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Abstract

We use the World Input Output Database (WIOD) to estimate the potential employment effects of a hard Brexit in 43 countries. In line with other studies we assume that imports from the European Union (EU) to the UK will decline by 25% after a hard Brexit. The absolute effects are largest in big EU countries which have close trade relationships with the UK like Germany and France. However, there are also large countries outside the EU which are heavily affected via global value chains like China, for example. The relative effects (in percent of total employment) are largest in Malta and Ireland. UK employment will also be affected via intermediate input production. Within Germany, the motor vehicle industry and in particular the "Autostadt" Wolfsburg are most affected.

Keywords: Brexit, employment, European Union, international trade, tariffs

JEL classification: C67, D57, F16, R15

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1 Introduction

In June 2016, the British people voted to leave the European Union (EU) by applying article 50 of the Treaty on European Union. The UK's departure is scheduled for March 29, 2019. The details of the Brexit are subject of a treaty that the UK and the remaining EU member countries aim to close. Since the British parliament has rejected the Brexit deal[1] negotiated between the UK's Prime Minister and the remaining member countries of the EU on January 15, 2019, the probability of a no-deal, or hard Brexit is increasing. A hard Brexit may imply that exports from the remaining EU member countries to the UK will be subject to tariffs. Furthermore, there will be many organizational problems at the borders between the EU and the UK. Accordingly, the British demand for EU products is likely to decrease due to these tariffs. In this paper, we use the World Input Output Database (WIOD) in order to document (i) which industries, (ii) in which countries will be affected most by a decline of British imports from EU member countries and (iii) what the according employment effects are. For Germany, we also provide a detailed regional breakdown of potential employment effects. Of course, not only international trade in goods and services will be affected by Brexit.[2] However, we only focus on trade in goods and services here.

The paper is organized as follows. First, we describe the data and our methodology in section 2. Then we explain the results by country, by industry and – for Germany – by region in section 3. Finally, we provide conclusions in section 4.

2 Data and methodology

2.1 World Input-Output Table

The main data source for our analysis is the World Input Output Database (WIOD).[3] The 2016 edition (Timmer et al. 2015, Timmer et al. 2016) is used which covers data for 43 countries (plus rest of the world) and 56 industries. The countries and the industries are listed in the appendix. We use the most recent available data which refers to the year 2014. Table 1 shows the general structure of the World Input-Output Table. Among the 44 (including rest of the world) countries, we distinguish between the $m = 27$ countries which remain in the EU, the UK (country $m + 1$) and $M - m - 1$ non-EU countries (including rest of the world).

The matrix $X = \left\{x_{ij}^{k\ell}\right\}$ is called transaction matrix.[4] Dividing the elements of X by column sums $x^{k\ell}$ yields matrix $A = \left\{\frac{x_{ij}^{k\ell}}{x^{k\ell}}\right\}$. Total output ($x$) in the $M \times N = 44 \times 56 = 2464$ supply-country-industry combinations can now be written as follows:

$$x = Ax + y,$$

where the $(M \times N) \times 1$ vector $y = \left\{\sum_{i=1}^{M} y_i^{k\ell}\right\}$ denotes final demand in the M countries covered by the 2464 supply-country-industry combinations, respectively. For a given vector of final

[1] Agreement on the withdrawal of the United Kingdom of Great Britain and Northern Ireland from the European Union and the European Atomic Energy Community, as endorsed by leaders at a special meeting of the European Council on 25 November 2018, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/759019/25_November_Agreement_on_the_withdrawal_of_the_United_Kingdom_of_Great_Britain_and_Northern_Ireland_from_the_European_Union_and_the_European_Atomic_Energy_Community.pdf.

[2] Dhingra et al. (2018) discuss foreign direct investment after Brexit, for example, and Powdthavee et al. (2019) the effect of Brexit on subjective wellbeing.

[3] http://www.wiod.org/home.

[4] For a general discussion of input-output analysis see Miller and Blair (2009).

Table 1: Stylized World Input-Output Table

			Intermediate Use							Final Use			Total Use
			Country 1			...	Country M			Countries			
			Industries				Industries						
			1	...	N	...	1	...	N	1	...	M	(x)
Supply	EU-Country (1)	Ind. 1	x_{11}^{11}		x_{1N}^{11}		x_{M1}^{11}		x_{MN}^{11}	y_1^{11}		y_M^{11}	x^{11}
		...											
		Ind. N	x_{11}^{1N}		x_{1N}^{1N}		x_{M1}^{1N}		x_{MN}^{1N}	y_1^{1N}		y_M^{1N}	x^{1N}
	...												
	EU-Country (m)	Ind. 1	x_{11}^{m1}		x_{1N}^{m1}		x_{M1}^{m1}		x_{MN}^{m1}	y_1^{m1}		y_M^{m1}	x^{m1}
		...											
		Ind. N	x_{11}^{mN}		x_{1N}^{mN}		x_{M1}^{mN}		x_{MN}^{mN}	y_1^{mN}		y_M^{mN}	x^{mN}
	United Kingdom ($m+1$)	Ind. 1	$x_{11}^{m+1,1}$		$x_{1N}^{m+1,1}$		$x_{M1}^{m+1,1}$		$x_{MN}^{m+1,1}$	$y_1^{m+1,1}$		$y_M^{m+1,1}$	$x^{m+1,1}$
		...											
		Ind. N	$x_{11}^{m+1,N}$		$x_{1N}^{m+1,N}$		$x_{M1}^{m+1,N}$		$x_{MN}^{m+1,N}$	$y_1^{m+1,N}$		$y_M^{m+1,N}$	$x^{m+1,N}$
	Non-EU Country ($m+2$)	Ind. 1	$x_{11}^{m+2,1}$		$x_{1N}^{m+2,1}$		$x_{M1}^{m+2,1}$		$x_{MN}^{m+2,1}$	$y_1^{m+2,1}$		$y_M^{m+2,1}$	$x^{m+2,1}$
		...											
		Ind. N	$x_{11}^{m+2,N}$		$x_{1N}^{m+2,N}$		$x_{M1}^{m+2,N}$		$x_{MN}^{m+2,N}$	$y_1^{m+2,N}$		$y_M^{m+2,N}$	$x^{m+2,N}$
	...												
	Non-EU Country (M)	Ind. 1	x_{11}^{M1}		x_{1N}^{M1}		x_{M1}^{M1}		x_{MN}^{M1}	y_1^{M1}		y_M^{M1}	$x^{M,1}$
		...											
		Ind. N	x_{11}^{MN}		x_{1N}^{MN}		x_{M1}^{MN}		x_{MN}^{MN}	y_1^{MN}		y_M^{MN}	$x^{M,N}$
Value added by labor and capital													
Gross output (x')			x^{11}		x^{1N}		$x^{M,1}$		$x^{M,N}$				

