr}	0.0263*** (0.00687)				
Labour productivity _{isr} x JK-1 Esh _{sr}		0.0285*** (0.00621)	0.0395*** (0.0064)		0.0416*** (0.0101)
Labour productivity _{isr} x (JK-1 Esh _{sr} /less JK-2 Esh _{sr})				0.0420*** (0.0102)	
Labour productivity _{isr} x JK-2 Esh _{sr}					-0.0473*** (0.0133)
Cyclical controls					
Labour productivity _{isr} x ΔEmp _{sr} (Feb-20 to end date)	-0.00247 (0.00428)	-0.0206*** (0.00470)	-0.0129** (0.00424)	0.00385 (0.00210)	0.00374 (0.00208)
Labour productivity _{isr} x ΔEmp _{sr} (Aug-20 to end date)				-0.00124 (0.00233)	-0.00116 (0.00231)
Fixed Effects					
Industry x State	Yes	Yes	Yes	Yes	Yes
Firm Size Class	Yes	Yes	Yes	Yes	Yes
Firm Age Class	Yes	Yes	Yes	Yes	Yes
Number of observations	381781	383640	386562	444999	444999
Adjusted R-squared	0.0259	0.0255	0.0644	0.0281	0.0281

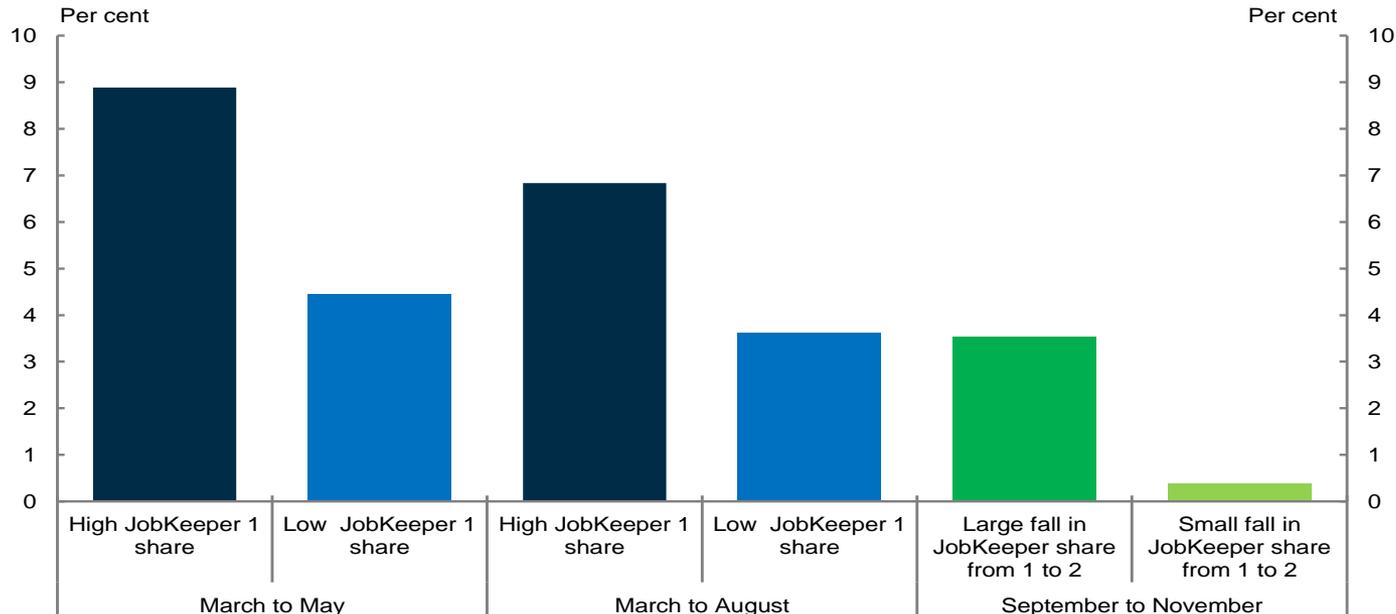
Note: errors clustered at the state*industry level.

