A photograph of several workers in a vineyard, wearing orange safety vests and dark clothing, working among rows of green grapevines. The scene is outdoors with bright, natural light.

Missing migrants: Border closures as a labour supply shock

Melanie Morten (Stanford), Dave Maré (Motu)
and Lynda Sanderson (Productivity Commission)

24 October 2023
Productivity Hub Seminar

Disclaimer

- ▶ This presentation contains preliminary results which are subject to revision. Please do not cite or circulate.
- ▶ These results are not official statistics. They have been created for research purposes from the Integrated Data Infrastructure (IDI) and/or Longitudinal Business Database (LBD) which are carefully managed by Stats NZ. For more information about the IDI and/or LBD please visit <https://www.stats.govt.nz/integrated-data/>
- ▶ The results are based in part on tax data supplied by Inland Revenue to Stats NZ under the Tax Administration Act 1994 for statistical purposes. Any discussion of data limitations or weaknesses is in the context of using the IDI for statistical purposes, and is not related to the data's ability to support Inland Revenue's core operational requirements.

Active debate about labour market impacts of temporary migration

- ▶ Rapid growth in temporary migration since 2010
- ▶ Recognised Seasonal Employer (RSE) programme
 - ▶ Cap of 16,000 workers/year (2022), 191 employers
 - ▶ Horticulture and viticulture
 - ▶ 7 month visa to work in NZ
 - ▶ Strictly regulated: employment conditions, labour market tests
- ▶ RSE workers provide up to 30% of seasonal labour force
- ▶ Dual mandate: benefit NZ and Pacific Islands' economies
- ▶ But contested: perverse impacts on local employment and investments in labour-replacing innovation?

COVID border closure: natural experiment to study short-run productivity + employment effects

Outline

1. Context

- COVID border closure
- RSE in the labour force

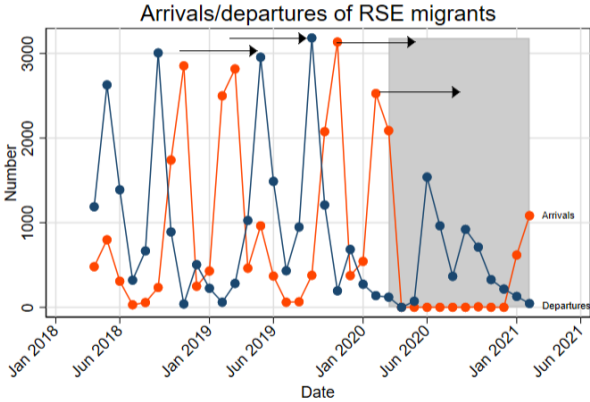
2. Identification strategy

3. Results

- Employment
- Employee earnings
- Short-term profits

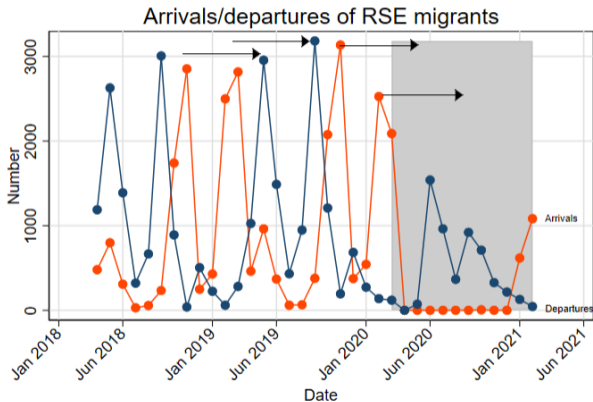
4. Discussion

NZ border closed: 19 March 2020



Shaded area shows period after 19 March 2020 when borders closed.

NZ border closed: 19 March 2020

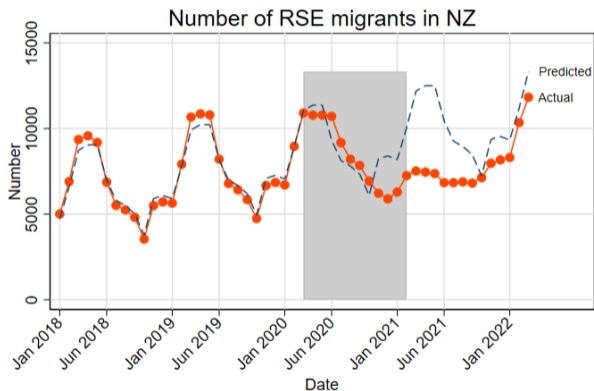


Shaded area shows period after 19 March 2020 when borders closed.

Conflicting effects:

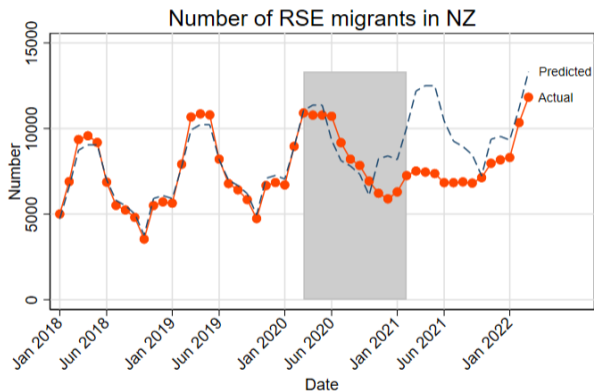
- ▶ Approximately 1700 RSE workers failed to arrive
- ▶ No further arrivals until Jan 2021
- ▶ Visa extensions for RSE already in NZ

RSE workers: Aggregate shortages and surpluses



Shaded area shows period after 19 March 2020 when borders closed.
An observation is the number of RSE present in each month/year based on arrival data.

RSE workers: Aggregate shortages and surpluses



Shaded area shows period after 19 March 2020 when borders closed.
An observation is the number of RSE present in each month/year based on arrival data.

Distinct periods:

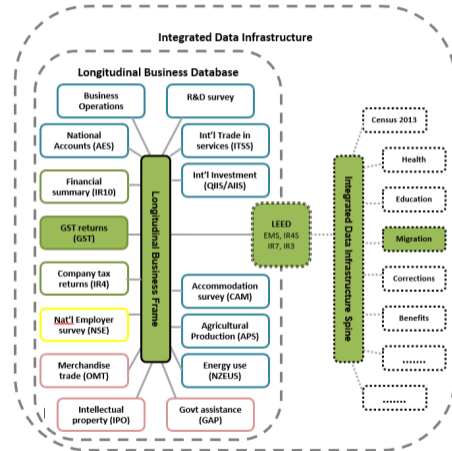
- ▶ April/May: Mild shortage
- ▶ June-September: Mild surplus
- ▶ October-February: Increasing shortage
- ▶ March onwards: significant shortage (outside study period)

This paper

- ▶ Use sudden border closure as a *firm-level* shock to migration
- ▶ Study short-run firm and labour market response (to Feb 2021)
 1. Could firms hire other workers?
 - ▶ Where from?
 - ▶ At what cost?
 2. Were firms with missing migrants disadvantaged?

