Price Effects of the Internal Market

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Abstract

I analyse the effect of trade on prices in the Internal Market of the European Union on a panel dataset of European manufacturing industries. I find a significant but small negative partial effect of industry-level import penetration that is observable across the majority of industries. However, more intense trade does not explain price developments in new EU members around the 2004 enlargement; the evolution of markups could have played a more important role in shaping producer prices.

Keywords: Competition, European integration, Industrial prices, Trade

JEL codes: E31, F12, F13, L16

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1. Introduction

The Internal Market is a key pillar of the European Union. The European Commission maintains that "the single market is Europe's best asset in reaping the benefits of globalisation. It enables Europeans to benefit from global market opening through reduced prices and increased choice."[1] This statement is a hypothesis worth testing: it is the objective of this paper.

A number of studies report that the free trade agreements lead to more trade thanks to falling trade costs; for example, Nahuis (2004) finds that trade volumes among EU members exceed trade among comparable non-EU countries by 33-73%, depending on industry and specialisation pattern, implying an over 10% reduction of trade costs with EU accession. The impact of trade integration is even larger if self-selection into these integrations is accounted for: Baier et al. (2008) show that EU membership increases trade by as much as 127-146% after 10-15 years. Such a rise in trade volumes can indeed have a massive effect on prices through intensified competition among producers.

However, evidence on the price effects of trade openness is mixed. Romalis (2007) shows in a disaggregated analysis involving around 5000 product categories that NAFTA and CUSFTA had a substantial effect on trade volumes but a modest impact on prices. NAFTA even raised North American prices in many protected sectors by driving out imports from non-member countries. On the other hand, Álvarez and López (2008) report that mark-ups appear to

[1] Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: "A single market for 21st century Europe", COM(2007) 724 final, Brussels, 20 November 2007.

decrease during the three years following trade liberalisation in a sample of 28 manufacturing industries in 46 countries. Chen, Imbs and Scott (2006) find a significant (although small) price-reducing effect of import competition in the manufacturing sectors of western Europe between 1989-1999.

The 2004 enlargement of the European Union offers a useful natural experiment in assessing the price effects of the Internal Market. However, knowledge on the impact of the eastern EU enlargement on prices is scarce; to my knowledge, the only study analysing this topic so far is that of Dreger et al. (2007). They explain price developments in the enlarged European Union during 1999-2005 using real convergence and import competition as explanatory variables. In the case of the new member states, import penetration was found to be especially relevant for consumer durables and semi-durables.

This paper complements the last two papers. I start off with an analysis similar to that in Chen, Imbs and Scott (2006) by analysing the impact of import penetration on producer prices in a panel of European manufacturing sectors. However, my sample covers the enlarged EU in the 1999-2006 period, therefore it allows the analysis of enlargement effects. I proceed with a simple comparison of price developments in old and new EU members using my estimation results. My approach differs from Dreger et al. (2007) in that it analyses producer instead of consumer prices; and in that I control for a wider range of factors.

I find a significant but very small negative effect of higher import penetration on domestic producer prices. This effect is observable in a wide variety of manufacturing sectors. However, the model does not explain adequately price developments around EU enlargement. It appears that EU accession brought a temporary blip in producer price inflation in 2004 in

the new member states, an effect that was reversed over the next two years. Meanwhile, import penetration appears to have fallen in new member states following accession, contrary to expectations. Furthermore, estimated partial effects of explanatory variables are too small to explain the 2004 surge in producer prices. The largest inflationary effect may be attributed to the countercyclical movement of markups.

2. Empirical strategy

Economic theory suggests that trade integration induces competition, leading to a fall in prices. For example, an import duty acts similar to a transportation cost, driving a wedge between marginal costs and prices. The abolition of the duty will encourage imports and lower domestic prices. With imperfect competition the emergence of foreign competitors will also force domestic firms to lower their markups. If economies of scale are present, access to export markets will allow firms to reach their optimal size, leading to lower marginal costs (see e.g. Helpman and Krugman, 1985, for an overview). Finally, in models with heterogeneous firms (e.g. Mélitz and Ottaviano, 2008), lowering trade barriers will drive the least efficient firms out of the market. This raises average productivity and pushes down prices, at least in the short term. In the long term, however, endogenous relocation of firms to less competitive markets can overturn these effects. Chen, Imbs and Scott (2006) present an estimable model in this spirit with import penetration as a proxy for trade costs. Following their approach, I regress the change in the relative price of product i in every j country-pair in period t ($\Delta \log P_{i,j,t}$) on the change of product-level import penetration and various controls ($\Delta \log X_{i,j,t}$) as well as product and country-pair fixed effects:

$$\Delta \log P_{i,j,t} = \mu_i + \delta_j + \beta \cdot \Delta imppen_{i,j,t} + \gamma \cdot \Delta X_{i,j,t} + u_{i,j,t} \quad (1)$$

