

The EU Accession of Central and Eastern European Countries in 2004: A Value-Added Perspective

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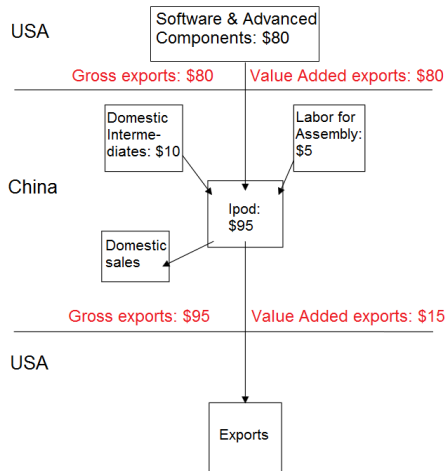
International Fragmentation

Montáž | Zvarovňa | Lakovňa | ▶ Montáž | Lanovka | Testovacia dráha | Výroba prevodoviek | Výroba komponentov | Automobily



Source: Volkswagen Slovakia, 2013.

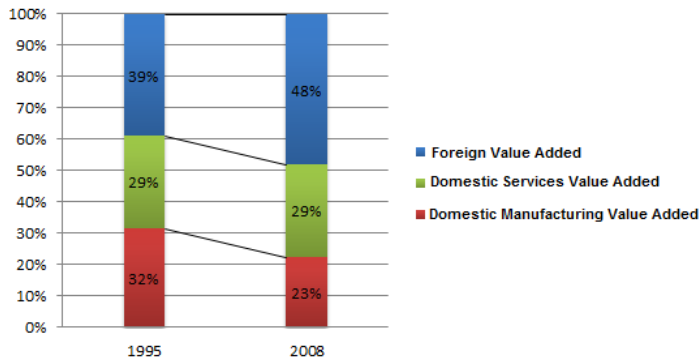
Gross Exports vs Value Added Exports



International Fragmentation

- The share of domestic Value Added (VA) in gross exports fell from **85 percent** in the 1970s to **70 percent** today (Johnson, 2014).

Figure 1: Composition of Intra-EU27 Exports 1995-2008



Source: Estimations based on WIOD.

Literature

- **Global fragmentation** Vertical specialization, production networks and global value chains (Hummels et al. 2001; Yi 2003; Baldwin 2006; Grossman & Rossi-Hansberg 2006; Timmer et al. 2014).

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- **Trade policy** Determinants and consequences of trade agreements in global value chains still poorly understood (Johnson & Noguera 2012).
- **Regional integration** Assessment of 2004 EU enlargement with gross exports (Hornok 2010; Kohl 2014; Martínez-Zarzoso et al. 2015).

Contribution

- Estimate the impact of the CEECs' EU accession on value-added exports
- Distinguish between manufacturing and services sectors
- Reveal how EU accession affects labour and capital embodied in value-added trade

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- Distinguish between manufacturing and services sectors
- Reveal how EU accession affects labour and capital embodied in value-added trade
- **Main result**
 - CEECs' EU accession primarily fostered **intra**-CEEC value-added exports. . .
 - and promoted HOV specialization in EU15-CEEC value-added exports

Gravity Equation

$$\ln(E_{ijt}) = \beta_1 \ln(Y_{it}) + \beta_2 \ln(Y_{jt}) + \beta_3 \ln(D_{ij}) \\ + \beta_4 EU_{ijt} + F_{it} + F_{jt} + F_{ij} + \epsilon_{ijt}$$

Dependent variables

- Gross exports
- Value added exports (VAX)
- Capital embodied in VAX
- Low-skilled labor in VAX
- Medium-skilled labor in VAX
- High-skilled labor in VAX

Data

- Vale Added Exports from World Input-Output Database (www.wiod.org)
- 35 sectors (ISIC Rev. 3) and 4 production factors
- Panel data: 1995-2009, 40 countries
- Leontief inverse: direct and indirect contributions
- Some assumptions: e.g., average production structure across all firms in a country

Table 1: Country coverage of the WIOD

European Union			Asia and Pacific	North America	Latin America
Austria	Germany	Netherlands	Australia	Canada	Brazil
Belgium	Greece	Poland	China	USA	Mexico
Bulgaria	Hungary	Portugal	India		
Cyprus	Ireland	Romania	Indonesia		
Czech Republic	Italy	Slovakia	Japan		
Denmark	Latvia	Slovenia	Korea		
Estonia	Lithuania	Spain	Russia		
Finland	Luxembourg	Sweden	Taiwan		

