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## Credit chain and sectoral comovement: A multi-region investigation

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## **ONLINE APPENDIX**

ADB Economics Working Paper No. 640

Credit Chain and Sectoral Comovement:  
A Multi-Region Investigation

Hsiao-Hui Lee, S. Alex Yang, Yuxuan Zhang, and Kijin Kim

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Table A1: Multi-Region Input-Output Economy List

Asia (25)	Europe (32)
China, People's Republic of	Austria
Indonesia	Belgium
India	Bulgaria
Japan	Switzerland
Korea, Republic of	Cyprus
Bangladesh	Czechia*
Malaysia	Germany
Philippines	Denmark
Thailand	Spain
Viet Nam	Estonia
Kazakhstan	Finland
Mongolia**	France
Sri Lanka	United Kingdom and
Pakistan	Northern Ireland (United Kingdom)
Fiji	Greece
Lao People's Democratic Republic*	Croatia
Brunei Darussalam*	Hungary
Bhutan*	Ireland
Kyrgyz Republic*	Italy
Cambodia**	Lithuania
Maldives*	Luxembourg
Nepal*	Latvia
Singapore	Malta
Hong Kong, China	The Netherlands
Taipei, China	Norway
South America (1)	Poland
Brazil	Portugal
North America (3)	Romania
Canada	Russian Federation
Mexico	Slovakia
United States	Slovenia
Oceania (1)	Sweden
Australia	Turkey

\* = economies not included in Worldscope database and in the current analysis.

\*\* = economies not included in the current analysis due to Worldscope data limitation.

Notes: Economy names are listed as in the MRIO; if their names are different in Worldscope, we show them in brackets.

Source: Authors.

Table A2: Data Coverage of US Industries Based on Compustat

Industry Code	Number of Firms	Number of Firms with at Least 5 Years of Data
2 (Mining and quarrying)	986	641
3 (Food, beverages and tobacco)	390	261
4 (Textiles and textile products)	226	156
5 (Leather, leather and footwear)	31	27
6 (Wood and products of wood and cork)	148	102
7 (Pulp, paper, paper, printing and publishing)	307	230
8 (Coke, refined petroleum and nuclear fuel)	94	62
9 (Chemicals and chemical products)	1,611	1,116
10 (Rubber and plastics)	172	128
11 (Other non-metallic mineral)	86	61
12 (Basic metals and fabricated metal)	382	298
13 (Machinery, nec)	888	655
14 (Electrical and optical equipment)	2,091	1,531
15 (Transport equipment)	309	232
16 (Manufacturing, nec; recycling)	187	123
17 (Electricity, gas and water supply)	661	546
18 (Construction)	212	146
19 (Sale, maintenance and repair of motor vehicles)	110	80
20 (Wholesale trade and commission trade)	693	472
21 (Retail trade; repair of household goods)	790	547
22 (Hotels and restaurants)	375	271
23 (Inland transport)	156	106
24 (Water transport)	40	27
25 (Air transport)	96	64
26 (Other supporting and auxiliary transport activities)	98	75
27 (Post and telecommunications)	703	473
29 (real estate activities)	238	155
30 (Renting of M&Eq and other business activities)	855	661
31 (Public admin and defence; compulsory social security)	284	180
32 (Education)	79	54
33 (Health and social work)	441	302
34 (Other community, social and personal services)	3,371	2,190

nec = not elsewhere classified, M&Eq = machine and equipment.

Source: Authors.

