The Impact of Trade Liberalization on Gross Exports and Domestic Value Added

Mid-Course Assignment in Trade Policy Analysis

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Introduction

Introduction

Research Question: Was the effect of trade liberalization policies between 2002 and 2014 stronger on gross exports or on domestic value added (DVA) in gross exports?

Motivation:

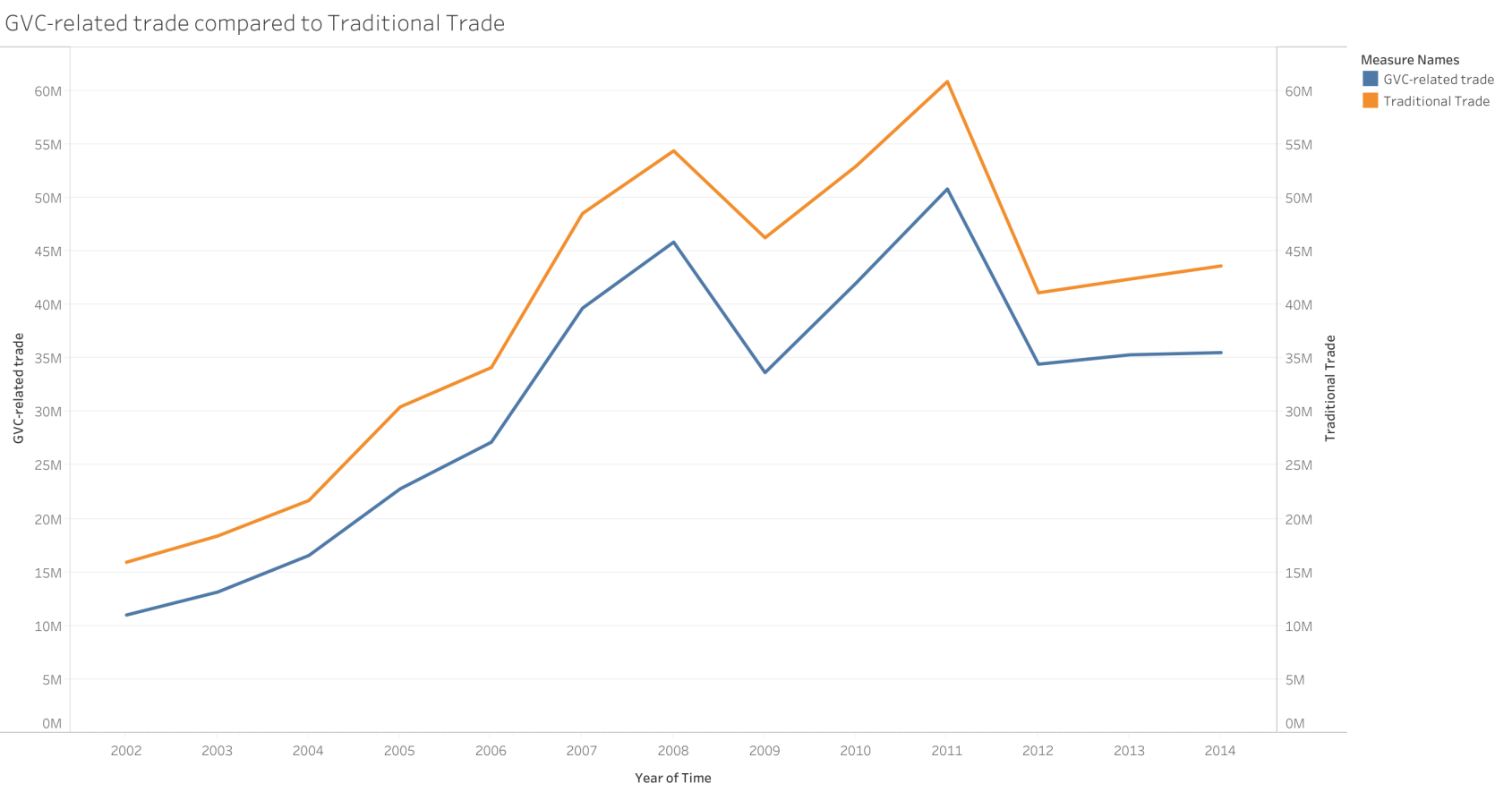
- Significant increase in RTAs: from 28 in 1990 to 355 in 2021
- `Time frame:` 2002-2014, captures integration into GVCs (e.g. EU enlargement 2004)

