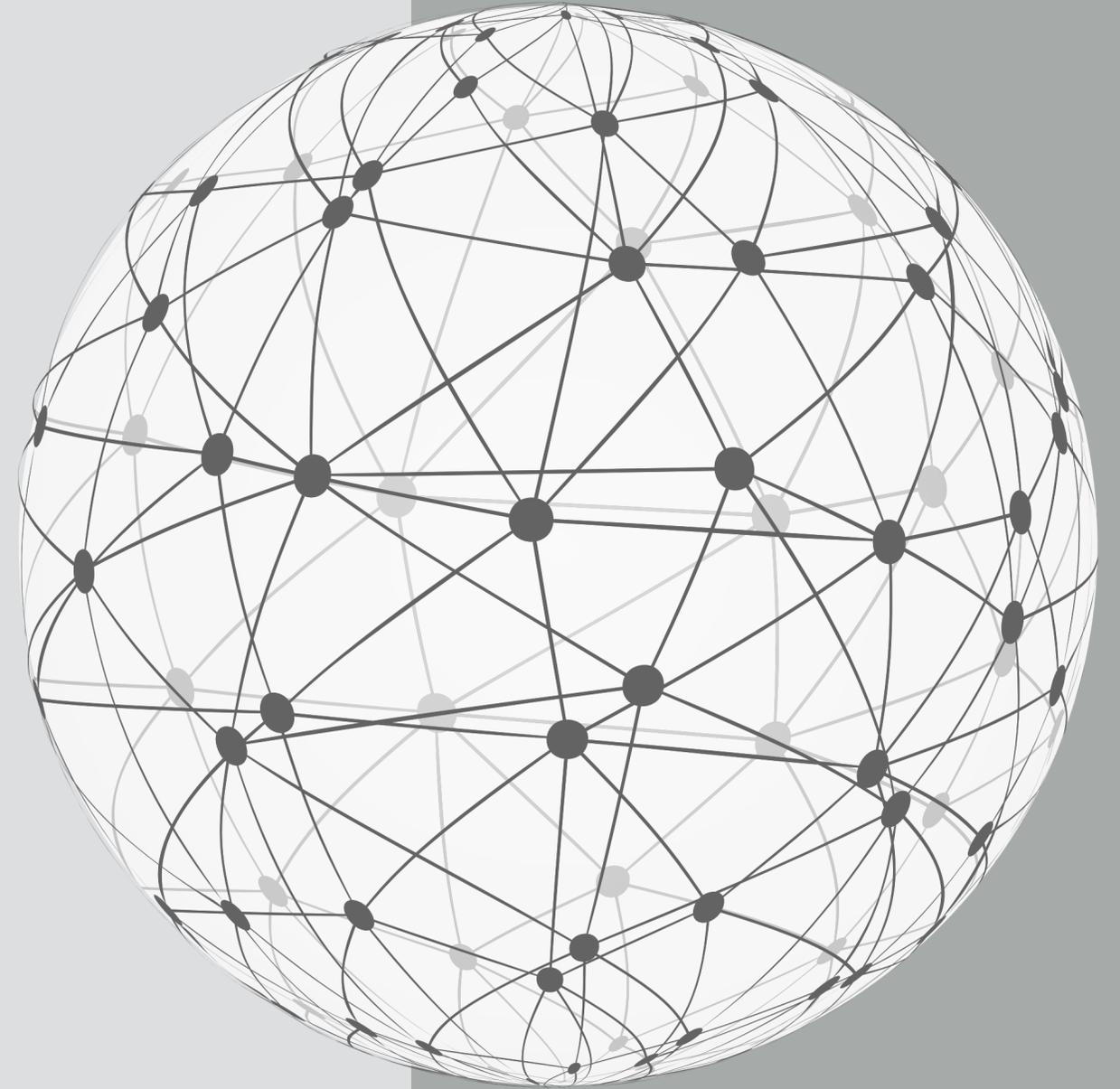# ERF 26th ANNUAL CONFERENCE

The Effects of Openness and Global Value Chains on the Performance of Turkish Sectors

Prof. Dr. Halit Yanıkkaya
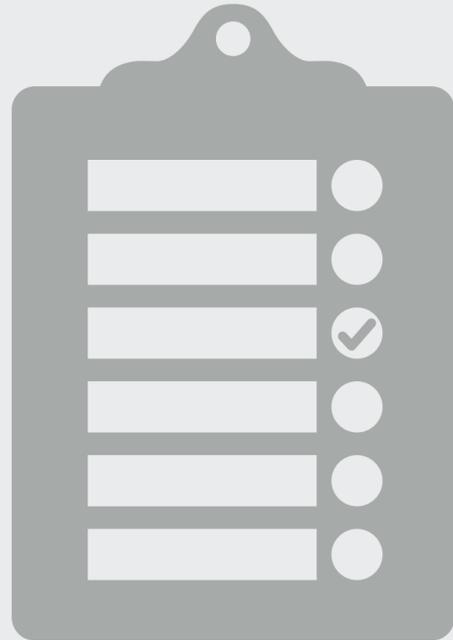
Dr. Abdullah Altun

Res. Assist. Pınar Tat

⟶ "Sustainable Development Goals (SDGs) as a Framework for MENA's Development Policy"

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MOTIVATIONS

* Improvements in information and telecommunication technologies
* Decreases in transportation costs
* Highly integrated global economy and fragmented production process
  * Intermediate goods and services compose two-thirds of international trade (Johnson and Noguera 2012).
* Opportunities of participating in GVCs and capital movements
* Decreases in tariff rates over the past three decades (World Development Report, 2020)
* Spillovers from foreign direct investments

CONTRIBUTIONS
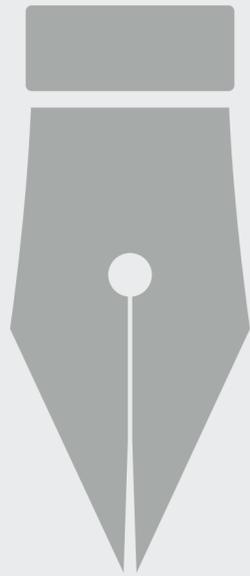
* First sectoral study investigating relationship between a variety of sectoral performance and opennes measures for Turkey
* New version of WIOD (2014, 2016), WITS and OECD (TiVA 2016, 2018)
* Longer time period with two distinct datasets
* Forward and backward participation indexes (OECD methodology)
* Length and distance measures

