

The dragon down under: The regional labour market impact of growth in Chinese imports to Australia

James Maccarrone¹, Jeff Borland² and Michael Coelli²

¹Economics, University of Oxford

²Economics, University of Melbourne

15 July, 2019

Research Questions

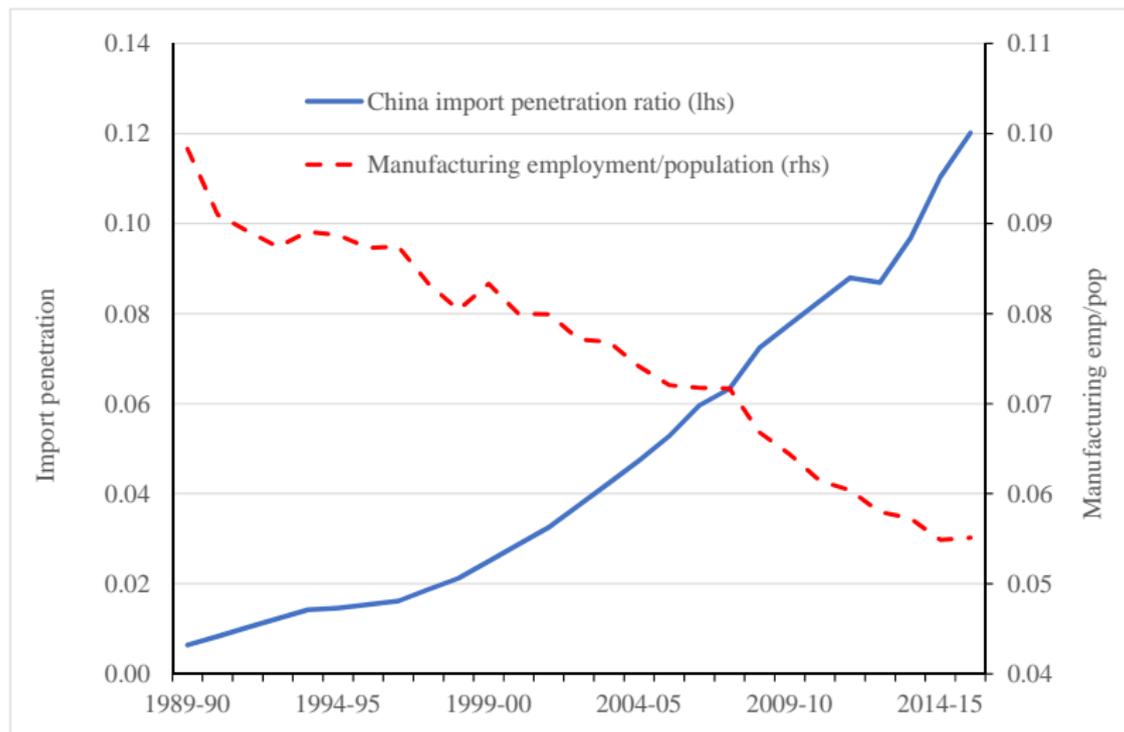
Has the rapid growth in manufacturing exports from China to Australia since 1991 affected local labour markets in Australia?

- 1 Did local manufacturing employment decrease?
- 2 Did local employment in other industries offset any declines?
- 3 Did workers move to other local labour markets in response?

Motivation

- Substantial liberalisation of trade policies occurred in Australia from the mid-1980s onwards.
- Imports of manufactured goods from China to Australia grew more than ten-fold in real terms between 1991 and 2006.
- Concerns expressed regarding the effect of this on local workers, particularly the less-skilled.
- The uneven distribution of manufacturing within countries (including Australia) may cause significant local adjustment issues.

Chinese Imports and Manufacturing Employment



Related Literature

Autor, Dorn and Hansen (2013, AER) [hereafter ADH] was the initial investigation of this issue for the US:

– significant negative effects on local manufacturing employment.

