CROSS-COUNTRY RELATIVE PRICE VOLATILITY: EFFECTS OF MARKET STRUCTURE

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Abstract

Using annual data on nine manufacturing sectors of eighteen OECD countries, the article studies the implications of market structure for cross-country relative price variability. It is found that, in accordance with predictions from a standard markup pricing model, reductions in market competition, along with increased nominal exchange rate volatility, are associated with greater variability of cross-country relative prices. The market structure also has similar effects on components of cross-country relative price variability. The empirical findings are robust to the inclusion of various control variables and alternative sample specifications.

JEL Code: F31, F41.

Keywords: relative price volatility, market structure, price-cost margin, variance decomposition.

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Introduction

Considerable efforts have been devoted to examine cross-country exchange-rate-adjusted relative price (which, for brevity, is labeled cross-country relative price hereafter) fluctuations and their determinants. Engel (1993, 1999), for instance, demonstrate that the main determinant of real exchange rate variability is the relative price movement between similar goods, rather than between traded and non-traded goods, across countries. Using the US and Canadian city data, Engel and Rogers (1996) find that volatilities of relative prices of similar goods and services are significantly amplified when markets are separated by a national border. Their results indicate that the magnitude of the cross-border effect is far beyond what the physical distance between the U.S. and the Canadian cities can explain – a result indicative of market segmentation and the violation of the law of one price.[1]

Volatile-nominal-exchange-rate-cum-sticky-price is one factor commonly emphasized by some recent studies on cross-country relative price variability. When local prices are sticky, higher nominal exchange rate volatility will lead to higher cross-country relative price variability. For instance, Engel and Rogers (1996) assess that the volatile-nominal-exchange-rate-cum-sticky-price effect can account for 10% to 15% of the total cross-border relative price variation. In addition to volatile-nominal-exchange-rate-cum-sticky-price, unit shipping costs, (formal and informal) trade barriers, and relative wage variability are considered determining factors in studies of cross-border relative price variability (Engel and Rogers, 2001; Parsley and Wei, 2001).

One potential source of cross-country relative price volatility is the price setting behavior under an imperfectly competitive market structure (Engel and Rogers, 1996, 2000). Specifically, prices are determined by, among other factors, price markups under imperfect competition. Prices

1. Violations of the law of one price are reported in, for example, Isard (1977) and Haskel and Wolf (2001). Goldberg and Verboven (2001), on the other hand, use a panel data on car prices in Europe and report strong evidence of convergence toward the law of one price as a result of market integration.

can vary when markups change. Thus, the market structure, which affects markup behavior, can affect prices and, hence, impact cross-country relative price fluctuations.

In this study, we investigate the implications of market structure for cross-country relative price volatility. Annual data on nine manufacturing sectors from eighteen OECD countries are used to explore the role of market competitiveness. The sample of sectors across various countries is expected to display a diverse market structure profile that allows us to reveal the effects of market competitiveness on pricing behavior and, hence, cross-country relative price variation. A markup pricing model is used to motivate the choices of empirical market structure variables. Specifically, the price-cost margin is adopted as a proxy for the degree of monopolistic pricing power. In addition to cross-country relative price volatility itself, we examine the effects of market structure on its components.

The current exercise can be viewed as a companion piece to Cheung, Chinn and Fujii (2001), who find the *persistence* of deviations from purchasing power parity is affected by the degree of market competitiveness. In this exercise, however, we examine market structure effects on the *volatility* of cross-country relative prices. The current exercise should complement their study and shed additional light on cross-country relative price dynamics.

The remainder of this manuscript is organized as follows. Section 2 describes the data. Section 3 presents a markup pricing model that illustrates the role of market competitiveness. Section 4 describes the proxies for market competitiveness and reports the empirical evidence of market structure effects on cross-country relative price variability and on its components. Some robustness analysis results are also discussed. A summary is provided in section 5.

1. Data

In this study, we examine annual data on nine manufacturing sectors of eighteen OECD

countries. The sample period is from 1970 to 1994. The sector and country coverage is determined by data availability. The nine sectors (two-digit International Standard Industrial Classification (ISIC) Revision 2 codes in parentheses) are: food (31); textiles, apparel, and leather (32); wood products and furniture (33); paper, paper products, and printing (34); chemical products (35); non-metallic mineral products (36); basic metal industries (37); fabricated metal industries (38); and other manufacturing (39).[2] The country sample consists of Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Italy, Japan, the Netherlands, Norway, Portugal, Spain, Sweden, the United Kingdom, and the US. The countries are drawn from North America and Europe as well as Scandinavia, Asia, and Oceania, creating a geographically and culturally diverse sample.

The OECD International Sectoral Database contains data on gross output, value added in gross output, and labor compensation. Data on the value added in current and 1990-constant prices are used to construct sectoral price indexes. Annual U.S. dollar exchange rates obtained from the International Financial Statistics are used to compute all the bilateral exchange rates. The great circle distance between national capitals is used as a proxy for the distance between countries.

2. Market Structure and Relative Price Variability

The potential effect of market structure on cross-country relative price volatility can be illustrated using a standard markup pricing formulation. For instance, the price of sector *k* in country *i* at time *t*, $p_{i,t}^k$, can be written as (Engel and Rogers, 1996; 2000):

$$p_{i,t}^k = \mu_{i,t}^k + \tau w_{i,t}^k + (1-\tau) m_{i,t}^k, \qquad (1)$$

2. Lately, the OECD has updated the industry classification codes from ISIC Revision 2 to ISIC Revision 3. The effective sample period under the ISIC Revision 3 scheme is rather short for many countries due to missing observations. Thus, we work with the data based on the Revision 2 codes. Results pertaining to data based on the Revision 3 classification are discussed in Section 4d.

where $\mu_{i,t}^k$ is the monopolistic markup, $w_{i,t}^k$ is the cost of the non-traded service, $m_{i,t}^k$ is the cost of traded input, and τ is the share of the non-traded component in the total costs. All terms except τ are in logarithms. Similarly, the price of sector *k* in country *j* can be written as:

$$p_{j,t}^k = \mu_{j,t}^k + \tau w_{j,t}^k + (1-\tau) m_{j,t}^k . \quad (2)$$

From the standard demand analysis, it is known that the optimal markup is inversely related to the underlying demand elasticity. In a perfectly competitive sector *k*, $\mu_{i,t}^k$ and $\mu_{j,t}^k$ equal zero. Under imperfect competition and effective segmentation between markets *i* and *j*, monopolistically competitive firms can determine the optimal markups according to the demand elasticities in these markets. In addition, monopolistically competitive firms can stabilize local prices by adjusting the degree of exchange rate pass-through to prices. With such a pricing practice, markups can differ across markets ($\mu_{i,t} \neq \mu_{j,t}$) and vary according to conditions in individual markets.