Table A3: Data Coverage Based on Worldscope, Economy Level

Economy	Number of Firms	Number of Firms with at Least 5 Years of Data
Cambodia	1	1
Mongolia	3	3
Fiji	13	13
Estonia	21	19
Malta	31	21
Latvia	35	34
Slovakia	40	28
Lithuania	43	41
Slovenia	51	49
Kazakhstan	60	56
Hungary	79	73
Bangladesh	96	85
Croatia	116	113
Luxembourg	118	98
Portugal	121	98
Cyprus	140	119
Austria	191	157
Romania	193	183
Sri Lanka	205	199
Ireland	210	166
Bulgaria	282	271
Belgium	283	227
Finland	284	228
Philippines	285	259
Mexico	322	275
Pakistan	334	312
Denmark	356	288
Spain	403	301
Greece	416	373
Turkey	447	407
Switzerland	457	391
The Netherlands	460	391
Norway	469	356
Italy	643	494
Indonesia	661	542

*continued on next page*

Table A3 *continued*

<b>Economy</b>	<b>Number of Firms</b>	<b>Number of Firms with at Least 5 Years of Data</b>
Poland	694	625
Brazil	698	607
Thailand	861	793
Singapore	1,039	932
Sweden	1,116	856
Russian Federation	1,145	1,062
Viet Nam	1,208	1,038
Malaysia	1,423	1,293
Germany	1,586	1,305
France	1,651	1,348
Hong Kong, China	1,895	1,662
Taipei, China	2,415	2,191
Korea, Republic of	2,719	2,284
Australia	3,150	2,548
India	3,537	3,244
United Kingdom	4,204	3,184
Canada	4,717	3,293
Japan	5,499	5,031
China, People's Republic of	5,612	4,934
United States	16,212	11,282

Source: Authors.

**Table A4: Data Coverage Based on Worldscope, Industry Level Summary**

<b>Number of Economies</b>	<b>More Than # Industries with at Least 5 Firms (each firm has at least 5 years of data)</b>
45	5
39	10
36	15
26	20
18	25
11	30

Source: Authors.