The controls are motivated by unobserved heterogeneity. First productivity and market structure can react to trade liberalisation as the least efficient firms quit production or upgrade their facilities. I use real wages and real labour productivity (both deflated with the sectoral price index) as measures of production costs and efficiency; the expected signs of their parameters are positive and negative, respectively. Incidentally, these variables also control for real convergence in new EU members, which implies a long-term convergence of prices (see Égert, Halpern and MacDonald, 2006, for an overview of this issue).

The proxy for market structure is the number of firms within a given industry. A growth in the number of market players can enhance competition and drive down prices, therefore the expected sign of its parameter is negative. Second, Romer (1993) argues that monetary policy can be endogenous to trade liberalisation. Because an unanticipated monetary expansion causes more harm through real depreciation in more open economies, the incentives for surprise monetary shocks are reduced following liberalisation. Besides, most new EU members were aiming for fast entry into the euro-area at the time of accession, thus monetary authorities were particularly keen on reducing inflation. I proxy monetary conditions with the aggregate inflation rate; in line with Romer's line of thinking its expected sign is positive. Finally, I account for unspecified country- and industry-level heterogeneity in inflationary trends with fixed effects.

Reverse causality can also arise between import penetration and prices: for example, higher domestic prices induce imports. This leads to an upward bias in estimates of the parameter of import penetration. To overcome reverse causality I use three instruments of import

penetration. The first instrument (G) is a gravity-type measure relating the size of industry i in country j to the size of the same industry in other countries of the sample:

$$G_{i,j,t} = \frac{y_{i,j,t} / Y_{i,j,t}}{\sum_{j' \neq j} D_{j'j} \cdot y_{i,j',t} / Y_{i,j',t}} \tag{2}$$

where D is the distance between countries, measured by the distance between capital cities, y is sectoral value added and Y is gross domestic product. If size of industry i grows in country j, or if it shrinks in the rest of the world, G increases, implying lower import demand and higher exports (hence, lower import penetration) of industry i in country j. The second instrument is the bulkiness of imports, measured as weight per value. Bulkier goods are more difficult to transport, leading to lower import penetration. The third instrument is import unit value per export unit value, a crude measure of trade costs. Import prices are measured c.i.f. (including freight costs, etc.) while export prices are measured f.o.b. (free on board). Changes in the ratio of import and export unit values should therefore correlate with changes in transport costs; a rising ratio is expected to lower import penetration. Instruments should not influence prices except for their indirect effect through import penetration. Arguably, this is indeed the case with the selected three instruments.

The dataset also allows making use of a natural experiment, the 2004 EU enlargement. I conduct a simple difference-in-differences analysis. The treatment group consists of country-pairs with exactly one country acceding the EU in 2004; all other country-pairs form the control group. The treatment is EU accession, which can have either one-off or persistent effects. I define the difference-in-differences transformation of any variable Z in regression (1) as

$$Z^{DID1} = \left(Z_{2004}^{acc=1} - \overline{Z}^{acc=1} \right) - \left(Z_{2004}^{acc=0} - \overline{Z}^{acc=0} \right) \quad (3)$$

$$Z^{DID2} = \left(Z_{post}^{acc=1} - \overline{Z}^{acc=1} \right) - \left(Z_{post}^{acc=0} - \overline{Z}^{acc=0} \right) \quad (4)$$

EU accession is assumed to have a one-off effect on variables in Z^{DID1}, for example a temporary surge/fall in inflation. On the other hand, Z^{DID2} implies that EU membership has persistent effects, for example higher/lower trend inflation following EU membership. I then calculate the fitted values for the difference-in-difference transformations (note that the transformation eliminates fixed effects):

$$\log \Delta \hat{P}_{i,j}^{DID} = \hat{\beta} \cdot \Delta imppen_{i,j}^{DID} + \hat{\gamma} \cdot \Delta X_{i,j}^{DID} \quad (5)$$

I compare fitted values with observed (difference-in-difference) price changes to establish how the regression model explains price developments around EU accession.