DATA
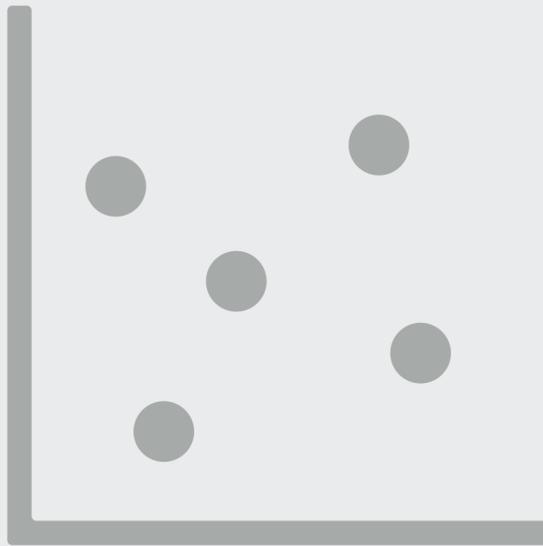
Five main databases:

* WIOD (World Input Output Database) 2014/2016: Output, capital, labor compensation, and the share of workhour

* OECD TiVA (Trade in Value Added) 2016/2018: Sectoral gross exports, domestic content of export, imports, global value chain (GVC) participation, sectoral value added measures

* WITS (World Integrated Trade Solution): Average tariff rates

* TiVA ICIO (Inter-Country Input-Output): Length of GVCs and distance to final consumption

* CBRT (Central Bank of Republic of Turkey): Sectoral foreign direct investment inflow and outflow

DATA (Cont.)
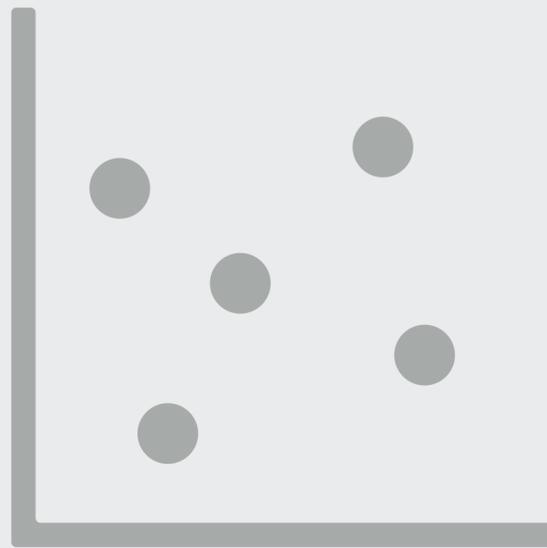
* WIOD (2014) and TiVA (2016) for the time period of 1995-2009
* WIOD (2016) and TiVA (2018) for the time period of 2005-2014
* 24 sectors for the first sample and 25 sectors for the second sample
* Among them, one is agriculture, one is construction, twelve are manufacturing, and eleven are service sectors.

FIGURE 1: LENGTH OF GVCS BY INDUSTRY - 1995 AND 2014
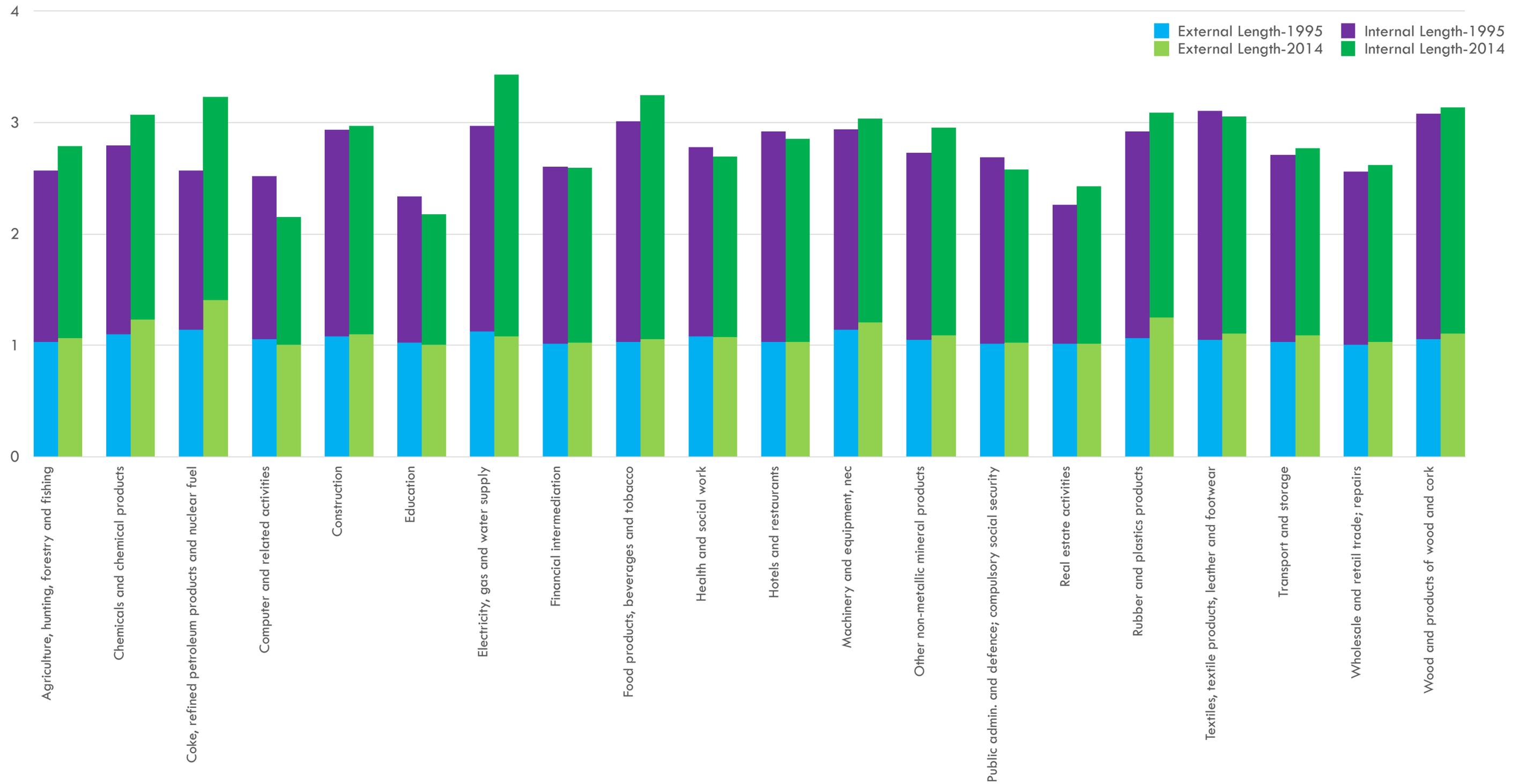
DATA (Cont.)

