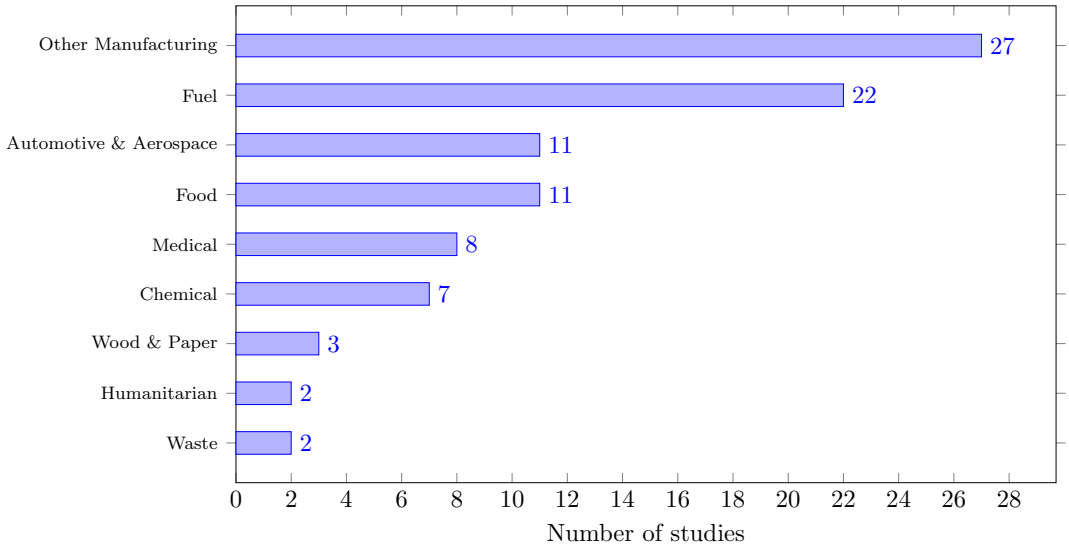

Figure A1.: Distribution of reviewed studies according to industrial case study presented.

Appendix A. Additional classification metrics

This appendix extends the classification presented in Section 4, to include three more metrics: (1) industry used as case study, (2) country used within case study and (3) risk or uncertainty types modelled.

A.1. *Case studies*

Fig. A1 shows the different industries that have been used as case studies in the reviewed literature. Note that only real-world case studies have been considered and not hypothetical supply chains or artificially generated numerical examples. The most common cases involve supply chains that manufacture and distribute various products, as well as supply chains that deal with fuel (from oil to biomass). The majority (66%) of the reviewed studies does not include such a case study, a higher percentage than what has been reported in other surveys (e.g. Qazi, Quigley, and Dickson (2015) report 38%). This is probably due to the quantitative nature of AI-related techniques: it is more likely to resort to randomly or otherwise generated test sets for such techniques, as opposed to qualitative and strategic approaches, which may also be informed by specific industries.

The countries related to the aforementioned case studies (if stated) are shown in Fig. A2. As should be expected, countries of case studies closely mirror the countries of the authors' affiliations.

A.2. *Risk and uncertainty types*

Most of the reviewed studies mention explicitly a set of parameters which they consider risky or uncertain and which they address through the proposed approach. The ratio of explicitly referencing uncertainty and risk is roughly 3:1, with 176 studies describing their research in relation to uncertainty and 66 studies relating it to risk. As mentioned