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Other considerations

- Multilateral Resistance Terms (MRTs) (Anderson & Van Wincoop 2003, Feenstra 2004)
- Endogeneity of VAX and GDP
- Endogeneity of trade policy and trade flows (Baier & Bergstrand 2007)
- Lagged EU-variable to allow for phase-in effects
- Wooldridge (2002) test for autocorrelation: first-differencing preferable to using fixed effects

Gravity Equation in First Differences

$$\begin{aligned} d\ln(E_{ij,t-(t-1)}) = & \beta_1 dEU_{ij,t-(t-1)} + \beta_2 dEU_{ij,(t-1)-(t-2)} \\ & + \beta_3 dEU_{ij,(t-2)-(t-3)} + \beta_4 dEU_{ij,(t-3)-(t-4)} \\ & + \beta_5 dEU_{ij,(t-4)-(t-5)} + \beta_6 dEU_{ij,(t-5)-(t-6)} \\ & + dF_{i,t-(t-1)} + dF_{j,t-(t-1)} + v_{ij,t-(t-1)}. \end{aligned}$$

Entire Table

Manufacturing

	(1)	(2)	(3)	(4)	(5)	(6)
	Gross Exports	VAX Total	VAX Capital	VAX LabHS	VAX LabMS	VAX LabLS
$EU04_{(j,t)-(j,t-1)}$	0.141*** (0.007)	0.0822*** (0.000)	0.0570** (0.015)	0.0897*** (0.000)	0.0934*** (0.000)	0.0935*** (0.000)
$EU04_{(j,t-1)-(j,t-2)}$	-0.00598 (0.877)	0.00615 (0.716)	0.0316 (0.104)	-0.00801 (0.683)	-0.00810 (0.680)	-0.00898 (0.647)
$EU04_{(j,t-2)-(j,t-3)}$	0.0111 (0.788)	0.00838 (0.656)	-0.00230 (0.906)	0.0137 (0.516)	0.0171 (0.419)	0.0153 (0.469)
$EU04_{(j,t-3)-(j,t-4)}$	0.0366 (0.425)	0.00405 (0.849)	-0.00846 (0.704)	0.0119 (0.587)	0.00882 (0.687)	0.00649 (0.769)
$EU04_{(j,t-4)-(j,t-5)}$	0.00388 (0.923)	0.0000714 (0.997)	-0.00125 (0.954)	-0.00212 (0.913)	-0.000285 (0.988)	0.00294 (0.882)
$EU04_{(j,t-5)-(j,t-6)}$	0.0481 (0.249)	0.0659*** (0.002)	0.0580** (0.011)	0.0628*** (0.005)	0.0674*** (0.003)	0.0682*** (0.002)
Total ATE:	0.109 (0.2190)	0.133*** (0.0045)	0.115** (0.0307)	0.1369** (0.0105)	0.1451*** (0.0060)	0.1467*** (0.0049)
N	21832	21838	21775	21838	21838	21838
R^2	0.201	0.490	0.577	0.521	0.492	0.519

p -values in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Manufacturing

Directions of Trade - Total ATEs with 5 Lags

	(1) Gross Exports	(2) VAX	(3) VAX Capital	(4) VAX LHS	(5) VAX LMS	(6) VAX LLS
Manufacturing						
NEW-OLD	-0.0988 (0.6625)	0.0732 (0.2318)	-0.0446* (0.0747)	0.0745 (0.3768)	0.0759 (0.3465)	0.0770 (0.2976)
NEW-NEW	0.362*** (0.0088)	0.3121*** (0.0000)	0.2839*** (0.0000)	0.2976*** (0.0000)	0.3116*** (0.0000)	0.3141*** (0.0000)
OLD-NEW	0.1988*** (0.0002)	0.0922*** (0.0000)	0.1223*** (0.0000)	0.1342*** (0.0000)	0.1075*** (0.0000)	0.1042*** (0.0000)
<i>N</i>	21832	21838	21775	21838	21838	21838
<i>R</i> ²	0.203	0.492	0.579	0.523	0.494	0.521

Note: Robust standard errors (clustered by dyad) were used. *p*-values of joint-significance of the coefficients in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

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Recap: Manufacturing

- EU15→CEEC: specialization in Capital and High-Skilled Labor.
- CEEC→EU15: no significant effects.
- Largest relative increase for manufacturing trade among entrants, but no clear specialization pattern for production factors.