FIGURE 2: UPSTREAMNESS OF INDUSTRIES - 1995 AND 2014
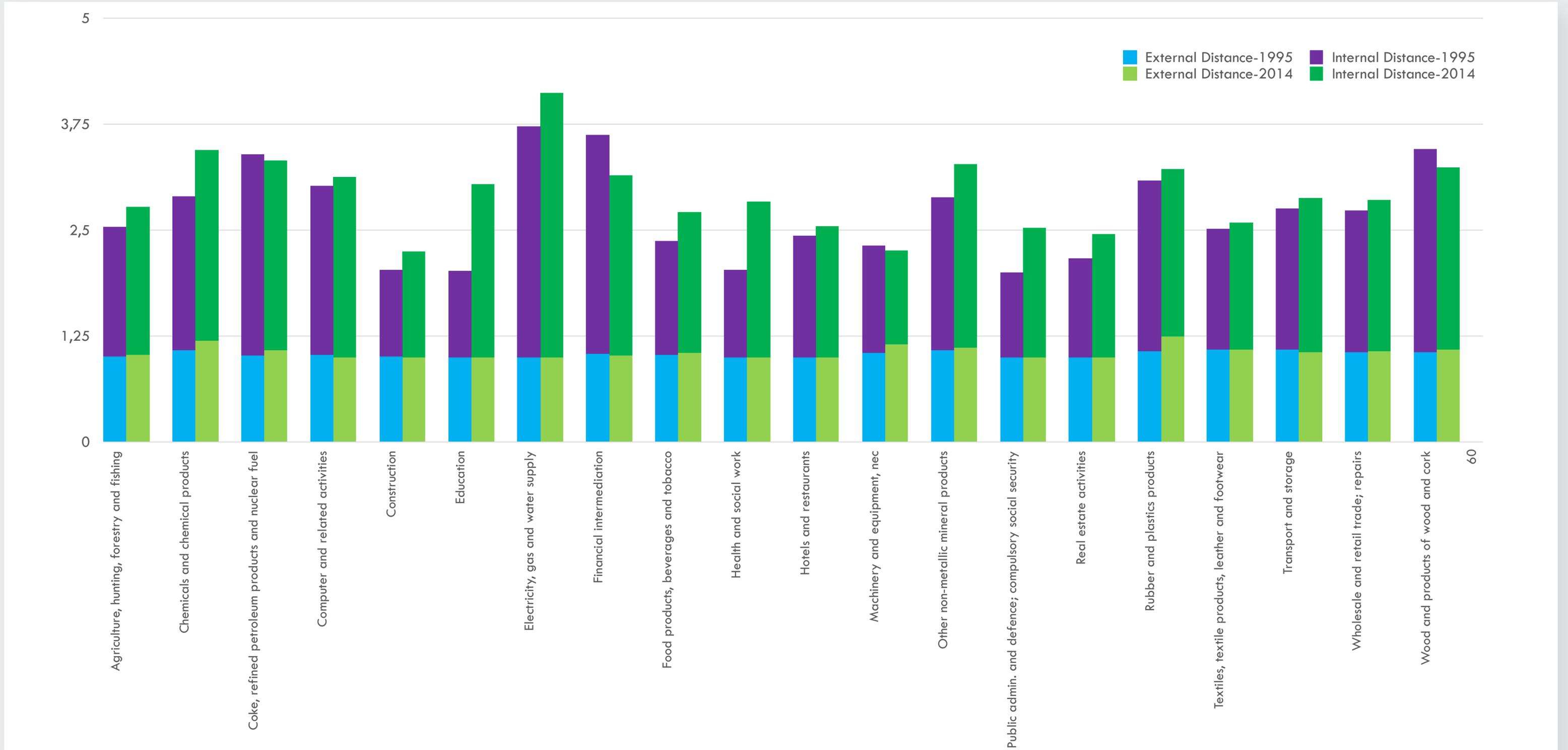
FIGURE 3: SECTORAL LENGTH AND BACKWARD GVC PARTICIPATION, 1995 AND 2014