(JK-1 Esh less JK2 Esh captures the amount of labour transitioning off JobKeeper
Where more labour flowed off JobKeeper less it flowed to productive firms
Suggests it was becoming distortive, stopping labour from flowing to better uses



Productivity-enhancing reallocation across markets according to JobKeeper coverage

Difference in employment growth between high and low productivity firms

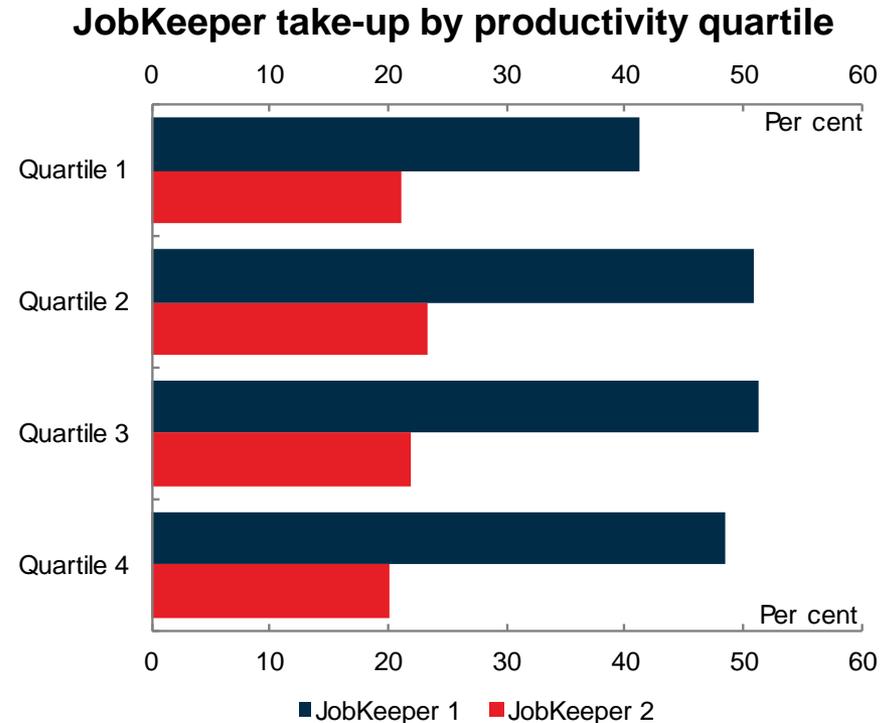


Gap between high and low productivity firms larger where JK use was more intense – strong link reallocation and productivity

Gap was larger where more labour was freed up - it was now able to flow to more productive firms.

More productive firms took up JobKeeper

- More productive firms were statistically more likely to take up JobKeeper 1.0
 - Significant at the 1 per cent level
 - Especially vulnerable low liquidity firms
- Greater incentive to withstand losses and keep the firm, if good long-term prospects
- Not evident for JobKeeper 2.0
 - Given recovery, firms
 - *In still affected sectors*
 - *Those on downward trajectory*
 - *Those that were less able to adapt*
 - *Likely less productive*

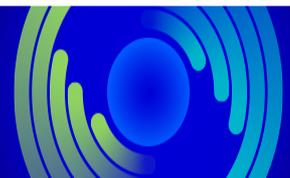


Note: Likelihood of JobKeeper take-up by labour productivity quartile after controlling for various balance sheet metrics and firm characteristics. Quartile 1 is the lowest productivity quartile and represents the bottom 25th percentile.



