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Trade and growth in the world economy

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1. Introduction

In this paper, we project the national accounts GDP by expenditure for the top 20 exporting countries. That is the 20 countries which rank highest in their share of the total world exports for the year 2022. We project in two ways; first based on its recent past (2010–2021) using a Harrod-Domar production function for each country and extrapolating its GDP to 2025. Demand equations for private consumption and total imports as a function of GDP are estimated to project those components (see Table A1). Government and Gross Capital Formation are treated as exogenous and are based on the sum of the component from 2015 to 2021 divided by the sum of GDP over the same period. Exports are then derived by using the national accounts identity. These are called the *Pre-Linked Estimates*. The data come from the United Nations Statistical office and are in constant 2015 U.S. dollars.

The second way we project these 20 countries is by linking them to a world trade matrix, thereby, adjusting the exports to their import demand. These are called the *Post-Linked Estimates*. The data for the trade matrix also comes from the United Nations Statistical office, and while this series has been updated to 2022, the national accounts data ends in 2021.

2. Methodology

We assembled the world trade matrix for the 20 countries and a residual row and column entry for the rest of the world (ROW). The residual group accounts for about 13% of world exports in 2022. Each country is then re-estimated using the trade matrix to LINK them (see

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Table 1
Comparison between the Pre-Linked and the Post-Linked GDP's for 2023.

	GDP in Units of	2015 U.S. Dollars	
	Pre-Linked Estimates	Post-Linked Estimates	
	2023	2023	% different
USA	21352391	20232057	5.2
China	17798637	22274419	-25.1
Germany	3633901	3640378	-0.2
France	2618606	2389201	8.8
Japan	4454968	4575614	-2.7
Netherlands	875421	890787	-1.8
Italy	1861930	2203148	-18.3
Canada	1722704	1981371	-15.0
Rep. of Korea	1779253	1583433	11.0
Mexico	1229230	1410742	-14.8
United Kingdom	3086775	2462474	20.2
Belgium	499547	580663	-16.2
Spain	1264222	1314393	-4.0
Australia	1477267	2240577	-51.7
Switzerland	790806	696409	11.9
Poland	645997	647217	-0.2
Brazil	1833564	2015534	-9.9
Norway	430617	805797	-87.1
Ireland	527249	173566	67.1
Sweden	589368	535481	9.1

Ball, 1973). This is done through an iteration process for each year where the import vector of the 20 countries is multiplied by the trade share matrix yielding a new export vector. The new vectors are then used to create a new GDP vector and the new GDP vector produces new vectors for the remaining components. The process is considered converged for the year when the iteration produces less than 1% change in GDP for each of our 20 countries. A complete set of projections for 2023–2025 is shown in Table A2. In Table 1 below we see a comparison between the pre-linked and the post-linked GDPs for the year 2023.

In some countries there is a large positive difference between the pre-linked and the postal-linked GDP, i.e. China, and in some countries there is a large negative difference as in the United Kingdom. For the United States the difference is on the order of 5%. There are also some counties that hardly change, for example Germany. In the case of Italy, the post-linked GDP shows positive growth, whereas the pre-linked GDP showed no growth. The large increase in China's post-linked GDP is reflected in Australia's GDP. Since a high proportion of Australia's exports are flowing to China, its GDP increases with the increase in China's demand for imports.

3. The special case of China

Our estimate for China's per capita GDP in 2022 is $15,132. Considering China's prominence in world exports this seems too low, especially when compared to the developed high-exporting countries. It is about half of the Republic of Korea ($30,057) and slightly lower than

Table 2
Expected GDP to 2025.