Linked individual and firm data

- ▶ Admin data from the Integrated Data Infrastructure (IDI) and Longitudinal Business Database (LBD)
- ▶ Immigration records (individual)
 - ▶ Arrivals, departures
 - ▶ Visa status + changes
- ▶ Individual characteristics from IDI spine
- ▶ Linked firm and individual PAYE returns (earnings/other income sources, payroll)
- ▶ Other firm characteristics (industry, location)
- ▶ Monthly firm GST sales and purchases
- ▶ Data from 2015 onwards. Study period April 2019 - February 2021



RSE – an important but highly concentrated workforce

Table: Firms that ever hire RSE workers

	Num. firms	Mean employees	(Ind. mean)	Emp at peak	Mean RSE share	RSE share at peak
Apple	48	97	(31.7)	158	0.22	0.30
Growing	78	82	(11.9)	115	0.15	0.12
PackWS	30	302	(70.8)	590	0.17	0.23
Support	51	91	(9.35)	117	0.30	0.25
Pooled	207	122	(13)	179	0.21	0.26

Notes: Data is from 2018-9. Sample is firms in main RSE-hiring industries that have hired at least one RSE since 2015. Industry mean is mean employment for all firms in the industry.

Two broad types of workers

Table: Worker summary stats: April 2019

	NZR	RSE	Temp	WHM
Mean earnings	3145.6	3632.1	2072.7	1962.8
Mean earnings (full months)	3871.3	3820.3	3124.0	3228.5
Median age	38	32	28.3	26.4
Median ind4 exp	11	13	3	2
Median job duration	6	7	3	2

Notes: Data is all firms in RSE ind. Data is computed for April 2019; experience and spell variables measured as of April 2019.

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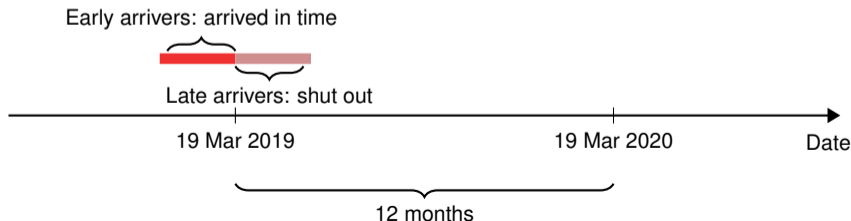
4. Discussion

Empirical challenge: why do some firms have RSE and some don't?

- ▶ Want to measure the impact of having RSE on firms
- ▶ Under normal circumstances, can't simply compare firms with/without RSE
 - ▶ Firms have different levels of desire and capacity to host RSEs
 - ▶ MBIE decides allocation for each firm (max number can recruit)
 - ▶ Allocation increases: firm requests, local labor market assessment, national cap

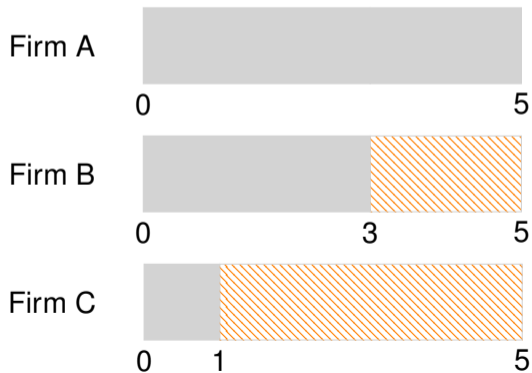
Identification: Timing discontinuity as a natural experiment

- ▶ Ideal experiment: two firms that both want RSE, one gets RSE + one doesn't
- ▶ Border closure gives us an exogenous reason that some firms miss out
 - ▶ Take firms with at least one RSE arrival, 30 days either side of March 19, 2019
 - ▶ Predict how many missing migrants in 2020 using 2019 arrival dates
- ▶ Holding overall effect of COVID shock constant, minimal demand effects



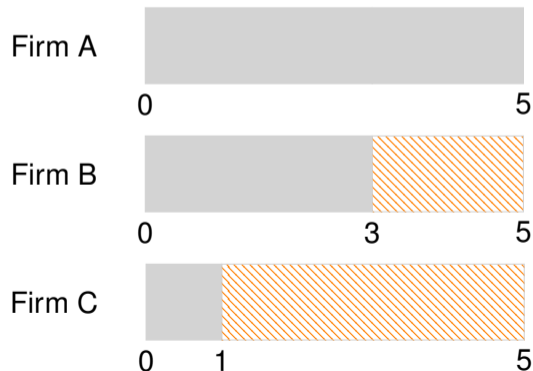
Identification strategy: a visual example

- ▶ Three firms, each have 5 (potential) RSE in window
- ▶ Differ in whether workers arrived before/after threshold



Identification strategy: a visual example

- ▶ Three firms, each have 5 (potential) RSE in window
- ▶ Differ in whether workers arrived before/after threshold



- ▶ Regressions control for:
 - ▶ Number of arrivals in window (e.g., 5)
 - ▶ **Number of late arrivals (e.g., 2 or 4)**
 - ▶ Lagged outcomes in the previous year
 - ▶ Aggregate conditions (monthly dummies)
 - ▶ Industry X region fixed effects
- ▶ Key coefficient: Effect on firm of each RSE that was *expected*, but failed to arrive

Estimating equation

$$Y_{it}^{(g)} = \mathcal{T}(1 + \alpha \text{N. in window in 2019}_i + \beta \text{N.late in 2019}_i) + \phi_t + \gamma Y_{i,t-12}^{(g)} + \lambda_{jr} + \varepsilon_{it}^{(g)}$$

- ▶ Sample: all firms that had RSE arrivals in the March window of 2019
- ▶ Focus is $\beta_{\mathcal{T}}$ N.late in 2019_{*i*} : effect in time period \mathcal{T} of one additional missing RSE
- ▶ Three options for \mathcal{T} (time period of treatment effects):
 - ▶ monthly (baseline = Feb 2020); pre/post border closure; three treatment periods
- ▶ Outcomes (Y) for the firm as a whole (i), and four worker groups (g):
 - ▶ RSE; NZers (inc. perm residents, Australians); WHM; other TEMP migrants

What do we need for this strategy to work?