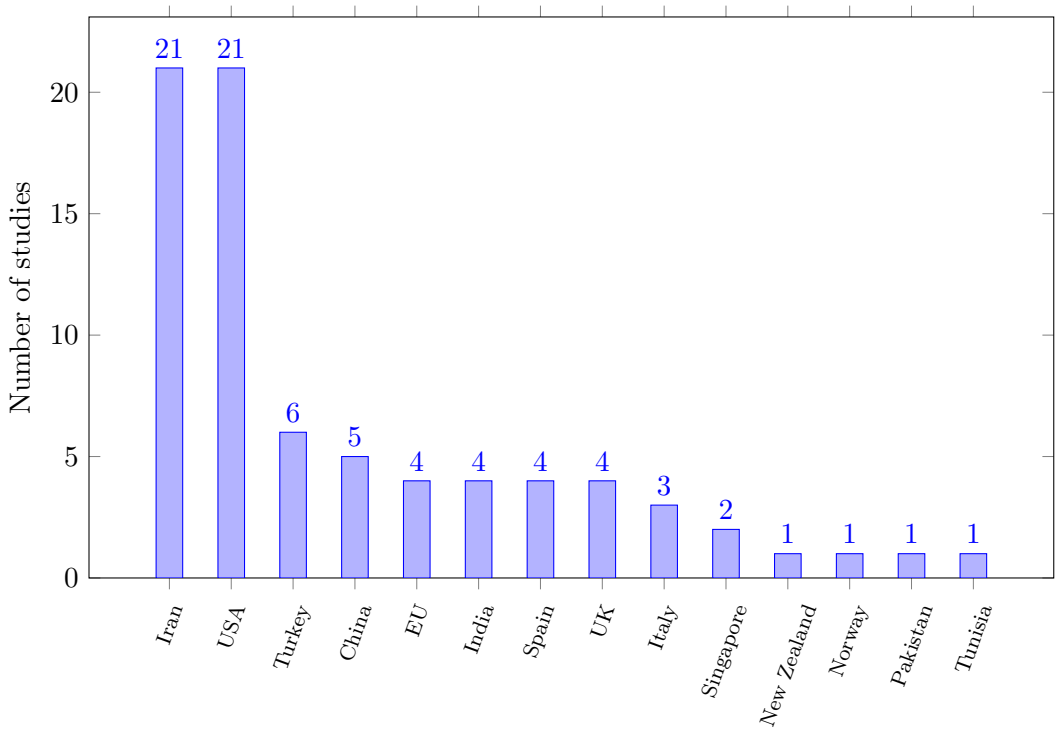

Figure A2.: Distribution of reviewed studies according to country of case study.

in Section 2.1, risk is most closely associated to disruptions or financial parameters, with other supply chain aspects more often linked to uncertainty.

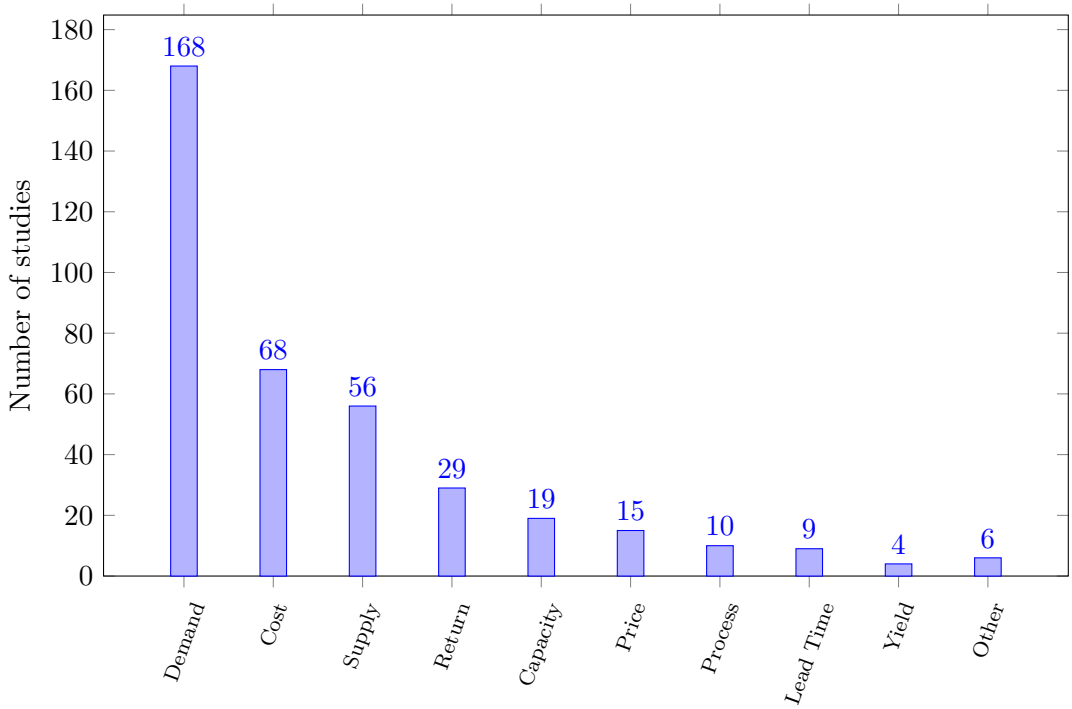

Figure A3.: Distribution of reviewed studies according to risk/uncertainty type.