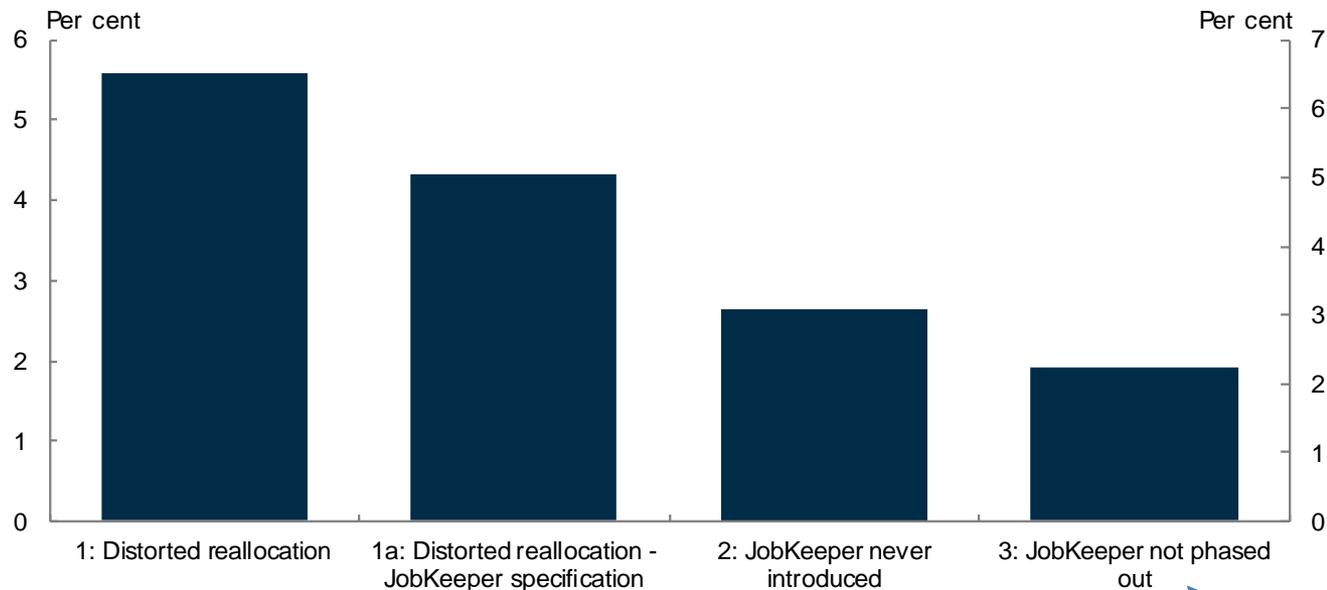
Aggregate implications

- How important was it that links between employment and productivity were maintained?
- Simulate counterfactual productivity based on prior productivity, and predicted employment:
 - Distorted reallocation: No relationship between productivity and growth
 - Fall in productivity if there was an indiscriminate shake-out due to restrictions
 - No JobKeeper: JobKeeper provided no 'boost' to relationship
 - Fall in productivity if no JobKeeper to prevent indiscriminate shakeout
 - Does not capture other benefits to JobKeeper
 - JobKeeper not phased out: JobKeeper coverage did not decline (August to November)
 - Fall in productivity if labour wasn't freed up with the phasing down of productivity.
- Estimates should be taken as indicative, not precise



Aggregate Implications

Gain in aggregate labour productivity (%) from actual outcome, relative to counterfactual scenarios



If there was an indiscriminate shakeout, productivity would have been 4-6% lower. Substantial medium-term scarring.

JobKeeper prevented around ½ of this scarring by protecting more productive firms