Let $e_{i,j,t}$ be the log of the nominal exchange rate defined as the number of *i*'s currency units per *j*'s currency and

$$q_{i,j,t}^k = p_{i,t}^k - p_{j,t}^k - e_{i,j,t} \quad (3)$$

be the cross-country sector *k* relative price. Then, the effects of markup variation on cross-country relative price volatility can be inferred from the variance of the first difference of $q_{i,j,t}^k$:

$$Var(\Delta q_{i,j,t}^k) = Var(\Delta\mu_{i,t}^k - \Delta\mu_{j,t}^k) + \tau^2 Var(\Delta w_{i,t}^k - \Delta w_{j,t}^k) + Var(\Delta e_{i,j,t})$$

$$+(1-\tau)^2 Var(\Delta m_{i,t}^k - \Delta m_{j,t}^k) - 2Cov(\Delta\mu_{i,t}^k - \Delta\mu_{j,t}^k, \Delta e_{i,j,t}) , \quad (4)$$

where "*Var*" is the variance operator, "Δ" is the first-difference operator, "*Cov*" indicates covariance, and only the covariance between relative markups and exchange rates is assumed to be

non-zero. Equation (4) shows that change in the relative markup, $\Delta\mu_{i,t}^k - \Delta\mu_{j,t}^k$, impacts the cross-country relative price volatility via a) its own variability, $Var(\Delta\mu_{i,t}^k - \Delta\mu_{j,t}^k)$, and b) its comovement with exchange rate changes $Cov(\Delta\mu_{i,t}^k - \Delta\mu_{j,t}^k, \Delta e_{i,j,t})$. The variance term $Var(\Delta\mu_{i,t}^k - \Delta\mu_{j,t}^k)$ depends on factors affecting relative markups and, for example, exchange rate pass-through is one of the possible factors. The covariance term $Cov(\Delta\mu_{i,t}^k - \Delta\mu_{j,t}^k, \Delta e_{i,j,t})$, on the other hand, measures the association between changes in the exchange rate and the relative markup and, thus, bears a more direct implication for the degree of exchange rate pass-through.

4. Empirical Analysis of Market Structure Effects

As illustrated in Section 3, cross-country relative price volatility is affected by pricing behavior in an imperfectly competitive market. Our empirical exercise focuses on the role of market structure factors because of the paucity of quality data on costs of non-traded and traded components for the sample under consideration.[3]

4a. Price-Cost Margin

We measure the markup using the price-cost margin (PCM) variable, which is commonly interpreted as a proxy for the degree of discriminatory pricing and monopolistic competition. The PCM for sector *k* of country *i* is defined as:

$$PCM_{i,t}^k = \frac{V_{i,t}^k - M_{i,t}^k - W_{i,t}^k}{V_{i,t}^k} = \frac{VA_{i,t}^k - W_{i,t}^k}{VA_{i,t}^k + M_{i,t}^k} \qquad (5)$$

3. Cheung, Chinn and Fujii (2001), for example, offered some additional discussions of the role of market structure.

where $V_{i,t}^k$ is the value of total production, $M_{i,t}^k$ is the cost of material inputs, $W_{i,t}^k$ is labor compensation, and $VA_{i,t}^k = (V_{i,t}^k - M_{i,t}^k)$ is the value added. Since the PCM can be derived from accounting data, it is widely used as a measure of market structure (Campa and Goldberg, 1995; Domowitz, Hubbard and Petersen, 1987). A larger value of the PCM represents a greater elevation of the price over the cost and a greater degree of monopolistic power.

Based on PCM, we construct three variables to capture market structure effects. The first variable is

$$APCM_{i,j}^k = (\overline{\ln PCM}_{i,t}^k + \overline{\ln PCM}_{j,t}^k)/2, \quad (6)$$

which is the average markup of sector *k* in countries *i* and *j*, in logarithms. The over-bar "$\bar{}$" denotes the sample mean over time *t*. While $APCM_{i,j}^k$ is not included in (4), we speculate that sectors with a greater degree of monopolistic market power are likely to be more segmented and, hence, have a more variable cross-country relative price fluctuation. The relevance of this variable is assessed in the subsequent subsections.

The proxies for $Var(\Delta\mu_{i,t}^k - \Delta\mu_{j,t}^k)$ and $Cov(\Delta\mu_{i,t}^k - \Delta\mu_{j,t}^k, \Delta e_{i,j,t})$ in (4) are:

$$VPCM_{i,j}^k = Var(\Delta(\ln PCM_{i,t}^k - \ln PCM_{j,t}^k)) \quad (7)$$

and

$$CPCM_{i,j}^k = -Cov(\Delta(\ln PCM_{i,t}^k - \ln PCM_{j,t}^k),\ \Delta e_{i,j,t}). \quad (8)$$

Since $PCM_{i,t}^k$ and $PCM_{j,t}^k$ are proxies for the monopolistic markups $\mu_{i,t}^k$ and $\mu_{j,t}^k$, $VPCM_{i,j}^k$ can be interpreted as the empirical counterpart of $Var(\Delta\mu_{i,t}^k - \Delta\mu_{j,t}^k)$ in equation (4). By the same token, the empirical counterpart of $Cov(\Delta\mu_{i,t}^k - \Delta\mu_{j,t}^k, \Delta e_{i,j,t})$ is given by $CPCM_{i,j}^k$. The

pricing-to-market activity, for example, implies a negative covariance between relative PCM changes and exchange rate movements. To simplify the interpretation, we include a negative sign in defining $CPCM_{i,j}^{k}$ so that a more intensive pricing-to-market activity implies a larger value of $CPCM_{i,j}^{k}$. Indeed, $CPCM_{i,j}^{k}$ has a small but positive sample average suggesting that the interaction between relative PCM changes and exchange rate movements is likely to intensify cross-country relative price volatility. Further, $CPCM_{i,j}^{k}$ displays considerable variability as it has the largest coefficient of variation amongst the three market structure proxies.[4]

4b. Effects on Cross-Country Relative Price Volatility

Effects of market structure are investigated using the cross-sectional regression equation:

$$Var(\Delta q_{i,j}^{k}) = \beta DIST_{i,j} + X'\theta + \sum_{g=1}^{m} \alpha_g SD_g + \sum_{h=1}^{n} \gamma_h CD_h + u_{i,j}^{k} \qquad (9)$$

where $Var(\Delta q_{i,j}^{k})$ is the sample variance of $\Delta q_{i,j,t}^{k}$ (across time), $DIST_{i,j}$ is the geographical distance in logarithms between countries *i* and *j*, *X* is a column vector containing explanatory variables that vary across specifications, SD_g and CD_h are the sector- and country-dummy variables, and $u_{i,j}^{k}$ is a disturbance term. The inclusion of the dummy variables allows the relative price volatility to assume different values among different countries and sectors.

The first specification considered is equation (9) without $X'\theta$ and the estimation result is reported under the second column (labeled specification "1") in Table 1. The heteroskedasticity-consistent standard error (White, 1980) is reported underneath the coefficient estimate. In

4. The sample coefficients of variation of the three market structure variables are 0.14 ($APCM_{i,j}^{k}$), 1.99 ($VPCM_{i,j}^{k}$), and 28.26 ($CPCM_{i,j}^{k}$).

accordance with previous findings, the distance variable has a highly significant positive effect on cross-country relative price variability. The adjusted R^2 is 56%; indicating that the distance variable and the sector and country dummies explain slightly more than one half of the relative price variability.

Table 1. The Results of the Cross-Country Relative Price Volatility Regression

	Model Specifications					
	1	2	3	4	5	6
Distance	0.0048**	-0.0006	-0.0006	-0.0007	-0.0006	-0.0007
	(0.0004)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)
Exchange Rate Volatility		1.2622**	1.2769**	1.2575**	1.2460**	1.2565**
		(0.0806)	(0.0807)	(0.0794)	(0.0808)	(0.0785)
$APCM_{i,j}^{k}$			0.0049**			0.0064**
			(0.0018)			(0.0019)
$VPCM_{i,j}^{k}$				0.0053**		0.0083**
				(0.0017)		(0.0023)
$CPCM_{i,j}^{k}$					0.1015**	0.1633**
					(0.0354)	(0.0402)
Adjusted R^2	0.5594	0.6277	0.6281	0.6346	0.6326	0.6494

Notes: The estimation results of equation (9) are presented. For all specifications, both country dummy and sector dummy variables are included, and the number of observations is 1344. Heteroskedasticity-robust standard errors (White, 1980) are provided in parentheses. ** and * indicate statistical significance at, respectively, the 1% and 5% levels. See the text for definitions of the variables.