Data: Decomposition of WIOD trade data from the 2016 release (Timmer et al. (2015)) following Borin and Mancini (2019)

Strategy: Obtain figures on gross exports and DVA and regress both trade measures on trade policy dummy variables and set of controls

Increase in Trade

Figure 1: GVC-related trade compared to Traditional Trade. Source: WITS



Literature

Literature

Existing Literature

- Trade creation and trade disruption: RTAs are able to increase the welfare of the region in which they are implemented (Baier and Bergstrand (2007), Mayer et al. (2019))
- Determinants of effects of trade: geographical location, economic size, political ties (Felbermayr et al. (2018), Felbermayr et al. (2022), Baier et al. (2019))
- **Existing gap in the literature**: The existing literature does not address the question if reshoring which follows economic disintegration is linked to increased domestic value added!
- Given the complexity of **GVC**, it is now vital to account for the different components of the value added generated by trade (Antras and Chor (2021), Aslam et al. (2017)). Koopman et al. (2014) provides an insightful decomposition of gross exports that takes into account both the created value added and the vertical specialization

Data and Specifications

Data i

Gross exports and DVA

- Source: WIOD 2016 release, decomposition scheme as in Borin and Mancini (2019)
  - Gross exports (GTRADE) in million USD
  - Domestic value added (DVA) in million USD

Trade liberalization policy

- Source: Larch's RTA database (Egger and Larch (2008))
  - RTA dummies capture seven different FT policies: *CU, FTA, PSA, EIA, CUEIA, FTAEIA, PSAEIA*
    - e.g. *EIA* captures the EU, *CU* captures EU-TUR CU (1995), *FTAEIA* captures NAFTA (1993), EU-MEX (2000), EU-KOR (2011)

Controls

- Source: CEPII GRAVITY database (Conte et al. (2022))
  - Standard gravity dummies capture several controls for endogeneity: *Distance, Border, Language, Colony*