How valid is the difference-in-differences setup for this analysis? One could argue that European integration was a lengthy process, involving many steps of trade liberalisation starting in the 1990s; therefore the choice of periods may be inadequate. However, the gradual nature of EU accession does not invalidate the question whether anything significant happened in 2004. There are reasons to believe that the actual event of EU accession might have affected trade, through lower administrative and psychological obstacles. For example, the abolishment of border controls made cross-border movement of persons and goods much more convenient.

Another potential criticism concerns the endogeneity of EU accession. For example, the timing of EU accession could be correlated with unobserved factors, which in turn affect producer prices. If this is the case, the simple difference-in-difference estimator will be biased. However, I do not view difference-in-differences here as estimators, but rather as transformations of variables. In other words, I do not aim to explain whether EU accession *caused* producer price increases, higher import penetration, and so on. I am only interested in establishing whether my model is able to explain price developments *observed* around EU enlargement with developments in explanatory variables.

Data

Prices of manufactured goods are taken from the New Cronos dataset of Eurostat. Observations are annual; data are collected across EU member states for 2-digit NACE industries. Import penetration is calculated with trade data obtained from the Comext database of Eurostat. It is defined as import value relative to net imports plus domestic production value. This measure is higher than one if exports exceed domestic production. Likewise, if exports exceed domestic production plus imports, the measure falls below zero. Since such extreme values are not very meaningful and outliers can distort estimations, I truncate import penetration to the interval [0;1]. Industry-level productivity, the number of firms and inflation were retrieved from the New Cronos database of Eurostat. In the end, missing observations limit the analysis to the period of 1999-2006 for 21 industries in 275 country-pairs of EU member states. Detailed definitions of variables and their descriptive statistics are presented in Appendix 1.

Results

Estimation results are reported in Table 1 for three specifications: OLS without controls, OLS with controls and fixed effects and 2SLS with controls and fixed effects. "Simple" OLS is presented only for comparison; it reveals that import penetration itself has a low explanatory power and that import penetration is indeed endogenous. OLS with fixed effects explains nearly 20% of the variation of price changes; parameters are highly significant.[2] The parameter of import penetration has the expected negative sign although it is minuscule: if import penetration of an industry doubles while keeping everything else fixed, the industry's price index is expected to fall by just 0.07%. This magnitude is similar to that reported by Chen, Imbs and Scott (2006) but around double the estimates of Dreger et al. (2007), although the latter were calculated for consumer prices.

As expected, wage growth is inflationary, but this is hardly offset by productivity gains. A potential explanation for the weak negative price effect of productivity growth is that price-increasing quality improvements may counterweight cost reductions. Firm entry is associated with rising prices, contrary to prior expectations about the effects of extra competitors. However, if trade is intensive with a low-cost, low-quality trade partner (e.g. China), then comparative advantage dictates that domestic entrants specialise in high quality, while foreign competitors drive out low-quality domestic producers. If quality is not accounted for, this results in an upward bias of the parameter of the number of firms.[3] Finally, higher aggregate

[2] Parameter significance is robust to the clustering of observations across country-pairs or industries.

[3] Filer and Hanousek (2003) show the importance of quality improvements in explaining the inflation and price convergence of central and eastern European countries.

inflation is associated with a fall in producer prices once labour costs and the number of firms (market structure) are accounted for. This is consistent with the observation of countercyclical markups (e.g. Rotemberg and Woodford, 1999).

Using instruments for import penetration leaves parameter signs and significances unaltered, except for labour productivity. The estimated effect of import penetration on prices trebles: while still small, this can cause prices to drop by almost 0.2% if import penetration doubles. The overidentification test does not suggest that instruments are inappropriate.

I also run regressions for individual industries. My motivation is that industry characteristics (e.g. capital intensity, market structure) may affect the impact of trade (and other variables) on prices. Results are summarised in Table 2. Parameters remain significant in the majority of sectors; the median of significant parameters is slightly larger in absolute value than with pooled industries. Some interesting results emerge. For example, higher import penetration appears to raise domestic prices in some sectors (e.g. food and beverages). This could happen because more imports encourage domestic producers to shift to higher quality. Higher real wage growth lowers prices in a few cases, probably reflecting the introduction of cost-cutting technologies in the face of rising labour costs. Finally, higher aggregate inflation raises prices in three sectors: leather, coke, petroleum and nuclear fuel and motor vehicles. In the case of oil refining (where the marginal effect is by far the highest) this is a result of rising crude oil prices during the sample period.