Several studies followed ADH:

- Dauth, Findeisen and Suedekum (2014, JEurEA) for Germany.
- Balsvik, Jensen and Salvanes (2015, JPubE) for Denmark, and
- Donoso, Martin and Minondo (2015, RegionalS) for Spain.

Mostly negative effects on local manufacturing employment confirmed.

Estimation Strategy

- Construct a measure of exposure to Chinese imports at the local labour market level based on local manufacturing industry mix.
- Instrument for Chinese imports to Australia using Chinese imports to other developed countries.
- Control for other variables thought to influence manufacturing employment:
 - initial manufacturing share,
 - potential routinisation, and
 - offshorability of jobs.
- Conduct MANY robustness checks.

Preview of Results

- 1 Significant negative effect on local manufacturing employment.
- 2 Robust to almost all alternative specifications considered.
- 3 No strong offsetting effects on employment in other industries.
 - An exception is among more educated (Bachelors degree or higher).
- 4 Reductions in population holding diplomas or certificates:
 - Is this mobility or education choices?
- 5 Unemployment rose significantly, particularly among the less-skilled and males.

Main Estimating Equation

We estimate the following equation at the local labour market / time-period level:

$$\Delta L_{it} = \gamma_t + \beta_1 \Delta IPW_{ait} + X'_{it} \beta_2 + \varepsilon_{it} \quad (1)$$

- ΔL_{it} = the 5 year change in the manufacturing employment share of the working-age population in local labour market i ,
- ΔIPW_{ait} = Chinese import exposure in market i , period t ,
- γ_t = time dummy for each period t , and
- X_{it} = controls which may affect manufacturing employment.

β_1 is our parameter of interest – expect to be negative

Measuring Import Exposure at Local Labour Market Level

The main covariate of interest is constructed as follows:

$$\Delta IPW_{ait} = \sum_j \frac{L_{ijt}}{L_{ajt}} \frac{\Delta M_{acjt}}{L_{it}} \quad (2)$$

- L_{ijt}/L_{ajt} = labour market i 's share of Australian employment in industry j at time t i.e. start of period.
- ΔM_{acjt} = change in Australian imports of manufacturing industry j 's products from China between t and $t + 1$ (in thousands of inflation-adjusted US dollars).
- L_{it} = the total employment in labour market i in period t .

ΔIPW_{ait} = change in Chinese imports per local worker in market i

Two Sources of Variation in Exposure

ΔIPW_{ait} will vary across local labour markets due to:

- ① differences across markets in the importance of manufacturing generally,
- ② differential growth in Chinese imports across industries within manufacturing, and variation across regions in the local mix of industries within manufacturing.

We are more interested in the role of the second source of variation.

We control for initial manufacturing employment to minimise impact of (1)
– which accounts for 34% of variation in ΔIPW_{ait} .

Endogeneity Concerns

We wish to estimate the causal effect of Chinese imports on local manufacturing

– due to a supply shock stemming from China's re-integration into the global economy:

- (1) starting around 1991 (Chinese policy change), and
- (2) ramping up in 2001 (WTO entry).

Observed import growth may, however, also reflect negative shocks to Australian manufacturing in specific products.

Thus OLS estimates may be biased – too negative.

Instrumenting for Chinese Imports to Australia

We follow ADH and instrument for Chinese imports to Australia using:

$$\Delta IPW_{oit} = \sum_j \frac{L_{ijt-1}}{L_{ajt-1}} \frac{\Delta M_{ocjt}}{L_{it-1}} \quad (3)$$

- ΔM_{ocjt} = change in Chinese imports to other high-income countries across the period¹
- L_{ijt-1}/L_{ajt-1} = representing labour market i 's share of Australian employment in industry j in $t - 1$.
- L_{it-1} = total employment in labour market i in $t - 1$

5-year lagged employment measures ($t - 1$) used to mitigate simultaneity bias.