- ▶ Variation: firms differ in the number of migrants they missed out on ▶ Variation in instrument
- ▶ Exogeneity: small differences in timing across firms are unrelated to unobserved characteristics of the firm or the worker
 - ▶ Balanced, conditional on controlling for total arrivals, and industry X region dummies
 - ▶ Balance tests
 - ▶ No evidence of significant pre-trends
- ▶ Relevance: arrival timing in 2019 predicts (non)arrivals in 2020

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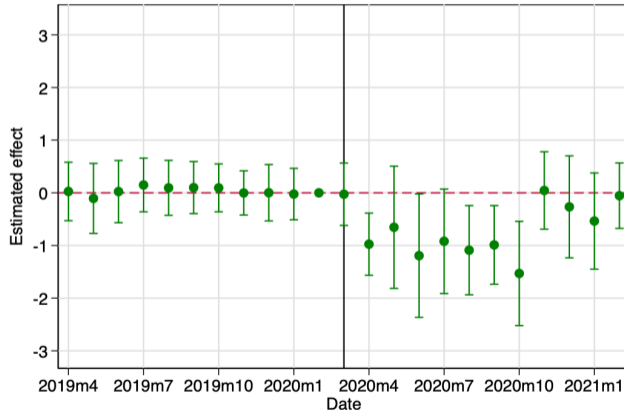
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Each missing arrival leads to roughly one fewer RSE employed

Figure: RSE employment (monthly headcount)



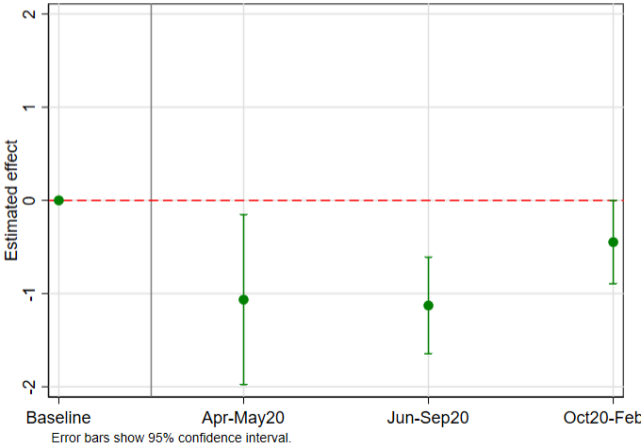
Error bars show 95% confidence interval.

Mean mthly number of firms in 30 day window around 19th March: 83

- ▶ Plots the firm-level gap in RSE employment *per late arrival* in each month (11 months prior / March 2020 / 11 months post)
- ▶ 7 month visa: usually arrive March, leave October
- ▶ Gap closes in November (next cohort fails to arrive, for all firms)

Simplifying for greater precision

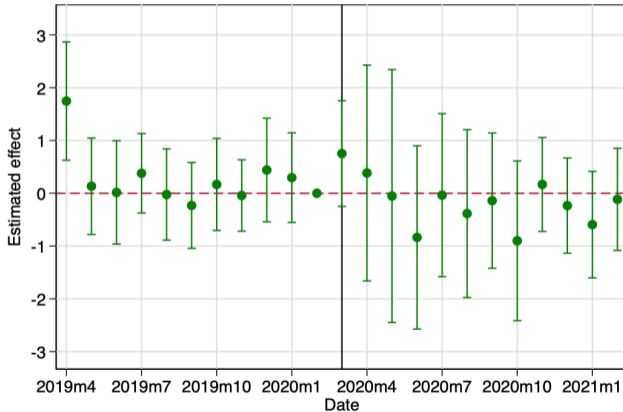
Figure: RSE employment (monthly headcount)



- ▶ Overall (April-February): $-.80^{***}$
- ▶ April/May: -1.065^{**}
- ▶ June-Sept: -1.128^{***}
- ▶ October-February: -0.448^*

Firms partially able to replace lost workers

Figure: Total employment (monthly headcount)

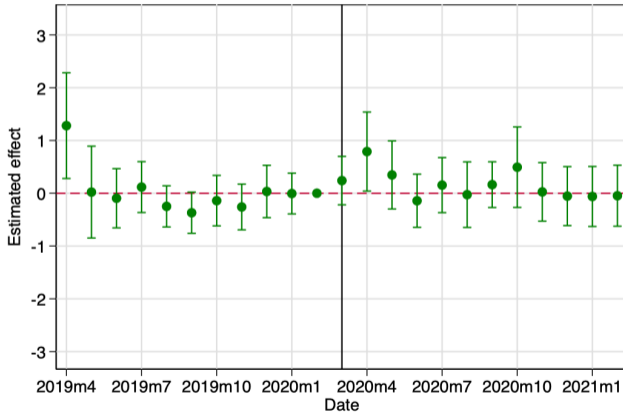


Error bars show 95% confidence interval.
Mean mthly number of firms in 30 day window around 19th March: 83

- ▶ Overall (April-February): $-.55^{**}$
- ▶ April/May: almost all RSE replaced (headcount) $-.22$
- ▶ June-Sept: -0.70^*
- ▶ October-February: -0.59^{**}

Where did replacement workers come from? NZ residents

Figure: NZ citizens and permanent residents

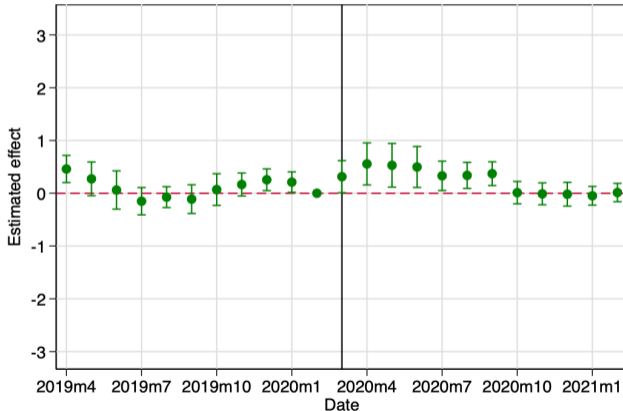


Error bars show 95% confidence interval.
Mean mthly number of firms in 30 day window around 19th March: 83

- ▶ Employment of NZers higher during lockdown
- ▶ Main source was wage and salary earners, not students, pensioners or beneficiaries
- ▶ Horticulture/viticulture deemed essential industries

Where did replacement workers come from? Working holidaymakers

Figure: Working Holidaymakers (WHM)

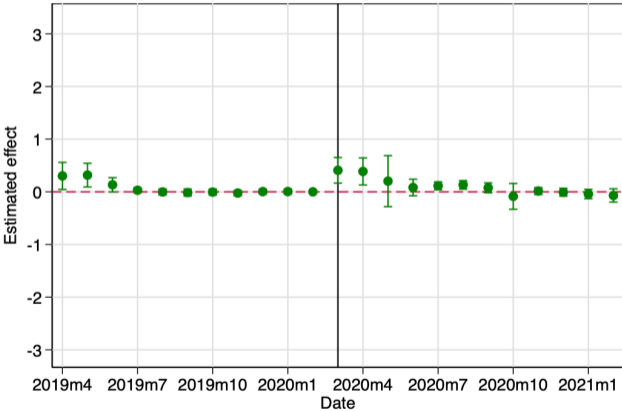


Error bars show 95% confidence interval.
Mean mthly number of firms in 30 day window around 19th March: 83

- ▶ Beyond lockdown, substitution to WHMs
- ▶ Many WHM left, despite visa extensions ▶ [Stock of WHMs](#)
- ▶ But demand from other industries (esp. hospitalities) also fell ▶ [Wider labour market](#)
- ▶ In initial lockdown period, non-affected firms also increased hiring of WHMs

Where did replacement workers come from? Other temporary

Figure: Other temporary migrants (TEMP)



Error bars show 95% confidence interval.
Mean mthly number of firms in 30 day window around 19th March: 83

Did firms find workers by increasing wages?