	2023	2024	2025	2023	2024	2025
	GDP	GDP	GDP	P.C. GDP	P.C. GDP	P.C. GDP
USA	20232057	20503847	20740479	59506	59953	60292
China	22274419	22909444	23851954	15620	16078	16750
Germany	3640378	3665606	3733949	43705	44030	44880
France	2389201	2401651	2430793	36895	37016	37395
Japan	4575614	4596001	4634246	37111	37478	37998
Netherlands	890787	904145	916602	50560	51165	51720
Italy	2203148	2221152	2256728	37423	37841	38564
Canada	1981371	2020416	2076313	51091	51664	52656
Rep. of Korea	1583433	1606148	1637796	30578	31041	31685
Mexico	1410742	1425481	1449580	10982	11017	11125
United Kingdom	2462474	2480239	2507387	36354	36495	36776
Belgium	580663	587920	610180	49688	50182	51954
Spain	1314393	1324800	1346663	27660	27906	28399
Australia	2240577	2278569	2357572	83920	84523	87574
Switzerland	696409	707670	727861	79167	79950	81740
Poland	647217	653900	670203	15776	16257	16917
Brazil	2015534	2027885	2047074	9313	9318	9356
Norway	805797	814968	838200	147195	147787	150906
Ireland	173566	176148	183792	34322	34610	35891
Sweden	535481	540338	550713	50517	50975	52449

Poland ($16,038). When we examine the expenditure table of the national accounts, the share of household expenditure in GDP for China is less than 40%. That is low for both developed and developing countries. We simulated what would have happened to per capita GDP if China had raised this share from 37.3% to 40% in 2022 and at the same time imported more consumer goods to bring the total share of imports in GDP to 15.5% (see Table A3). The reasoning behind this is that an increase in consumer goods would go to households. The result was an increase of income per capita of about $1000 to $16,369. Hopefully, such an increase would be helpful to the distribution of household income by raising the living standards of the poorer populations in China. Furthermore, the increase in imports would benefit Australia and other countries which send a large portion of their exports to China.

4. Expected GDP to the year 2025

The corresponding growth rates of the levels of GDP and per capita GDP are given in Table 3 below. Our projections show a continuance of the slow growth in the world economy which began after 2015. The United States is moving steadily at less then 1.5% per annum which is a few decimal points lower than its average before the COVID crisis. China has also slowed down from over 6% to about 4%. All in all the outlook does not seem too pessimistic, but not too exciting either. However, these estimates assume there will be no shock to the world economy due to a recession in North America or Europe. If that happened, the outlook would be worse.

Table 3
Corresponding Growth Rates of the Levels of GDP and Per Capita GDP for the World Economy.

	growth rate	GDP	growth rate	P.C. GDP
	2013–2024	2024 – 2025	2013–2024	2024 – 2025
USA	1.34	1.15	0.75	0.57
China	2.85	4.11	2.93	4.18
Germany	0.69	1.86	0.74	1.93
France	0.52	1.21	0.33	1.02
Japan	0.45	0.83	0.99	1.39
Netherlands	1.50	1.38	1.20	1.08
Italy	0.82	1.60	1.12	1.91
Canada	1.97	2.77	1.12	1.92
Rep. of Korea	1.43	1.97	1.51	2.07
Mexico	1.04	1.69	0.32	0.98
United Kingdom	0.72	1.09	0.39	0.77
Belgium	1.25	3.79	0.99	3.53
Spain	0.79	1.65	0.89	1.77
Australia	1.70	3.47	0.72	3.61
Switzerland	1.62	2.85	0.99	2.24
Poland	1.03	2.49	3.05	4.06
Brazil	0.61	0.95	0.05	0.41
Norway	1.14	2.85	0.40	2.11
Ireland	1.49	4.34	0.84	3.70
Sweden	0.91	1.92	0.91	2.89

5. Conclusions

Based on the latest solid data that we could obtain, over the next few years until 2025, the world economy will move along steadily but at a slower pace than it has before the COVID crisis. However, if world trade could be stimulated by increased demand for imports in some of the larger economies such as China or North America, the multiplier effects that result would be beneficial to all countries.

Appendix A

Table A1
Production Function Parameters/Harrod-Domar Model Estimation Historical Period 2012–2021.

Country	Incremental Capital-Output Ratio (ICOR)	Investment Share in GDP (%)	GDP Growth Rate (%)
United States	10.757	21.348	1.985
China	6.97	42.75	6.1296
Germany	18.5	20.883	1.288
Netherlands	12.688	21.436	1.689
Japan	117.18	25.2	0.22
Italy	167.1942	18.34	0.1097
France	28.969	23.54	0.8126
Republic of Korea	12.3091	30.726	2.496
Canada	18.131	22.909	1.2635
Mexico	22.95	21.12	0.92
United Kingdom	20.8	17.139	0.8239
Belgium	20.766	24.704	1.1896
Spain	18.952	19.75	1.042
Australia	11.848	24.687	2.084
Switzerland	16.0	24.271	1.517
Poland	5.301	20.725	3.909
Brazil	negative	16.37	0.001
Norway	20.786	28.078	1.351
Ireland	4.083	34.8364	8.532
Sweden	11.888	25.164	2.1167
Rest of the World	11.1447	25.535	2.291