¹Denmark, Finland, Germany, Japan, New Zealand, Spain, Switzerland, US

Time Period of Estimation

Equation (1) is estimated using three five-year Census data intervals as a stacked model:

– 1991-1996, 1996-2001 and 2001-2006.

- 1991 coincides with start of growth in Chinese imports.
- We stop in 2006 as the instrument “breaks down” due to the GFC:
 - consumption (import) growth slowed in many developed countries,
 - but Australia kept growing strongly.
- Concerned that correlated demand shocks may be undermining instrument.

Classification of Local Labour Markets

We attempted to construct local labour markets as closely as possible to the commuting zones defined for the US and employed by ADH.

- We started with home to work commuting flows at the SA3 level (2011 Census data).
- Employed the *flowbca* algorithm of Meekes and Hassink (2018).
- This joins nearby regions using flows on a hierarchical basis.
- Stopping rule chosen so containment of local labour markets was similar to US commuting zones:
 - minimum of 57%, average of 89% and 95% of the population.
 - ⇒ 124 local labour markets (versus 722 CZ's in the US)

The Data

Three main sources of data:

- Australian 5-yearly Census counts data: 1986-2011.
- Trade data: (a) direct from ABS (Australian imports),
(b) Comtrade (Other country imports, exports).
- US DOT and O*NET (routinisation and offshorability).

Several mappings required (using ABS concordances mainly):

- Trade data to 3-digit ANZSIC06 industry (55 in manufacturing).
- ABS geographic areas (SLA then SA3 to 2011 SA3 areas).
- Industry employment etc. from ASIC and ANZSIC93 to ANZIC06 (reallocated “not further defined” proportionately).
- US DOT and O*NET to Australian ANZSCO (our own).

Distribution of Chinese Import Exposure

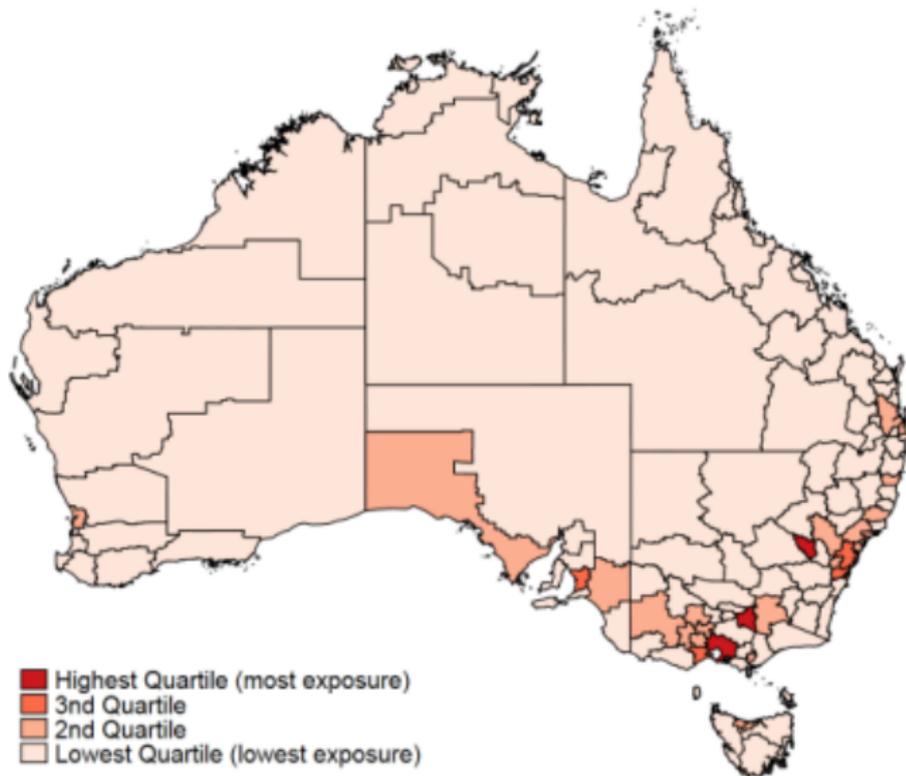
Distribution of IPW across the 124 regions – \$1,000 US per worker.