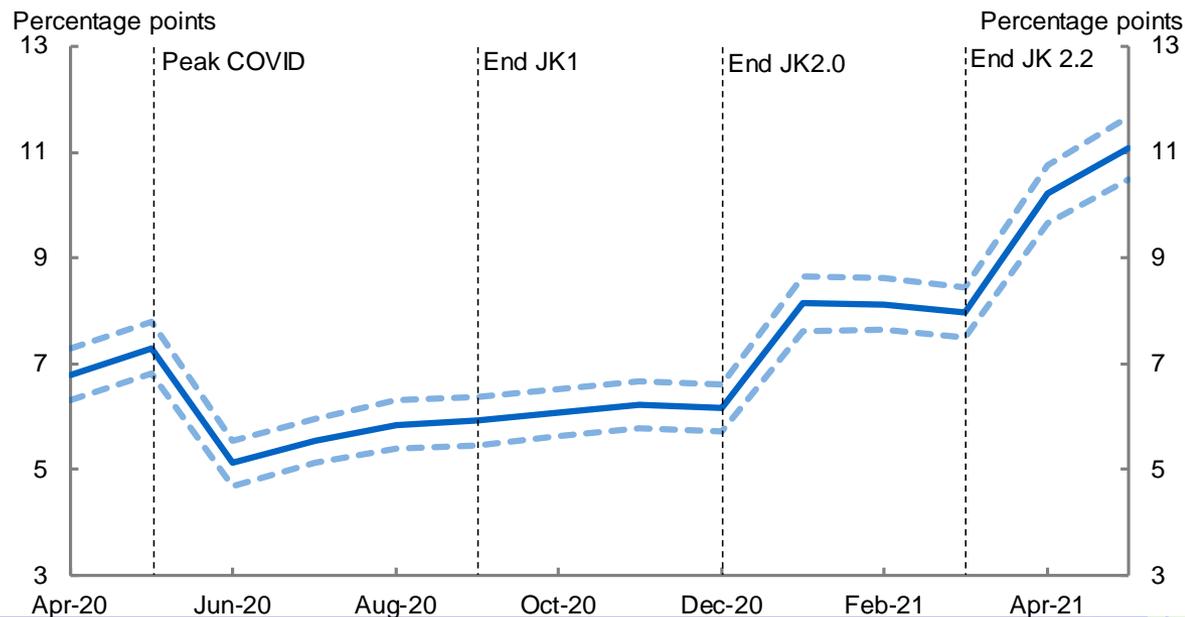
But had it not been phased out, productivity would have been 2% as labour remained stuck, at least in the short-run



The relationship between productivity and reallocation strengthened at end of JobKeeper

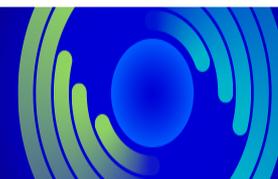
- Sharp increase in strength of relationship at the end of JobKeeper
 - More evident in less hard hit sectors
 - Larger boost in sectors with more firms still on Phase 3 of JobKeeper
- Consistent with policy becoming more distortive over time, though with a different focus on protecting industry still hit hard

Estimated employment growth gaps between high and low productivity firms



Summary

- Reallocation-productivity link remained intact over the course of the pandemic
 - The scarring effects from an indiscriminate shakeout of productive firms avoided.
- JobKeeper played an important role in facilitating this and protecting highly productive firms
- But it became more distortive over time
- JRS can be a crucial, are likely to become distortive over time
 - Needs to be considered, alongside their other policy aims and disincentives from changes to policy



TACKLING CORONAVIRUS (COVID-19)
CONTRIBUTING TO A GLOBAL EFFORT

Appendix A: Extra Slides

Productivity-enhancing reallocation goes real time!

The seminal study on reallocation in the Great Recession arrived ~6 years after Lehman collapsed

REALLOCATION IN THE GREAT RECESSION:
CLEANSING OR NOT?

Lucia Foster
Cheryl Grim
John Haltiwanger

Working Paper 20427
<http://www.nber.org/papers/w20427>

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
Cambridge, MA 02138
August 2014

The high pace of reallocation across producers is pervasive in the US economy. Evidence shows that this high pace of reallocation is closely linked to productivity. While these patterns hold on average, the extent to which the reallocation dynamics in recessions are “cleansing” is an open question. We find that downturns prior to the Great Recession are periods of accelerated reallocation even more productivity enhancing than reallocation in normal times. In the Great Recession, we find that the intensity of reallocation fell rather than rose and that the reallocation that did occur was less productivity enhancing than in prior recessions.

“Business death is difficult to measure in real time since official statistics are released with substantial lags – **BLS data** on establishment deaths during mid-2020 will become available in **late 2021**, and **Census Bureau data** on firm deaths will likely not be public until **2023**.”

Crane et al (2020)

Can we get an earlier read on how the COVID-19 shock may affect productivity-enhancing reallocation?

Allocative efficiency: no approach is perfect

1. Olley & Pakes (1996): covariance tradition
2. Hsieh & Klenow (2009): dispersion in MRPL / MRPK
3. Baquee & Fahri (2020): mark-up based approaches

Empirical studies: high (low) productivity firms more likely to expand (contract/exit) (Decker et al 2020). **Structure** based on:

- Canonical models of firm dynamics: idiosyncratic shocks to productivity, demand & costs shapes growth/exit of heterogeneous firms.
- Adjustment cost literature: conditional on initial size, plants with positive productivity shocks are more likely to grow.