FIGURE 4: SECTORAL UPSTREAMNESS AND FORWARD GVC PARTICIPATION, 1995 AND 2014

DATA (Cont.)
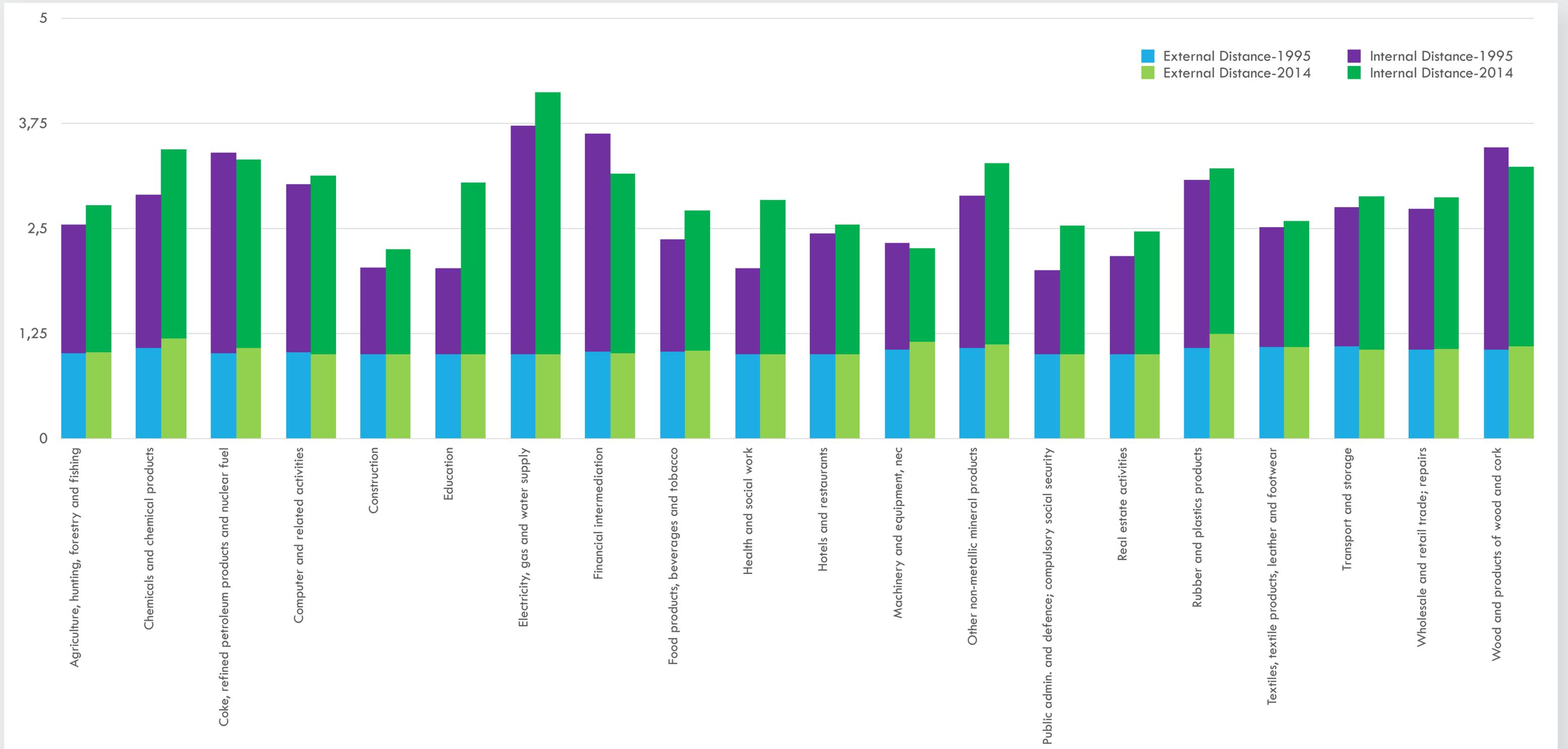
Legend: External Position-1995, External Position-2014, Internal Position-1995, Internal Position-2014
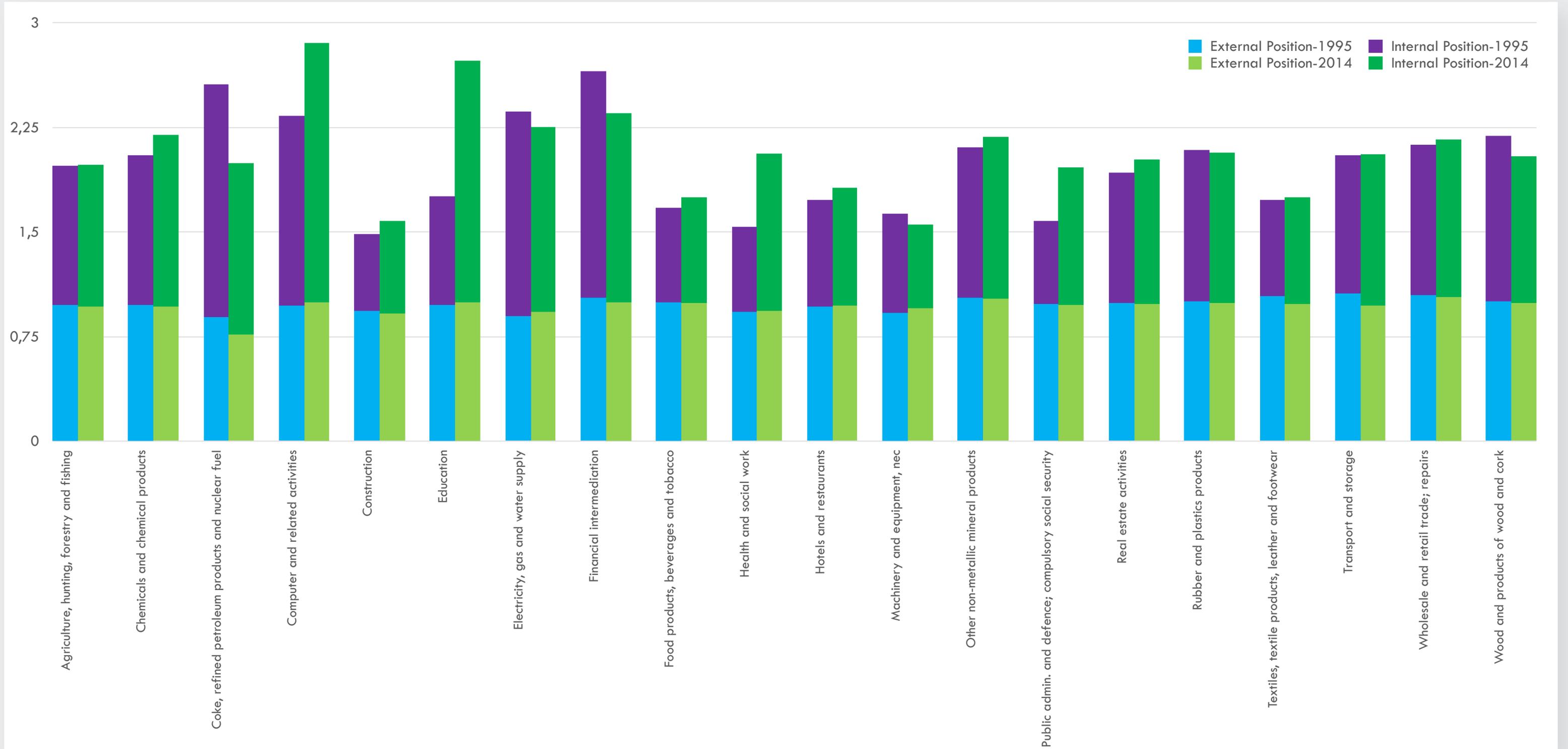
METHODOLOGY