percentile	1991-96	1996-2001	2001-06	1991-2006
90th	0.585	0.509	2.590	4.432
75th	0.457	0.392	2.367	3.988
50th	0.303	0.242	1.608	2.655
25th	0.203	0.151	0.998	1.661
10th	0.094	0.083	0.651	0.863

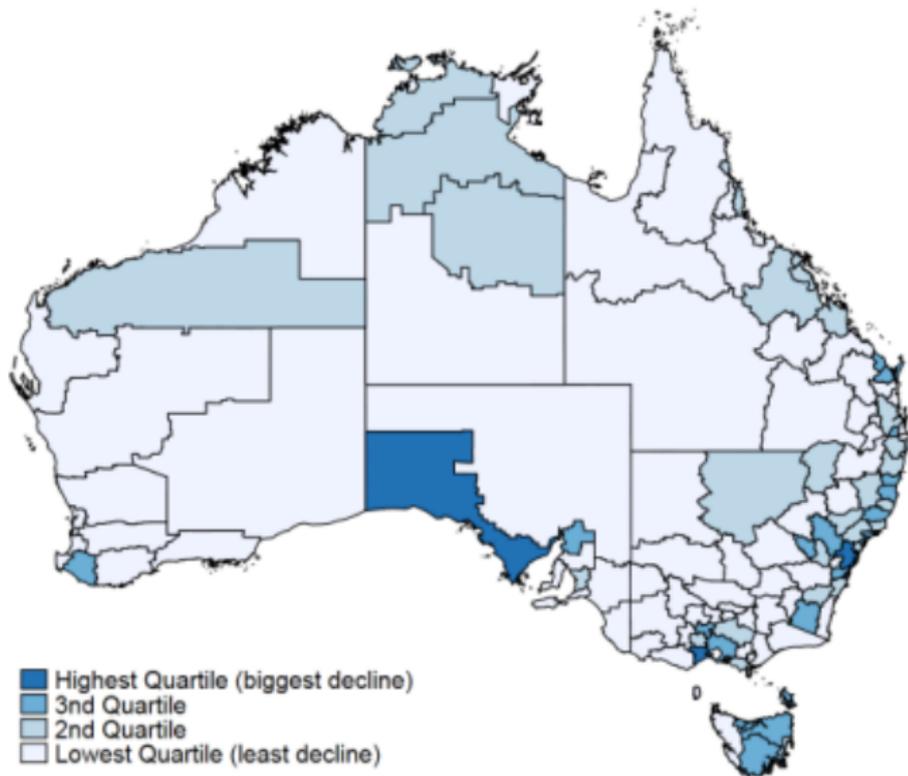
Main imports by 3-digit industry:

- 1 Computer and electronic equipment – 30%.
- 2 Clothing and footwear – 9%.