Feasibility drives our choice approach but we note *caveats*:

- CRS & perfect competition: highest average prod = highest marginal prod, so resources → most productive firm will ↑ aggregate productivity.
 - But with imperfect competition, as resources shift to the most productive firms, marginal revenue products ↑ (↓) for the least (most) productive firms.

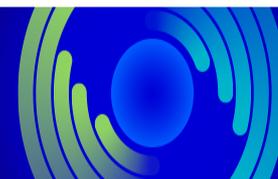


Variable definitions

- Employment growth rate:

$$E_{i,t} = \frac{N_{i,t} - N_{i,t-1}}{\frac{N_{i,t} + N_{i,t-1}}{2}} * 100$$

- Measure is bounded between -200 and 200.
- Second order approximation of the log difference for growth rates around zero.
- Can accommodate growth rate of exiting firms, in which case the function takes a value of -200 (exit).



Summary statistics

	Employment growth (Mar-Dec)	Log Labour productivity	Firm age (in 2018/19)	Firm size (in 2018/29)
Mean	-18.6	10.4	12.8	22.0
Median	0.0	10.6	10.0	6.0
Standard deviation	70.7	1.3	10.5	359.3
25th percentile	-18.2	9.8	4.0	3.0
75th percentile	10.5	11.2	19.0	15.0
Min	-200.0	2.7	0.0	1.0
Max	198.0	21.4	202.0	148667.0
				N=404,001