The third column (specification "2") of Table 1 reports the coefficient estimates of the second specification under which X contains the sample variance of nominal exchange rate changes as an explanatory variable. The nominal exchange rate volatility is highly significant, and

its coefficient is greater than unity.[5] In the presence of exchange rate variability, the distance variable is statistically insignificant.[6]

The estimation results with $APCM_{i,j}^{k}$, $VPCM_{i,j}^{k}$, and $CPCM_{i,j}^{k}$ sequentially included in X are given under the headings of specifications 3 to 5. All the PCM variables are significantly positive. The significance of $APCM_{i,j}^{k}$ indicates that sectors with a greater degree of monopolistic behavior tend to have a more variable cross-country relative price. One possible interpretation is that, in addition to adjusting prices, a high PCM offers sellers an extra degree of freedom to strategically respond to demand and supply conditions by varying the markups. The signs of $VPCM_{i,j}^{k}$ and $CPCM_{i,j}^{k}$ are consistent with the predictions of (4). A variable relative PCM implies a volatile cross-country relative price, *ceteris paribus*. For $CPCM_{i,j}^{k}$, the evidence suggests that the relative PCM and the nominal exchange rate comove in a way to amplify the cross-country relative price variability. The positive coefficient is in accordance with the notion that firms reduce the markups to weaken the pass-through of exchange rate effect to local prices.

The results of specification 6, which includes all the three PCM variables simultaneously, indicate that the three market structure variables contain their own unique information on cross-country relative price variability. All the three PCM variables are jointly significant. In addition to the markup effects captured by $APCM_{i,j}^{k}$ and $VPCM_{i,j}^{k}$, the $CPCM_{i,j}^{k}$ estimate attests to the relevance of pricing-to-market behavior, which affects the comovement between exchange rates and relative markups, for determining the cross-country relative price variability. It is noted

5. Similar results are found in Engel and Rogers (2001, Table 5). Equation (4), for instance, indicates that the nominal exchange rate can affect cross-country relative price volatility via two channels.

6. A similar replacement result is reported in some of the regressions in Engel and Rogers (2001). We do not have a persuasive explanation for the displacement result. However, it is noted that distance and nominal exchange rate variability have a sample correlation coefficient of 0.84. The high sample correlation is not likely to be driven by the EMS countries. In fact, the two variables have a sample correlation coefficient of 0.46, 0.90, and 0.82 for the

that the inclusion of these market structure variables does not materially affect the size or significance of the coefficient estimate on foreign exchange volatility.

Next, we investigate the robustness of the market structure effects to some control variables; namely *Adjacency*, *Language*, *Sea*, *EEC*, and *EFTA*.[7] *Adjacency* is a dummy variable that assumes the value of one if the countries share a common border and zero otherwise. The dummy variable *Language* takes up the value of one if the countries share a common language. In some studies, this dummy variable is used as a proxy for informal trade barriers. If the two countries are separated by an ocean, then we set the *Sea* variable to one. *EEC* and *EFTA* are included to capture the effects of the two formal free trade agreements - the European Economic Community and the European Free Trade Agreement, respectively.[8]

The incremental effects of these explanatory variables are presented in Table 2. While the *Adjacency* and *Language* variables have the expected negative sign and the *Sea* variable has the wrong sign, none of these three variables are significant when they are added to the equation individually or jointly. Similar insignificant results are also reported in Engel and Rogers (2001).[9] The two trade agreement dummy variables have the expected negative sign. Nonetheless, only the negative coefficient estimate of *EFTA* is statistically significant, indicating that this trade agreement reduces relative price volatility among its member countries. It is noted that the inclusion of these control variables, separately or jointly, has a very limited implication for the PCM effects. Both the magnitude and significance of the three PCM variables are virtually unchanged across various specifications in Table 2. In sum, the PCM effects appear fairly robust.

EMS-EMS, EMS-nonEMS, and nonEMS-nonEMS country pairs, respectively.

7. These control dummy variables have been considered by, for example, Engel and Rogers (2001) and Parsley and Wei (1995).

8. Formally, the European Economic Community is more than a free-trade zone. It was first set up as a customs union with the intention of promoting additional economic integration among its member countries.

9. In Parsley and Wei (1995), which use the standard error instead of variance of relative prices as the regressand, *Language* is insignificant and Sea is highly significantly positive. The coefficient estimates of *Adjacency* and *Language* have different signs and levels of significance across subsamples in Engel and Rogers (2001).

Table 2. The Results of the Cross-Country Relative Price Volatility Regression

	Model Specifications					
	7	8	9	10	11	12
Distance	-0.0011	-0.0008	-0.0006	-0.0010	-0.0013	-0.0013*
	(0.0006)	(0.0005)	(0.0005)	(0.0006)	(0.0006)	(0.0006)
Exchange Rate Volatility	1.2554**	1.2203**	1.2816**	1.2639**	1.2755**	1.2560**
	(0.0786)	(0.0821)	(0.0880)	(0.0888)	(0.0803)	(0.0933)
$APCM_{i,j}^{k}$	0.0064**	0.0064**	0.0064**	0.0064**	0.0064**	0.0064**
	(0.0019)	(0.0019)	(0.0019)	(0.0019)	(0.0019)	(0.0019)
$VPCM_{i,j}^{k}$	0.0083**	0.0083**	0.0083**	0.0083**	0.0083**	0.0083**
	(0.0023)	(0.0023)	(0.0023)	(0.0023)	(0.0023)	(0.0023)
$CPCM_{i,j}^{k}$	0.1640**	0.1631**	0.1628**	0.1628**	0.1654**	0.1647**
	(0.0402)	(0.0403)	(0.0402)	(0.0403)	(0.0400)	(0.0401)
Adjacency	-0.0012			-0.0008		-0.0000
	(0.0009)			(0.0010)		(0.0010)
Language		-0.0014		-0.0014		-0.0012
		(0.0009)		(0.0010		(0.0010)
Sea			-0.0006	-0.0011		-0.0003
			(0.0012)	(0.0012)		(0.0013)
EEC					-0.0015	-0.0015
					(0.0009)	(0.0010)
EFTA					-0.0046**	-0.0042*
					(0.0014)	(0.0016)
Adjusted R^2	0.6496	0.6496	0.6492	0.6495	0.6511	0.6506

Notes: The estimation results of equation (9) are presented. For all specifications, both country dummy and sector dummy variables are included, and the number of observations is 1344. Heteroskedasticity-robust standard errors (White, 1980) are provided in parentheses. ** and * indicate statistical significance at, respectively, the 1% and 5% levels. See the text for definitions of the variables.

4c. Effects on Components

In this subsection, we examine the market structure effects on the components of cross-country relative price variation. For this purpose, we breakdown the cross-country relative price

volatility into three components and consider the following decomposition:

$$Var(\Delta q_{i,j}^k) \equiv Var(\Delta p_i^k - \Delta p_j^k) + Var(\Delta e_{i,j}) - 2Cov(\Delta e_{i,j}, \Delta p_i^k - \Delta p_j^k). \qquad (10)$$

Equation (10) is an identity that gives the exact contributions of the three components to the total cross-country relative price variation. The relative contributions of the three components, by country and by sector, are presented in Appendix A. One notable observation is that the variances of inflation differentials and exchange rate changes account for the lion's share of cross-country relative price variability and the covariance term $Cov(\Delta e_{i,j}, \Delta p_i^k - \Delta p_j^k)$ explains a very small proportion of the variability. On the average, the exchange rate change and the inflation differential each explains approximately 50% of the cross-country relative price variability.