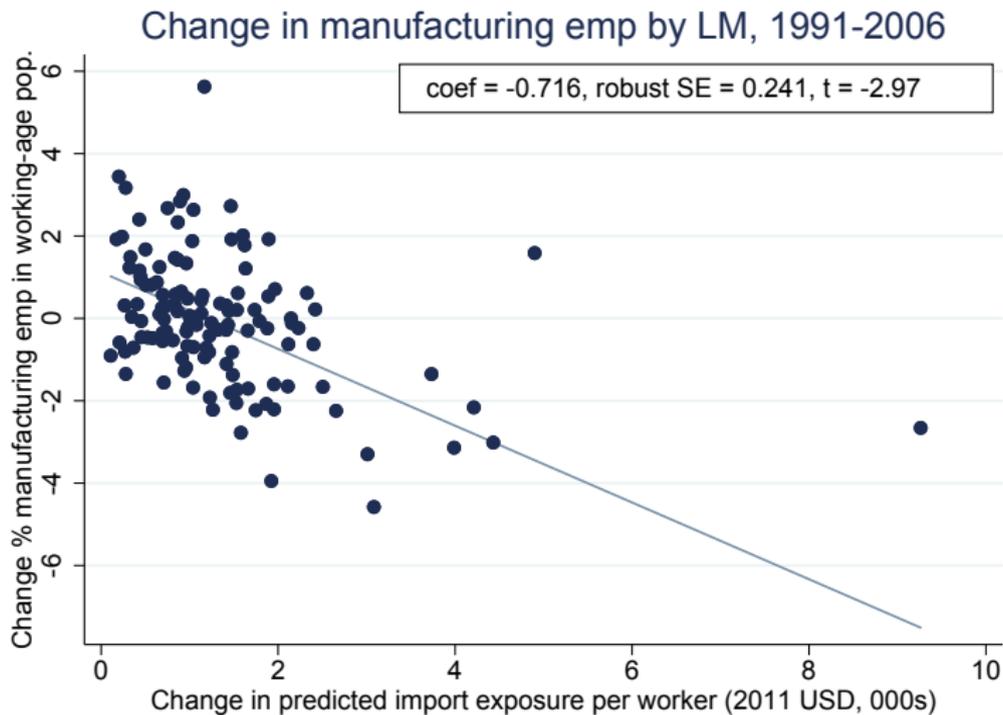
Chinese Import Exposure – 1991-2006



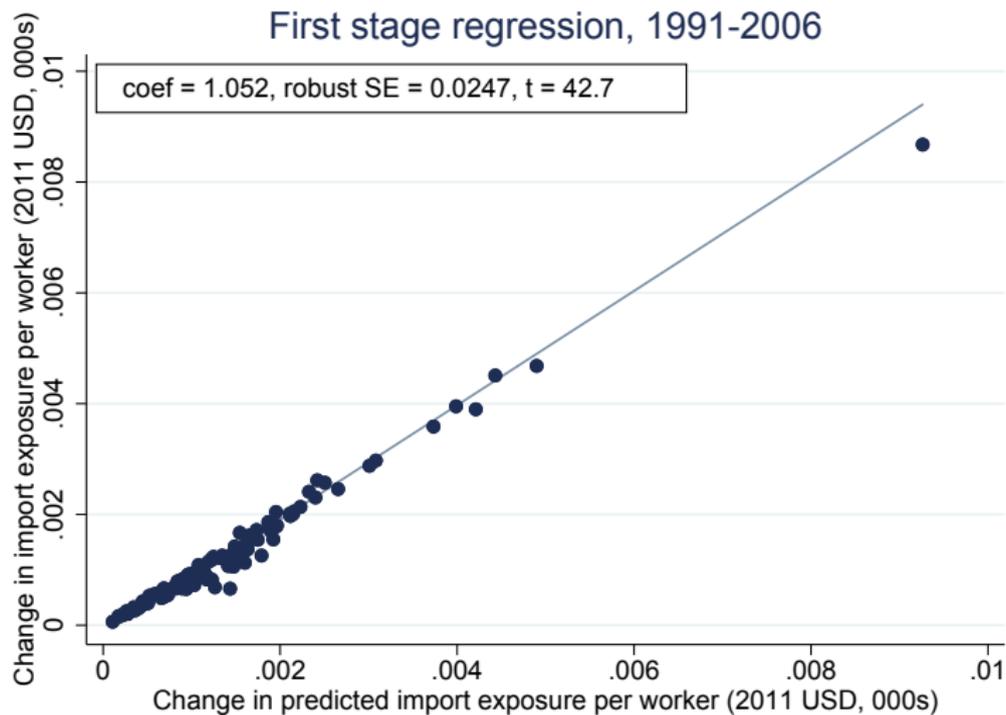
Decline in Manufacturing Share of Population – 1991-2006