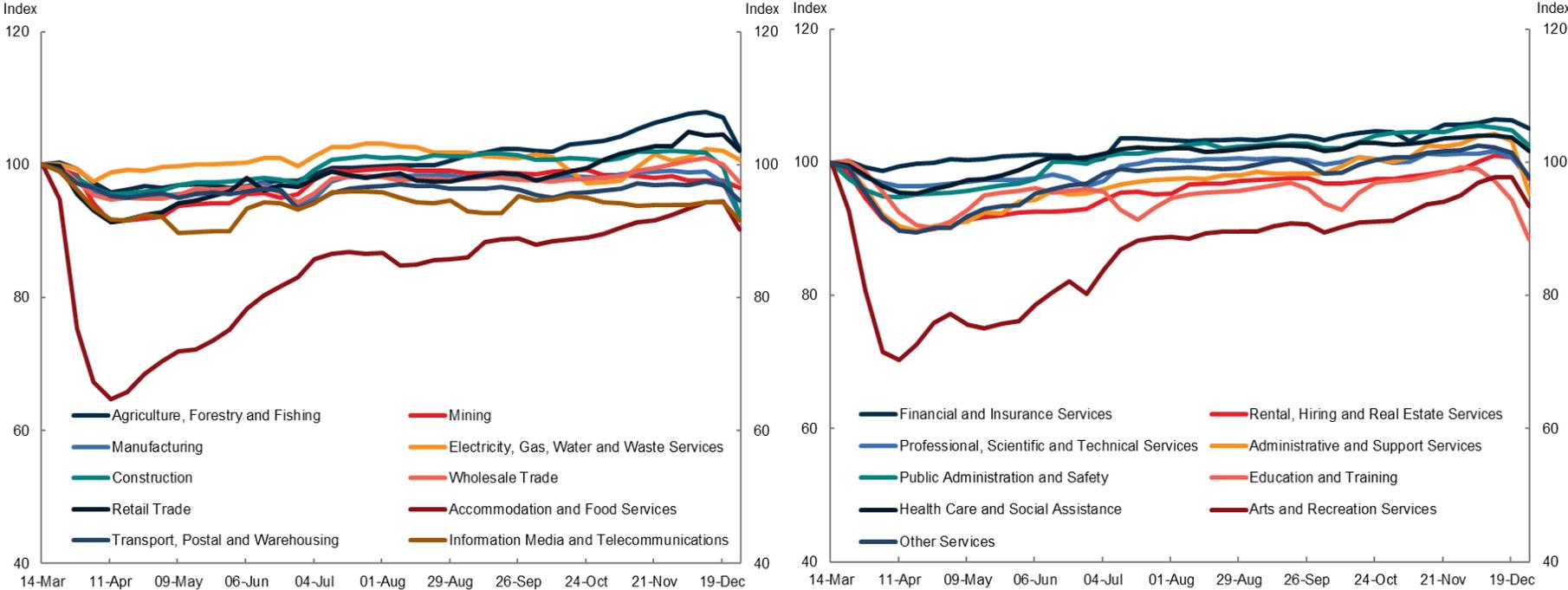


Distribution of jobs by division

	Labour Account	STP Payrolls
Agriculture, Forestry and Fishing	3.3	1.3
Mining	1.3	1.7
Manufacturing	6.4	6.7
Electricity, Gas, Water and Waste Services	0.9	1
Construction	8.2	6.5
Wholesale Trade	4.2	4.5
Retail Trade	9.9	10
Accommodation and Food Services	7.3	6.4
Transport, Postal and Warehousing	4.3	3.9
Information Media and Telecommunications	1.2	1.3
Financial and Insurance Services	3.4	4.2
Rental, Hiring and Real Estate Services	1.9	2.1
Professional, Scientific and Technical Services	8.9	8.3
Administrative and Support Services	6.8	6.8
Public Administration and Safety	5.5	6.6
Education and Training	7.2	7.8
Health Care and Social Assistance	14.4	14.7
Arts and Recreation Services	1.4	1.6
Other Services	3.6	3.4



Payroll jobs by division – STP



Note: Payroll jobs index, ABS Weekly Payroll Jobs and Wages, Australia. Series indexed to week ending 14 March 2020.



Baseline regression table for May 2021

	A: Change in employment		B: Probability of firm exit	
	(1)	(2)	(5)	(6)
Productivity				
Labour productivity _{isr}	4.415*** (0.144)		-0.0197*** (0.0006)	
Labour productivityQ2 _{isr}		5.965*** (0.398)		-0.0354*** (0.0018)
Labour productivityQ3 _{isr}		9.932*** (0.392)		-0.0577*** -0.0019
Labour productivityQ4 _{isr}		12.630*** (0.465)		-0.0735*** (0.0026)
Fixed Effects				
Firm Size Class	Yes	Yes	Yes	Yes
Firm Age Class	Yes	Yes	Yes	Yes
Industry x State FE	Yes	Yes	Yes	Yes
Number of obs	404080	404080	404,080	404,080
Adjusted R-squared	0.0417	0.0412	0.063	0.063

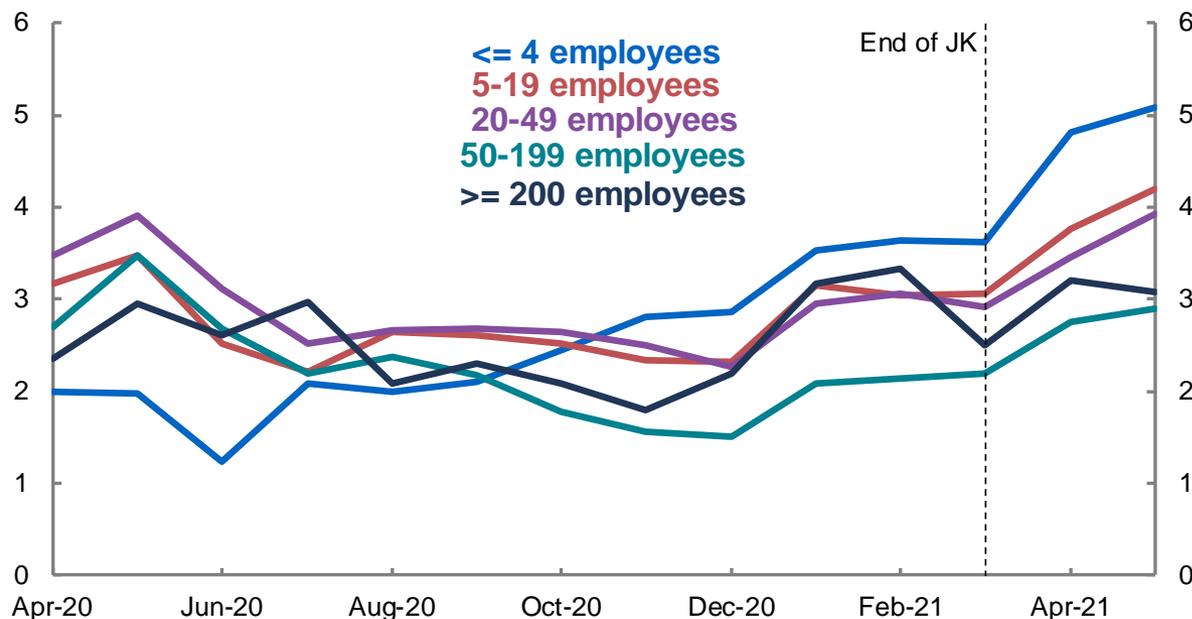
Note: clustered standard errors in parentheses. * p<0.05 ** p<0.01 *** p<0.001