I proceed with plugging in difference-in-difference transformations of variables into the estimated model. Transformations are presented in Table 3 while results of this exercise are illustrated on Figure 1. In 2004 the temporary excess inflation in acceding countries was much

higher than predicted. In 2004-06, acceding countries experienced a very modest disinflation relative to non-acceding ones. Surprisingly, import penetration fell markedly in new member states relative to old ones, although trade volumes rose. However, this fall in import penetration is limited to 2004 and is reversed over the next two years. Wages and productivity in the new members were converging to western European levels, but productivity growth in 2004 was very modest. It also appears that the regression I estimated implies fairly small price increases in acceding countries relative to non-acceding ones around 2004, regardless of assuming temporary or persistent effects of EU accession. The greatest contributor to rising prices is aggregate inflation, possibly pointing to the role of countercyclical markups. On the other hand, the impact of openness and real convergence can be barely noticed. Overall, the model does a poor job in explaining price developments around enlargement. Still, it is fair to say that entry into the Internal Market had a negligible effect on producer prices in the new EU members.

Conclusions

Does the Internal Market of the European Union bring lower prices through trade integration and competition? I aimed to answer this question using a panel dataset on manufacturing sectors in the enlarged European Union. I found that greater openness (measured by industry-level import penetration) exerts a very small but significant downward pressure on domestic producer prices. Estimation results also suggest that quality changes – unaccounted for in this paper – may have an important role in explaining price developments.

However, price developments around the first years of enlargement are hard to explain either with intensified trade or with the cost-side effects of real convergence. The largest contributor to the observed 2004 jump in producer price inflation in new EU members could by the countercyclical movement of markups. Although trade volumes grew following enlargement, the share of imports relative to domestic sales fell in 2004 in the new EU members, although this was reversed over the coming two years.

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Table 1 – Determinants of producer prices, all industries

Dependent variable: change of domestic producer price (Δprice_dom_eur)

	OLS	**OLS Fixed effects**	**2SLS Fixed effects**
Import penetration (Δimppen)	-0.0011***	-0.0022***	-0.0061**
	(0.0003)	(0.0003)	(0.0025)
Real wage (Δwage_r)		0.0487***	0.0470***
		(0.0064)	(0.0064)
Labour productivity (Δva_emp_r)		-0.0023*	0.0003
		(0.0012)	(0.0010)
Number of firms (Δfirmsno)		0.0115***	0.0119***
		(0.0018)	(0.0018)
Inflation (Δhicp)		-0.1958***	-0.1992***
		(0.0235)	(0.0234)
Number of observations	22483	15088	15057
F =	12.00	11.86	
(p-value)	(0.0005)	(0.0000)	
R^2 =	0.0006	0.2045	0.1964
Adjusted R^2 =	0.0005	0.1885	
Test of overidentification			
χ^2 score =			1.0219
(p-value)			(0.5999)

*Note: robust standard errors in parentheses. Significance of parameters: * at 10%, ** at 5%, *** at 1%. Fixed effects for industry and country-pairs. 2SLS instruments of imppen: gravity, import bulkiness, import unit value per export unit value; see text and Appendix 1 for definitions of variables.*

Table 2 – Determinants of producer prices, regressions by industry

Dependent variable: change of domestic producer prices (Δprice_dom_eur). OLS with country-pair fixed effects

	Import penetration (Δimppen)	**Real wage (Δwage_r)**	**Labour productivity (Δva_emp_r)**	**Number of firms (Δfirmsno)**	**Inflation (Δhicp)**
Food and beverages	0.1208	0.1636			
Tobacco		0.1358			-0.5404
Textile	-0.0036	0.2884	-0.0778	0.0152	-0.2539
Apparel	-0.0052	0.1910	-0.1330	0.0150	-0.4069
Leather		0.1838	0.0387	-0.0827	0.6788
Wood	0.0290	0.1806			
Pulp, paper		0.0985		0.0463	-0.2620
Coke, petroleum	0.0047	-0.0562	0.0050		1.9310
Chemicals		-0.0419	0.0253	-0.0200	-0.3375
Rubber and plastic	-0.0025	0.1667			-0.3473
Non-metallic minerals	-0.0036	0.2363		0.0404	
Basic metals	0.0051	-0.1224			
Fabricated metals		0.1734			
Machinery	-0.0034	0.2722	0.0530	0.0166	-0.2395
Office machinery and computers	-0.0087	-0.1128	-0.0031	0.0282	-0.6337
Electrical machinery	-0.0114	0.1345	-0.0350		
Radio, television and communication equipment	-0.0240	-0.1419	0.0261	0.0688	-0.5086
Medical, precision and optical instruments	-0.0065	0.0963			-0.3685
Motor vehicles		0.2897		-0.0667	0.3987
Other transport equipment	-0.0014	0.2369	-0.0452		-0.4516
Furniture, manufacturing n.e.c.		0.2719	-0.0381	-0.0173	
Median	*-0.0035*	*0.1667*	*-0.0031*	*0.0152*	*-0.3424*

Note: only parameters significant at 10% are included, median of significant parameter values.