Fig. A3 shows the distribution of parameters associated with risk or uncertainty in the reviewed studies. The most common case, by far, is uncertain demand (or demand risk), followed by parameters related to cost and financial exposure. Supply risk (or uncertain supply) is also quite commonly tackled. Parameters such as return and capacity are primarily included in the case of reverse or closed-loop supply chains.

Appendix B. Additional comparison tables

In this appendix, detailed comparison tables are provided for the reviewed studies that involve some form of mathematical programming, which are briefly summarised in Sections 5.1, 5.2, 5.3 and 5.4.

Table B1.: Stochastic programming approaches to SCRM with continuous parameters.

Reference	# parameters	Large datasets	Decision-making	Identification	Assessment	Response
(Gupta and Maranas 2000)	1	No	No			✓
(Guillén et al. 2003)	1	No	No			✓
(Lin and Chen 2003)	1	No	No			✓
(Miranda and Garrido 2004)	1	No	No			✓
(Ryu, Dua, and Pistikopoulos 2004)	4	No	∼			✓
(Han and Damrongwongsiri 2005)	1	No	No			✓
(Tapiero and Grando 2006)	2	No	No			✓
(Gaonkar and Viswanadham 2007)	1	No	No			✓
(Lieckens and Vandaele 2007)	3	No	No			✓
(Qi and Shen 2007)	2	No	No			✓
(Miranda and Garrido 2008)	1	No	No			✓
(You and Grossmann 2008)	1	∼	No			✓
(You and Grossmann 2008)	1	No	No			✓
(Guillén-Gosálbez and Grossmann 2009)	2	No	No			✓
(You and Grossmann 2009)	1	No	No			✓
(Cui, Ouyang, and Shen 2010)	1	No	No			✓
(Hnaien, Delorme, and Dolgui 2010)	1	No	No			✓
(Park, Lee, and Sung 2010)	1	No	No			✓
(Qi, Shen, and Snyder 2010)	4	No	No			✓
(You and Grossmann 2010)	1	No	No			✓
(Dal-Mas et al. 2011)	2	No	No		✓	✓
(Taleizadeh, Niaki, and Barzinpour 2011)	1	No	No			✓
(You and Grossmann 2011)	1	No	No			✓
(Liu, Shah, and Papageorgiou 2012)	1	No	No			✓
(Azad and Davoudpour 2013)	1	No	∼		✓	✓
(Benyoucef, Xie, and Tanonkou 2013)	1	No	No			✓
(Kumar and Tiwari 2013)	1	No	No			✓
(Meena and Sarmah 2013)	1	No	No			✓
(Azad et al. 2014)	3	No	No		✓	✓
(Jeong, Hong, and Xie 2014)	2	No	∼			✓
(Mari, Lee, and Memon 2014)	1	No	∼			✓
(Marufuzzaman et al. 2014)	1	No	No			✓
(Nasiri, Zolfaghari, and Davoudpour 2014)	1	No	No			✓
(Hnaien, Dolgui, and Wu 2016)	2	No	No			✓
(Yongheng et al. 2014)	1	No	No			✓
(Nooraie and Parast 2015)	1	No	No			✓
(Sharifzadeh, Garcia, and Shah 2015)	2	No	No			✓
(PrasannaVenkatesan and Goh 2016)	1	No	No			✓
(Rayat, Musavi, and Bozorgi-Amiri 2017)	1	No	No			✓

Table B2.: Scenario-based stochastic programming approaches to SCRM.