Small firms exhibit stronger reallocation when JobKeeper ends → policy was holding back productive movement

- Coefficients on baseline regression increase after March 2021, especially for small and micro firms
- Smaller firms also more likely to have received JobKeeper

Estimated coefficients on baseline employment model over time



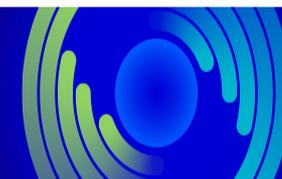
Firm-level growth and exit responsiveness to productivity: role of firm size (to December)

	Change in Employment growth (1)	Probability of Firm Exit (2)
Productivity		
<=4 employees	2.640*** (0.246)	-0.0155*** (0.00138)
5-19 employees	3.007*** (0.171)	-0.0187*** (0.000971)
20-49 employees	1.868*** (0.459)	-0.00857** (0.00292)
50-199 employees	1.488*** (0.444)	-0.00435 (0.00281)
>=200 employees	1.249 (0.920)	0.0014 (0.0028)
Constant	-45.93*** (1.604)	0.311*** (0.0103)
Controls and Fixed Effects		
Industry x State	Yes	Yes
Firm Size Class	Yes	Yes
Firm Age Class	Yes	Yes
Number of observations	403,693	492,477
Adjusted R-squared	0.0272	0.0634



Firm-level growth and exit responsiveness to productivity: role of firm age (to December)

	Change in Employment growth (1)	Probability of Firm Exit (2)
Productivity		
<=2 years	2.467*** -0.346	-0.0128*** -0.00142
3-5 years	2.737*** -0.237	-0.0151*** -0.0012
6-10 years	2.416*** -0.287	-0.0124*** -0.00124
11-20 years	2.695*** -0.259	-0.0163*** -0.0015
>20 years	2.450*** -0.244	-0.0166*** -0.00164
Constant	-45.36*** -1.633	0.307*** -0.0104
Controls and Fixed Effects		
Industry x State	Yes	Yes
Firm Size Class	Yes	Yes
Firm Age Class	Yes	Yes
Number of observations	403,693	492,477
Adjusted R-squared	0.0272	0.0633