demand y, the corresponding total output vector including the intermediate inputs necessary for production can be recovered:

$$x = (I - A)^{-1} y,$$

where $(I - A)^{-1}$ is called inverse Leontief matrix. Accordingly, changes in final demand Δy affect total output:

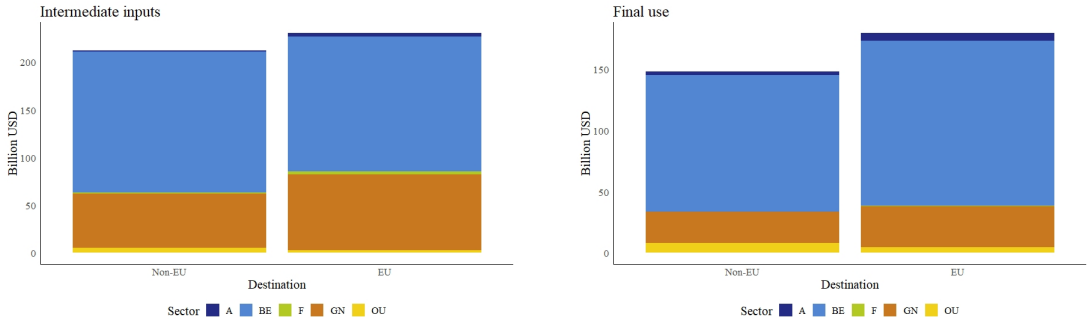
$$\Delta x = (I - A)^{-1} \Delta y.$$

2.2 British final import demand and EU gross output after Brexit

Both for intermediate inputs and for final use, the EU is the quantitatively most important trading partner of the UK. Figure 1 shows that the UK imports more goods and services from the EU than from all other trading partners together. We assume that final demand imports from the remaining EU member countries (supply countries $k = 1, ..., m$) to the UK (use country $i = m + 1$) are reduced by s percent after a hard Brexit. This implies

$$\Delta y = -s \times \begin{pmatrix} y_{m+1}^{11} \\ ... \\ y_{m+1}^{k\ell} \\ ... \\ y_{m+1}^{mN} \\ 0 \\ ... \\ 0 \end{pmatrix}.$$

Figure 1: UK Imports from EU and non-EU countries



Source: World Input-Output Database and own calculations.

Since the inverse Leontief matrix is given and does not depend on s, the effects on total output are linear in s.

Of course, it is difficult to calibrate the percentage decline (s) in British final import demand from remaining EU countries after a no-deal Brexit. The potential consequences depend on the exit scenario. The negotiated deal between the British Prime Minister and the remaining EU countries state in the political declaration of November 25, 2018[5] that the trading relationship in goods should be as close as possible, facilitating the ease of trade between the EU and the UK. This implies a free trade area for goods.[6]

However, without a formal agreement, trade between the UK and the EU would follow World Trade Organization rules after Brexit. This implies that tariffs would apply between the UK and the EU. Cars and car parts, for example, would be taxed at 10%. Agricultural tariffs are even higher. Non-tariff costs would also increase.[7] Higher import prices will lead to less import demand. The magnitude of this effect is uncertain. Hantzsche et al. (2018) estimate that a no-deal Brexit would reduce bilateral trade between the UK and the EU by 56% in the long-run and that about half of this effect would occur immediately after March 29, 2019. Accordingly, we assume that UK final imports form the EU decline by 25% after Brexit and set $s = 0.25$. Other estimates of the change in UK imports have a similar order of magnitude; Dhingra et al. (2017) report a short-run estimate of 34% (including intermediate inputs) based on a trade model which considers the respective tariffs to be expected in the various industries.

2.3 Employment effects

In order to estimate the employment effects that are associated with changes in total output (Δx) we use employment data from the Social-Economic Accounts provided by the World Input-Output Database. Using employment by country and industry ($n^{k\ell}$), we construct coefficients $b^{k\ell}$ which indicate how many employed persons are necessary to produce on unit of output in a given indus-

[5]Political declaration setting out the framework for the future relationship between the European Union and the United Kingdom, `https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/759021/25_November_Political_Declaration_setting_out_the_framework_for_the_future_relationship_between_the_European_Union_and_the_United_Kingdom__.pdf`.

[6]Article B.23 of the political declaration: "The economic partnership should ensure no tariffs, fees, charges or quantitative restrictions across all sectors, with ambitious customs arrangements that, in line with the Parties' objectives and principles above, build and improve on the single customs territory provided for in the Withdrawal Agreement which obviates the need for checks on rules of origin."