Reference	# parameters	Large datasets	Decision-making	Identification	Assessment	Response
(Koutsoukis et al. 2000)	1	No	Yes			✓
(Chan, Carter, and Burnes 2001)	1	No	No			✓
(Lucas et al. 2001)	1	No	No			✓
(Tsiakis, Shah, and Pantelides 2001)	1	∼	No			✓
(Alonso-Ayuso et al. 2003)	3	No	No			✓
(Lababidi et al. 2004)	2	No	No			✓
(Levis and Papageorgiou 2004)	1	No	No			✓
(Guillén et al. 2005)	1	No	No			✓
(Santoso et al. 2005)	4	No	No			✓
(Guillén, Espuña, and Puigjaner 2006)	1	No	No			✓
(Guillén et al. 2006)	1	No	No			✓
(Goh, Lim, and Meng 2007)	2	∼	No			✓
(Lee et al. 2007)	3	No	No			✓
(Salema, Barbosa-Povoa, and Novais 2007)	2	No	No			✓
(Azaron et al. 2008)	6	No	No			✓
(Bonfill, Espuña, and Puigjaner 2008)	3	No	No			✓
(Poojari, Lucas, and Mitra 2008)	1	No	No		✓	✓
(Lee and Dong 2009)	2	No	No			✓
(Schütz, Tomasgard, and Ahmed 2009)	11	No	No			✓
(Sodhi and Tang 2009)	1	No	No			✓
(You, Wassick, and Grossmann 2009)	22	No	No			✓
(Franca et al. 2010)	1	No	∼			✓
(Kara and Onut 2010)	2	No	∼			✓
(Kumar, Tiwari, and Babiceanu 2010)	3	No	∼			✓
(Lee, Dong, and Bian 2010)	2	No	No			✓
(Sabio et al. 2010)	2	No	No			✓
(Shu, Ma, and Li 2010)	7	No	No			✓
(Cardona-Valdés, Álvarez, and Ozdemir 2011)	1	No	No			✓
(Georgiadis et al. 2011)	1	No	No			✓
(Kim, Realff, and Lee 2011)	5	No	No			✓
(Longinidis and Georgiadis 2011)	1	No	No			✓
(Bidhandi and Yusuff 2011)	3	No	No			✓
(Rajgopal et al. 2011)	8	No	No			✓
(Sawik 2011)	1	No	No		✓	✓
(Shimizu, Fushimi, and Wada 2011)	7	No	No			✓
(Shukla, Lalit, and Venkatasubramanian 2011)	1	No	No			✓
(Almansoori and Shah 2012)	1	No	No			✓
(Chen and Fan 2012)	1	No	No			✓
(Gebreslassie, Yao, and You 2012)	2	No	No			✓
(Giarola, Shah, and Bezzo 2012)	2	No	∼			✓
(Kiya and Davoudpour 2012)	2	No	No			✓
(Klibi and Martel 2012)	2	No	No			✓
(Mak and Shen 2012)	2	No	∼			✓
(Nickel, Saldanha-da Gama, and Ziegler 2012)	2	No	No			✓
(Noyan 2012)	4	No	No			✓
(PrasannaVenkatesan and Kumanan 2012)	4	No	No			✓
(Ahmadi-Javid and Seddighi 2013)	2	No	No			✓
(Amin and Zhang 2013)	2	No	No			✓
(Awudu and Zhang 2013)	2	No	No			✓
(Cardoso, Barbosa-Pvoa, and Relvas 2013)	1	No	No			✓
(Kazemzadeh and Hu 2013)	2	No	No			✓
(Longinidis and Georgiadis 2013)	7	No	No			✓
(Oliveira et al. 2013)	1	No	No			✓
(Pimentel, Mateus, and Almeida 2013)	1	No	No			✓
(Qin, Liu, and Tang 2013)	1	No	∼			✓
(Ramezani, Bashiri, and Tavakkoli-Moghaddam 2013a)	7	No	No			✓
(Ruiz-Femenia et al. 2013)	1	No	No			✓
(Sawik 2013)	1	No	No		✓	✓
(Singh, Jain, and Mishra 2013)	1	No	No			✓
(Cardona-Valdés, Álvarez, and Pacheco 2014)	1	No	No			✓
(Dayhim, Jafari, and Mazurek 2014)	1	No	No			✓
(Li and Hu 2014)	3	No	∼			✓
(Liu and Guo 2014)	6	No	No			✓
(Madadi et al. 2014a)	2	No	No			✓
(Madadi et al. 2014b)	2	∼	∼		✓	✓
(Sawik 2014)	1	No	∼		✓	✓
(Soleimani and Govindan 2014)	4	No	No		✓	✓
(Soleimani, Seyyed-Esfahani, and Kannan 2014)	5	No	No		✓	✓
(Zeballos et al. 2014)	2	No	∼			✓

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Table B2.: (continued)