Sectoral Total Factor Productivity

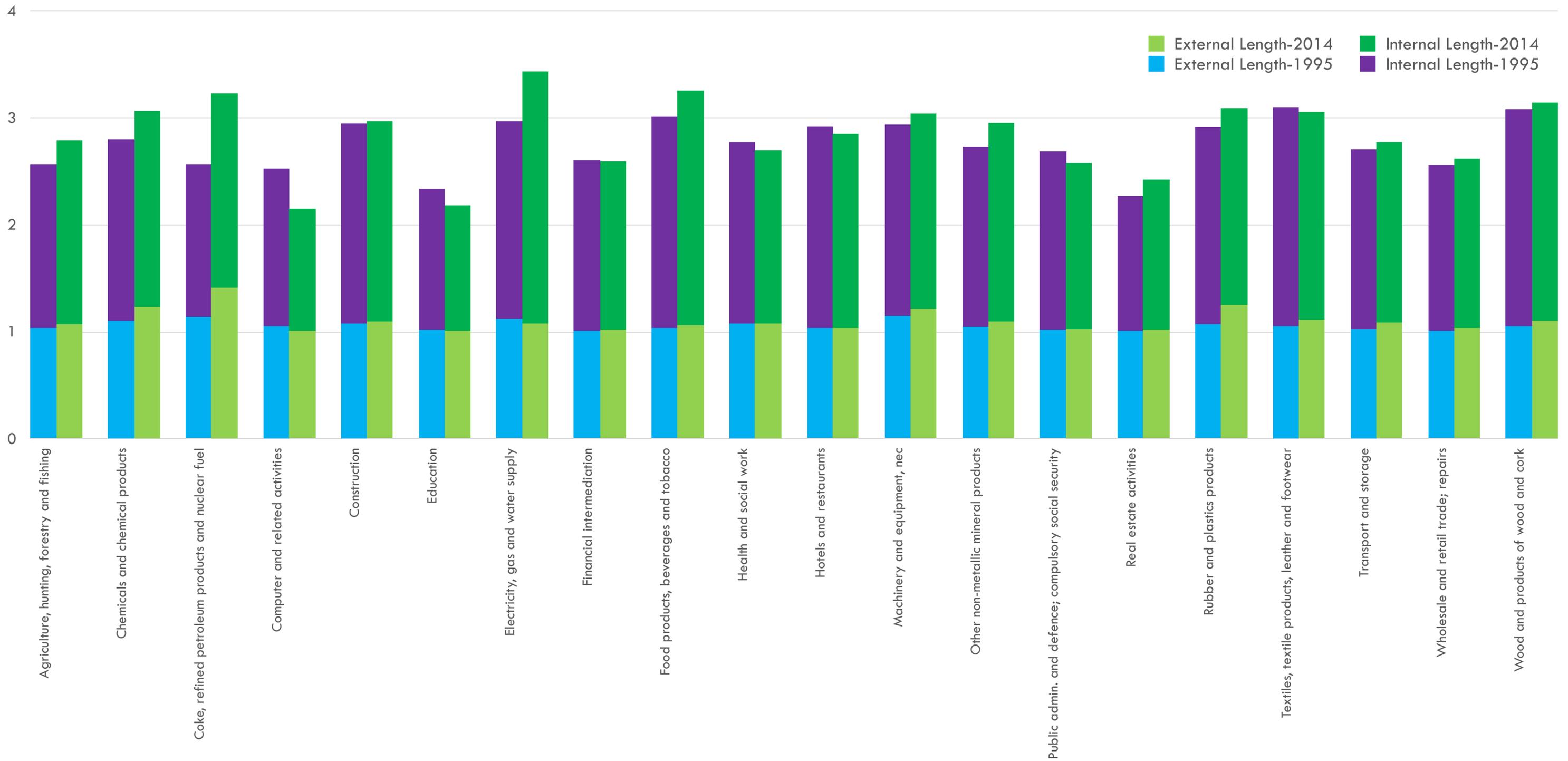To calculate sectoral total factor productivity (TFP), we follow Timmer et al. (2007) sectoral model. The sectoral production function is given as follows:

$$Y_j = f_j\,(X_j,\ L_j,\ K_j,\ T)$$

where Y stands for gross output, X stands for an index of intermediate inputs, L is an index of labor service flows, K stands for an index of capital service flows, and T indicates time.

$$\Delta lnA_{l,t} = \ \Delta lnY_{l,t} - v\,{}^{K}_{j,t}\,\Delta lnK_{l,t} - v\,{}^{L}_{j,t}\Delta lnL_{l,t} - \ v\,{}^{X}_{j,t}\,\Delta lnX_{l,t}$$

where v is the two period average share of the input in the value of output.

$$\Delta L_t = \sum v_{l,\,t}\Delta lnH_{l,t}$$

where $\Delta lnH_{l,t}$ represents the growth of hours worked by labor type l and v is again the two period average share of the input in the value of labor compensation.

METHODOLOGY

Difference Generalized Methods of Moments (DGMM) and Fixed Effects (FE)

$$TFP_{i,t}/EXG_{i,t} = \beta_0 + \beta_1 K_{i,t-1} + \beta_2 LP_{i,t-1} + \beta_3 OPEN1_{i,t-1} + \beta_4 OPEN2_{i,t-1} + \beta_5 D_{i,t-1} + \beta_6 S_{i,t} + e_{i,t}$$
(1)

$$VAG_{i,t} = \beta_0 + \beta_1 K_{i,t-1} + \beta_2 OPEN1_{i,t-1} + \beta_3 OPEN2_{i,t-1} + \beta_4 D_{i,t} + \beta_5 S_{i,t} + e_{i,t}$$
(2)

$TFP_{i,t}$: Total factor productivity growth

$EXG_{i,t}$: Gross export growth/domestic value added in export growth

$K_{i,t-1}$: Lagged value of the natural logarithm of capital stock per employees

$LP_{i,t-1}$: Lagged value of labor productivity

METHODOLOGY

The vector of $OPEN1_{i,t-1}$: Import per employees, tariff rates which Turkey imposes, backward participation, and FDI inflows per employees

The vector of $OPEN2_{i,t-1}$: Export per employees, tariff rates which Turkey faced, forward participation, and FDI outflows per employees