- ▶ Large media attention on labour shortages
- ▶ Affected firms in particular had lower headcount
- ▶ Did firms pay more to attract local workers?

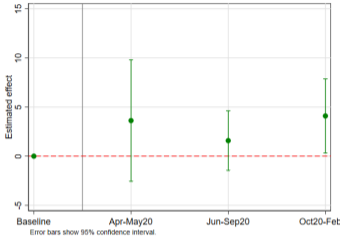
What can we measure from the payroll data?

- ▶ Observe monthly payroll data
 - ▶ Combines hours worked and earnings per hour
 - ▶ Many hort. jobs are a combination of wages and piece rate
 - ▶ Short jobs spells are common

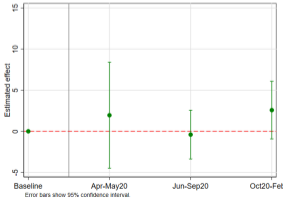
- ▶ Higher (lower) earnings per worker could be:
 - ▶ Workers working longer (shorter) hours
 - ▶ Workers putting in more (less) effort (if piecerate)
 - ▶ Workers being paid more (less) (piecerate/wage)
 - ▶ Different selection of workers (skill/effort)

Negligible impacts on average earnings

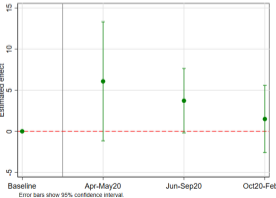
Average full-month earnings: All



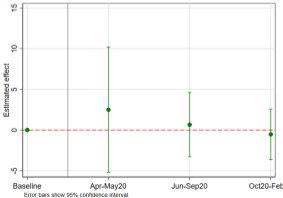
NZ



RSE

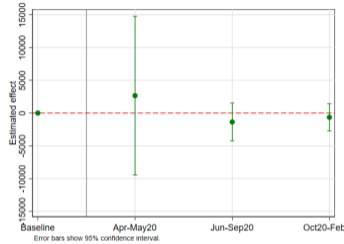


WHM

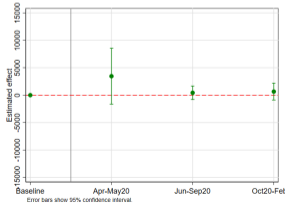


Firm's wagebill constant; components track employment change

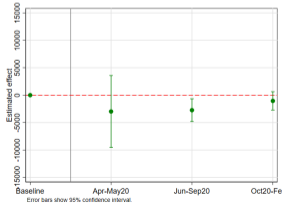
Wagebill: All



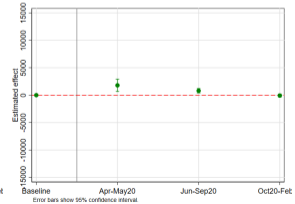
NZ



RSE



WHM



Affected firms did not pay more for workers

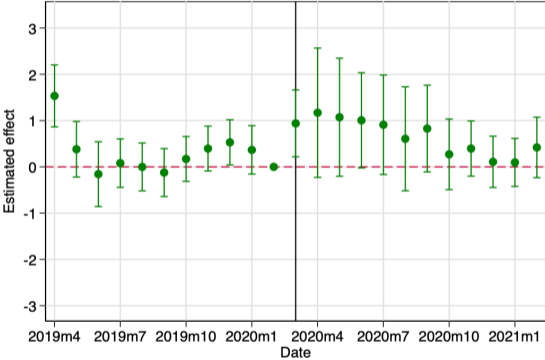
- ▶ Any relative increase statistically and economically insignificant ($< \$5/\text{worker}/\text{month}$)
- ▶ Some evidence of wage effects at labour market level ▶ GE effects
- ▶ Rises counteracted by shift towards low hours/low productivity workers?

Were firms with missing migrants disadvantaged?

- ▶ Firms with missing migrants experienced labour shortage (from June), but did not pay more to recruit domestically
- ▶ RSE workers were partly replaced by other workers, esp. WHMs ▶ [Changing composition](#)
- ▶ Gibson and McKenzie (2014) found RSE workers were:
 - ▶ 50-60% more productive (apples) and picked 82% more fruit per week (citrus) than WHMs
 - ▶ 11-18% more productive (apples) and picked 54% more fruit per week (citrus) than NZ contract labour
 - ▶ RSEs' productivity increased by 8-10% per year of experience (citrus)

Affected firms hired more inexperienced workers

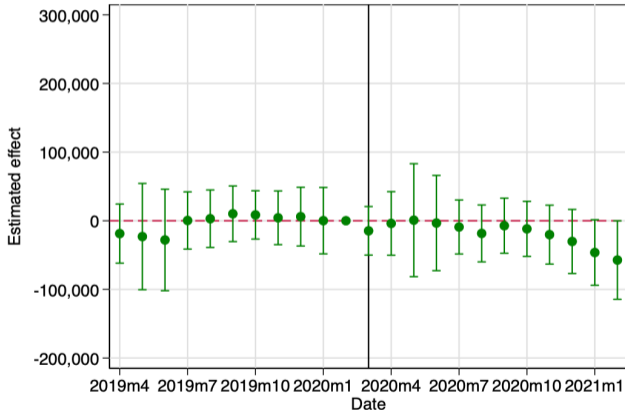
Number of workers with no prior industry experience



Error bars show 95% confidence interval.
Mean mthly number of firms in 30 day window around 19th March: 83

Did worker shortage and changing composition hurt profitability?

Figure: Cumulative short-run profits



Error bars show 95% confidence interval.
Mean mthly number of firms in 30 day window around 19th March: 77

- ▶ Short-run profitability: sales - purchases - wagebill
- ▶ By February 2021, affected firms had \$57,000 lower profit per missing migrant
- ▶ Source of decline is increase in purchases, rather than decline in sales
 - ▶ [Sales vs purchases](#)
 - ▶ Investment in mechanisation?
 - ▶ Contract labour hire?