[7]Dhingra et al. (2017) estimate the increase in non-tariff costs to amount to about 8% in case of a hard Brexit.

try:

$$b^{k\ell} = \frac{n^{k\ell}}{x^{k\ell}}$$

and a corresponding $(k \times \ell) \times 1$ vector $b = \left\{b^{k\ell}\right\}$. The change in employment by country and industry triggered by a decline in British final imports from remaining EU member countries including all pipeline effects trough provision of intermediate inputs is given by:

$$\Delta b = b * \Delta x,$$

where $*$denotes element-wise multiplication.

The employment effect can be decomposed into a direct and an indirect effect. The direct effect refers to the first-round effect of lower British imports without taking into account that affected firms will demand less intermediate inputs from other firms. The direct employment effect is then given by:

$$\Delta b^D = b * \Delta y.$$

Finally, we can calculate the indirect effect:

$$\Delta b^{Ind} = \Delta b - \Delta b^D.$$

3 Results

3.1 Results by country

The overall effect on absolute employment is largest for Germany (Figure 2 a) where about 100.000 persons are potentially affected (see also table 6 in the appendix). The absolute effect is also relatively large for China (about 59.000 persons) although there are no direct effects because China is not a member country of the EU. However, China will be affected via intermediate inputs of firms that export to the UK. Relative to total employment, Malta and Ireland are heavily affected. In these two countries, exports to the UK amount to 13.5% (Malta) and 7,3% (Ireland) of total production (see Table 5 in the appendix). In Malta the reduction of trade with the UK may potentially affect 1,7% and in Ireland 1,0% of all employed persons (Figure 2 b).

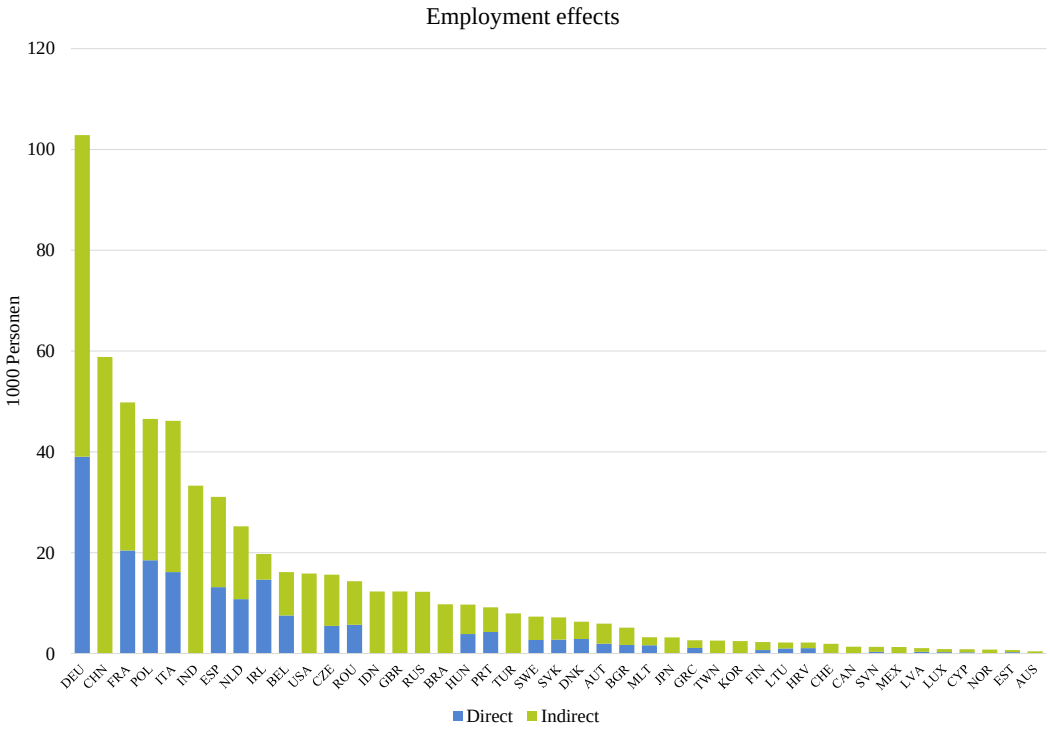
3.2 Results by industry

Which industries are affected most varies from country to country (see table 7 in the appendix). Figure 3 shows country-specific heat maps of the employment effects. Green squares indicate that the effect is relatively small in an industry while red squares indicate a relatively large effect (based on the absolute total employment effect by country and industry). In some countries like Bulgaria or Brazil, for example, agriculture is heavily affected. In other countries like Czech Republic and Germany, the effects are largest in manufacturing industries. In Austria and Belgium, wholesale and retail trade show the strongest exposure. In Canada and France, administrative and support services are strongly affected.