$D_{i,t}$: Dummy variables for years

$S_{i,t}$: Dummy variables for sectors

i represents sectors and t represents time

RESULTS

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
Lag of TFP	0.284**	0.262**	0.270**	0.317***	0.264	0.239**
	(0.110)	(0.124)	(0.126)	(0.106)	(0.199)	(0.095)
ln(capital)	-0.026	-0.038	-0.037	-0.029	-0.037	-0.015
	(0.017)	(0.025)	(0.025)	(0.025)	(0.053)	(0.030)
ln(labor productivity)	-0.044	-0.008	-0.015	-0.002	0.077	0.007
	(0.058)	(0.082)	(0.079)	(0.068)	(0.206)	(0.070)
ln(import)		0.020	0.016			
		(0.069)	(0.070)			
ln(export)		0.064*				
		(0.036)				
ln(export_dva)			0.073*			
			(0.039)			
Tariff rates (imposes)				0.115		
				(0.612)		
Tariff rates (faced)				-2.199		
				(1.752)		
Backward participation					0.413	
					(1.241)	
Forward participation					0.254	
					(0.440)	
ln(inflow)						-0.007
						(0.007)
ln(outflow)						-0.004
						(0.007)
Observations	288	285	285	285	285	285
Number of sectorcodes	24	24	24	24	24	24
j	25	26	26	26	26	25
ar2p	0.220	0.196	0.196	0.216	0.311	0.251
hansenp	0.346	0.314	0.318	0.323	0.315	0.268

RESULTS (Cont.)

TABLE 2: VALUE ADDED GROWTH, 1995-2009, TOTAL SAMPLE

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
Lag of va_growth	0.089	0.158	0.159	0.148	0.128*	0.103
	(0.096)	(0.122)	(0.122)	(0.099)	(0.074)	(0.151)
ln(capital)	-0.134***	-0.053	-0.062	-0.086**	-0.036	-0.115*
	(0.024)	(0.051)	(0.049)	(0.038)	(0.023)	(0.059)
ln(import)		-0.285	-0.239			
		(0.182)	(0.170)			
ln(export)		0.224**				
		(0.091)				
ln(export_dva)			0.181*			
			(0.095)			
Tariff rates (imposes)				0.873		
				(2.286)		
Tariff rates (faced)				-3.355*		
				(1.822)		
Backward participation					0.817	
					(0.661)	
Forward participation					0.656*	
					(0.319)	
ln(inflow)						0.015
						(0.027)
ln(outflow)						-0.043
						(0.029)
Observations	288	285	285	285	285	285
Number of sectorcodes	24	24	24	24	24	24
j	25	26	26	26	26	25
ar2p	0.176	0.143	0.140	0.189	0.232	0.259
hansenp	0.414	0.324	0.308	0.304	0.476	0.301

RESULTS (Cont.)

VARIABLES	(1)	(2)	(3)	(4)	(5)
Lag of ex_growth	0.027	0.022	0.012	-0.005	0.019
	(0.107)	(0.090)	(0.108)	(0.103)	(0.120)
ln(capital)	-0.136**	-0.166**	-0.107	-0.163*	-0.124
	(0.051)	(0.071)	(0.064)	(0.091)	(0.124)
ln(labor productivity)	0.159*	0.134	0.111	0.189	0.177
	(0.081)	(0.200)	(0.153)	(0.261)	(0.261)
ln(import)		0.100			
		(0.162)			
Tariff rates (imposes)			-2.382		
			(1.934)		
Tariff rates (faced)			-2.436*		
			(1.398)		
Backward participation				0.643	
				(1.460)	
Forward participation				-0.363	
				(1.030)	
ln(inflow)					-0.002
					(0.027)
ln(outflow)					-0.005
					(0.025)
Observations	284	284	284	284	284
Number of sectorcodes	24	24	24	24	24
j	25	25	26	26	25
ar2p	0.412	0.437	0.407	0.497	0.420
hansenp	0.391	0.413	0.361	0.432	0.361

RESULTS (Cont.)

TABLE 4: TOTAL FACTOR PRODUCTIVITY GROWTH, 2005-2014, TOTAL SAMPLE

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
Lag of TFP	-0.538***	-0.583***	-0.570***	-0.541**	-0.536**	-0.508***
	(0.188)	(0.180)	(0.198)	(0.201)	(0.196)	(0.180)
ln(capital)	-0.027	-0.075	-0.062	0.027	-0.040	0.008
	(0.090)	(0.117)	(0.126)	(0.110)	(0.138)	(0.087)
ln(labor productivity)	-0.158***	-0.076	-0.091	-0.132	-0.123	-0.192**
	(0.053)	(0.120)	(0.146)	(0.091)	(0.115)	(0.087)
ln(import)		0.171	0.163			
		(0.124)	(0.113)			
ln(export)		-0.089				
		(0.073)				
ln(export_dva)			-0.090			
			(0.075)			
Tariff rates (imposes)				1.512		
				(1.227)		
Tariff rates (faced)				-3.069**		
				(1.391)		
Backward participation					0.578	
					(0.437)	
Forward participation					0.084	
					(0.429)	
ln(inflow)						0.002
						(0.005)
ln(outflow)						-0.004
						(0.006)
Observations	200	200	200	200	200	200
Number of sectorcodes	25	25	25	25	25	25
j	25	26	26	26	26	31
ar2p	0.336	0.210	0.249	0.347	0.338	0.325
hansenp	0.308	0.276	0.243	0.234	0.275	0.600

TABLE 5: VALUE ADDED GROWTH, 2005-2014, TOTAL SAMPLE

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
Lag of va_growth	-0.337***	-0.314***	-0.313***	-0.372***	-0.356***	-0.292***
	(0.064)	(0.091)	(0.091)	(0.089)	(0.072)	(0.060)
ln(capital)	-0.592***	-0.535***	-0.537***	-0.469***	-0.625***	-0.465***
	(0.131)	(0.170)	(0.179)	(0.145)	(0.138)	(0.124)
ln(import)		-0.113				
		(0.122)				
ln(export)		-0.034	-0.042			
		(0.167)	(0.178)			
ln(export_dva)			-0.086			
			(0.117)			
Tariff rates (imposes)				2.240**		
				(1.008)		
Tariff rates (faced)				-1.636		
				(2.784)		
Backward participation					-1.640	
					(1.554)	
Forward participation					-0.688	
					(0.897)	
ln(inflow)						-0.016
						(0.014)
ln(outflow)						-0.020**
						(0.008)
Observations	175	175	175	175	175	175
Number of sectorcodes	25	25	25	25	25	25
j	24	25	25	25	25	25
ar2p	0.447	0.808	0.727	0.240	0.553	0.267
hansenp	0.288	0.222	0.219	0.237	0.261	0.259

RESULTS (Cont.)