The Relationship in a Diagram – Reduced Form



First Stage – Relevance of Instrument



Main Results – Manufacturing Employment

	(1)	(2)	(3)	(4)	(5)
Δ Chinese imports to Aust. per worker	-1.111*** (0.0761)	-0.954*** (0.124)	-0.879*** (0.106)	-0.834*** (0.115)	-0.805*** (0.125)
% employment in manufacturing		-0.0295** (0.0148)	-0.0577*** (0.0158)	-0.0664*** (0.0200)	-0.0591*** (0.0205)
% employment routine occupations				0.0567* (0.0315)	0.0276 (0.0409)
Offshorability index of occupations				-0.0464 (0.0513)	0.123 (0.134)
% population with post-secondary					-0.0232 (0.0273)
% population foreign-born					-0.0116 (0.0077)
% working-age females employed					0.0137 (0.0127)
State FE	No	No	Yes	Yes	Yes
First-stage regression					
Δ Chinese imports to other high-Y per worker	0.0303*** (0.00187)	0.0308*** (0.00269)	0.0311*** (0.00300)	0.0295*** (0.00428)	0.0295*** (0.00435)
F-stat. (instrument)	263.8	131.3	108	47.41	45.89
R-squared	0.974	0.974	0.974	0.976	0.976

Breakdowns – Manufacturing Employment

Sample	Time period	Change in Chinese imports to Australia per worker	Observations
All	1991-1996	-1.725*** (0.625)	124
All	1996-2001	-1.195*** (0.240)	124
All	2001-2006	-1.060*** (0.0709)	124
All	2006-2011	-0.310*** (0.0742)	124
Bachelors' or higher	1991-2006	-0.619*** (0.145)	372
Diploma / certificate	1991-2006	-0.806*** (0.303)	372
No post-school ed.	1991-2006	-0.773*** (0.123)	372
Males	1991-2006	-1.159*** (0.232)	372
Females	1991-2006	-0.468*** (0.0629)	372

Robustness (1) – Manufacturing Employment

Model	Description	Change in Chinese imports to Australia per worker
1	Main estimates	-0.805*** (0.125)
2	Change in NET Chinese imports to Australia per worker	-0.802*** (0.123)
3	Estimates from a Gravity Model	-0.706*** (0.173)
4	Exclude construction-related imports	-0.801*** (0.117)
5	Exclude apparel, footwear and textile imports	-0.821*** (0.161)
6	Exclude computers and electronic equipment	-1.042*** (0.215)
7	Excluding US from instrument countries	-0.729*** (0.129)
8	Excluding New Zealand from instrument countries	-0.804*** (0.126)
9	Including Canada in instrument countries	-0.810*** (0.126)

Robustness (2) – Manufacturing Employment

Model	Description	Change in Chinese imports to Australia per worker
1	Main estimates	-0.805*** (0.125)
10	Including 2006-2011 period	-0.729*** (0.136)
11	Clustering errors at the state level	-0.805*** (0.0767)
12	Adding interactions of initial manufacturing share with time dummies	-0.885*** (0.161)
13	Including initial manufacturing share separately by 15 sub-industries	-0.944*** (0.124)
14	Trade values in Australian Dollars	-0.289* (0.166)

Pre-exposure Test

▶ Pre-exposure Test

Exposure over the period 1991-2006 did not affect manufacturing employment changes from 1986-1991.

Population Responses (in logs) – Mobility?

Population	Change in Chinese imports to Australia per worker			
	Only time controls		Full set of controls	
	Coefficient	R ²	Coefficient	R ²
All	0.00004 (0.00622)	0.034	-0.0146* (0.00780)	0.488
Bachelor degree or higher	0.00865 (0.00802)	0.420	-0.00158 (0.00998)	0.638
Diploma or certificate	-0.0350** (0.0168)	0.420	-0.0526*** (0.0177)	0.620
No post-school qualification	-0.00763* (0.00457)	0.117	-0.00298 (0.00542)	0.506
15-34 years of age	0.0128* (0.00671)	0.268	-0.0175** (0.00840)	0.615
35-49 years of age	0.0104 (0.00707)	0.386	0.00140 (0.00815)	0.663
50-64 years of age	-0.0258*** (0.00579)	0.327	-0.0218*** (0.00819)	0.618