Data ii

Trade liberalization policy dummies

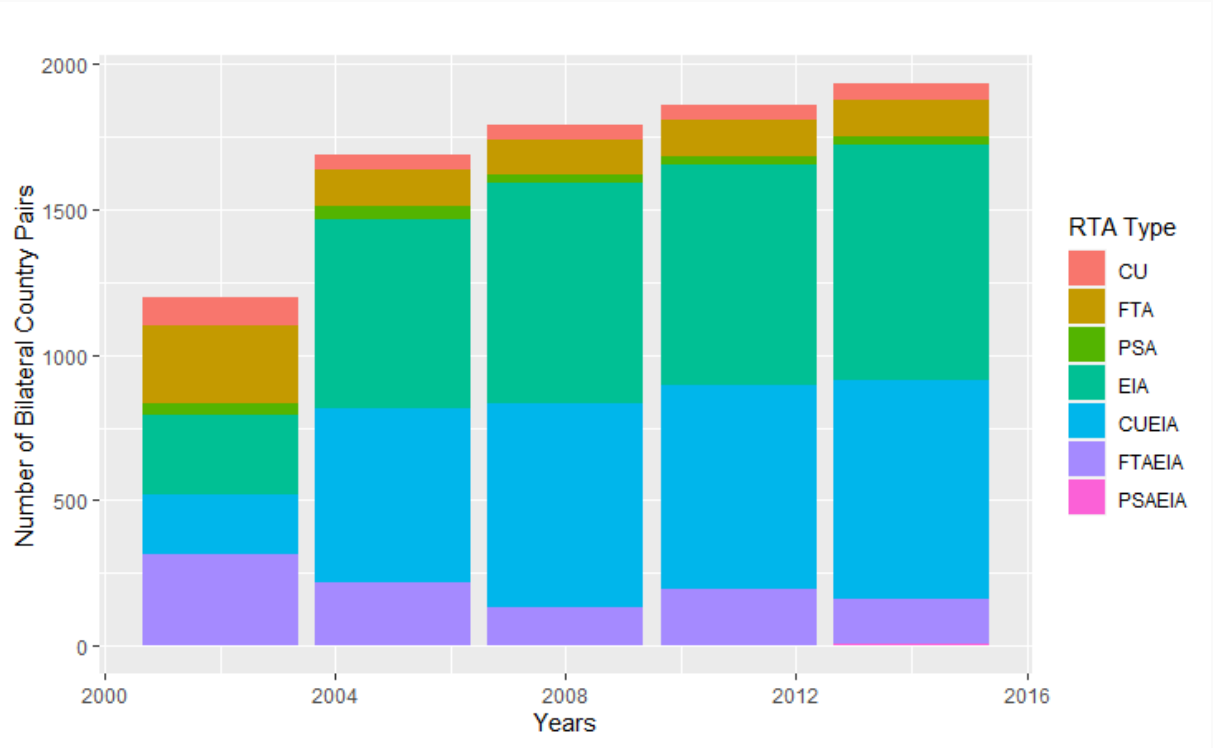


Figure 2: The RTA policy dummies (2002-2014). Information on RTAs from WTO's RTA database.

- e.g. EU-TUR CU (1995) $\in$ *CU*
- e.g. EU $\in$ *EIA*
- e.g. NAFTA (1993), EU-MEX (2000), EU-KOR (2011) $\in$ *FTAEIA*

Data iii

Trade Policy Dummy	Regional Trade Agreement Type	RTAs in our dataset
CU	Customs Union	Between EU countries and EU accession countries (accession in 2004 or later), EU-TUR (1995)
FTA	Free Trade Agreement	Among EU accession countries (accession in 2004 or later), EU-CHE (1973), EU-NOR (1973), CHE-TUR, NOR-TUR (part of EFTA-TUR 1992), CHE-CAN, NOR-CAN (part of EFTA-CAN 2009), BEL-HRV (in 2002), BEL-SVN (in 2002)
PSA	Partial Scope Agreement	1. Global System of Trade Preferences among Developing Countries (GSTP 1989): BRA, IDN, IND, KOR, MEX, 2. Bilateral PSAs between BRA-MEX (2003), CHN-IND, ROU-BRA, ROU-IDN, ROU-IND, ROU-KOR, ROU-MEX, ROU-TUR (2002-2005), TUR-BRA, TUR-KOR, TUR-MEX
EIA	Economic Integration Agreement	**EU**, EU-NOR (1973)
CUEIA	Customs Union & Economic Integration Agreement	**EU**
FTAEIA	Free Trade & Economic Integration Agreement	CHE-NOR (EFTA 1960), CHE-KOR and NOR-KOR (part of EFTA-KOR 2006), NOR-MEX and CHE-MEX (part of EFTA-MEX 2001), **EU-KOR (2011)**, **EU-MEX (2000)**, CHN-IDN (part of ASEAN 2005), JPN-CHE (2009), JPN-IDN (part of ASEAN-JPN 2008), JPN-IND (2011), JPN-MEX (2005), KOR-AUS (2014), KOR-IDN (part of ASEAN-KOR), KOR-IND (2010), NAFTA (CAN, MEX, USA 1993), USA-AUS (2005), USA-KOR (2007)
PSAEIA	Partial Scope & Economic Integration Agreement	CHN-IND, CHN-KOR, IND-KOR (2014)

Figure 3: The RTA policy dummies (2002-2014). Information on RTAs from WTO's RTA database.

Data Wrangling

Decomposition of gross exports:
Table: wiod (release 2016)
Year: 2014
Perspective: exporter
Origin: AUS
Exporter: AUS
Importer: total AUS exports
Destination: ALL
Return: domestic value-added

	Millions of $	% of export
AUS	**1835.77**	***0.64***
AUT	**317.76**	***0.11***
BEL	**653.44**	***0.23***

Figure 4: The icio command helps to extract DVA in gross exports. More on the command here.