TABLE 6: EXPORT GROWTH, 2005-2014, TOTAL SAMPLE

VARIABLES	(1)	(2)	(3)	(4)	(5)
Lag of ex_growth	-0.017**	-0.001	-0.002	-0.007	0.016
	(0.008)	(0.011)	(0.010)	(0.009)	(0.062)
ln(capital)	-0.122	-0.440**	-0.241	0.011	-0.332*
	(0.337)	(0.199)	(0.175)	(0.375)	(0.187)
ln(labor productivity)	-0.313	0.196	-0.131	-0.537	0.004
	(0.392)	(0.346)	(0.227)	(0.365)	(0.243)
ln(import)		-0.371			
		(0.287)			
Tariff rates (imposes)			1.623*		
			(0.795)		
Tariff rates (faced)			-2.924		
			(3.872)		
Backward participation				2.879	
				(4.795)	
Forward participation				-0.498	
				(0.997)	
ln(inflow)					-0.017
					(0.020)
ln(outflow)					0.031
					(0.023)
Observations	175	175	175	175	175
Number of sectorcodes	25	25	25	25	25
j	24	25	26	26	31
ar2p	0.100	0.724	0.680	0.734	0.670
hansenp	0.273	0.209	0.276	0.252	0.590

CONCLUSION

For the earlier dataset,

* Exports and exports of domestic value added raise total factor productivity and value added growth.

* Tariff rates which Turkey face are negatively related to value added growth, which means decreasing competitiveness of Turkish goods and services in the international market.

* Forward GVC participation leads to increase in value added growth.

* For export growth, tariff rates faced significantly reduce the growth rates of both export and domestic value added export.

* These effects are mainly driven by the estimates for manufacturing sectors.

CONCLUSION

For the later data set,

* All covariates other than tariff rates lose their significances.

* However, tariff rates Turkey imposes are still positively related to both total factor productivity and value added growth.

* The negative effect of faced tariff rates is also persistent in export growth.

* These effects are still driven by the manufacturing sectors.

* The weak relationship between sectoral performance and openness measures in the later data set because of the global slowndown of output and trade activities after the 2008 Financial crisis

DISCUSSIONS

* High backward participation ratio of chemicals and pharmaceutical products; coke and refined petroleum products; and machinery and equipment sectors make dependence of imported intermediates and GVCs more clear.

* Given positive effects of forward integration and losing its significance in shock times, more coordinations among countries and international institutions are required (high forward participation ratios in textiles, chemicals, machinery, and rubber sectors).

* Given the high internal upstream values of IT sector, developing countries such as Turkey should invest in information and communication technologies to enhance connectivities and coordinations of their manufacturing sectors in the international market.

* More detailed analyses at product level in internally upstream sectors such as IT, electricity supply, and financial intermediates are crucials.

✔ Thank you…

APPENDIX

TABLE A1. DESCRIPTIVE STATISTICS

Variables	The 1st Dataset						The 2nd Dataset					
	Manufacturing		Service		Total		Manufacturing		Service		Total	
	# of Obs.	Mean	# of Obs.	Mean	# of Obs.	Mean	# of Obs.	Mean	# of Obs.	Mean	# of Obs.	Mean
Total Factor Productivity Growth	168	-0.06	140	-0.09	336	-0.08	120	-0.01	110	-0.03	250	-0.02
Value Added Growth	168	0.06	140	0.09	336	0.07	108	0.02	99	0.01	225	0.02
Export Growth	168	0.13	136	0.08	332	0.10	108	0.07	99	0.11	225	0.09
DVA in Export Growth	168	0.12	136	0.07	332	0.09	108	0.06	99	0.11	225	0.09
ln(labor productivity)	180	10.37	150	10.45	360	10.42	120	10.68	110	10.85	250	10.79
ln(capital per worker)	180	8.30	150	8.18	360	8.32	120	11.60	110	10.93	250	11.34
ln(DVA in export per worker)	180	9.21	146	6.48	356	7.96	120	9.96	110	6.97	250	8.43
ln(export per worker)	180	9.48	146	6.56	356	8.13	120	10.23	110	7.03	250	8.60
ln(import per worker)	180	9.93	150	6.18	360	8.10	120	10.63	110	6.61	250	8.58
ln(inflow per worker)	180	1.91	150	1.54	360	1.72	120	5.88	110	4.26	250	5.07
ln(outflow per worker)	180	1.47	150	0.77	360	1.13	120	4.67	110	2.61	250	3.64
Traiff rates Turkey imposes	180	0.04	150	0.00	360	0.03	120	0.04	110	0.00	250	0.03
Traiff rates Turkey faced	180	0.06	150	0.00	360	0.03	120	0.05	110	0.00	250	0.03
Backward participation	180	0.38	150	0.11	360	0.24	120	0.48	110	0.13	250	0.29
Forward participation	180	0.28	150	0.13	360	0.20	120	0.32	110	0.21	250	0.26

APPENDIX

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
Lag of TFP	0.281	0.322	0.387*	0.400***	0.445**	0.321*
	(0.250)	(0.225)	(0.191)	(0.101)	(0.200)	(0.152)
ln(capital)	-0.094**	-0.026	-0.016	-0.020	-0.003	0.031
	(0.038)	(0.046)	(0.058)	(0.035)	(0.054)	(0.039)
ln(labor productivity)	-0.002	-0.028	-0.060	-0.046	-0.096	-0.108
	(0.081)	(0.100)	(0.106)	(0.087)	(0.172)	(0.137)
ln(import)		-0.134	-0.137			
		(0.085)	(0.097)			
ln(export)		0.128**				
		(0.051)				
ln(export_dva)			0.115*			
			(0.062)			
Tariff rates (imposes)				-0.172		
				(0.793)		
Tariff rates (faced)				-1.107		
				(0.891)		
Backward participation					-0.548	
					(0.751)	
Forward participation					0.608*	
					(0.321)	
ln(inflow)						-0.019*
						(0.010)
ln(outflow)						0.006
						(0.008)
Observations	144	144	144	144	144	144
Number of sectorcodes	12	12	12	12	12	12
j	14	16	16	16	16	16
ar2p	0.546	0.693	0.749	0.464	0.457	0.175
hansenp	0.240	0.329	0.336	0.350	0.333	0.342