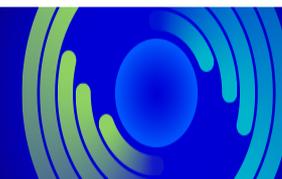


	JobKeeper 1.0				JobKeeper 2.0			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Productivity								
Labour productivity _{ISR}	0.0246*** (0.0006)	0.0296*** (0.0010)		0.0257*** (0.0019)	-0.0050*** (0.0005)	0.0023*** (0.0009)		0.0009 (0.0017)
Labour productivityQ2 _{ISR}			0.0953*** (0.0028)				0.0229*** (0.0025)	
Labour productivityQ3 _{ISR}			0.100*** (0.0028)				0.0075*** (0.0024)	
Labour productivityQ4 _{ISR}			0.0716*** (0.0028)				-0.0122*** (0.0025)	
Labour productivity _{ISR} x FinCons _{ISR}				0.0047** (0.0021)				-0.0012 (0.0019)
Labour productivity _{ISR} x FixCost _{ISR}				0.0078 (0.0080)				-0.0391*** (0.0071)
Balance sheet								
Liquid _{ISR}		0.0532*** (0.0024)	0.0461*** (0.0023)	0.0017 (0.0229)		0.0175*** (0.0021)	0.0142*** (0.0021)	0.0302 (0.0204)
Fixed share of expenses _{ISR}		0.279*** (0.0124)	0.248*** (0.0121)	0.198** (0.0855)		0.244*** (0.0110)	0.222*** (0.0107)	0.656*** (0.0758)
Controls and Fixed Effects								
Wage share of expenses _{ISR}	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Firm Size Class	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Age Class	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	288,684	288,684	292,223	288,684	285,385	285,385	288,887	285,385
Adjusted R-squared	0.097	0.102	0.0104	0.102	0.073	0.081	0.104	0.081



JobKeeper Scheme take-up and profitability

	JobKeeper 1.0		JobKeeper 2.0	
	(1)	(2)	(3)	(4)
Productivity				
ROA _{isr}	0.0251*** (0.0027)		-0.0173*** (0.0024)	
Loss-maker _{isr}		-0.0151*** (0.0016)		0.0083*** (0.0014)
Balance sheet				
Liquid _{isr}	0.0629*** (0.0020)	0.0500*** (0.0020)	0.0228*** (0.0018)	0.01289*** (0.0017)
Fixed share of expenses _{isr}	0.204*** (0.0107)	0.163*** (0.0094)	0.221*** (0.0095)	0.185*** (0.0083)
Controls and Fixed Effects				
Wage share of expenses _{isr}	Yes	Yes	No	Yes
Firm Size Class	Yes	Yes	Yes	Yes
Firm Age Class	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes
State	Yes	Yes	Yes	Yes
Number of observations	358,011	407,960	353,814	403,260
Adjusted R-squared	0.100	0.092	0.063	0.059



Robustness 1 – turnover-based labour productivity measure

	Change in Employment growth (1)	Probability of Firm Exit (2)
Productivity		
Labour productivity _{isr}	1.001*** (0.262)	-0.00418* (0.00202)
Constant	-30.97*** (3.043)	0.205*** (0.0235)
Controls and Fixed Effects		
Industry x State	Yes	Yes
Firm Size Class	Yes	Yes
Firm Age Class	Yes	Yes
Number of observations	435026	533837
Adjusted R-squared	0.0140	0.0298



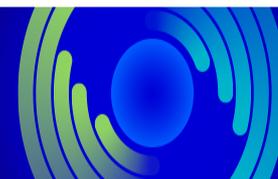
Robustness 2 – alternative headcount measure (i.e. paid employment only)

	Change in Employment growth (1)	Probability of Firm Exit (2)
Productivity		
Labour productivity _{isr}	1.332*** (0.180)	-0.00625*** (0.00129)
Constant	-31.29*** (1.872)	0.216*** (0.0135)
Controls and Fixed Effects		
Industry x State	Yes	Yes
Firm Size Class	Yes	Yes
Firm Age Class	Yes	Yes
Number of observations	401971	492477
Adjusted R-squared	0.0127	0.0298



Caveats and data coverage

- Not sure whether shock has *accelerated* efficient reallocation.
 - Would need to compare current estimates to pre-crisis rates, but this is hard given data cannot be compared.
 - Our [sister paper](#) though does have evidence of the pandemic accelerating productive reallocation relative to 2019.
- We only include firms reporting in STP as of 1 March 2020.
 - Cannot capture dynamics amongst new firms, which will be more important as time goes on.
- STP captures 99 per cent of major employers and 77 per cent of those employing 19 people or less (ABS)
 - Could be missing different dynamics in small/micro businesses or those that have STP reporting exemptions.



Productive reallocation strongest in hard hit sectors until JobKeeper ends → boost to other sectors observed

Estimated employment growth gaps between high and low productivity firms