Services

Directions of Trade - Total ATEs with 5 Lags

	(1) Gross Exports	(2) VAX	(3) VAX Capital	(4) VAX LHS	(5) VAX LMS	(6) VAX LLS
Services						
NEW-OLD	-0.3270** (0.0171)	0.1195** (0.0255)	0.0739** (0.0254)	-0.0201** (0.0423)	0.1199** (0.0132)	0.1218* (0.0643)
NEW-NEW	-0.340 (0.4060)	0.2390*** (0.0075)	0.253*** (0.0044)	0.2169** (0.0113)	0.232*** (0.0058)	0.2287** (0.0137)
OLD-NEW	0.0000 (0.4335)	0.1064 (0.1787)	0.1220* (0.0616)	0.0572 (0.4627)	0.0520 (0.2677)	0.0598 (0.2648)
<i>N</i>	21772	21840	21840	21840	21840	21840
<i>R</i> ²	0.228	0.486	0.510	0.504	0.490	0.556

Note: Robust standard errors (clustered by dyad) were used. *p*-values of joint-significance of the coefficients in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

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Recap: Services

- Gross trade (negative) vs. VAX (positive) matters.
- No evidence of EU15→CEEC promotion of trade in services.
- Especially low- and medium-skilled VAX for CEEC→EU15 trade in services (but not manufacturing).
- Once again: Largest relative increase for services trade among entrants, but no clear specialization pattern for production factors.

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- **Anticipation effects** are negligible and, as a result, assumption of strict exogeneity of EU accession is not violated (Wooldridge 2002, Baier & Bergstrand 2007)
- **“Placebo”** enforcement of EU Enlargement in 2000, 2001, 2002 or 2003 to control for earlier CEFTA, BAFTA membership. Largely insignificant point estimates suggest our analysis captures the “true” EU-accession effect in 2004.

Conclusion

- The 2004 EU enlargement enhanced Value Added Exports of new and old member states at an aggregate level. . .
- . . .yet gross exports and VAX tell different stories.
- Main effect on **intra-CEEC trade** for both VAX manufacturing and VAX services, across all production factors.
- Evidence of **HOV specialization** for trade between EU15 and CEEC's. . .
 - EU15 specialization in capital and high-skilled labor for VAX manufacturing to CEECs,
 - CEECs specialization in medium-skilled and low-skilled labor for VAX services to EU15.

Thanks for Your Attention!

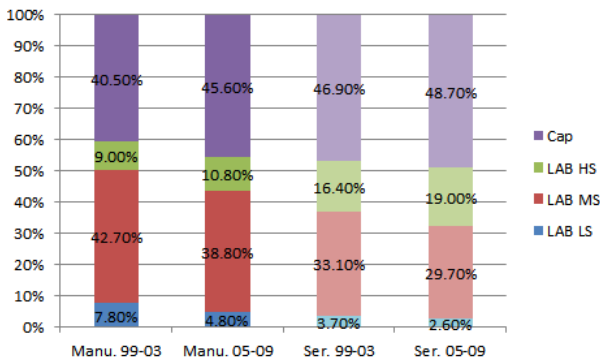
The EU Accession of CEECs in 2004: A Value-Added Perspective

Lennart Kaplan, Tristan Kohl & Inmaculada Martínez-Zarzoso

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Accession Effects on Factorial Composition

Figure 3: Factorial Composition of VA Exports from CEECs to EU27



Source: *Estimations based on WIOD.*

Input-Output Framework

		Country A Intermediate <i>Industry</i>	Country B Intermediate <i>Industry</i>	Country A Final domestic	Country B Final domestic	Total
		Intermediate use of domestic output	Intermediate use by B of exports from A	Final use of domestic output	Final use by B of exports from A	Output in A
Country A	Industry	Intermediate use of domestic output	Intermediate use by B of exports from A	Final use of domestic output	Final use by B of exports from A	Output in A
Country B	Industry	Intermediate use by A of exports from B	Intermediate use of domestic output	Final use by A of exports from B	Final use of domestic output	Output in B
		Value added	Value added			
		Output in A	Output in B			