Note that the decomposition formulation has variances (and covariance) of *percentage change*s on both sides of the identity. Since the variables are in logs, the two underlying components $p_{i,t}^k - p_{j,t}^k$ and $e_{i,j,t}$ have the same unit of measurement; that is *i*'s currency per *j*'s currency. One feature of (10) is that it isolates the nominal exchange rate effect from the price effect. Thus, we can assess the market structure effect on the corresponding price components of cross-country relative price variability. To this end, we estimate the two regression equations:

$$Var(\Delta p_i^k - \Delta p_j^k) = \beta DIST_{i,j} + \theta X + \sum_{g=1}^{m} \alpha_g SD_g + \sum_{h=1}^{n} \gamma_h CD_h + u_{i,j}^k \qquad (11)$$

and

$$Cov(\Delta e_i, \Delta p_i^k - \Delta p_j^k) = \beta DIST_{i,j} + \theta X + \sum_{g=1}^{m} \alpha_g SD_g + \sum_{h=1}^{n} \gamma_h CD_h + u_{i,j}^k. \qquad (12)$$

The explanatory variables used in the previous subsection are also used in these regressions.

The estimation results for equation (11) are given in Table 3. A few observations are in order. First, the coefficient estimates of the distance and the nominal exchange rate variance variables are statistically insignificant; indicating that these two variables do not influence the

inflation differential volatility $Var(\Delta p_i^k - \Delta p_j^k)$. Second, the three PCM variables appear to be important factors determining the variance of inflation differentials. Both $APCM_{i,j}^k$ and $VPCM_{i,j}^k$ display significant positive effects in all specifications under consideration. The results bear out the relevance of market structure on relative inflation variability. On the other hand, the effect of $CPCM_{i,j}^k$, which captures the comovement between changes in relative price-cost margins and exchange rates, is significantly positive only in the presence of the other two PCM variables. Third, none of the *Adjacency*, *Language*, *Sea*, or trade agreement dummy variables are found to affect the volatility of inflation differentials.[10] These regression results suggest that the PCM variables have a significant influence on inflation differential volatility.

Table 3. The Results of the Inflation Differential Variability Regression

	Model Specifications					
	1	2	3	4	5	6
Distance	0.0003	-0.0000	-0.0001	-0.0000	-0.0000	-0.0001
	(0.0003)	(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0004)
Exchange Rate Volatility		0.0791	0.0927	0.0751	0.0716	0.0812
		(0.0639)	(0.0638)	(0.0624)	(0.0644)	(0.0625)
$APCM_{i,j}^k$			0.0041**			0.0057**
			(0.0117)			(0.0015)
$VPCM_{i,j}^k$				0.0044**		0.0062**
				(0.0016)		(0.0021)
$CPCM_{i,j}^k$					0.0470	0.0801*
					(0.0303)	(0.0359)
Adjusted R^2	0.6088	0.6089	0.6024	0.6170	0.6105	0.6185

Notes: The estimation results of equation (11) are presented. For all specifications, both country dummy and sector dummy variables are included. The number of observations is 1344.

10. These results are presented in Appendix A.

Heteroskedasticity-robust standard errors (White, 1980) are provided in parentheses. ** and * indicate statistical significance at, respectively, the 1% and 5% levels. See the text for definitions of the variables.

Table 4. The Results of Exchange Rate Change – Inflation Differential Covariance Regression

	Model Specifications					
	1	2	3	4	5	6
Distance	-0.0000	0.0003*	0.0002*	0.0003*	0.0003*	0.0002*
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Exchange Rate Volatility		-0.0915**	-0.0920**	-0.0911**	-0.0872**	-0.0876**
		(0.0227)	(0.0227)	(0.0227)	(0.0226)	(0.0225)
$APCM_{i,j}^{k}$			-0.0003			-0.0003
			(0.0004)			(0.0004)
$VPCM_{i,j}^{k}$				-0.0004		-0.1039**
				(0.0002)		(0.0003)
$CPCM_{i,j}^{k}$					-0.0272**	-0.0416**
					(0.0073)	(0.0073)
Adjusted R^2	0.1715	0.1826	0.1853	0.1835	0.1939	0.2086

Notes: The estimation results of equation (12) are presented. For all specifications, both country dummy and sector dummy variables are included. The number of observations is 1344. Heteroskedasticity-robust standard errors (White, 1980) are provided in parentheses. ** and * indicate statistical significance at, respectively, the 1% and 5% levels. See the text for definitions of the variables.

The estimation results for equation (12), which are given in Tables 4 and 5, can be summarized as follows. First, across all the specifications, distance and exchange rate volatility exhibit, respectively, a positive and a negative effect. Second, compared with inflation differential volatility, $Cov(\Delta e_{i,j}, \Delta p_i^k - \Delta p_j^k)$ is affected by a smaller group of market structure variables. In these two tables $CPCM_{i,j}^{k}$ is the only PCM variable that displays a robust negative effect. The effect of $CPCM_{i,j}^{k}$ can be attributed to pricing to market. If $CPCM_{i,j}^{k}$ contains some information

on exchange rate pass-through that influences local prices, then it helps explain the comovement of exchange rates and inflation differentials, which is represented by $Cov(\Delta e_{i,j}, \Delta p_i^k - \Delta p_j^k)$. The variable $APCM_{i,j}^k$ that measures the general level of non-competitiveness is insignificant across these specifications. Variability of the relative markup, $VPCM_{i,j}^k$, is significant with the expected sign only in the presence of $CPCM_{i,j}^k$.

Table 5. The Results of Exchange Rate Change –Inflation Differential Covariance Regression

	Model Specifications					
	7	8	9	10	11	12
Distance	0.0003*	0.0003*	0.0002#	0.0003*	0.0005**	0.0004**
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Exchange Rate Volatility	-0.0874**	-0.0702**	-0.1026**	-0.0941**	-0.0944**	-0.0927**
	(0.0225)	(0.0230)	(0.0259)	(0.0256)	(0.0227)	(0.0264)
$APCM_{i,j}^k$	-0.0003	-0.0003	-0.0003	-0.0003	-0.0003	-0.0003
	(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0004)
$VPCM_{i,j}^k$	-0.0010**	-0.0010**	-0.0010**	-0.0010**	-0.0010**	-0.0010**
	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)
$CPCM_{i,j}^k$	-0.0417**	-0.0415**	-0.0413**	-0.0410**	-0.0423**	-0.0417**
	(0.0073)	(0.0073)	(0.0073)	(0.0073)	(0.0072)	(0.0072)
Adjacency	0.0002			0.0000		-0.0002
	(0.0002)			(0.0002)		(0.0002)
Language		0.0006**		0.0008**		0.0008**
		(0.0002)		(0.0002)		(0.0002)
Sea			0.0003	0.0007*		0.0005
			(0.0003)	(0.0003)		(0.0003)
EEC					0.0005*	0.0004#
					(0.0002)	(0.0002)
EFTA					0.0016**	0.0015**
					(0.0003)	(0.0004)
Adjusted R^2	0.2088	0.2114	0.2087	0.2126	0.2159	0.2387

Notes: The estimation results of equation (12) are presented. For all specifications, both country dummy and sector dummy variables are included. The number of observations is 1344. Heteroskedasticity-robust standard errors (White, 1980) are provided in parentheses. **, *, and # indicate statistical significance at, respectively, the 1%, 5%, and 10% levels. See the text for definitions of the variables.