1. Extract WIOD 2016 data on gross exports (GTRADE) and DVA: STATA icio command by Belotti et al. (2021)
2. Merge both datasets on GTRADE and DVA with the RTA and GRAVITY datasets
3. Perform gravity regressions on final dataset

Estimation Challenges and Specifications

Estimation Challenges

- Our **four specifications** tackle different econometric challenges
  - **(i)**: OLS estimator with absorbed importer-time and exporter-time FE
  - **(ii-iv)**: PPML estimator with absorbed importer-time and exporter-time FE
    - **(iii)**: intra-national trade to account for home bias
    - **(iv)**: exporter-time and importer-time and exporter-importer pair FE to account for endogeneity

Solutions

Challenges	Specification (i)	Specification (ii)	Specification (iii)	Specification (iv)
1: Multilateral resistances	X	X	X	X
2: Zero trade flows (not applicable)				
3: Heteroskedasticity		X	X	X
4: Bilateral trade costs	X	X	X	
5: Endogeneity of trade policy				X
6: Non-discriminatory trade policy			X	
7: Adjustment to trade policy changes	X	X	X	X
8: Gravity with disaggregated data				

Figure 5: How we tackle estimation challenges defined in Yotov et al. (2016)

Specifications (i)-(iv)

Specification (ii): PPML estimator

1. $GTRADE_t^{ij} = \alpha + \beta GRAVITY^i + \gamma_1 CU + \gamma_2 FTA + \gamma_3 PSA + \gamma_4 EIA + \gamma_5 CUEIA + \gamma_6 FTAEIA + \gamma_7 PSAEIA + \mu_t^i + \eta_t^j + \epsilon_t^{ij}$
2. $DVA_t^{ij} = \alpha + \beta GRAVITY^i + \gamma_1 CU + \gamma_2 FTA + \gamma_3 PSA + \gamma_4 EIA + \gamma_5 CUEIA + \gamma_6 FTAEIA + \gamma_7 PSAEIA + \mu_t^i + \eta_t^j + \epsilon_t^{ij}$

Specification (iii): Home bias with the PPML estimator

1. $GTRADE_t^{ij} = \alpha + \beta GRAVITY^i + \gamma_1 CU + \gamma_2 FTA + \gamma_3 PSA + \gamma_4 EIA + \gamma_5 CUEIA + \gamma_6 FTAEIA + \gamma_7 PSAEIA + \delta INTRA + \sigma_t^i + \theta_t^j + \psi^{ij} + \epsilon_t^{ij}$
2. $DVA_t^{ij} = \alpha + \beta GRAVITY^i + \gamma_1 CU + \gamma_2 FTA + \gamma_3 PSA + \gamma_4 EIA + \gamma_5 CUEIA + \gamma_6 FTAEIA + \gamma_7 PSAEIA + \delta INTRA + \sigma_t^i + \theta_t^j + \psi^{ij} + \epsilon_t^{ij}$

Results and Discussion

Results i

Variables	(1) OLS GTRADE	(2) OLS DVA	(3) PPML GTRADE	(4) PPML DVA	(5) INTRA GTRADE	(6) INTRA DVA	(7) PAIR_FE GTRADE	(8) PAIR_FE DVA
CU	7,351***	6,042***	0.748***	0.712***	0.748***	0.712***	-0.0470	-0.0183
	(2,340)	(1,790)	(0.152)	(0.161)	(0.152)	(0.161)	(0.0910)	(0.0778)
FTA	5,753**	5,054***	0.499***	0.496***	0.498***	0.495***	0.0158	0.00726
	(2,251)	(1,696)	(0.0979)	(0.105)	(0.0977)	(0.104)	(0.0489)	(0.0518)
PSA	-4,565**	-3,530***	-0.126	-0.128	-0.126	-0.128	0.0278	0.0226
	(1,841)	(1,311)	(0.110)	(0.110)	(0.110)	(0.110)	(0.0444)	(0.0416)
EIA	4,258***	3,387***	0.554***	0.565***	0.554***	0.565***	0.112	0.113
	(1,430)	(1,083)	(0.139)	(0.148)	(0.139)	(0.148)	(0.0809)	(0.0942)
CUEIA	6,512***	5,411***	0.0899	0.0449	0.0891	0.0441	0.0346	0.0459
	(2,438)	(1,845)	(0.157)	(0.167)	(0.157)	(0.166)	(0.0742)	(0.0865)
FTAEIA	9,061**	7,511**	0.150*	0.126	0.150*	0.126	-0.000342	-0.00872
	(4,018)	(3,019)	(0.0822)	(0.0854)	(0.0820)	(0.0852)	(0.0245)	(0.0247)
PSAEIA	14,409	9,136	-0.325**	-0.350**	-0.323**	-0.347**	-0.0570	-0.0635
	(17,013)	(11,019)	(0.148)	(0.149)	(0.147)	(0.147)	(0.0511)	(0.0567)
Distance	-5,163***	-3,636***	-0.462***	-0.454***	-0.462***	-0.454***		
	(937.0)	(694.3)	(0.0306)	(0.0314)	(0.0306)	(0.0314)		
Contiguity	6,850***	4,917***	0.380***	0.387***	0.380***	0.387***		
	(2,564)	(1,814)	(0.0726)	(0.0730)	(0.0726)	(0.0729)		
Language	1,320	855.3	0.133*	0.130	0.133*	0.130		
	(2,153)	(1,598)	(0.0791)	(0.0794)	(0.0791)	(0.0794)		
Colony	-4,455**	-3,504**	0.110	0.118	0.111	0.118		
	(1,761)	(1,370)	(0.165)	(0.174)	(0.165)	(0.174)		
Constant	40,483***	28,049***	13.27***	13.00***	13.27***	13.01***		
	(7,361)	(5,423)	(0.277)	(0.285)	(0.274)	(0.282)		
Observations	9,030	9,030	9,030	9,030	9,245	9,245	9,245	9,245
R-squared	0.467	0.460					0.986	0.986
Exporter-Year FE	YES	YES	YES	YES	YES	YES	YES	YES
Importer-Year FE	YES	YES	YES	YES	YES	YES	YES	YES
Pair FE	NO	NO	NO	NO	NO	NO	YES	YES