Demand Equations for Consumption, Government and Imports

Country	Private Consumption	Government	Imports
United States	C= 0.679735Y	G= 0.1415498Y	M= −1100478 + 0.2116Y
China	C= 0.3801367Y	G= 0.1644118Y	M= 0.4275Y
Germany	C= 0.5246206Y	G= .20456Y	M= 0.361949Y
Netherlands	C= 0.437265Y	G= 0.24678Y	M= 0.75305Y
Japan	C= 1594818.2 + 0.195Y	G= 0.201785Y	M= −871290 + 0.37542Y
Italy	C= 0.60347Y	G= 0.18969Y	M= −572601 + 0.58278Y
France	C= 185473.08 + .46394Y	G= .23541307Y	M= −100177 + 0.71505Y
Republic of Korea	C= 191794.11 + 0.3558Y	G= 0.161819Y	M= −45986.9 + 0.40309Y
Canada	C= 0.58435Y	G= 0.21305Y	M= 59163.6 + 0.303132Y
Mexico	C= 0.68429Y	G= 0.123363Y	M= −447642 + 0.75369Y
United Kingdom	C= 0.6451885Y	G= 0.1941208Y	M= −512361.4 + 0.4656Y
Belgium	C= 44616 + 0.41713Y	G= 0.235252342Y	M= 0.829442Y
Spain	C= 97338.2 + 0.50174Y	G= 0.197008Y	M= −261169 + 0.52265Y
Australia	C= 189107.9 + 0.41305Y	G= 0.2146871Y	M= 154519.33 + 0.09833Y
Switzerland	C= 122522.6 + 0.3431189Y	G= 0.1117697Y	M= 117296.4 + 0.33977Y
Poland	C= 31477.1 + 0.52823Y	G= 0.1780242Y	M= −160106 + 0.7934Y
Brazil	C= 87060 + 0.59042Y	G= 0.1973288Y	M= −703477.3 + 0.536Y
Norway	C= 12050.1 + 0.3993Y	G= 0.235579Y	M= 17584 + 0.27329Y
Ireland	C= 0.269Y	G= 0.1221Y	M= 1.0632Y
Sweden	C= 18831.8 + 0.422353Y	G= 0.252222Y	M= −124731.3 + 0.649777Y
Rest of the World	C= 380390.5 + 0.5709Y	G= 0.15058Y	M= 2677538 + 0.25438Y

Table A2
Post-Linked Projections.

		Projected	**2023**			
	Y	C	G	I	X	M
USA	20232057	13752437	2863848	4319140	2351552	3180909
China	22274419	8467324	3661915	9522314	4038580	3329494
Germany	3640378	1909817	744661	760220	1827633	1599795
France	2389201	1293916	567435	562442	668197	706625
Japan	4575614	2487063	923267	1153055	854133	847960
Netherlands	890787	389510	221512	190940	824207	729376
Italy	2203148	1328124	417937	404057	754795	711350
Canada	1981371	1157814	422032	453932	603257	659780
Rep. of Korea	1583433	755180	256200	487064	674333	592287
Mexico	1410742	965371	174029	297920	586627	615616
U.K.	2462474	1588760	477966	422019	591429	634339
Belgium	580663	286828	136630	143424	494700	481627
Spain	1314393	756822	258935	259579	458961	425798
Australia	2240577	1114578	488446	553131	479841	374835
Switzerland	696409	361474	77859	169019	437937	353915
Poland	647217	373357	115218	134136	376881	353396
Brazil	2015534	1277072	397665	329943	384952	376880
Norway	805797	333805	190007	226244	289046	237800
Ireland	173566	46689	21191	60463	230833	184541
Sweden	535481	244994	135059	134743	242552	223212
ROW	14053009	8403253	2116383	3588436	5929398	6252342
		Projected	**2024**			
	Y	C	G	I	X	M
USA	20503847	13937183	2902320	4377161	2390663	3238423
China	22909444	8708720	3766313	9793787	4105033	3404431
Germany	3665606	1923052	749822	765488	1855126	1625484
France	2401651	1299692	570392	565373	678189	715527
Japan	4596001	2491038	927381	1158192	869047	855620
Netherlands	904145	395351	224834	193804	837308	750075
Italy	2221152	1338977	421353	407359	766582	721842
Canada	2020416	1180630	430349	462877	614045	671616
Rep. of Korea	1606148	763261	259875	494051	687117	601443
Mexico	1425481	975457	175847	301033	597381	626725
U.K.	2480239	1600222	481414	425063	600489	642612
Belgium	587920	289855	138338	145216	501357	487646
Spain	1324800	762043	260986	261635	465990	431238
Australia	2278569	1130271	496728	562510	488545	378571
Switzerland	707670	365338	79118	171752	445433	357742
Poland	653900	376887	116407	135521	382802	358698
Brazil	2027885	1284364	400102	331965	392052	383500
Norway	814968	337467	192169	228819	293132	240307
Ireland	176148	47384	21506	61363	234417	187287
Sweden	540338	247045	136284	135965	246095	226368
ROW	14487346	8651216	2181794	3699344	6035034	6362829