Third, the *Language* and two trade agreement (*EEC* and *EFTA*) variables are significant and have the expected sign. However, their presence does not alter the significance of the PCM variables. The significance of two trade agreement variables is supportive of the view that free trade agreements make prices more responsive to exchange rate fluctuations.

Undoubtedly, the regression results lend considerable support for the market structure effect and are quite intuitive. For instance, the variables $APCM_{i,j}^{k}$ and $VPCM_{i,j}^{k}$ are proxies derived from PCM, which is a measure of the degree of market imperfection. These variables, thus, are likely to have direct impacts on relative local price behavior. Indeed, the two variables are found to have more profound effects on the variance of inflation differentials than on the covariance of exchange rate variations and inflation differentials. In general, these findings reinforce the effects of market structure reported in the previous subsection.

4d. Some Robustness Analyses

To investigate the robustness of the empirical market structure effects, we conduct a few alternative analyses. First, the global economy is increasingly integrated over time. During the sample period, the barriers to international trade and capital flows are weakening. It is worthwhile investigating whether cross-country relative price volatility and market structure effects have changed over time. Constrained by the sample size, we repeated the preceding empirical exercise on only two subsamples: 1970-1982 and 1983-1994. The results were collected in Appendix B.

Second, we examine the market structure effect using a different industry classification scheme and the results were reported in Appendix C.

The subsample analysis (reported in Appendix B) can be summarized as follows. First, all the sectoral averages of cross-country relative price volatility from the second subsample are smaller than those from the first one. For country averages, only Australia exhibits an increase. The general decline in cross- country relative price volatility is consistent with the notion of increasing global integration.

Second, there are some discernible changes in the composition of cross-country relative price volatility. While the cross-country relative price volatility decreases, the relative contribution of nominal exchange rate variability is more significant and increases uniformly for both the sector and country categories in the second subsample. On the average, the contribution of the nominal exchange rate effect surges from 40% to 62%. The covariance term, in general, is small and tends to change its sign across the two subsample periods. As a result of the sign change, the covariance term adds to cross-country relative price volatility in the first subsample but reduces it in the second one. The evidence indicates that local prices respond slightly better to exchange rate fluctuations in the second susbsample.

Third, the overall market structure effect is slightly more prominent in the first subsample than in the second one. For instance, $Cov(\Delta e_{i,j}, \Delta p_i^k - \Delta p_j^k)$ is only affected by $CPCM_{i,j}^k$ in the second subsample. One possible interpretation is that, with reduction in barriers to trade and capital flows, local prices become more responsive to exchange rates. Such a change will weaken the effect of $APCM_{i,j}^k$ and $VPCM_{i,j}^k$ on $Cov(\Delta e_{i,j}, \Delta p_i^k - \Delta p_j^k)$ and hence, $Var(\Delta q_{i,j}^k)$ in the latter sample period. Importantly, the estimates of these market structure variables are quite insensitive

to the presence of control variables.

As indicated in footnote 2, the new industry classification system – ISIC Revision 3, recently implemented by OECD offers a limited country sample but a few additional years of data for our analysis. Specifically, under the new classification scheme and for the 1970-1998 period, only nine countries in our sample that have complete observations on value of total production, value added in the current price, value added in the constant price, and labor compensation, which are required to calculate PCM and sectoral price indexes.[11] In addition, we had to drop some sectors under the ISIC Revision 3 convention because of missing observations. Consequently, the effective sample size of our cross-country-cum-cross-sector regression analysis is severely reduced.

To check for robustness of our results, we nevertheless replicated our empirical exercise using data available under the ISIC Revision 3 codes. To facilitate comparison, we also re-did the exercise using the ISIC Revision 2 data for the countries and sectors that are included in the ISIC Revision 3 sample. These additional estimation results were given in Appendix C. In general, the results of these exercises corroborate the finding of empirical market structure effects reported in the previous subsections. The estimation results derived from the ISIC Revision 3 data and those from the corresponding ISIC Revision 2 data are qualitatively the same. Furthermore, the results based on the two nine-country samples (ISIC Revision 2 and Revision 3) are quite similar to those obtained from the original 18-country sample. Specifically, increases in monopolistic market power and nominal exchange rate volatility are associated with greater variability of cross-country relative prices. Thus, the reported market structure effect on cross-country relative price variability

11. The countries are Belgium, Canada, Denmark, Finland, Italy, Japan, Netherlands, Norway, and the U.K. The sample period can be extended from 1998 to 2000. In this case, however, the effective country sample size is further reduced as four of the nine countries have adopted the common currency euro since 1999.

is quite robust.

5. Summary

One intriguing price behavior is the resilient variability exhibited by the exchanged-rate-adjusted relative prices of similar goods across countries. The existing empirical literature suggests that a large portion of cross-country relative price variability is not explained by factors including nominal exchange rate variability and distance. Motivated by a standard markup pricing formulation, we examine the role of market structure as a determinant of cross-country relative price variability.

Using data on nine manufacturing sectors across eighteen OECD countries, we reveal considerable evidence of market structure effects on both cross-country relative price volatility itself and its components. The reported market structure effects are robust to some common control variables considered in the literature. Results from subsample analyses and alternative sample specifications also affirm the presence of market structure effects.

It is noted that there is a non-negligible portion of cross-country relative price variability unaccounted for by the factors considered in the current exercise. The discussion in section 3, for example, indicates that the costs of traded and non-traded inputs should be considered. It is also conceived that differences in distribution systems and inventory management methods may affect cross-country relative price variability.[12] Unfortunately, we do not have data on these variables. Future research on the other potential determinants of relative price variability across countries is warranted.

12. MacDonald and Ricci (2001) examine the impact of the distribution sector on real exchange rate dynamics and convergence.

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Appendix A

Decomposition of cross-country relative price volatility and additional results of the inflation differential variability regression

Table A1. Relative Price Volatility by Sectors and Countries

ISIC	U.S.	Australia	Austria	Belgium	Canada	Denmark	Finland	France	Germany	Greece
31	2.4298	3.8320	1.3756	1.7617	2.1869	1.3128	1.6163	1.2613	1.6183	1.7261
32	1.8797	2.5381	0.9412	1.3791	2.0529	1.2348	1.3934	1.2692	1.0680	1.1296
33	2.2844	3.2896	1.3475	1.6870	2.4818	1.7828	2.6164	1.6394	1.5057	1.6167
34	2.0277	2.6600	1.2708	1.6233	2.0949	1.2952	2.1302	1.3502	1.3603	1.4868
35	2.2109	2.8547	1.8534	1.7573	2.7837	1.5107	2.1658	1.8365	1.6220	1.3875
36	1.9291	2.6418	1.1884	2.0660	2.0880	1.4351	1.8711	1.1909	1.2288	1.3119
37	2.9500	4.4165	2.2814	3.4024	3.2739	5.1140	2.5128	2.2150	2.2275	2.3181
38	2.0721	2.3277	1.1513	1.6487	2.0432	1.0886	1.5212	1.0759	1.11424	1.4443
39	2.8967	3.8316	n.a.	4.7215	3.1749	2.1108	2.2607	2.4265	2.0012	3.0517
31-39	2.2939	3.1551	1.4262	2.2110	2.4598	1.8746	2.0081	1.5794	1.5274	1.7104