Notes: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Figure 6: The results of specifications (i)-(iv) for both trade measures.

Results ii

Columns (1) and (2):

- Estimated results for the baseline gravity equation (i) by OLS
- CU, FTA, EIA, CUEIA, and FTAEIA: significant positive effects on bilateral trade flows, both measured by GTRADE and DVA
- PSA has significant negative effects and no significant effects of PSAEIA
- GTRADE vs DVA: the former has a larger absolute magnitude in all coefficient estimates, suggesting the trade agreement variables have larger effects on GTRADE than DVA

Columns (3) and (4):

- Estimated results for the baseline gravity equation (i) by PPML
- Significantly positive effects of CU, FTA, and EIA. CUEIA and FTAEIA lose significance. PSAEIA has significantly negative effects
- Absolute magnitude of effects is larger on GTRADE than DVA

Results ii

Columns (5) and (6):

- Estimated results for the gravity equation (iii) controlling for intra-national trade by PPML.
- The results are similar to those estimated for equation (1), besides some slight decrease in absolute magnitude.

Columns (7) and (8):

- Estimated results for the gravity equation (iv) controlling for endogeneity by PPML
- NO significant results at all

Discussion

Trade liberalization and aggregate trade flows:

- EU effects in comparison:
  - 1950-2012: Mayer et al. (2019)'s PPML yield a 300% increase for EU trade (+6 times)
  - 1995-2011: Felbermayr et al. (2018) find a 122% increase for EU trade (+2.5 times)
    - Plausible explanation: rise in GVC integration in the 1990s and slowdown in GVC integration after 2014

Trade liberalization and domestic value added (DVA):

- Coefficients on GTRADE absolutely larger than on DVA
- BUT: In our sample, DVA/GTRADE=74%
  - DVA increasing relatively more than GTRADE: GTRADE partly driven by GVC integration
- Regional GVC integration: both CU and EIA dummies > FTA dummy
  - FTA dummy: loose FTAs, e.g. EU-NOR or EFTA-TUR vs. CU dummy: free tariffs on EU single market (2004 enlargement)

Conclusions

Conclusions i

- We study the trade effects of different trade agreement regimes by adopting a set of seven trade agreement regime dummies: CU, FTA, PSA, EIA, CUEIA, FTAEIA, and PSAEIA
- Instead of only targeting GTRADE, we add another measure for trade flows: trade in DVA
- Against the background of the international diffusion of production networks and countries' increasing participation in GVCs over the past decades, this is a fairly interesting endeavour
- Based on the icio STATA command, we extract gross bilateral trade flows and the DVA component of gross trade for 43 countries from 2002 to 2014, with an interval of three years