Source: *Timmer (2012), p.63.*

Appendix

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Appendix

Manufacturing: 5 Annual Lags and a 5 Year Lead

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	Gross Exports	VAX Total	VAX Capital	VAX LabHS	VAX LabMS	VAX LabLS
$EU04_{(j,t)-(j,t-1)}$	0.141*** (0.007)	0.0822*** (0.000)	0.0570** (0.015)	0.0897*** (0.000)	0.0934*** (0.000)	0.0935*** (0.000)
$EU04_{(j,t-1)-(j,t-2)}$	-0.00598 (0.877)	0.00615 (0.716)	0.0316 (0.104)	-0.00801 (0.683)	-0.00810 (0.680)	-0.00898 (0.647)
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$EU04_{(j,t-5)-(j,t-6)}$	0.0481 (0.249)	0.0659*** (0.002)	0.0580** (0.011)	0.0628*** (0.005)	0.0674*** (0.003)	0.0682*** (0.002)
$EU04_{j,t+5}$	-0.0320* (0.065)	-0.0151** (0.015)	-0.0115 (0.111)	-0.0156** (0.015)	-0.0157** (0.015)	-0.0150** (0.020)
Total ATE:	0.109 (0.2190)	0.133*** (0.0045)	0.115** (0.0307)	0.1369** (0.0105)	0.1451*** (0.0060)	0.1467*** (0.0049)
N	21832	21838	21775	21838	21838	21838
R^2	0.201	0.490	0.577	0.521	0.492	0.519

p-values in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Appendix

Services: 5 Annual Lags and a 5 Year Lead

	(1)	(2)	(3)	(4)	(5)	(6)
	Gross Exports	VAX Total	VAX Capital	VAX LabHS	VAX LabMS	VAX LabLS
$EU04_{(j,t)-(j,t-1)}$	0.0133 (0.827)	0.0419* (0.054)	0.0355 (0.106)	0.0415* (0.060)	0.0504** (0.024)	0.0524** (0.024)
$EU04_{(j,t-1)-(j,t-2)}$	-0.0133 (0.840)	0.00163 (0.943)	-0.00400 (0.862)	0.0105 (0.672)	0.0167 (0.460)	0.0175 (0.454)
$EU04_{(j,t-2)-(j,t-3)}$	0.00967 (0.858)	0.0327* (0.089)	0.0291 (0.138)	0.0383* (0.058)	0.0399** (0.041)	0.0403* (0.051)
$EU04_{(j,t-3)-(j,t-4)}$	0.0490 (0.380)	0.0127 (0.510)	0.00902 (0.647)	0.0115 (0.597)	0.0145 (0.464)	0.0141 (0.475)
$EU04_{(j,t-4)-(j,t-5)}$	-0.293*** (0.002)	-0.0176 (0.562)	-0.0211 (0.492)	-0.0403 (0.225)	-0.00857 (0.774)	0.000795 (0.979)
$EU04_{(j,t-5)-(j,t-6)}$	-0.0117 (0.831)	0.0652*** (0.003)	0.0768*** (0.001)	0.0460** (0.031)	0.0607*** (0.004)	0.0647*** (0.006)
$EU04_{j,t+5}$	0.00507 (0.731)	-0.00663 (0.257)	-0.00387 (0.521)	-0.00652 (0.269)	-0.0103* (0.084)	-0.0134** (0.027)
Total ATE:	-0.293* (0.0812)	0.1398** (0.0335)	0.0768** (0.0223)	0.1258* (0.0604)	0.1407** (0.0152)	0.144** (0.0231)
N	21772	21840	21840	21840	21840	21840
R^2	0.227	0.485	0.509	0.503	0.489	0.556

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Appendix

Manufacturing: Placebos including 5 lags

	(1)	(2)	(3)	(4)	(5)	(6)
	Gross_Exports	VAX_Total	VAX_Capital	VAX_LabHS	VAX_LabMS	VAX_LabLS
2004:	0.109 (0.2515)	0.1179*** (0.0077)	0.0921** (0.0364)	0.1213** (0.0156)	0.1295*** (0.0079)	0.1317*** (0.0057)
2003:	0.109 (0.1553)	0.0157** (0.0048)	0.0008** (0.0144)	0.0213** (0.0191)	0.0226** (0.0134)	0.0243** (0.0126)
2002:	0.109 (0.2012)	0.0157*** (0.0059)	0.0008** (0.0186)	0.0213** (0.0233)	0.0226** (0.0151)	0.0243** (0.0136)
2001:	0.109 (0.1957)	0.0157*** (0.0059)	-0.0902** (0.0232)	0.0213** (0.0164)	0.0226** (0.0111)	0.0243** (0.0106)
2000:	-0.054* (0.0812)	-0.0206*** (0.0039)	0.0008** (0.0176)	-0.0146** (0.0113)	0.0226*** (0.0076)	0.0243*** (0.0081)

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

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Services: Placebos including 5 lags