(Table A1 continued)

ISIC	Italy	Japan	Netherla-nds	Norway	Portugal	Spain	Sweden	U.K.	All
31	1.5874	2.4156	1.5284	1.8780	2.1378	3.8456	1.7318	2.0527	2.0166
32	1.3736	2.0294	1.2921	0.9876	1.5540	2.0990	1.3126	1.9534	1.5295
33	1.6934	3.1455	1.7490	1.6585	3.1470	3.2928	2.2280	2.9029	2.2260
34	1.9510	2.2615	1.4754	1.4471	3.2821	1.9361	1.7366	2.3298	1.8733
35	1.3625	4.1797	1.5577	1.8230	2.9613	1.9608	1.9107	2.4439	2.1212
36	1.5501	1.9159	1.3845	1.5585	1.5328	2.1601	1.3989	2.1448	1.6998
37	2.8997	3.2009	2.9333	3.9009	6.1315	4.4980	2.2623	2.9266	3.3036
38	1.2586	1.8436	1.1868	1.1671	2.0532	2.8483	1.2557	1.9749	1.6169
39	3.4014	2.9795	2.8704	2.3288	4.1178	6.3215	3.1087	2.5595	3.1861
31-39	1.8876	2.6614	1.7681	1.8580	2.9834	3.1976	1.8747	2.3641	2.1621

Notes: The entries are sample variances of sectoral relative prices of the specified sectors and countries. Sectors are denoted by their international standard industry classification (ISIC) codes in the first column.

Table A2 Decomposition of Cross-Country Relative Price Volatility

A. By Sector

	$Var(\Delta q_{i,j}^k)$	$\frac{Var(\Delta e_{i,j})}{Var(\Delta q_{i,j}^k)}$	$\frac{Var(\Delta p_i^k - \Delta p_j^k)}{Var(\Delta q_{i,j}^k)}$	$\frac{-2Cov(\Delta e_{i,j}, \Delta p_i^k - \Delta p_j^k)}{Var(\Delta q_{i,j}^k)}$
31: Food, beverages and tobacco	2.0166	0.5312	0.4318	0.0370
32: Textiles, apparel and leather	1.5295	0.7004	0.3563	-.0566
33: Wood products and furniture	2.2260	0.4813	0.4658	0.0530
34: Paper, paper products and printing	1.8733	0.5719	0.4604	-.0323
35: Chemical products	2.1212	0.5050	0.4447	0.0503
36: Non-metallic mineral products	1.6998	0.6302	0.4088	-.0391
37: Basic metal industries	3.3036	0.3243	0.7373	-.0616
38: Fabricated metal products	1.6169	0.6626	0.3264	0.0111
39: Other manufacturing	3.1861	0.3362	0.6348	0.0157
31-39:	2.1621	0.4955	0.5055	-.0026

B. By Country

	$Var(\Delta q_{i,j}^k)$	$\frac{Var(\Delta e_{i,j})}{Var(\Delta q_{i,j}^k)}$	$\frac{Var(\Delta p_i^k - \Delta p_j^k)}{Var(\Delta q_{i,j}^k)}$	$\frac{-2Cov(\Delta e_{i,j}, \Delta p_i^k - \Delta p_j^k)}{Var(\Delta q_{i,j}^k)}$
U.S.	2.2939	0.6485	0.3291	0.0222
Australia	3.1551	0.6143	0.3765	0.0101
Austria	1.4262	0.5489	0.4997	-.0432
Belgium	2.2110	0.3688	0.5653	0.0636
Canada	2.4598	0.6217	0.3650	0.0134
Denmark	1.8746	0.3974	0.5612	0.0390
Finland	2.0081	0.4245	0.5484	0.0260
France	1.5794	0.5042	0.4760	0.0176
Germany	1.5274	0.5342	0.4634	-.0010
Greece	1.7104	0.5278	0.6465	-.1749
Italy	1.8876	0.5406	0.5582	-.0992
Japan	2.6614	0.6199	0.3913	-.0115
Netherlands	1.7681	0.4348	0.5540	0.0084
Norway	1.8580	0.3875	0.6031	0.0082
Portugal	2.9834	0.4158	0.6701	-.0857
Spain	3.1976	0.3248	0.6354	0.0391
Sweden	1.8747	0.4907	0.4826	0.0256
U.K.	2.3641	0.5325	0.4142	0.0525
All	2.1621	0.4955	0.5055	-.0026

Notes: $Var(\Delta q_{i,j}^k)$ gives the sample variances of cross-country relative prices. The proportions of $Var(\Delta q_{i,j}^k)$ explained by variance of exchange rate changes, variance of inflation differentials, and covariance of exchange rate changes and inflation differentials are given by $Var(\Delta e_{i,j})/Var(\Delta q_{i,j}^k)$, $Var(\Delta p_i^k - \Delta p_j^k)/Var(\Delta q_{i,j}^k)$, and $-2Cov(\Delta e_{i,j}, \Delta p_i^k - \Delta p_j^k)/Var(\Delta q_{i,j}^k)$.

Table A3. Additional Results of the Inflation Differential Variability Regression

	Model Specifications					
	7	8	9	10	11	12
Distance	-0.0003	-0.0001	-0.0001	-0.0003	-0.0003	-0.0005
	(0.0005)	(0.0004)	(0.0004)	(0.0005)	(0.0005)	(0.0005)
Exchange Rate Volatility	0.0806	0.0798	0.0763	0.0755	0.0867	0.0705
	(0.0624)	(0.0658)	(0.0697)	(0.0706)	(0.0640)	(0.0741)
$APCM_{i,j}^{k}$	0.0057**	0.0057**	0.0057**	0.0057**	0.0057**	0.0057**
	(0.0015)	(0.0015)	(0.0015)	(0.0015)	(0.0015)	(0.0015)
$VPCM_{i,j}^{k}$	0.0062**	0.0062**	0.0062**	0.0062**	0.0062**	0.0062**
	(0.0021)	(0.0021)	(0.0021)	(0.0021)	(0.0021)	(0.0021)
$CPCM_{i,j}^{k}$	0.0805*	0.0801*	0.0802*	0.0808*	0.0807*	0.0812*
	(0.0360)	(0.0359)	(0.0359)	(0.0360)	(0.0360)	(0.0360)
Adjacency	-0.0007			-0.0008		-0.0005
	(0.0007)			(0.0008)		(0.0008)
Language		-0.0000		0.0003		0.0003
		(0.0007)		(0.0008)		(0.0008)
Sea			0.0001	0.0003		0.0006
			(0.0009)	(0.0009)		(0.0010)
EEC					-0.0005	-0.0005
					(0.0007)	(0.0008)
EFTA					-0.0013	-0.0011
					(0.0011)	(0.0013)
Adjusted R^2	0.6184	0.6182	0.6182	0.6179	0.6182	0.6276

Notes: The estimation results of equation (11) are presented. For all specifications, both country dummy and sector dummy variables are included. The number of observations is 1344. Heteroskedasticity-robust standard errors (White, 1980) are provided in parentheses. ** and * indicate statistical significance at, respectively, the 1% and 5% levels. See the text for definitions of the variables.