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Discussion: Taking stock

- ▶ Comparison is between firms that missed out on one or more RSE vs firms whose workers arrived before the border closure
- ▶ Headcount employment suggests a shortfall among affected firms
 - ▶ Locally available workers only partially fill the gaps left by missing RSEs
- ▶ Affected firms:
 - ▶ did not pay more, on balance, to attract local workers
 - ▶ hired more WHMs and inexperienced workers
 - ▶ experienced lower short-run profitability going into the 2021 season

Discussion: clear identification vs broader applicability

- ▶ External validity of the COVID shock, GE effects
 - ▶ Essential industries, minimal demand effects ▶ [Aggregate GST](#)
 - ▶ Labour market flexibility may have been unusually high over COVID period ▶ [Released labour](#)
 - ▶ Wages determined at market level rather than firm level, and influenced by govt requirement to pay living wage
- ▶ Distribution of shock across industries
 - ▶ Direct effects of border closure felt most in packing and wholesaling, where work is less physical and less reliant on RSEs ▶ [Seasonality](#)
- ▶ Short-run analysis
 - ▶ Overall shortage worsened in 2021, continued to 2022 ▶ [Aggregate shortage](#) ▶ [NZ workers](#)
 - ▶ Possible impacts on longer term productivity through eg, foregone planting, thinning, market development (cf investment in mechanisation)

Conclusion

- ▶ Even under “ideal” conditions, firms were not able to replace all their lost workers
- ▶ Further disadvantaged by a loss of experience
- ▶ Estimated impacts likely understate the potential impacts of longer term, more widespread shortages
- ▶ Even “unskilled labour” not perfectly substitutable



Additional slides



Summary of average firm level effects (16 late arrivals)

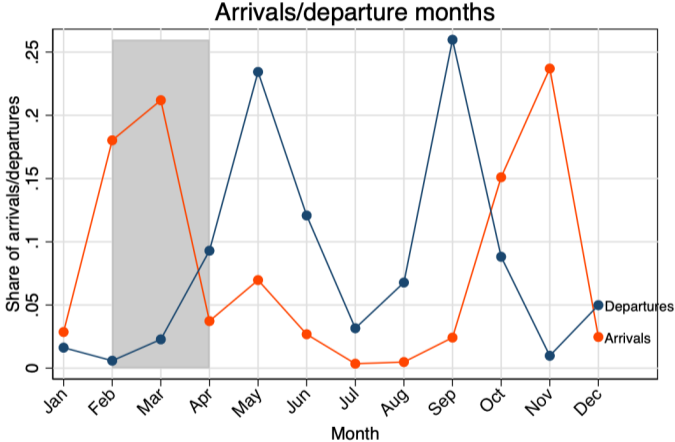
	(1) Baseline (2019)	(2) Regression (b/se)	(3) Avg. firm effect	(4) Percentage change
<i>Employment (number of workers)</i>				
All	209.1	-0.553** (0.245)	-8.903	-4.257
RSE	67.96	-0.799*** (0.164)	-12.86	-18.93
NZR	112.2	0.102 (0.125)	1.642	1.464
WHM	21.63	0.124* (0.0718)	1.996	9.231
TEMP	7.540	-0.0250 (0.0448)	-0.403	-5.338
<i>Monthly earnings for full-month workers (NZD per month)</i>				
All	4166.5	3.091** (1.330)	49.77	1.194
RSE	4009.8	3.122* (1.710)	50.26	1.254
NZR	4330.3	1.369 (1.284)	22.04	0.509
WHM	3289.3	0.889 (1.654)	14.31	0.435
TEMP	3575.3	-0.725 (1.355)	-11.67	-0.326
<i>Components of firm profit</i>				
Net sales (cumulative 10 months)	7312606.9	-43211 (31712)	-695697.1	-9.514
Wagebill (monthly)	706484.8	-315.5 (1461)	-5079.6	-0.719

External validity: many WHM released into labor market

- ▶ Sample: all firms who have ever hired a WHM
- ▶ Unusual to have workers available: labor market effects mitigated?

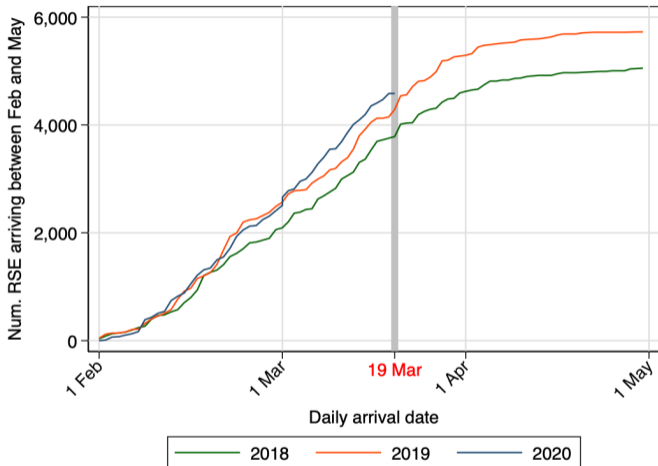


Average arrivals/departures by month



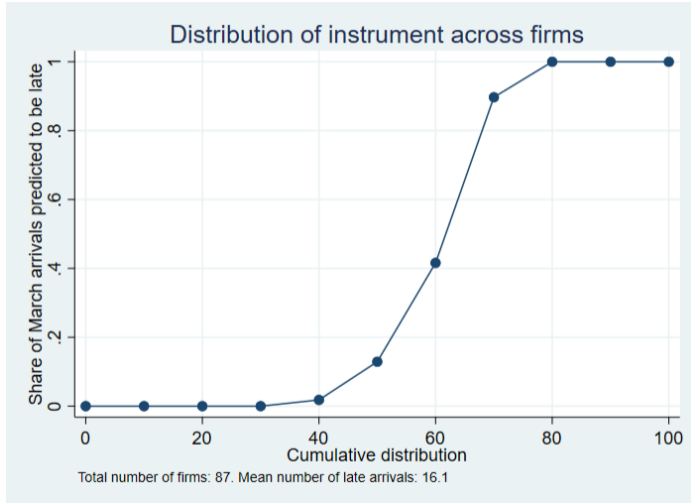
Data from 2018 and 2019.

Cumulative arrivals, 1 Feb – 1 May



- ▶ Border closure occurred towards the end of the Autumn peak arrival season
- ▶ Approx 1,700 RSEs were locked out (30% of expected arrivals)

Variation in instrument



Firm balance tests

	Employment		All controls	
	(1)	(2)	(3)	(4)
Number in window	0.453	0.182	0.438	0.462
Total employment	0.078***	0.115	0.064***	0.103***
	-0.011	0.037		
	0.017	0.026		
Num. WHM			0.074	0.082
			0.186	0.225
Num. RSE			-0.057	-0.174
			0.157	0.214
Num. NZR			0.035	0.019
			0.137	0.193
Net sales			-0.000	-0.000
			0.000	0.000
Avg. earnings RSE			0.006	0.006
			0.005	0.007
Avg. earnings NZR			-0.004	-0.003
			0.003	0.005
Avg. earnings WHM			-0.007	-0.003
			0.004*	0.005
Avg firm experience of employees			-0.455	0.027
			0.712	0.945
Avg. industry experience of employees			0.674	0.172
			0.772	0.980
Profit			0.000	0.000
			0.000	0.000
n	93	81	81	69
F	0.403	2.114	2.793	1.464
p	0.527	0.151	0.006	0.184
indXregionFE		✓		✓

$$\text{num_treated}_i = \text{num_window}_i + X_i + \epsilon_i$$

- ▶ Test whether X_i is significant
- ▶ With industry X region controls, pre-treatment firm characteristics do not predict treatment intensity

◀ [Back to presentation](#)

Worker balance tests

	Base		Base + nationality	
	(1)	(2)	(3)	(4)
Male	-0.167 0.079**	-0.031 0.047	-0.135 0.069*	-0.045 0.050
Age	0.004 0.002**	0.001 0.002	0.002 0.001	0.001 0.001
Firm experience	-0.001 0.003	-0.003 0.002	-0.002 0.003	-0.002 0.002
Samoa			-0.125 0.087	0.026 0.066
Tonga			-0.126 0.108	-0.101 0.136
Other Pacific			-0.109 0.095	-0.031 0.114
Non-Pacific			0.093 0.131	-0.052 0.092
n	4329	3924	4329	3924
F	4.171	1.519	2.712	1.411
p	0.008	0.216	0.013	0.212
indXregionFE		✓		✓

Notes: The unit of observation is a worker. Industry x region FE is whether industry x region FE are additionally included in the regression. Standard errors clustered by firm.