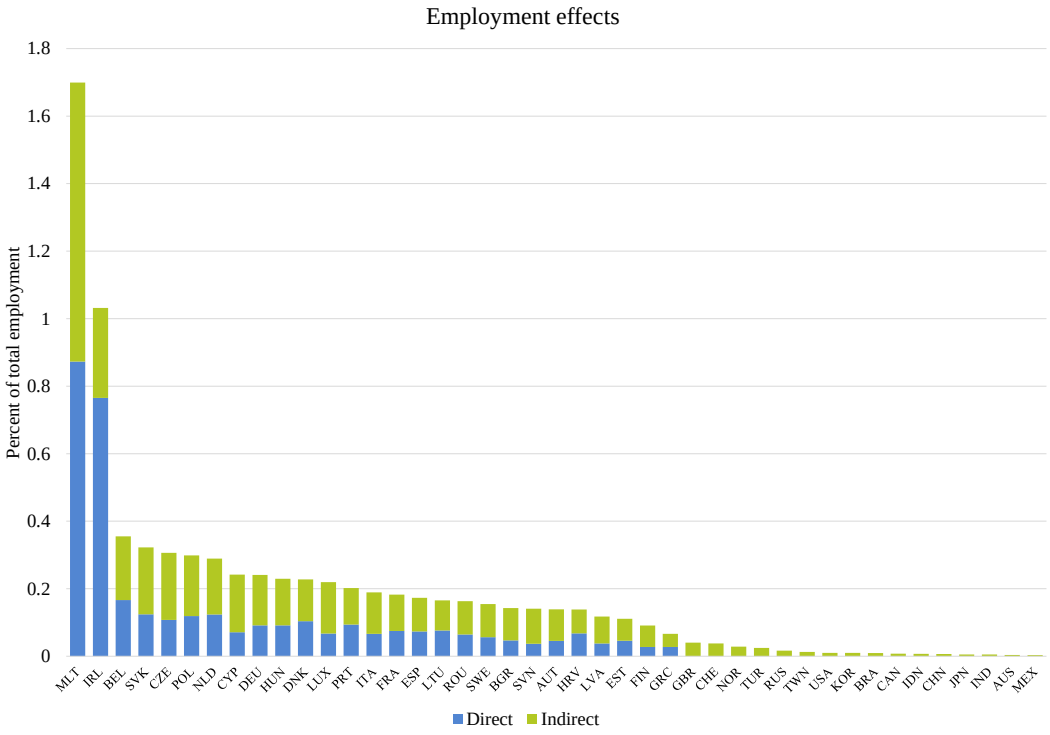
Note that the UK itself is also affected due to intermediate inputs exported by UK firms to non-UK firms which deliver to firms exporting from the remaining EU to the UK directly or indirectly via global value chains.

Figure 2: Potential employment effects of a 25% reduction of UK final import demand

(a) Absolute effect

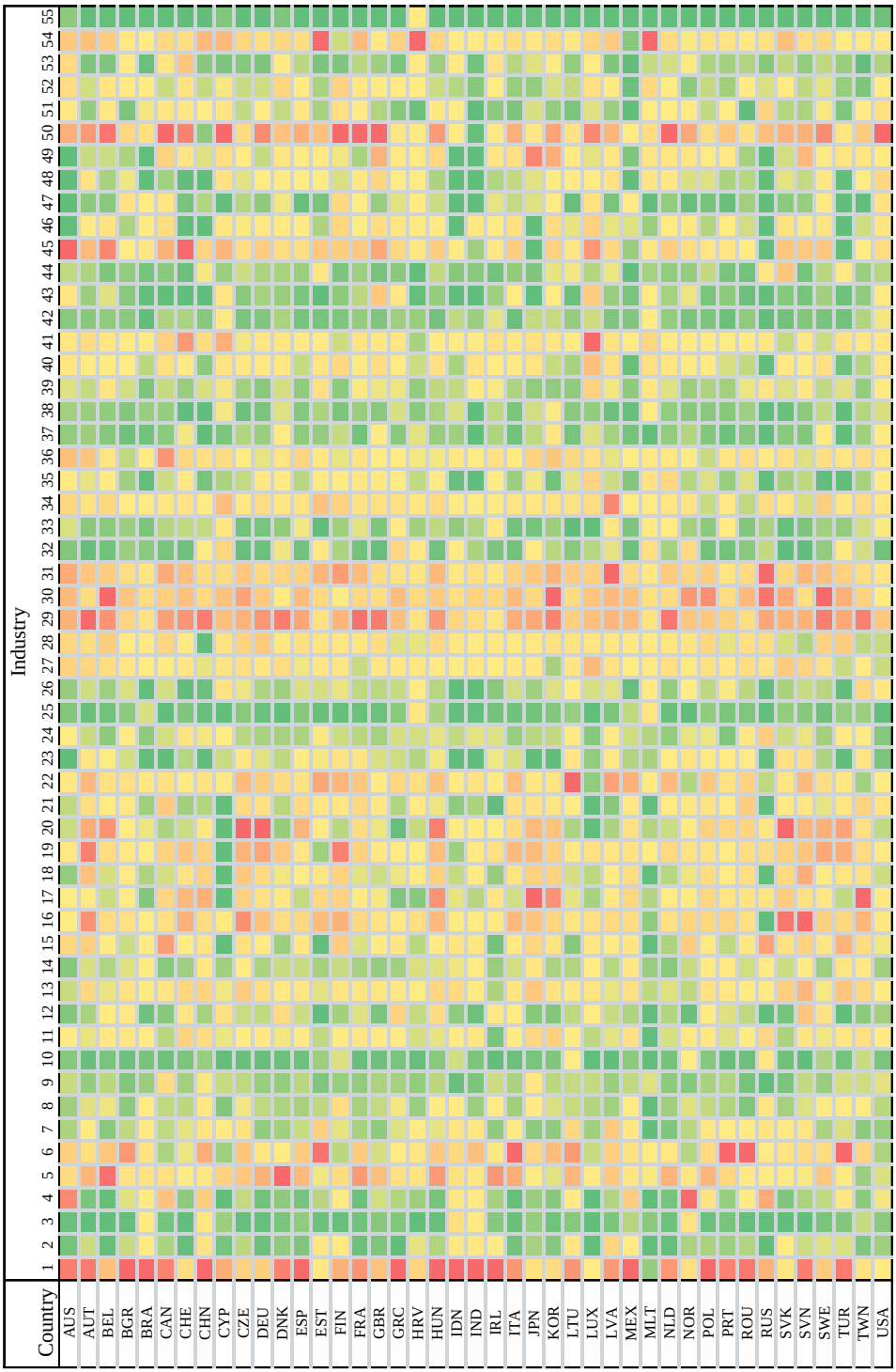


(b) Relative effect



Source: World Input-Output Database and own calculations.