Labour Force Status Responses

Main covariate: Δ Chinese imports to Australia per worker

Sample	Manufacturing Employment	Non-manuf. Employment	Unemployment	Not in the labour force
All	-0.805*** (0.125)	-0.932*** (0.358)	0.884*** (0.224)	0.770*** (0.238)
Bachelors' or higher	-0.619*** (0.145)	0.367** (0.149)	0.313*** (0.0967)	-0.124 (0.147)
Diploma / certificate	-0.806*** (0.303)	-0.476 (0.346)	0.957*** (0.247)	0.273 (0.177)
No post-school ed.	-0.773*** (0.123)	-1.260*** (0.427)	0.960*** (0.254)	1.009*** (0.292)
Males	-1.159*** (0.232)	-1.045** (0.413)	1.192*** (0.295)	0.892*** (0.269)
Females	-0.468***	-0.751**	0.588***	0.597**

Models include full set of controls.

Compared to Other Studies

The estimated effects on manufacturing for Australia are:

- slightly more negative than those for the US:
 - with more response from unemployment than NILF;
- similar to those for Denmark,
 - with less response from unemployment than NILF;
 - and no offsetting effect of non-manufacturing employment;
- considerably more negative than for Spain and Germany.

Concluding Remarks

- Massive growth in manufacturing good imports to Australia since 1991.
- Significant negative effect on local manufacturing employment.
- Not offset by increasing employment in other industries, mobility or leaving the labour force.
- Higher unemployment was the main response.

Related Research

- ① We (including Aaron Blanco) also have a draft industry-level analysis:
 - a la Acemoglu, Autor, Dorn, Hansen and Price (2015).

- ② We are currently investigating the role of exports to China:
 - (a) in affecting local labour markets
(where mines are located and potentially where workers come from),
 - and
 - (b) potentially affecting indigenous communities.

Pre-exposure Test – Manufacturing Employment, 1986-91

	(1)	(2)	(3)	(4)	(5)
Δ Chinese imports to Aust. per worker % employment in manufacturing	-0.520*** (0.0568)	-0.177 (0.110)	-0.141 (0.0876)	-0.0519 (0.128)	0.0246 (0.107)
% employment routine occupations		-0.111*** (0.0287)	-0.131*** (0.0219)	-0.130*** (0.0214)	-0.128*** (0.0229)
Offshorability index of occupations				0.00499 (0.0463)	-0.00436 (0.0671)
% population with post-secondary education				-0.140 (0.144)	-0.0114 (0.314)
% population foreign-born					0.0187 (0.0507)
% working-age females employed					-0.0261* (0.0141)
State FE	No	No	Yes	Yes	Yes
First-stage regression					
Δ Chinese imports to other high-Y per worker	0.0315*** (0.000875)	0.0306*** (0.00101)	0.0309*** (0.000954)	0.0297*** (0.000878)	0.0289*** (0.00104)
F-stat. (instrument)	1297	914.3	1049	1147	775.8
R-squared	0.980	0.980	0.982	0.983	0.983

Summary Statistics

	1991	1996	2001	2006
Chinese imports to Australia	0.321	0.593	0.807	2.324
per working-age population	(0.171)	(0.323)	(0.368)	(0.936)
% working-age population	9.197	8.640	8.458	7.665
employed in manufacturing	(2.799)	(2.522)	(2.342)	(1.897)
% working-age population	55.31	57.14	59.05	63.45
employed in non-manufacturing	(4.178)	(4.398)	(3.987)	(3.871)
% working-age population	8.504	6.671	5.390	3.974
unemployed	(1.248)	(1.408)	(1.102)	(0.779)
% working-age population	26.95	27.54	27.09	24.90
not in the labour force	(2.663)	(2.668)	(2.980)	(2.817)

▶ Return