Conclusions ii

- By and large, we find significant and positive trade effects of CU, FTA, and EIA and that, with one exception, the absolute magnitude of effects is larger for GTRADE compared to DVA
- Important finding: despite smaller absolute effects of trade liberalization on DVA than on GTRADE, the relative gains to DVA are larger
- Overall, the inconsistency and instability of estimates is expected given our limited data coverage, as we only include five periods and 43 countries
- Important limitation: aggregation over industries masks sectoral heterogeneity
- Debate on welfare effects of trade liberalization get another measure: DVA
- Potential further questions in the light of DVA as an additional GVC measure: does DVA result in welfare gains? Who gains the most?

Questions?

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Appendix i

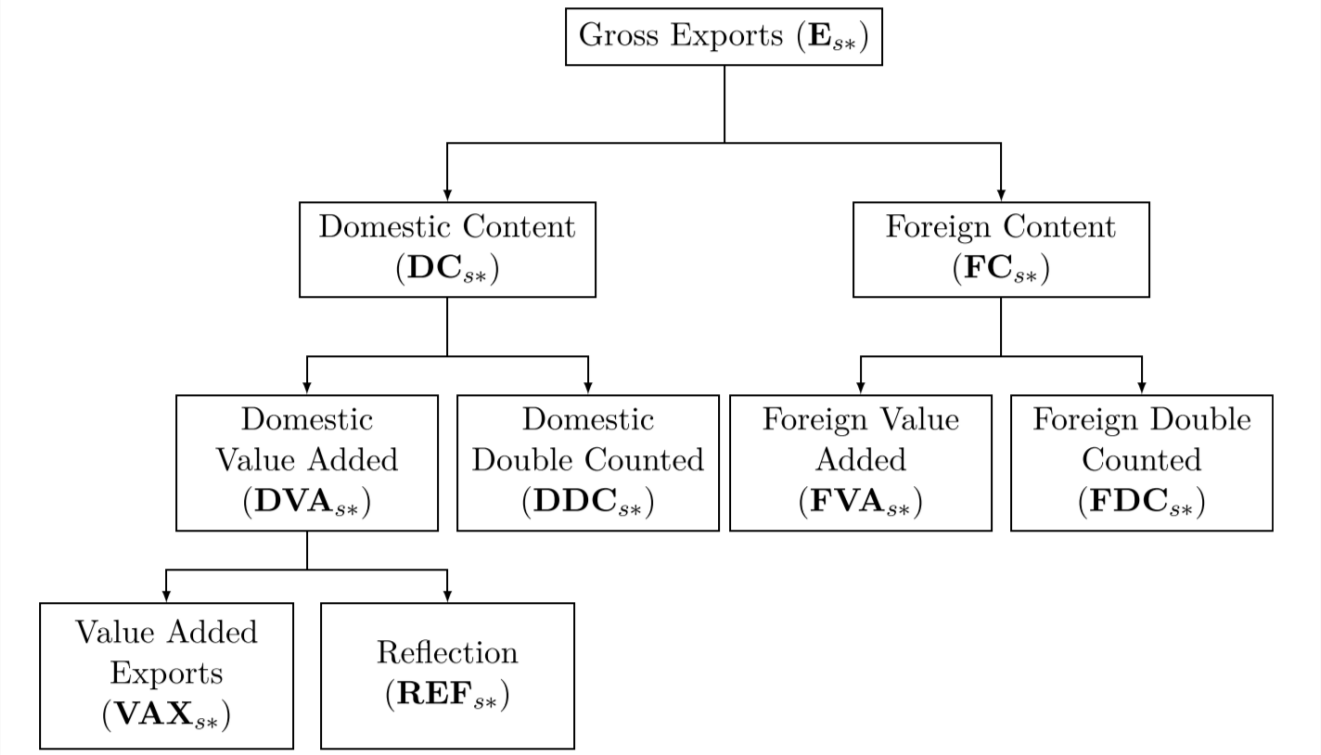

Figure 7: The break-down of gross exports into sub-components which Borin and Mancini (2019) adapt in their algorithm. Framework drawn from Koopman et al. (2014).

Appendix ii

Please find **replication code and data** `here` for download