Figure 3: Absolute total employment effects by country and industry



Source: World Input-Output Database and own calculations. Green: relative small effect, red: relative large effect. Based on absolute total employment effects by country and industry.

3.3 Regional disaggregation for Germany

Using the distribution of employment by industry within Germany, we allocate the industry-specific employment effects for Germany to the 401 German counties. However, employment by industry for counties is only available for more general sectors not for the 56 industries covered by the World Input-Output database. Employment data by county is available for sectors A, B-E, F, G-J, K-N and O-T. We group the 56 industries accordingly. Let the number of affected employed persons in a county k and industry ℓ be denoted by $n^{k\ell}$ and the total number of affected employed persons in the six sectors A, B-E, ..., O-T by $n^{\cdot\ell}$. Then the number of affected employed persons in a county is given by

$$n^{k\ell} = n^{\cdot\ell} \times w^{k\ell},$$

where $w^{k\ell}$ is the share of county k in total employment in industry ℓ. Finally, the corresponding share of affected persons in county k is $n^{k\ell}/n^k$, where n^k denotes total employment in county k.

The share of affected workers if final import demand by the UK decreases by 25% varies between 0.15% and 0.4% in German counties (see table 8). The county which is affected most is Wolfsburg (500 of about 127,000 employed persons) followed by Dingolfing-Landau (265 of about 67,000 employed persons). The overall distribution across German counties is depicted in figure 4. Overall, counties in which production and trade of cars and car parts is relatively important are affected more than other counties.[8]

4 Conclusions

If the UK leaves the EU without an agreement on international trade in goods and services many countries will be affected by the corresponding decline in exports to the UK. Since production is organized in global value chains not only firms in the remaining EU countries will suffer from declining exports to the UK but also firms which supply intermediate inputs to firms that deliver final goods to the UK. The international integration of trade can be disentangled using World Input-Output Tables. If final import demand from the UK declines by 25% as assumed for the short-run by Hantzsche et al. (2018) then in total about 612,000 employed persons are affected in 43 countries (without rest of the world) of which only 179,000 persons in firms within the European Union that directly export final goods to the UK. About 433,000 persons will be affected by second-round effects that hit firms delivering intermediate inputs.

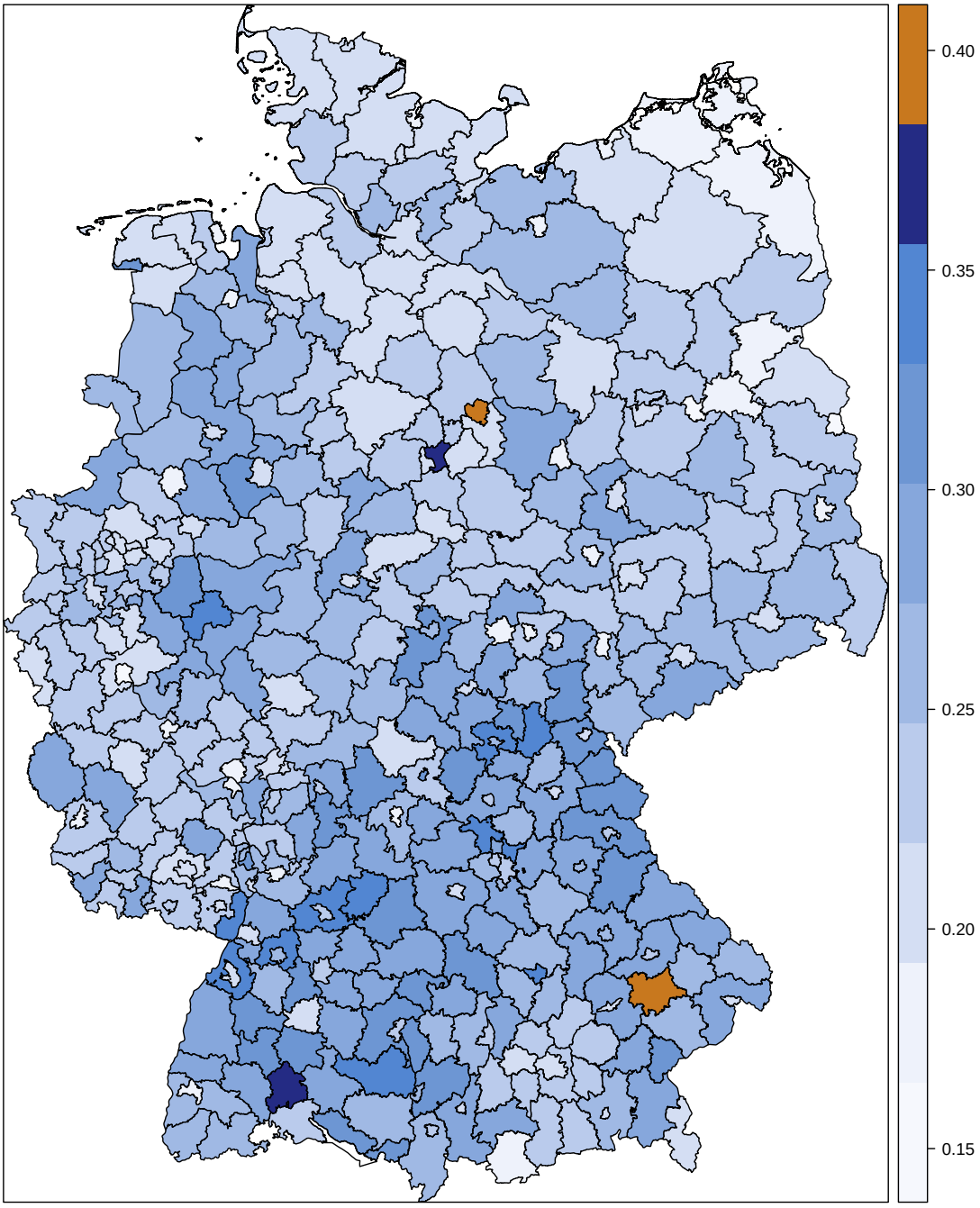
The motor vehicle industry will be the most affected industry (both manufacture and trade). Alone in Germany, about 15,000 persons in the motor vehicle industry (0.9% of total employment in motor vehicle manufacturing or trade) are working directly or indirectly for exports to the UK. Accordingly, within Germany important motor vehicle manufacturing places like Wolfsburg (Volkswagen) or Dingolfing-Landau (BMW) are most exposed to employment risks after a hard Brexit. However, there will also be considerable absolute effects in non-EU countries like China or India. The relative effect (in relation to total employment) in these countries will of course be rather low.