(*continued on next page*)

Table A2 (*continued*)

		Projected	**2025**			
	Y	C	G	I	X	M
USA	20740479	14098030	2935815	4427678	2470061	3288498
China	23851954	9067003	3921261	10196710	4259664	3515653
Germany	3733949	1958906	763802	779760	1926570	1695076
France	2430793	1313212	577313	572233	704199	736365
Japan	4634246	2498496	935098	1167830	902258	869991
Netherlands	916602	400798	227931	196474	868015	769377
Italy	2256728	1360423	428101	413884	795420	742575
Canada	2076313	1213293	442255	475683	634477	688560
Rep. of Korea	1637796	774522	264995	503786	708032	614200
Mexico	1449580	991948	178820	306122	617386	644888
U.K.	2507387	1617737	486684	429716	622632	655253
Belgium	610180	299140	143575	150714	522856	506110
Spain	1346663	773013	265293	265952	484224	442664
Australia	2357572	1162903	513951	582014	504884	386339
Switzerland	727861	372265	81375	176652	461606	364602
Poland	670203	385498	119309	138900	398112	371633
Brazil	2047074	1295693	403888	335106	405694	393786
Norway	838200	346743	197648	235342	305209	246656
Ireland	183792	49440	22439	64026	243289	195413
Sweden	550713	251427	138901	138576	254823	233109
ROW	14794964	8826836	2228122	3777894	6214315	6441081

Table A3
Corresponding Growth Rates of the Levels of GDP and Per Capita GDP for the World Economy, for Scenario 3 with China.

	Scenario 3 Y	China C	raises C/Y G	to 40% I	and M/Y to X	15.5% M	pop
USA	19871652	13507457	2812832	4242200	2327350	3104642	338
China	23315389	9326155	3833050	9967329	3972872	3613885	1424
Germany	3620188	1899225	740531	756004	1804452	1579236	83
France	2368707	1284408	562568	557617	654101	691970	65
Japan	4553135	2482680	918732	1147390	840794	839514	124
Netherlands	878746	384245	218518	188359	807500	710719	18
Italy	2174230	1310691	412451	398754	741729	694497	59
Canada	1936373	1131519	412447	443623	591153	646140	38
Rep. of Korea	1597960	760348	258550	491533	685983	598143	52
Mexico	1392112	952623	171731	293986	573792	601575	128
U.K.	2428898	1567097	471449	416265	584195	618704	68
Belgium	569843	282314	134084	140751	485075	472652	12
Spain	1296092	747639	255330	255965	450263	416233	48
Australia	2258666	1122050	492389	557597	485289	376614	26
Switzerland	687439	358396	76856	166842	434308	350868	9
Poland	638175	368580	113608	132262	369425	346222	40
Brazil	2018797	1278998	398309	330477	388987	378629	215
Norway	784039	325117	184876	220135	282512	231854	5
Ireland	171386	46103	20925	59704	227079	182223	5
Sweden	528723	242140	133355	133043	238284	218821	11

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