Reference	# parameters	Large datasets	Decision-making	Identification	Assessment	Response
(Ayvaz, Bolat, and Aydin 2015)	2	No	No			✓
(Fattahi et al. 2015)	1	No	No			✓
(Govindan, Jafarian, and Nourbakhsh 2015)	1	No	No			✓
(Khatami, Mahootchi, and Farahani 2015)	2	No	No			✓
(Kilic and Tuzkaya 2015)	3	No	No			✓
(Sawik 2015)	1	No	No			✓
(Sawik 2016)	1	No	∼			✓
(Behzadi et al. 2017)	1	No	∼			✓
(Chatzikontidou et al. 2017)	1	No	No			✓
(Kamalahmadi and Parast 2017)	1	No	∼			✓
(Ghavamifar, Makui, and Taleizadeh 2018)	9	No	∼			✓
(Jalali, Seifbarghy, and Niaki 2018)	2	No	∼			✓
(Jerbia et al. 2018)	6	No	No			✓
(Namdar et al. 2018)	4	No	∼			✓
(Pariazar and Sir 2018)	3	No	∼			✓
(Rahimi and Ghezavati 2018)	3	No	∼			✓
(Sawik 2018)	2	No	∼			✓
(Song, Chen, and Lei 2018)	2	No	∼			✓
(Weskamp et al. 2018)	1	No	∼			✓
(Xie and Huang 2018)	1	No	∼			✓
(Zahiri et al. 2018)	2	No	∼			✓

Table B3.: Other stochastic programming approaches to SCRM

Ref	# parameters	Large datasets	Decision-making	Identification	Assessment	Response
(Huchzermeier and Cohen 1996)	1	No	No		✓	✓
(Gupta, Maranas, and McDonald 2000)	1	No	No			✓
(Mitra et al. 2008)	1	No	No			✓
(Guillén-Gosálbez and Grossmann 2010)	1	No	No			✓
(Fang et al. 2013)	1	No	No			✓
(Pasandideh, Niaki, and Asadi 2015)	11	No	No			✓
(Scott et al. 2015)	1	No	Yes			✓
(Chibani et al. 2018)	1	No	No			✓
(Liu et al. 2018)	2	No	No			✓
(Quddus et al. 2018)	1	No	∼			✓

Table B5.: Fuzzy programming approaches to SCRM.

Reference	# parameters	Large datasets	Decision-making	Identification	Assessment	Response
(Petrovic, Roy, and Petrovic 1998)	2	No	∼			✓
(Petrovic, Roy, and Petrovic 1999)	2	No	∼			✓
(Petrovic 2001)	3	No	∼			✓
(Giannoccaro, Pontrandolfo, and Scozzi 2003)	2	No	∼			✓
(Chen and Lee 2004)	2	No	No			✓
(Wang and Shu 2005)	4	No	∼			✓
(Amid, Ghodsypour, and O'Brien 2006)	3	∼	No			✓
(Kumar, Vrat, and Shankar 2006)	4	No	∼			✓
(Xie, Petrovic, and Burnham 2006)	1	No	∼			✓
(Peidro, Mula, and Poler 2007)	11	No	∼			✓
(Selim and Ozkarahan 2008)	1	No	Yes			✓

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Table B5.: (continued)

Reference	# parameters	Large datasets	Decision-making	Identification	Assessment	Response
(Tang, Lau, and Ho 2008)	1	No	Yes		✓	
(Xu, Liu, and Wang 2008)	2	No	∼			✓
(Amid, Ghodsypour, and O'Brien 2009)	4	No	∼			✓
(Mitra et al. 2009)	2	No	∼			✓
(Peidro et al. 2009)	11	No	∼			✓
(Xu, He, and Gen 2009)	3	No	∼			✓
(Bilgen 2010)	1	No	∼			✓
(Mula, Peidro, and Poler 2010)	1	No	No			✓
(Peidro, Mula, and Poler 2010)	11	No	∼			✓
(Peidro et al. 2010)	11	No	∼			✓
(Pishvaee and Torabi 2010)	28	No	∼			✓
(Qin and Ji 2010)	3	No	No			✓
(Wu et al. 2010)	11	No	∼			✓
(Haleh and Hamidi 2011)	9	No	∼			✓
(Kabak and lengin 2011)	4	No	∼			✓
(Pishvaee and Razmi 2012)	19	No	∼			✓
(Bouzembrak et al. 2013)	10	No	∼			✓
(Fazlollahtabar, Mahdavi, and Mohajeri 2013)	5	No	No			✓
(Jouzdani, Sadjadi, and Fathian 2013)	8	No	∼			✓
(Tabrizi and Razmi 2013)	11	No	∼			✓
(Wu et al. 2013)	8	No	∼			✓
(Jindal and Sangwan 2014)	20	∼	No			✓
(Khalili-Damghani, Tavana, and Amirkhan 2014)	24	No	∼			✓
(Micheli, Mogre, and Perego 2014)	4	No	Yes			✓
(Mirakhorli 2014)	2	No	∼			✓
(Özceylan and Paksoy 2014)	17	No	No			✓
(Pishvaee, Razmi, and Torabi 2014)	54	No	No			✓
(Ramezani et al. 2014)	37	No	∼			✓
(Tong et al. 2014)	4	No	∼			✓
(Vahdani et al. 2014)	32	No	∼			✓
(Yilmaz Balaman and Selim 2014)	1	No	∼			✓
(Hatefi et al. 2015a)	17	No	No			✓
(Hatefi et al. 2015b)	17	No	No			✓
(Moghaddam 2015)	3	No	∼			✓
(Mousazadeh, Torabi, and Zahiri 2015)	7	No	No			✓
(Salehi Sadghiani, Torabi, and Sahebjamnia 2015)	4	No	∼			✓
(Subulan et al. 2015)	15	No	∼			✓
(Torabi, Baghersad, and Mansouri 2015)	7	No	∼			✓
(Yang, Liu, and Yang 2015)	4	No	∼			✓
(Yang and Liu 2015)	4	No	∼			✓
(Babazadeh et al. 2017)	51	No	∼			✓
(Tsao et al. 2018)	5	No	No			✓