Our quantitative effects depend crucially on the assumption about the decline in UK final demand from abroad. The actual decline can be smaller or larger than 25%, of course. The results from the input-output analysis are linear in the size of the initial shock. If the decline in UK final demand from abroad amounts only to 10% then our absolute figures and shares in total employment have to be divided by 2.5. The relative distribution of the effects over countries and industries, however, would be unaffected by this. This also holds true for the regional distribution within Germany. Furthermore, UK final demand in the various industries will not be affected to the same extent

[8] Aichele and Felbermayr (2015) also find that the car industry is the most-affected industry of Brexit in Germany.

Figure 4: Regional employment effects of a hard Brexit in Germany

Share of affected employed persons in relation to total employment by county in percent



Source: World Input-Output Database, VGR der Länder (regional employment data) and own calculations.

because the price elasticity of imports or the relative increase in prices due to tariffs and non-tariff costs varies. In a more detailed analysis it would also be possible to track the effects of heterogeneous changes in the various industries.

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Appendix

Countries

Table 2: Countries in the World Input Output Database

Acronym	Country	Acronym	Country	Acronym	County
AUS	Australia	FRA	France*	MLT	Malta*
AUT	Austria*	GBR	United Kingdom	NLD	Netherlands*
BEL	Belgium*	GRC	Greece*	NOR	Norway
BGR	Bulgaria*	HRV	Croatia*	POL	Poland*
BRA	Brazil	HUN	Hungary*	PRT	Portugal*
CAN	Canada	IND	India	ROU	Romania*
CHE	Switzerland	IDN	Indonesia	RUS	Russian Federation
CHN	China	IRL	Ireland*	SVK	Slovakia*
CYP	Cyprus*	ITA	Italy*	SVN	Slovenia*
CZE	Czech Republic*	JPN	Japan	SWE	Sweden*
DEU	Germany*	KOR	South Korea	TUR	Turkey
DNK	Denmark*	LTU	Lithuania*	TWN	Taiwan
ESP	Spain*	LUX	Luxembourg*	USA	United States
EST	Estonia*	LVA	Latvia*		
FIN	Finland*	MEX	Mexico		

Notes: Remaining EU member countries after Brexit are market by an asterisk.

Industry classification (European Commission 2008)

No.	NACE Code	Description
	A	*Agriculture, forestry and fishing*
1	A01	Crop and animal production, hunting and related service activities
2	A02	Forestry and logging
3	A03	Fishing and aquaculture
	B, C, D, E	*Manufacturing, mining and quarrying and other industry*
4	B	Mining and quarrying
5	C10-C12	Manufacture of food products, beverages and tobacco products
6	C13-C15	Manufacture of textiles, wearing apparel and leather products
7	C16	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials
8	C17	Manufacture of paper and paper products
9	C18	Printing and reproduction of recorded media
10	C19	Manufacture of coke and refined petroleum products
11	C20	Manufacture of chemicals and chemical products
12	C21	Manufacture of basic pharmaceutical products and pharmaceutical preparations
13	C22	Manufacture of rubber and plastic products
14	C23	Manufacture of other non-metallic mineral products
15	C24	Manufacture of basic metals
16	C25	Manufacture of fabricated metal products, except machinery and equipment
17	C26	Manufacture of computer, electronic and optical products
18	C27	Manufacture of electrical equipment
19	C28	Manufacture of machinery and equipment n.e.c.
20	C29	Manufacture of motor vehicles, trailers and semi-trailers
21	C30	Manufacture of other transport equipment
22	C31_C32	Manufacture of furniture; other manufacturing
23	C33	Repair and installation of machinery and equipment
24	D35	Electricity, gas, steam and air conditioning supply
25	E36	Water collection, treatment and supply
26	E37-E39	Sewerage; waste collection, treatment and disposal activities; materials recovery; remediation activities and other waste management services
	F	*Construction*
27	F	Construction
	G-T	*Trade and Services*
28	G45	Wholesale and retail trade and repair of motor vehicles and motorcycles
29	G46	Wholesale trade, except of motor vehicles and motorcycles
30	G47	Retail trade, except of motor vehicles and motorcycles
31	H49	Land transport and transport via pipelines
32	H50	Water transport
33	H51	Air transport
34	H52	Warehousing and support activities for transportation
35	H53	Postal and courier activities
36	I	Accommodation and food service activities
37	J58	Publishing activities