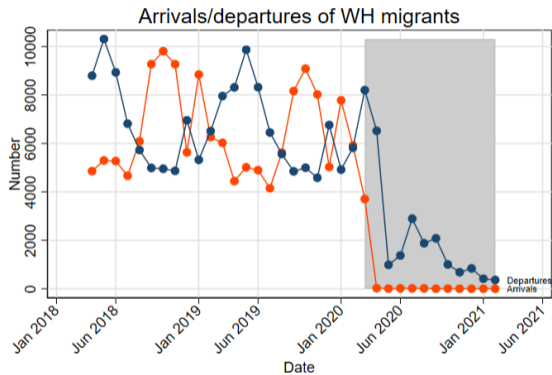
- ▶ Look at workers who arrived one year earlier in 2019 window:

$$\text{dum_late}_i = X_i + \epsilon_i$$

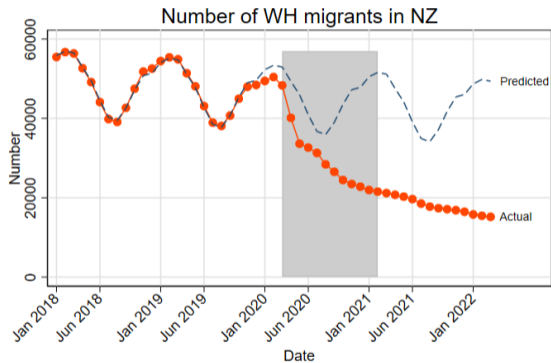
- ▶ Test whether X_i is significant.
- ▶ With industry X region controls, worker characteristics don't predict who will arrive early

◀ [Back to presentation](#)

Stock of Working holidaymakers



Shaded area shows period after 19 March 2020 when borders closed.



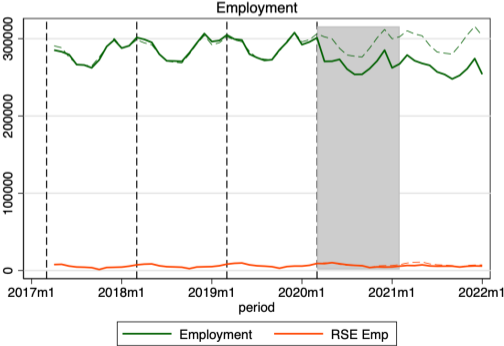
Shaded area shows period after 19 March 2020 when borders closed.
An observation is the number of WH present in each month/year based on arrival data.

[◀ Back to presentation](#)

Overall labour market

- ▶ Expand sample: not just firms affected by date threshold
- ▶ Dashed line - simple trend line
- ▶ Significant amounts of labour released from WHM industries

Firms that have ever hired WHM

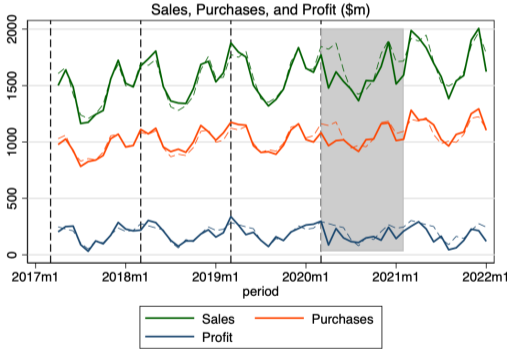


Firms that have ever hired RSE

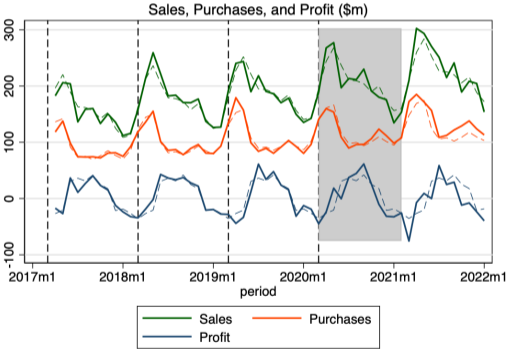


Aggregate outcomes: RSE firms remained close to trend

RSE-hiring industries



RSE-hiring firms



Some evidence of earnings impacts at the labour market level

- ▶ Main analysis: firm variation within industry x region
- ▶ But could miss effects at a higher level
- ▶ Regional: Measure shock as late workers / 2019 march employment

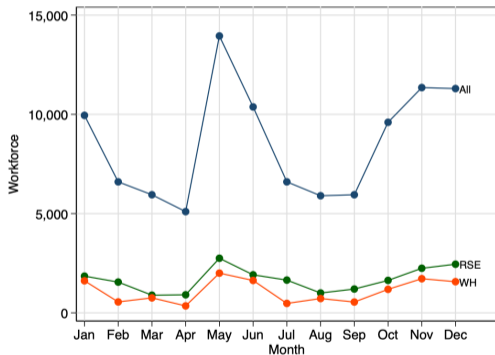
Table: GE effects at regional level: earnings

	All employees	RSE	NZ	WHM
Aggregate shock \times post	0.191*** (0.055)	0.102 (0.347)	0.391*** (0.067)	0.689** (0.281)
N	1740	747	1740	1314

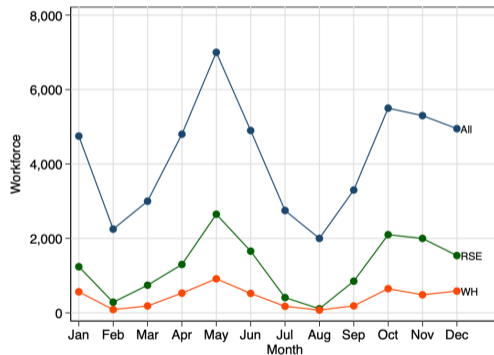
Notes: The dependent variable is the log monthly earnings for full-month employees. The unit of observation is a region X industry. The aggregate shock is the number of missing RSE in the regionXindustry as a share of the total employment in the regionXindustry in March 2019. Includes industryXregion and month dummies. Regressions are weighted by employment size in March 2019. Standard errors are clustered by region X industry.