Table A5: Trade Credit and Short-Term Debt Use by Economy, Previous 20 Years

Economy	Payables Financing				Short-Term Debt to Payables			
	2000	2007	2013	2018	2000	2007	2013	2018
Australia	0.10	0.13	0.14	0.17	0.41	0.30	0.23	0.18
Austria	0.11	0.11	0.11	0.13	1.21	1.06	1.01	0.94
Belgium	0.10	0.14	0.16	0.18	0.84	0.84	0.80	0.67
Bulgaria	...	...	0.23	0.23	...	...	0.23	0.21
Brazil	0.09	0.10	0.11	0.12	2.46	1.94	1.89	1.69
Canada	0.14	0.18	0.20	0.22	0.30	0.30	0.22	0.21
Switzerland	0.12	0.12	0.12	0.13	1.07	0.85	0.65	0.47
PRC	0.24	0.17	0.18	0.20	2.14	2.53	1.68	1.35
Cyprus	...	...	0.23	0.23	...	...	0.80	0.80
Germany	0.09	0.10	0.11	0.12	0.76	0.67	0.61	0.54
Denmark	0.09	0.11	0.12	0.13	1.14	1.03	0.84	0.66
Spain	0.17	0.20	0.22	0.24	0.80	0.80	0.72	0.74
Estonia	...	...	0.12	0.12	...	...	0.48	0.54
Finland	0.08	0.10	0.10	0.11	1.35	1.14	1.09	0.85
France	0.16	0.18	0.19	0.19	0.63	0.55	0.46	0.44
United Kingdom	0.15	0.16	0.17	0.18	0.48	0.45	0.38	0.35
Greece	0.13	0.18	0.22	0.24	1.98	1.84	1.88	1.75
Croatia	...	...	0.22	0.22	...	...	0.77	0.80
Hungary	0.08	0.12	0.12	0.15	0.64	0.70	0.63	0.60
Indonesia	0.14	0.12	0.11	0.12	3.57	2.41	1.89	1.59
India	0.17	0.16	0.15	0.15	1.10	0.86	1.08	1.18
Ireland	0.12	0.15	0.18	0.21	0.36	0.40	0.41	0.38
Italy	0.25	0.31	0.35	0.37	0.74	0.72	0.67	0.63
Japan	0.23	0.22	0.21	0.20	0.73	0.71	0.71	0.63
Korea, Republic of	0.14	0.12	0.11	0.11	2.71	1.67	1.73	1.72
Lithuania	...	...	0.14	0.13	...	...	1.07	1.07
Luxembourg	0.13	0.14	0.15	0.16	1.07	0.77	0.50	0.31
Latvia	...	...	0.10	0.11	...	...	0.86	0.91
Mexico	0.10	0.12	0.13	0.14	1.69	0.98	0.59	0.51
Malta	...	...	0.10	0.10	...	...	3.18	1.41
The Netherlands	0.11	0.13	0.13	0.16	0.70	0.69	0.74	0.72
Norway	0.09	0.11	0.12	0.13	0.63	0.46	0.43	0.41
Poland	0.02	0.11	0.16	0.16	0.97	0.63	0.67	0.69
Portugal	0.11	0.12	0.13	0.15	1.56	1.43	1.39	1.08
Romania	...	...	0.15	0.19	...	...	0.67	0.68
Russian Federation	...	0.10	0.10	0.14	1.42	1.45	1.12	0.84
Slovakia	...	0.13	0.13	0.16	1.82	0.72	0.53	0.48
Slovenia	...	0.20	0.13	0.12	...	0.76	0.82	0.71
Sweden	0.09	0.11	0.11	0.13	0.66	0.50	0.34	0.37
Turkey	0.11	0.13	0.14	0.16	1.17	1.03	1.03	1.00
Taipei, China	0.11	0.15	0.16	0.16	2.44	1.07	0.97	0.97
United States	0.09	0.12	0.13	0.14	0.25	0.24	0.22	0.19
Bangladesh	...	...	0.07	0.07	...	...	2.06	6.24
Malaysia	0.11	0.11	0.11	0.12	1.84	1.88	1.68	1.42
Philippines	0.19	0.16	0.16	0.14	1.25	1.65	1.39	1.10
Thailand	0.12	0.10	0.11	0.11	4.17	2.37	1.95	1.34
Viet Nam	...	...	0.09	0.09	...	1.07	2.08	1.98
Kazakhstan	...	...	0.11	0.11	...	...	1.97	2.18
Sri Lanka	0.05	0.08	0.08	0.08	4.31	2.98	1.75	1.97
Pakistan	0.07	0.07	0.07	0.09	3.74	3.38	3.30	2.64
Fiji	...	...	0.10	0.12	...	...	0.55	0.48
Singapore	0.13	0.15	0.15	0.16	0.95	0.74	0.82	0.69
Hong Kong, China	0.15	0.15	0.15	0.15	0.97	0.99	1.01	1.02
Mean	0.12	0.14	0.14	0.15	1.43	1.13	1.05	1.01
Median	0.11	0.13	0.13	0.14	1.09	0.86	0.82	0.74
s.d.	0.05	0.04	0.05	0.05	1.04	0.73	0.69	0.91

s.d. = standard deviation, PRC = People's Republic of China, ... = data not available.

Source: Authors' estimates.

**Table A6: Relative Use of Trade Credit Across US Manufacturing Industries, Previous 20 Years**

Industry Code	Relative Payables Financing				Relative Short-Term Debt to Payables			
	2000	2007	2013	2018	2000	2007	2013	2018
3 (Food, beverages and tobacco)	0.96	0.99	0.97	0.99	1.15	1.26	1.57	1.73
4 Textiles and textile products)	0.89	0.86	0.87	0.83	1.27	1.29	1.34	1.56
5 (Leather, leather and footwear)	0.72	0.75	0.83	0.82	1.45	1.12	0.33	0.18
6 (Wood and products of wood and cork)	0.78	0.75	0.69	0.68	0.85	0.79	0.90	0.95
7 (Pulp, paper, paper, printing and publishing)	1.01	1.00	1.02	1.01	0.92	0.98	1.16	1.34
8 (Coke, refined petroleum and nuclear fuel)	1.09	1.00	0.88	0.80	0.55	0.56	0.58	0.52
9 (Chemicals and chemical products)	1.31	1.24	1.17	1.13	0.78	0.70	0.89	0.73
10 (Rubber and plastics)	1.04	1.05	1.09	1.04	1.16	1.21	1.21	1.28
11 (Other non-metallic mineral)	0.94	0.92	0.98	0.97	1.29	1.08	1.56	1.55
12 (Basic metals and fabricated metal)	0.97	0.96	0.97	0.96	1.02	1.02	1.09	1.05
13 (Machinery, nec)	1.34	1.33	1.37	1.39	0.85	0.67	0.63	0.65
14 (Electrical and optical equipment)	1.33	1.35	1.37	1.41	0.98	0.82	0.78	0.70
15 (Transport equipment)	0.99	1.03	1.06	1.14	0.82	0.81	0.91	0.91
16 (Manufacturing, nec; recycling)	1.16	1.16	1.20	1.23	1.92	1.99	2.08	3.03