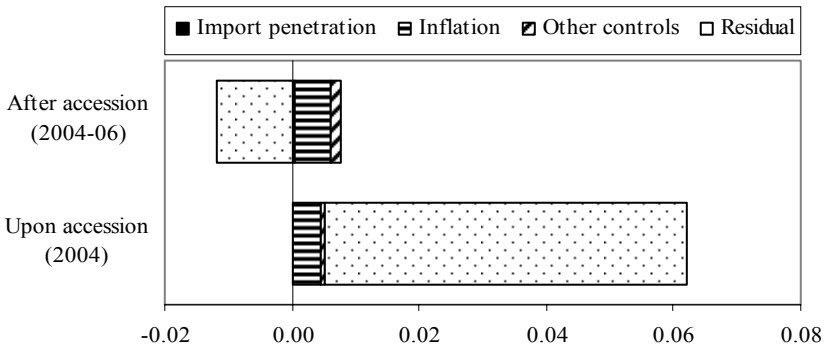
Table 3 – Changes in main variables and differences-in-differences

	Country acceding in 2004						Difference-in-differences (DID)	
	= 0			= 1				
	2000-06	2004	2004-06	2000-06	2004	2004-06	2004	2004-06
Price	-0.0007	-0.0072	-0.0088	0.0195	0.0752	0.0073	0.0622	0.0052
Import penetration	-0.0094	0.0049	-0.0168	-0.0129	-0.1218	-0.2399	-0.1231	0.0003
Real wage	0.0068	-0.0042	-0.0007	0.0125	0.0263	0.0423	0.0248	0.0012
Labour productivity	0.0031	0.0152	0.0146	0.0745	-0.0296	0.0634	-0.1162	0.0003
Number of firms	-0.0029	-0.0031	-0.0092	0.0543	-0.0057	0.0155	-0.0598	-0.0007
Inflation	-0.0079	-0.0057	-0.0028	0.0311	0.0124	0.0073	-0.0209	0.0041

Note: see text for definition of DID

Figure 1 – Determinants of price changes around EU accession

Difference-in-differences of variables plugged into estimated OLS FE regression



Appendix 1 – Description of data

A. Definitions and descriptive statistics

Variable	Definition and sources	Descriptive statistics				
		Obs.	Mean	S.D.	Min.	Max.
price_dom_eur	*Log of producer price index of domestic sales, transformed into euros using annual average euro exchange rates. Source: Eurostat New Cronos, own calculations*	32194	0.000	0.067	-0.497	0.476
imppen	*Import penetration is defined as Import value / (Domestic production + Import value – Export value; truncated to [0;1] interval, logarithms. Source: Eurostat Comext and New Cronos, own calculations*	33125	0.001	1.809	-18.421	18.421
wage_r	*Log of industry-level labour cost per employee in current euros, deflated with price_dom_eur. Source: Eurostat New Cronos, own calculations*	17233	0.010	0.161	-1.121	1.028
va_emp_r	*Log of value added per person employed in current euros, deflated with price_dom_eur. Source: Eurostat New Cronos, own calculations*	16797	0.005	0.622	-17.015	16.450
firmsno	*Log of number of active firms + 1. Source: Eurostat New Cronos*	41021	-0.003	0.278	-3.464	3.253
hicp	*Log of harmonised index of consumer prices. total index. Source: Eurostat New Cronos*	52325	-0.009	0.057	-0.365	0.368

Note: variables are expressed as the logs of relative values across country-pairs ($z_{i,j/k,t} = \log \frac{z_{i,j,t}}{z_{i,k,t}}$ for every variable Z, product i, country-pair j/k, period t).

Appendix 1 (continued)

B. Correlation matrix of variables

	price_dom_eur	imppen	wage_r	va_emp_r	firmsno	hicp
price_dom_eur	1					
imppen	-0.0297	1				
wage_r	0.0962	0.0025	1			
va_emp_r	-0.0016	0.0201	0.0862	1		
firmsno	0.1013	0.0251	0.0511	0.0279	1	
hicp	0.2501	0.0418	-0.1964	-0.0076	0.1591	1

Note: common sample of 15088 observations