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	Gross_Exports	VAX_Total	VAX_Capital	VAX_LabHS	VAX_LabMS	VAX_LabLS
2004:	-0.288* (0.0818)	0.0939** (0.0263)	0.0730*** (0.0093)	0.1062* (0.0628)	0.0905** (0.0197)	0.0903* (0.0670)
2003:	-0.288* (0.0986)	0.0007 (0.1344)	-0.0291 (0.2477)	0.0318* (0.0641)	-0.0008** (0.0409)	-0.0053* (0.0655)
2002:	0.0000 (0.8069)	0.0306* (0.0911)	0.0028 (0.1534)	0.0318* (0.0580)	0.0297** (0.0278)	-0.0053* (0.0602)
2001:	0.0000 (0.9685)	0.0306** (0.0458)	0.0028* (0.0722)	0.072** (0.0100)	0.0297** (0.0152)	-0.0053* (0.0509)
2000:	0.0000 (0.7565)	-0.0124** (0.0175)	-0.0472** (0.0135)	-0.0086*** (0.0038)	-0.0092** (0.0133)	-0.0438** (0.0280)

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

VAX

Value-added exports measure the amount of value added from a given source country that is consumed in each destination (i.e., embodied in final goods absorbed in that destination).

— Johnson & Noguera (2012)

$$VAX_{sut} = v_{st} * f_{ut} * (I - A)^{-1}$$

- Supplier s , user u , year t
- v_s supplier's value-added coefficients
- f_{ut} final user's use of worldwide output
- $(I - A)^{-1}$ Leontief inverse

Appendix

Industry Coverage in WIOD

ISIC Rev. 3 Code	Industry
AtB	Agriculture, hunting, forestry and fishing
C	Mining and quarrying
15t16	Food, beverages and tobacco
17t18	Textiles and textile products
19	Leather, leather products and footwear
20	Wood and products of wood and cork
21t22	Pulp, paper, printing and publishing
23	Coke, refined petroleum and nuclear fuel
24	Chemicals and chemical products
25	Rubber and plastics
26	Other non-metallic minerals
27t28	Basic metals and fabricated metal
29	Machinery, not elsewhere classified
30t33	Electrical and optical equipment
34t35	Transport equipment
36t37	Manufacturing, not elsewhere classified; recycling

Appendix

Industry Coverage in WIOD II

ISIC Rev. 3 Code	Industry
E	Electricity, gas and water supply
F	Construction
50	Sale and repair of motor vehicles and motorcycles; retail sale of fuel
51	Wholesale trade, except of motor vehicles and motorcycles
52	Retail trade and repair, except of motor vehicles and motorcycles
H	Hotels and restaurants
60	Inland transport
61	Water transport
62	Air transport
63	Other supporting transport activities
64	Post and telecommunications
J	Financial intermediation
70	Real estate activities
71t74	Renting of machinery and equipment and other business activities
L	Public administration and defence; compulsory social security
M	Education
N	Health and social work
O	Other community, social and personal services
P	Private households with employed persons

Appendix

Descriptive Statistics (in Millions of US\$)

Variable	Mean	Median	Max.	Min.	Std. Dev.
Manufacturing					
(1) Exports	2919.7	288.1	292331.7	0.00	11018.78
(2) VAX	1217.1	133.43	149851.3	-0.22	4733.7
(3) Capital	481.4	54.58	100421.1	-17.22	2211.7
(4) Labor HS	193.5	13.20	17567.9	-0.01	812.7
(5) Labor MS	378.4	33.56	36487.3	-0.01	1562.1
(6) Labor LS	163.8	16.16	24348.8	-.08	603.2
Services					
(7) Exports	837.2	86.7	90597.9	0.00	2781.3
(8) VAX	1405.4	179.7	128842.2	0.18	4717.0
(9) Capital	621.1	80.9	70668.5	0.04	2327.8
(10) Labor HS	282.0	28.4	20872.4	0.03	1008.0
(11) Labor MS	381.7	41.6	39208.0	0.03	1343.18
(12) Labor LS	120.6	14.8	8373.4	0.01	349.91

Source: Authors' calculations based on WIOD.

Appendix

Wooldridge Test for Autocorrelation

Model	Exports	VAX	Capital	Labor HS	Labor MS	Labor LS
Manufacturing						
FE	196.113 (0.0000)	324.653 (0.0000)	436.405 (0.0000)	300.29 (0.0000)	246.392 (0.0000)	282.519 (0.0000)
FD	0.654 (0.4187)	2.408 (0.1209)	0.048 (0.8273)	9.485 (0.0021)	11.753 (0.0006)	7.938 (0.0049)
Services						
FE	547.768 (0.0000)	1792.998 (0.0000)	1380.092 (0.0000)	1756.719 (0.0000)	1693.634 (0.0000)	1804.236 (0.0000)
FD	100.428 (0.0000)	10.446 (0.1209)	7.638 (0.0002)	22.110 (0.0000)	12.173 (0.0000)	8.572 (0.0000)

Note: F-values, with p-values in parentheses.