Late arrivals dominated by Packing and Wholesaling

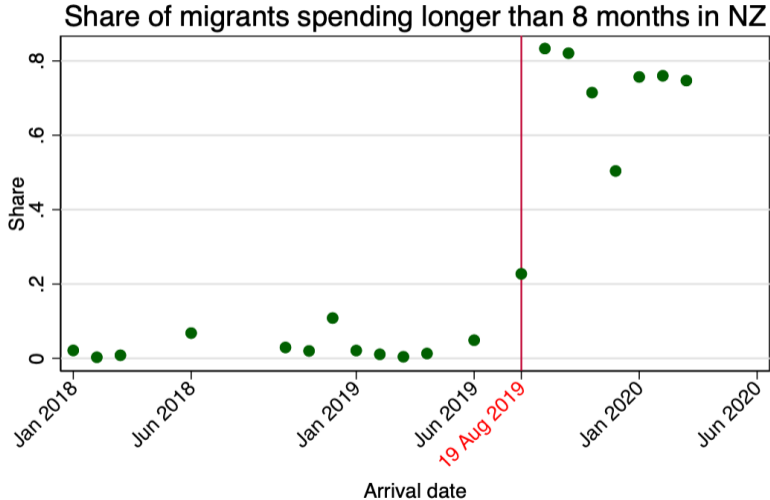
PackWS: 3:1 March window vs. October



Apple: 1:1 October window vs. March

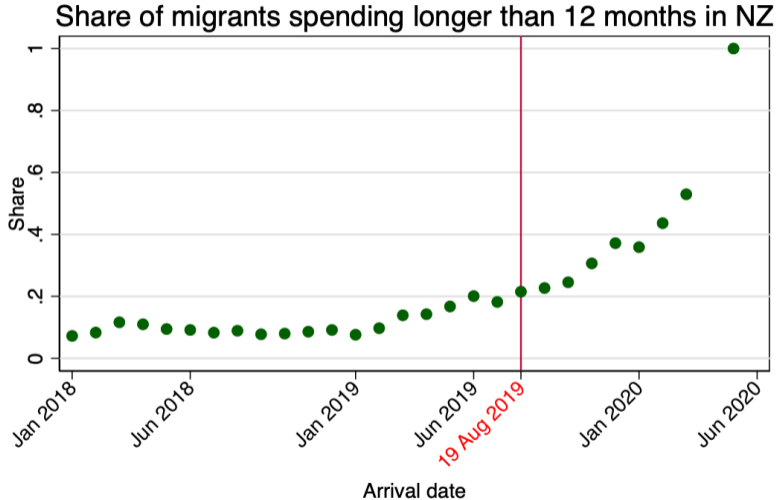


Proportion in NZ for more than 8 months: RSE



19 August 2019 is 7 months before NZ closed its borders on 19 March 2020.
An observation is arrivals in a given month/year.

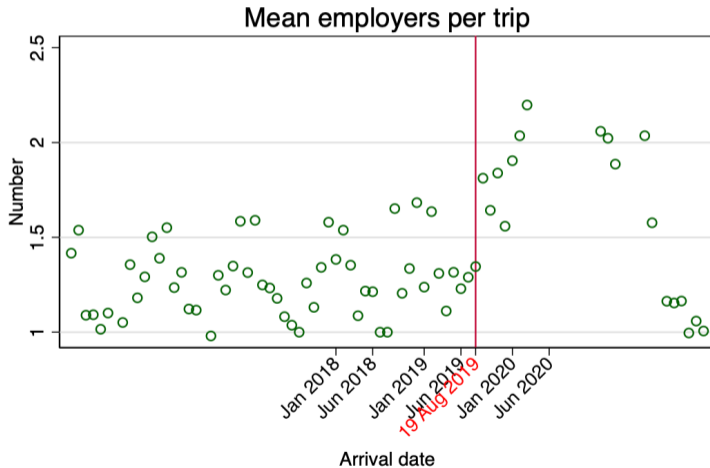
Proportion in NZ for more than 12 months: WHM



19 August 2019 is 7 months before NZ closed its borders on 19 March 2020.
An observation is arrivals in a given month/year.

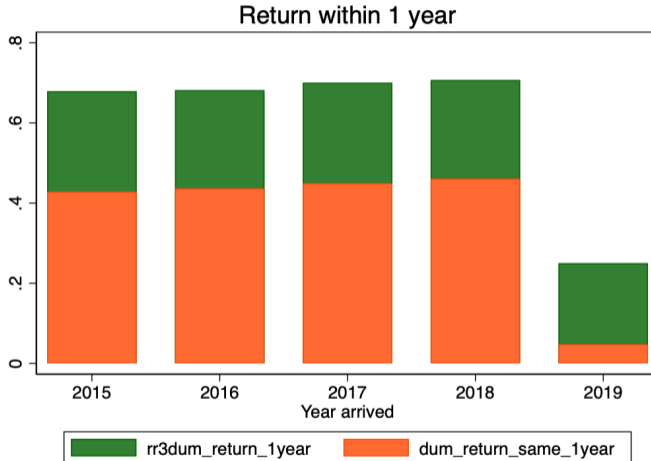
RSE employed by 1.4 (vs. 1.2) employers after COVID

[◀ Back to presentation](#)



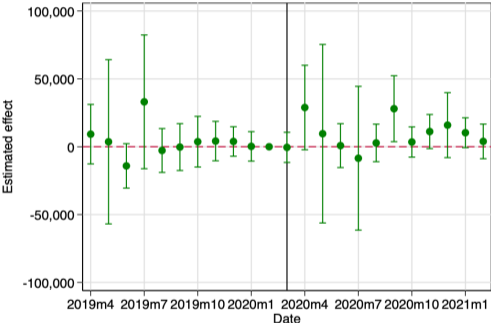
19 August 2019 is 7 months before NZ closed its borders on 19 March 2020.
An observation is arrivals in a given month/year.

RSE employment relationships persist over multiple years



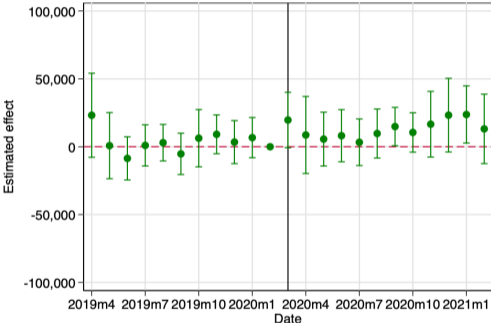
Sales and purchases

Sales



Error bars show 95% confidence interval.
Mean mthly number of firms in 30 day window around 19th March: 77

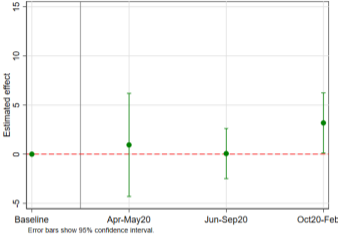
Purchases



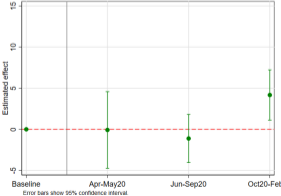
Error bars show 95% confidence interval.
Mean mthly number of firms in 30 day window around 19th March: 77