nec = not elsewhere classified.

Notes: Relative payables financing is the payables financing in a given manufacturing industry in US to the overall US median in manufactures. Similar ratios are reported for short-term debt to payables. The values of each measure for a given industry correspond to the median across all US firms in that industry included in Compustat. The value for the US manufacturing sector as a whole corresponds to the median across industries. For a given firm, the ratios correspond to their median across the corresponding years.

Source: Authors' estimates.

**Table A7: Economy-Industry Pairs with the Strongest Domestic Trade Credit Linkages, 1998–2018**

Economy 1	Industry 1	Economy 2	Industry 2	Domestic Trade Credit Linkage ( $C^D$ )	Ranking
Italy	6	Italy	16	0.1180	1
Spain	11	Spain	6	0.0830	2
Spain	12	Spain	10	0.0798	3
Italy	12	Italy	15	0.0796	4
PRC	11	PRC	13	0.0785	5
PRC	8	PRC	11	0.0759	6
Japan	4	Japan	11	0.0751	7
PRC	10	PRC	8	0.0751	8
Japan	6	Japan	4	0.0747	9
Spain	11	Spain	10	0.0733	10
Japan	6	Japan	11	0.0724	11
Spain	11	Spain	13	0.0723	12
PRC	7	PRC	8	0.0720	13
PRC	10	PRC	11	0.0719	14
Spain	13	Spain	6	0.0717	15
PRC	8	PRC	13	0.0715	16
Cyprus	3	Cyprus	6	0.0710	17
Spain	3	Spain	11	0.0707	18
Spain	6	Spain	10	0.0705	19
Spain	10	Spain	13	0.0700	20

PRC = People's Republic of China.

Source: Authors' estimates.



**Table A8: Economy-Industry Pairs with the Strongest Cross-Border Trade Credit Linkages, 1998–2018**

Economy 1	Industry 1	Economy 2	Industry 2	Cross-border Trade Credit Linkage ( $C^F$ )	Ranking
Austria	6	Hungary	6	0.1285	1
Hungary	6	Italy	16	0.1130	2
Slovenia	6	Hungary	6	0.1054	3
Slovenia	6	Austria	6	0.1024	4
Taipei,China	14	Viet Nam	14	0.1012	5
Italy	16	Austria	6	0.1005	6
Slovenia	6	Italy	16	0.0945	7
Taipei,China	14	PRC	14	0.0938	8
Viet Nam	14	PRC	14	0.0914	9
Taipei,China	14	Philippines	14	0.0908	10
Belgium	12	Luxembourg	12	0.0841	11
PRC	14	Philippines	14	0.0833	12
Belgium	12	Norway	12	0.0832	13
Taipei,China	14	Singapore	11	0.0829	14
PRC	12	Taipei,China	14	0.0820	15
Norway	12	Luxembourg	12	0.0814	16
Slovakia	12	Belgium	12	0.0805	17
The Netherlands	12	Luxembourg	12	0.0804	18
Luxembourg	12	Slovakia	12	0.0800	19
Belgium	12	Bulgaria	12	0.0796	20

PRC = People's Republic of China.

Source: Authors' estimates.