Appendix B

Results of sub-sample analyses

B1: 1971-1982

B2: 1983-1994

Table B1-1. The Results of the Cross-Country Relative Price Volatility Regression for 1971-1982

	Model Specifications					
	1	2	3	4	5	6
Distance	0.0039**	-0.0004	-0.0004	-0.0005	-0.0004	-0.0004
	(0.0007)	(0.0008)	(0.0008)	(0.0008)	(0.0008)	(0.0008)
Exchange Rate Volatility		1.2533**	1.2479**	1.2497**	1.2426**	1.2328**
		(0.1312)	(0.1306)	(0.1317)	(0.1308)	(0.1308)
$APCM_{i,j}^{k}$			0.0055**			0.0073**
			(0.0020)			(0.0023)
$VPCM_{i,j}^{k}$				0.0036*		0.0059**
				(0.0015)		(0.0018)
$CPCM_{i,j}^{k}$					0.1035**	0.0939*
					(0.0349)	(0.0375)
Adjusted R^2	0.5107	0.5427	0.5470	0.5475	0.5476	0.5607

Notes: The estimation results of equation (9) for 1971-1982 are presented. For all specifications, both country dummy and sector dummy variables are included. Heteroskedasticity-robust standard errors (White, 1980) are provided in parentheses. ** and * indicate statistical significance at, respectively, the 1% and 5% levels. See the text for definitions of the variables.

Table B1-2. The Results of the Cross-Country Relative Price Volatility Regression for 1971-1982

	Model Specifications					
	7	8	9	10	11	12
Distance	-0.0007	-0.0010	-0.0010	-0.0014	-0.0007	-0.0017[#]
	(0.0008)	(0.0008)	(0.0008)	(0.0009)	(0.0008)	(0.0009)
Exchange Rate Volatility	1.2222**	1.1776**	1.1174**	1.1072**	1.2404**	1.1100**
	(0.1320)	(0.1320)	(0.1379)	(0.1390)	(0.1307)	(0.1409)
$APCM_{i,j}^{k}$	0.0073**	0.0073**	0.0072**	0.0073**	0.0073**	0.0073**
	(0.0023)	(0.0022)	(0.0022)	(0.0022)	(0.0023)	(0.0023)
$VPCM_{i,j}^{k}$	0.0059**	0.0060**	0.0060**	0.0060**	0.0059**	0.0060**
	(0.0018)	(0.0019)	(0.0019)	(0.0019)	(0.0018)	(0.0019)
$CPCM_{i,j}^{k}$	0.0939*	0.0930*	0.0969*	0.0955*	0.0941*	0.0961*
	(0.0374)	(0.0374)	(0.0377)	(0.0375)	(0.0375)	(0.0375)
Adjacency	-0.0011			-0.0007		0.0000
	(0.0014)			(0.0016)		(0.0018)
Language		-0.0042**		-0.0028		-0.0027
		(0.0014)		(0.0017)		(0.0017)
Sea			0.0044*	0.0031		0.0037
			(0.0018)	(0.0021)		(0.0022)
EEC					-0.0002	-0.0010
					(0.0016)	(0.0017)
EFTA					-0.0036	-0.0039
					(0.0022)	(0.0028)
Adjusted R^2	0.5606	0.5623	0.5619	0.5622	0.5605	0.5620

Notes: The estimation results of equation (9) for 1971-1982 are presented. For all specifications, both country dummy and sector dummy variables are included. Heteroskedasticity-robust standard errors (White, 1980) are provided in parentheses. ** and * indicate statistical significance at, respectively, the 1% and 5% levels. See the text for definitions of the variables.

Table B1-3. The Results of the Inflation Differential Variability Regression for 1971-1982

	Model Specifications					
	1	2	3	4	5	6
Distance	0.0006	0.0004	0.0004	0.0004	0.0004	0.0004
	(0.0005)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)
Exchange Rate Volatility		0.0421	0.0419	0.0389	0.0404	0.0369
		(0.0979)	(0.0980)	(0.0986)	(0.0979)	(0.0983)
$APCM_{i,j}^{k}$			0.0015			0.0036*
			(0.0015)			(0.0018)
$VPCM_{i,j}^{k}$				0.0031*		0.0041*
				(0.0014)		(0.0016)
$CPCM_{i,j}^{k}$					0.0161	0.0160
					(0.0308)	(0.0343)
Adjusted R^2	0.5467	0.5464	0.5469	0.5533	0.5463	0.5565

Notes: The estimation results of equation (11) for 1971-1982 are presented. For all specifications, both country dummy and sector dummy variables are included. Heteroskedasticity-robust standard errors (White, 1980) are provided in parentheses. ** and * indicate statistical significance at, respectively, the 1% and 5% levels. See the text for definitions of the variables.

Table B1-4. The Results of the Inflation Differential Variability Regression for 1971-1982

	Model Specifications					
	7	8	9	10	11	12
Distance	0.0002	0.0003	0.0003	0.0001	0.0002	-0.0000
	(0.0006)	(0.0006)	(0.0006)	(0.0007)	(0.0006)	(0.0007)
Exchange	0.0320	0.0285	0.0135	0.0060	0.0381	0.0000
Rate	(0.0994)	(0.0998)	(0.1032)	(0.1044)	(0.0982)	(0.1058)
Volatility						
$APCM_{i,j}^{k}$	0.0036*	0.0036*	0.0036*	0.0036*	0.0036*	0.0036*
	(0.0018)	(0.0018)	(0.0018)	(0.0018)	(0.0018)	(0.0018)
$VPCM_{i,j}^{k}$	0.0041*	0.0041*	0.0041*	0.0041*	0.0041*	0.0041*
	(0.0016)	(0.0016)	(0.0016)	(0.0016)	(0.0016)	(0.0016)
$CPCM_{i,j}^{k}$	0.0161	0.0159	0.0166	0.0167	0.0161	0.0169
	(0.0343)	(0.0343)	(0.0344)	(0.0344)	(0.0343)	(0.0344)
Adjacency	-0.0005			-0.0005		-0.0005
	(0.0011)			(0.0013)		(0.0014)
Language		-0.0006		-0.0001		-0.0001
		(0.0011)		(0.0014)		(0.0014)
Sea			0.0009	0.0009		0.0012
			(0.0014)	(0.0015)		(0.0017)
EEC					-0.0008	-0.0010
					(0.0012)	(0.0013)
EFTA					-0.0001	0.0000
					(0.0017)	(0.0021)
Adjusted R^2	0.5562	0.5563	0.5563	0.5557	0.5560	0.5552

Notes: The estimation results of equation (11) for 1971-1982 are presented. For all specifications, both country dummy and sector dummy variables are included. Heteroskedasticity-robust standard errors (White, 1980) are provided in parentheses. ** and * indicate statistical significance at, respectively, the 1% and 5% levels. See the text for definitions of the variables.

Table B1-5. The Results of Exchange Rate Change – Inflation Differential Covariance Regression 1971-1982

	Model Specifications					
	1	2	3	4	5	6
Distance	0.0001	0.0004*	0.0004*	0.0004*	0.0004*	0.0004*
	(0.0001)	(0.0002)	(0.0001)	(0.0001)	(0.0002)	(0.0002)
Exchange Rate Volatility		-0.1056**	-0.1029**	-0.1053**	-0.1011*	-0.0979*
		(0.0389)	(0.0389)	(0.0389)	(0.0389)	(0.0389)
$APCM_{i,j}^{k}$			-0.0020**			-0.0018**
			(0.0004)			(0.0005)
$VPCM_{i,j}^{k}$				-0.0002		-0.0009**
				(0.0002)		(0.0002)
$CPCM_{i,j}^{k}$					-0.0436**	-0.0389**
					(0.0074)	(0.0074)
Adjusted R^2	0.1198	0.1253	0.1401	0.1251	0.1495	0.1617

Notes: The estimation results of equation (12) for 1971-1982 are presented. For all specifications, both country dummy and sector dummy variables are included. Heteroskedasticity-robust standard errors (White, 1980) are provided in parentheses. ** and * indicate statistical significance at, respectively, the 1% and 5% levels. See the text for definitions of the variables.