Table B6.: Hybrid mathematical programming approaches to SCRM.

Reference	# parameters	Large datasets	Decision-making	Identification	Assessment	Response
(Wu and Olson 2008)	3	No	∼			✓
(Li and Zabinsky 2011)	2	No	∼			✓
(Pishvaee, Torabi, and Razmi 2012)	6	No	∼			✓
(Tong, Feng, and Rong 2012)	2	No	No			✓
(Vahdani et al. 2012)	14	No	∼			✓
(Vahdani et al. 2013)	7	No	∼			✓
(Claypool, Norman, and Needy 2014)	3	No	∼			✓
(Bai and Liu 2016)	4	No	∼			✓
(Felfel, Ayadi, and Masmoudi 2016)	1	No	∼			✓
(Keyvanshokooh, Ryan, and Kabir 2016)	3	No	∼			✓
(Zhalechian et al. 2016)	29	No	∼			✓
(Zahiri and Pishvaee 2017)	15	No	No			✓
(Haddadsisakht and Ryan 2018)	3	No	No			✓
(Jabbarzadeh, Fahimnia, and Sabouhi 2018)	1	No	∼			✓
(Pavlov et al. 2018)	N/A	No	∼		✓	

Table B4.: Robust Optimisation approaches to SCRM

Ref	# parameters	Large datasets	Decision-making	Identification	Assessment	Response
(Aghezzaf 2005)	1	No	∼			✓
(Soner Kara and Onut 2010)	2	No	∼			✓
(Pan and Nagi 2010)	2	No	∼			✓
(Ben-Tal et al. 2011)	1	No	No			✓
(Mirzapour Al-E-Hashem, Malekly, and Aryanezhad 2011)	6	No	∼			✓
(Peng et al. 2011)	1	No	∼			✓
(Pishvaee, Rabbani, and Torabi 2011)	3	∼	No			✓
(Babazadeh and Razmi 2012)	3	No	No			✓
(Hahn and Kuhn 2012)	1	No	Yes			✓
(Hasani, Zegordi, and Nikbakhsh 2012)	2	No	∼			✓
(Baghalian, Rezapour, and Farahani 2013)	2	No	No			✓
(De Rosa et al. 2013)	2	No	∼			✓
(Ramezani, Bashiri, and Tavakkoli-Moghaddam 2013b)	2	No	No			✓
(Hatefi and Jolai 2014)	3	No	No			✓
(Huang and Goetschalckx 2014)	5	No	No			✓
(Jin et al. 2014)	2	No	No			✓
(Kaya, Bagci, and Turkay 2014)	2	No	No			✓
(Akbari and Karimi 2015)	1	No	No			✓
(Dubey, Gunasekaran, and Childe 2015)	1	∼	No			✓
(Hasani, Zegordi, and Nikbakhsh 2015)	3	No	∼			✓
(Hasani and Khosrojerdi 2016)	2	No	∼			✓
(Govindan and Fattahi 2017)	1	No	No			✓
(Zhang and Jiang 2017)	1	No	No			✓
(Zokaee et al. 2017)	8	No	∼			✓
(Buhayenko and den Hertog 2017)	1	No	∼			✓
(Behzadi et al. 2018)	5	No	∼			✓
(Jabbarzadeh, Haughton, and Khosrojerdi 2018)	3	No	∼			✓
(Kim et al. 2018)	3	No	∼			✓
(Prakash et al. 2018)	2	No	∼			✓
(Rahmani 2018)	4	No	∼			✓

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