No.	NACE Code	Description
38	J59_J60	Motion picture, video and television programme production, sound recording and music publishing activities; programming and broadcasting activities
39	J61	Telecommunications
40	J62_J63	Computer programming, consultancy and related activities; information service activities
41	K64	Financial service activities, except insurance and pension funding
42	K65	Insurance, reinsurance and pension funding, except compulsory social security
43	K66	Activities auxiliary to financial services and insurance activities
44	L68	Real estate activities
45	M69_M70	Legal and accounting activities; activities of head offices; management consultancy activities
46	M71	Architectural and engineering activities; technical testing and analysis
47	M72	Scientific research and development
48	M73	Advertising and market research
49	M74_M75	Other professional, scientific and technical activities; veterinary activities
50	N	Administrative and support service activities
51	O84	Public administration and defense; compulsory social security
52	P85	Education
53	Q	Human health and social work activities
54	R_S	Other service activities
55	T	Activities of households as employers; undifferentiated goods- and services-producing activities of households for own use
56	U	Activities of extraterritorial organizations and bodies

Grouped industries

Table 4: Grouped industries

Sector	Description	Industries
A	Agriculture, forestry and fishing	1-3
BE	Manufacturing, mining and quarrying and other industry	4-26
F	Construction	27
GN	Market services	28-50
OU	Others	51-56

Exports to the UK by country

Table 5: Exports to the UK by country

Country	Exports to UK (Million USD)	Total Exports (Million USD)	Total Output (Million USD)	Share of Exports to UK in Total Exports (%)	Share of Exports to UK in Total Output (%)
AUS	3736	287162	2723737	1.30	0.14
AUT	5452	210995	809631	2.58	0.67
BEL	27883	383014	1110756	7.28	2.51
BGR	767	31698	122873	2.42	0.62
BRA	4779	270263	4103502	1.77	0.12
CAN	13649	563511	3252175	2.42	0.42
CHE	12649	352570	1398665	3.59	0.90
CHN	51850	2425464	31745102	2.14	0.16
CYP	352	9347	39448	3.77	0.89
CZE	6825	161570	492772	4.22	1.38
DEU	103347	1682253	7066741	6.14	1.46
DNK	10686	170293	614582	6.28	1.74
ESP	21498	389005	2567905	5.53	0.84
EST	458	18266	54483	2.50	0.84
FIN	4288	100453	513658	4.27	0.83
FRA	60107	759654	5020134	7.91	1.20
GRC	1779	56261	375244	3.16	0.47
HRV	548	23269	97419	2.35	0.56
HUN	4521	116445	284430	3.88	1.59
IDN	2056	210599	1714343	0.98	0.12
IND	12221	369456	3983527	3.31	0.31
IRL	37295	262751	509477	14.19	7.32
ITA	33780	588585	4075402	5.74	0.83
JPN	9647	817514	8668736	1.18	0.11
KOR	7848	697935	3403854	1.12	0.23
LTU	1266	32723	85668	3.87	1.48
LUX	3209	118439	211968	2.71	1.51
LVA	669	14719	64726	4.54	1.03
MEX	2094	368185	2130489	0.57	0.10
MLT	3914	13420	28915	29.16	13.53
NLD	43525	575068	1671177	7.57	2.60
NOR	25676	188131	835079	13.65	3.07
POL	14176	251642	1105444	5.63	1.28
PRT	3805	76633	414281	4.97	0.92
ROU	2160	77648	398280	2.78	0.54
RUS	9321	493789	3381079	1.89	0.28
SVK	4635	82119	229289	5.64	2.02
SVN	574	30812	94238	1.86	0.61
SWE	12119	235354	1018189	5.15	1.19
TUR	12805	249783	1494428	5.13	0.86
TWN	4896	369923	1220629	1.32	0.40
USA	73796	1927091	30971023	3.83	0.24

Source: World Input-Output Database, own calculations.

Results by country

Table 6: Employment effects of a hard Brexit by Country

Country	Affected persons			Total	Share of affected persons (%)		
	direct	indirect	sum	employment	direct	indirect	sum
AUS	0.0	0.5	0.5	11863	0.00	0.00	0.00
AUT	1.9	4.0	5.9	4268	0.05	0.09	0.14
BEL	7.6	8.6	16.2	4547	0.17	0.19	0.36
BGR	1.7	3.4	5.1	3602	0.05	0.10	0.14
BRA	0.0	9.8	9.8	104029	0.00	0.01	0.01
CAN	0.0	1.4	1.4	18449	0.00	0.01	0.01
CHE	0.0	1.9	1.9	5084	0.00	0.04	0.04
CHN	0.0	58.8	58.8	858368	0.00	0.01	0.01
CYP	0.3	0.6	0.9	357	0.07	0.17	0.24
CZE	5.5	10.1	15.6	5111	0.11	0.20	0.31
DEU	39.1	63.8	102.9	42706	0.09	0.15	0.24
DNK	2.9	3.4	6.3	2765	0.10	0.12	0.23
ESP	13.2	17.9	31.1	17966	0.07	0.10	0.17
EST	0.3	0.4	0.7	620	0.05	0.07	0.11
FIN	0.7	1.6	2.3	2502	0.03	0.06	0.09
FRA	20.4	29.4	49.8	27295	0.07	0.11	0.18
GBR	0.0	12.3	12.3	30726	0.00	0.04	0.04
GRC	1.1	1.5	2.6	3965	0.03	0.04	0.07
HRV	1.1	1.1	2.2	1569	0.07	0.07	0.14
HUN	3.9	5.9	9.7	4235	0.09	0.14	0.23
IDN	0.0	12.3	12.3	168808	0.00	0.01	0.01
IND	0.0	33.3	33.3	658776	0.00	0.01	0.01
IRL	14.7	5.1	19.8	1914	0.77	0.27	1.03
ITA	16.2	30.0	46.2	24371	0.07	0.12	0.19
JPN	0.0	3.2	3.2	61232	0.00	0.01	0.01
KOR	0.0	2.5	2.5	24446	0.00	0.01	0.01
LTU	1.0	1.2	2.2	1319	0.08	0.09	0.17
LUX	0.3	0.6	0.9	403	0.07	0.15	0.22
LVA	0.3	0.7	1.1	900	0.04	0.08	0.12
MEX	0.0	1.3	1.3	38997	0.00	0.00	0.00
MLT	1.7	1.6	3.2	190	0.87	0.83	1.70
NLD	10.8	14.5	25.2	8727	0.12	0.17	0.29
NOR	0.0	0.8	0.8	2747	0.00	0.03	0.03
POL	18.5	28.0	46.5	15577	0.12	0.18	0.30
PRT	4.3	4.9	9.2	4546	0.09	0.11	0.20
ROU	5.7	8.6	14.3	8805	0.06	0.10	0.16
RUS	0.0	12.2	12.2	74286	0.00	0.02	0.02
SVK	2.8	4.4	7.2	2227	0.12	0.20	0.32
SVN	0.3	1.0	1.3	941	0.04	0.10	0.14
SWE	2.7	4.6	7.3	4750	0.06	0.10	0.15
TUR	0.0	7.9	7.9	32326	0.00	0.02	0.02
TWN	0.0	2.6	2.6	20207	0.00	0.01	0.01
USA	0.0	15.9	15.9	155769	0.00	0.01	0.01