APPENDIX

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
Lag of va_growth	0.033	-0.034	-0.029	0.093	0.109	-0.022
	(0.161)	(0.137)	(0.137)	(0.149)	(0.176)	(0.165)
ln(capital)	-0.141**	-0.219**	-0.212**	-0.094	-0.091	-0.018
	(0.046)	(0.084)	(0.079)	(0.068)	(0.065)	(0.055)
ln(import)		0.016	0.003			
		(0.164)	(0.153)			
ln(export)		0.315**				
		(0.132)				
ln(export_dva)			0.280*			
			(0.134)			
Tariff rates (imposes)				2.817		
				(2.433)		
Tariff rates (faced)				-1.987		
				(1.682)		
Backward participation					0.695	
					(0.464)	
Forward participation					0.839*	
					(0.461)	
ln(inflow)						-0.031
						(0.038)
ln(outflow)						-0.018
						(0.026)
Observations	144	144	144	144	144	144
Number of sectorcodes	12	12	12	12	12	12
j	13	13	13	13	13	13
ar2p	0.374	0.524	0.492	0.495	0.357	0.739
hansenp	0.335	0.369	0.370	0.230	0.308	0.340

VARIABLES	(1)	(2)	(3)	(4)	(5)
Lag of ex_growth	0.154	0.014	0.212	0.007	0.385
	(0.182)	(0.232)	(0.246)	(0.186)	(0.629)
ln(capital)	-0.189	-0.208	-0.204**	-0.171	-0.284
	(0.148)	(0.163)	(0.092)	(0.144)	(0.218)
ln(labor productivity)	0.035	0.091	0.331**	-0.571**	0.178
	(0.425)	(0.444)	(0.133)	(0.201)	(0.663)
ln(import)		0.011			
		(0.206)			
Tariff rates (imposes)			-2.330		
			(2.781)		
Tariff rates (faced)			-3.627		
			(2.922)		
Backward participation				-4.534***	
				(1.297)	
Forward participation				1.170	
				(1.332)	
ln(inflow)					0.033
					(0.038)
ln(outflow)					0.005
					(0.046)
Observations	144	144	144	144	144
Number of sectorcodes	12	12	12	12	12
j	13	13	16	12	16
ar2p	0.219	0.282	0.356	0.273	0.229
hansenp	0.392	0.297	0.576	0.217	0.489

APPENDIX

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
Lag of TFP	-0.014	0.060	-0.090	0.124	-0.279	0.145
	(0.271)	(0.331)	(0.219)	(0.466)	(0.520)	(0.220)
ln(capital)	0.072	0.235	0.008	0.166	0.227	0.100*
	(0.047)	(0.156)	(0.114)	(0.229)	(0.263)	(0.048)
ln(labor productivity)	-0.229***	-0.462**	-0.128	-0.314*	-0.289	-0.335
	(0.059)	(0.170)	(0.093)	(0.172)	(0.223)	(0.189)
ln(import)		-0.007	-0.001			
		(0.187)	(0.047)			
ln(export)		-0.249*				
		(0.121)				
ln(export_dva)			-0.006			
			(0.043)			
Tariff rates (imposes)				0.906		
				(0.999)		
Tariff rates (faced)				-1.344**		
				(0.496)		
Backward participation					-0.361	
					(0.483)	
Forward participation					-0.409	
					(0.616)	
ln(inflow)						0.001
						(0.004)
ln(outflow)						0.004
						(0.007)
Observations	96	96	96	96	96	96
Number of sectorcodes	12	12	12	12	12	12
j	14	12	16	16	16	12
ar2p	0.915	0.0945	0.104	0.221	0.192	0.759
hansenp	0.437	0.754	0.404	0.588	0.640	0.255

APPENDIX

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
Lag of va_growth	-0.319***	-0.029	-0.035	-0.322	-0.242**	-0.164*
	(0.092)	(0.199)	(0.163)	(0.201)	(0.102)	(0.077)
ln(capital)	-0.675**	0.449	0.501	0.056	-0.251	-0.193
	(0.225)	(0.301)	(0.337)	(0.368)	(0.209)	(0.190)
ln(import)		-0.640*	-0.711**			
		(0.296)	(0.301)			
ln(export)		-0.447**				
		(0.173)				
ln(export_dva)			-0.423*			
			(0.198)			
Tariff rates (imposes)				3.036		
				(2.004)		
Tariff rates (faced)				-6.669**		
				(2.591)		
Backward participation					-1.306	
					(1.773)	
Forward participation					-0.248	
					(1.162)	
ln(inflow)						-0.026*
						(0.014)
ln(outflow)						-0.009
						(0.016)
Observations	84	84	84	84	84	84
Number of sectorcodes	12	12	12	12	12	12
j	13	13	13	13	13	13
ar2p	0.810	0.948	0.804	0.397	0.538	0.276
hansenp	0.286	0.324	0.363	0.241	0.250	0.265

TABLE A7. EXPORT GROWTH, 2005-2014, MANUFACTURING

VARIABLES	(1)	(2)	(3)	(4)	(5)
Lag of ex_growth	-0.166	0.201	0.187	0.179	-0.134
	(0.115)	(0.149)	(0.177)	(0.105)	(0.137)
ln(capital)	-1.323**	0.416	0.538	0.132	-1.395*
	(0.544)	(0.587)	(0.938)	(0.622)	(0.674)
ln(labor productivity)	0.295	-0.985	-0.551	-0.725	1.216
	(0.524)	(0.585)	(1.030)	(0.980)	(0.845)
ln(import)		-0.091			
		(0.320)			
Tariff rates (imposes)			3.366		
			(4.046)		
Tariff rates (faced)			-9.336		
			(7.002)		
Backward participation				-2.975	
				(2.175)	
Forward participation				-1.185	
				(1.967)	
ln(inflow)					-0.026
					(0.026)
ln(outflow)					-0.035
					(0.038)
Observations	84	84	84	84	84
Number of sectorcodes	12	12	12	12	12
j	13	13	16	16	16
ar2p	0.479	0.125	0.565	0.336	0.172
hansenp	0.243	0.209	0.513	0.302	0.868

The Effects of Openness and Global Value Chains on the Performance of Turkish Sectors