Average earnings (including part-month)

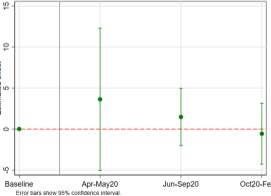
Average earnings: All



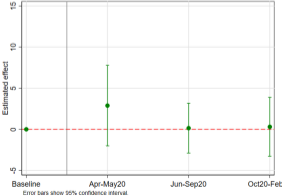
NZ



RSE

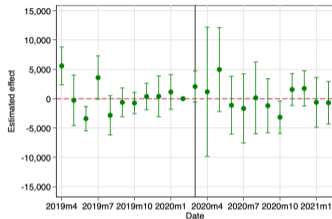


WHM



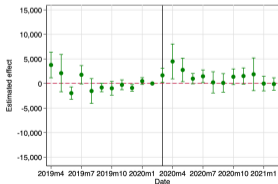
Firms' wagebill constant; components track employment change

Wagebill: All



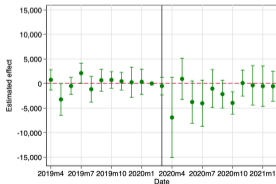
Error bars show 95% confidence interval.
Mean mthly number of firms in 30 day window around 19th March: 83

NZ



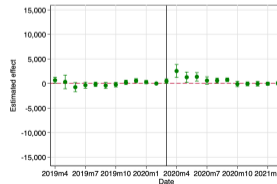
Error bars show 95% confidence interval.
Mean mthly number of firms in 30 day window around 19th March: 83

RSE



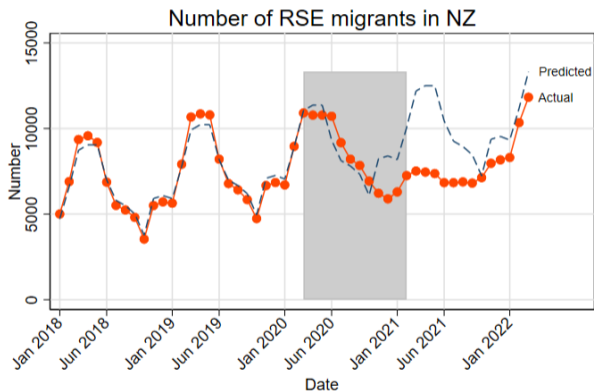
Error bars show 95% confidence interval.
Mean mthly number of firms in 30 day window around 19th March: 83

WHM



Error bars show 95% confidence interval.
Mean mthly number of firms in 30 day window around 19th March: 83

RSE workers: Aggregate shortages affect 2021 season



Shaded area shows period after 19 March 2020 when borders closed.
An observation is the number of RSE present in each month/year based on arrival data.

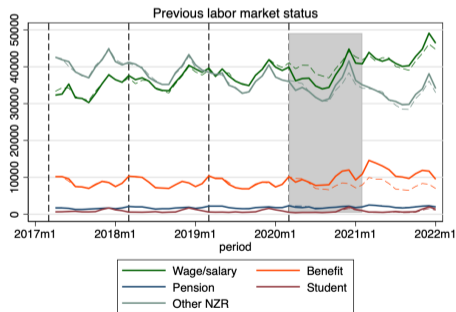
Distinct periods:

- ▶ April/May: Mild shortage
- ▶ June-September: Mild surplus
- ▶ October-February: Increasing shortage
- ▶ March onwards: significant shortage (outside study period)

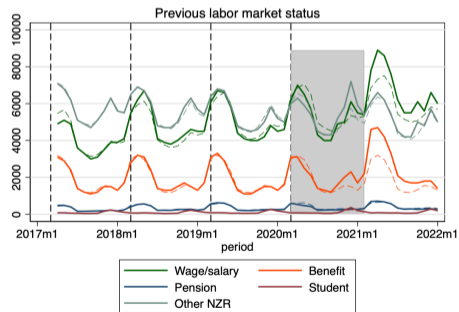
Additional NZ workers: 30% were beneficiaries

- ▶ Entire sample - plot status at start of spell
- ▶ Also: young, unemployed, inexperienced
- ▶ Poss. lower productivity for firm

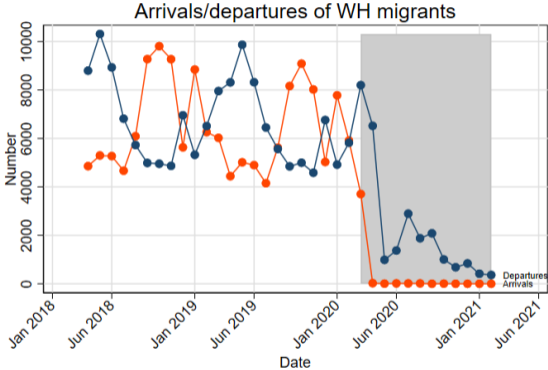
All firms in RSE-hiring industries



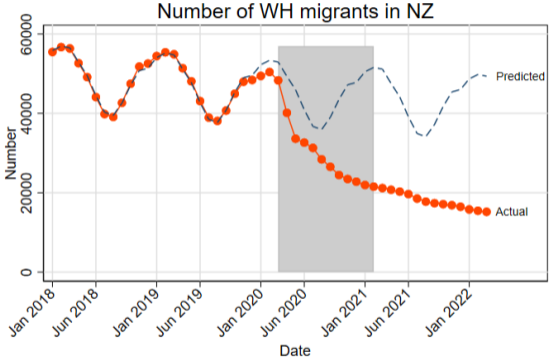
Firms who have ever hired RSE



Stock of Working holidaymakers



Shaded area shows period after 19 March 2020 when borders closed.

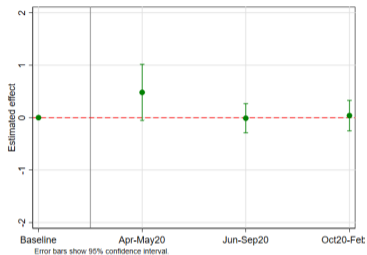


Shaded area shows period after 19 March 2020 when borders closed. An observation is the number of WH present in each month/year based on arrival data.

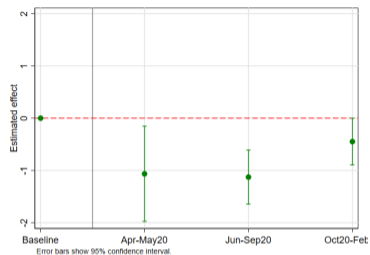
[◀ Back to presentation](#)

Changing composition of workforce

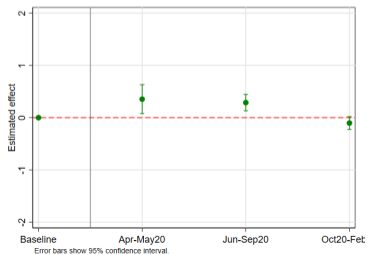
New Zealand residents



RSE workers



Working Holidaymakers



Other temporary migrants