**Table A9: Winsorizing or Trimming Based on Regression (4) in Table 3**

	Winsor 1%	Winsor 3%	Winsor 5%	Trim 5%
	$\rho_{ik}^{mo}$	$\rho_{ik}^{mo}$	$\rho_{ik}^{mo}$	$\rho_{ik}^{mo}$
$G_{ik}^{mo}$	0.636*** (0.0143)	0.550*** (0.0136)	0.497*** (0.0131)	0.306*** (0.0634)
$C_{ik}^{Dmo}$	6.742*** (0.524)	6.671*** (0.504)	6.364*** (0.484)	6.122*** (0.742)
$C_{ik}^{Fmo}$	3.515*** (0.447)	3.583*** (0.421)	3.452*** (0.398)	3.334*** (0.569)
Constant	0.187*** (0.000802)	0.190*** (0.000753)	0.192*** (0.000712)	0.197*** (0.000639)
Economy-industry pair ( $m, i$ ) FE	yes	yes	yes	yes
Economy-industry pair ( $o, k$ ) FE	yes	yes	yes	yes
Observations	511,589	511,589	511,589	460,432
$R^2$	0.429	0.431	0.432	0.379
Within $R^2$	0.027	0.025	0.023	0.009

Notes: Standard errors in parentheses and are robust to heteroskedasticity. \* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$ .

Source: Authors' estimates.

Table A10: Winsorizing or Trimming by Group (Economy-Industry Pair [ $m, i$ ])

	Winsor 1%	Winsor 3%	Winsor 5%	Trim 5%
	$\rho_{ik}^{mo}$	$\rho_{ik}^{mo}$	$\rho_{ik}^{mo}$	$\rho_{ik}^{mo}$
$G_{ik}^{mo}$	0.573*** (0.0138)	0.460*** (0.0109)	0.405*** (0.00949)	0.0867*** (0.0544)
$G_{ik}^{Dmo}$	7.115*** (0.510)	6.700*** (0.481)	6.349*** (0.454)	6.592*** (0.693)
$G_{ik}^{Fmo}$	3.912*** (0.451)	4.122*** (0.437)	4.147*** (0.424)	4.903*** (0.573)
Constant	0.186*** (0.000812)	0.188*** (0.000777)	0.190*** (0.000750)	0.196*** (0.000684)
Economy-industry pair ( $m, i$ ) FE	yes	yes	yes	yes
Economy-industry pair ( $o, k$ ) FE	yes	yes	yes	yes
Observations	511,589	511,589	511,589	461,570
$R^2$	0.430	0.444	0.458	0.482
Within $R^2$	0.025	0.021	0.019	0.008

Notes: Standard errors in parentheses and are robust to heteroskedasticity. \* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$ .

Source: Authors' estimates.

Table A11: Regression Table (Time Window: Previous 10 Years)

	2000	2007	2013	2018
	$\rho_{ik}^{mo}$	$\rho_{ik}^{mo}$	$\rho_{ik}^{mo}$	$\rho_{ik}^{mo}$
$G_{ik}^{mo}$	0.887*** (0.0177)	0.690*** (0.0175)	0.725*** (0.0149)	0.723*** (0.0166)
$G_{ik}^{Dmo}$	12.94*** (1.021)	7.428*** (0.811)	4.089*** (0.579)	7.068***
$G_{ik}^{Fmo}$	11.75*** (1.753)	6.983*** (0.866)	1.976*** (0.556)	2.456*** (0.441)
Constant	0.0544*** (0.00227)	0.248*** (0.00156)	0.220*** (0.000866)	0.229*** (0.000866)
Economy-industry pair ( $m, i$ ) FE	yes	yes	yes	yes
Economy-industry pair ( $o, k$ ) FE	yes	yes	yes	yes
Observations	266,268	303,314	484,277	472,424
$R^2$	0.180	0.394	0.440	0.439
Within $R^2$	0.044	0.036	0.017	0.021

FE = fixed effects.

Notes: Standard errors in parentheses and are robust to heteroskedasticity. \* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$ .

Source: Authors' estimates.

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