Source: World Input-Output Database, own calculations. Affected persons and total employment in 1,000 persons.

Most affected industries

Table 7: Most affected country-industry combinations

No.	Country	Industry	Direct (1,000 pers.)	Indirect (1,000 pers.)	Sum (1,000 pers.)	Tot. Empl. (1,000 pers.)	Share (%)
1	IND	1	12.4	0.0	12.4	253883	0.00
2	DEU	20	2.5	9.1	11.6	846	1.37
3	CHN	1	9.1	0.0	9.1	175119	0.01
4	DEU	50	8.5	0.3	8.8	3010	0.29
5	DEU	29	4.3	3.6	8.0	1878	0.42
6	CHN	29	7.8	0.0	7.8	79834	0.01
7	POL	1	5.9	1.3	7.2	1640	0.44
8	DEU	19	2.1	4.6	6.7	1129	0.59
9	IRL	1	0.4	5.4	5.8	80	7.30
10	FRA	50	4.8	0.9	5.7	2059	0.28
11	DEU	5	1.4	4.3	5.7	927	0.61
12	FRA	29	2.6	2.8	5.4	1110	0.49
13	BRA	1	5.3	0.0	5.3	13128	0.04
14	POL	30	2.4	2.8	5.2	1430	0.37
15	IDN	1	5.2	0.0	5.2	40597	0.01
16	ITA	6	2.0	3.2	5.2	515	1.01
17	USA	50	5.0	0.0	5.0	12808	0.04
18	ESP	1	1.9	2.8	4.7	667	0.71
19	DEU	16	3.6	1.0	4.5	901	0.50
20	CHN	6	4.5	0.0	4.5	32739	0.01
21	CHN	17	4.2	0.0	4.2	12779	0.03
22	IND	6	4.2	0.0	4.2	21927	0.02
23	DEU	30	3.7	0.3	4.0	3209	0.12
24	FRA	1	3.0	0.9	3.9	715	0.55
25	IRL	5	0.1	3.8	3.8	54	7.07
26	CHN	54	3.8	0.0	3.8	76270	0.00
27	DEU	28	3.3	0.5	3.8	824	0.46
28	FRA	5	1.0	2.7	3.7	607	0.61
29	DEU	45	3.6	0.0	3.6	1287	0.28
30	ITA	1	3.0	0.6	3.6	839	0.43

Source: World Input-Output Database, own calculations.

Most affected counties in Germany

Table 8: Most affected counties in Germany

No.	County	Affected persons	Total employment	Share of affected persons (%)
1	Wolfsburg	500	127082	0.39
2	Dingolfing-Landau	265	67339	0.39
3	Tuttlingen	309	83025	0.37
4	Salzgitter	205	56968	0.36
5	Enzkreis	276	79546	0.35
6	Erlangen-Höchstadt	205	59896	0.34
7	Ingolstadt	402	118072	0.34
8	Olpe	262	76972	0.34
9	Germersheim	200	58924	0.34
10	Heilbronn	555	164491	0.34
11	Hohenlohekreis	233	69060	0.34
12	Coburg	125	37232	0.34
13	Biberach	354	105286	0.34
14	Rastatt	380	113006	0.34
15	Kronach	111	33395	0.33
16	Märkischer Kreis	703	214231	0.33
17	Böblingen	726	222007	0.33
18	Rottweil	242	74578	0.33
19	Donau-Ries	259	79760	0.32
20	Ludwigshafen am Rhein	399	123478	0.32
21	Main-Spessart	195	60787	0.32
22	Hof	153	47707	0.32
23	Schweinfurt (Kreisfreie Stadt)	211	65896	0.32
24	Haßberge	125	39142	0.32
25	Neustadt an der Waldnaab	122	38039	0.32
26	Unterallgäu	214	67096	0.32
27	Saale-Orla-Kreis	128	40305	0.32
28	Wartburgkreis	165	52533	0.32
29	Sonneberg	87	27721	0.31
30	Bodenseekreis	375	120470	0.31

Source: World Input-Output Database, VGR der Länder (regional employment data for 2014 as of August 2017) and own calculations.

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