Table B1-6. The Results of Exchange Rate Change – Inflation Differential Covariance Regression for 1971-1982

	Model Specifications					
	7	8	9	10	11	12
Distance	0.0005*	0.0006**	0.0006**	0.0007**	0.0005*	0.0008**
	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)
Exchange Rate Volatility	-0.0950*	-0.0745#	-0.0519	-0.0505	-0.1011*	-0.0549
	(0.0394)	(0.0394)	(0.0413)	(0.0419)	(0.0390)	(0.0425)
$APCM_{i,j}^{k}$	-0.0018**	-0.0018**	-0.0017**	-0.0018**	-0.0018**	-0.0018**
	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)
$VPCM_{i,j}^{k}$	-0.0009**	-0.0009**	-0.0009**	-0.0009**	-0.0009**	-0.0009**
	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)
$CPCM_{i,j}^{k}$	-0.0389**	-0.0385**	-0.0401**	-0.0394**	-0.0390**	-0.0396**
	(0.0074)	(0.0074)	(0.0074)	(0.0074)	(0.0074)	(0.0074)
Adjacency	0.0003			0.0000		-0.0002
	(0.0003)			(0.0004)		(0.0004)
Language		0.0017**		0.0013**		0.0013**
		(0.0003)		(0.0004)		(0.0004)
Sea			-0.0017**	-0.0011#		-0.0012
			(0.0005)	(0.0006)		(0.0006)
EEC					-0.0002	0.0000
					(0.0004)	(0.0004)
EFTA					0.0017**	0.0019**
					(0.0005)	(0.0007)
Adjusted R^2	0.1614	0.1701	0.1676	0.1709	0.1634	0.1942

Notes: The estimation results of equation (12) for 1971-1982 are presented. For all specifications, both country dummy and sector dummy variables are included. Heteroskedasticity-robust standard errors (White, 1980) are provided in parentheses. ** and * indicate statistical significance at, respectively, the 1% and 5% levels. See the text for definitions of the variables.

Table B1-7. Relative Price Volatility by Sectors and Countries for 1971-1982

ISIC	U.S.	Australia	Austria	Belgium	Canada	Denmark	Finland	France	Germany	Greece
31	2.6145	3.6322	1.7578	2.3420	2.3730	1.6567	1.9657	1.5434	2.0755	1.7449
32	1.8284	1.7359	1.0304	1.4608	2.0607	1.1068	1.3632	1.5022	1.1155	1.2776
33	1.7944	2.2338	1.5090	1.7672	2.3310	1.9191	2.9619	1.8856	1.6932	1.6140
34	2.1437	2.9954	1.4357	1.8052	2.2635	1.5654	2.4885	1.4214	1.6326	1.7257
35	2.1711	2.8243	2.4307	2.1459	3.1710	1.7949	2.5092	2.2148	2.0155	1.5293
36	1.7169	2.4078	1.3475	2.9378	2.3324	1.4307	1.8395	1.3983	1.3639	1.5237
37	3.5039	5.3037	2.8590	4.2719	4.0451	7.2355	3.0774	2.7727	2.6691	3.0996
38	2.1563	1.9988	1.2349	1.9627	2.0511	1.2100	1.6467	1.2633	1.3544	1.8114
39	3.4506	3.6529	n.a.	7.0743	3.5927	2.5053	2.8991	2.5372	2.3638	3.2056
31-39	2.3685	2.9716	1.7006	2.8354	2.6852	2.2678	2.3018	1.8331	1.8056	1.9397

(Table B1-7 continued)

ISIC	Italy	Japan	Netherla-nds	Norway	Portugal	Spain	Sweden	U.K.	All
31	2.2339	3.1737	1.6946	2.4364	2.6344	6.7628	1.9522	2.3667	2.4978
32	1.5640	2.6798	1.2407	1.0646	1.6271	3.2326	1.3272	2.5222	1.6522
33	2.0445	4.6253	1.8596	1.7365	3.7117	5.4370	2.6989	2.8593	2.4823
34	2.7450	3.0103	1.8049	1.6266	2.9454	2.8578	2.3273	3.1803	2.2208
35	1.5824	6.7947	2.1519	2.4234	2.7050	2.6685	2.1533	2.8152	2.5612
36	2.0237	2.2992	1.6407	1.3824	1.6839	3.2946	1.5158	2.8193	1.9421
37	4.1836	4.2407	4.5659	3.9930	8.6035	7.6478	2.7471	3.3887	4.3449
38	1.6371	2.4373	1.4233	1.3634	2.9923	4.7793	1.5400	2.4686	1.9628
39	4.6665	4.1695	3.0885	3.0919	4.7701	10.100	3.4017	3.2194	3.9876
31-39	2.5060	3.7115	2.1573	2.1179	3.5110	5.1656	2.1768	2.8464	2.6110

Notes: The figures represent sample variances of sectoral relative prices of the specified sectors and countries. Sectors are denoted by their international standard industry classification (ISIC) codes in the first column.

Table B1-8. Decomposition of Cross-Country Relative Price Volatility for 1971-1982

A. By Sector

	$Var(\Delta q_{i,j}^k)$	$\frac{Var(\Delta e_{i,j})}{Var(\Delta q_{i,j}^k)}$	$\frac{Var(\Delta p_i^k - \Delta p_j^k)}{Var(\Delta q_{i,j}^k)}$	$\frac{-2Cov(\Delta e_{i,j}, \Delta p_i^k - \Delta p_j^k)}{Var(\Delta q_{i,j}^k)}$
31: Food, beverages and tobacco	2.4978	42.2372	49.8283	7.9346
32: Textiles, apparel and leather	1.6522	63.8541	40.9605	-4.8147
33: Wood products and furniture	2.4823	42.5002	56.8685	0.6311
34: Paper, paper products and printing	2.2208	47.5052	49.2384	3.2562
35: Chemical products	2.5612	41.1920	40.9476	17.8603
36: Non-metallic mineral products	1.9421	54.3222	47.0798	-1.4021
37: Basic metal industries	4.3449	24.2813	75.2895	0.4291
38: Fabricated metal products	1.9628	53.7487	37.1224	9.1288
39: Other manufacturing	3.9876	26.4569	66.7195	5.3362
31-39:	2.6110	40.4063	54.9553	4.4574

B. By Country

	$Var(\Delta q_{i,j}^k)$	$\frac{Var(\Delta e_{i,j})}{Var(\Delta q_{i,j}^k)}$	$\frac{Var(\Delta p_i^k - \Delta p_j^k)}{Var(\Delta q_{i,j}^k)}$	$\frac{-2Cov(\Delta e_{i,j}, \Delta p_i^k - \Delta p_j^k)}{Var(\Delta q_{i,j}^k)}$
U.S.	2.3685	49.3546	41.7587	8.8007
Australia	2.9716	45.7642	49.2430	5.0207
Austria	1.7006	46.6506	54.4542	-0.9821
Belgium	2.8354	31.3296	60.7017	7.7639
Canada	2.6852	48.7448	41.8437	9.3314
Denmark	2.2678	33.1019	61.4547	5.2427
Finland	2.3018	31.2392	61.8726	6.7667
France	1.8331	43.8423	53.2877	2.7304
Germany	1.8056	46.7649	50.1466	2.7725
Greece	1.9397	36.8188	67.9206	-4.8894
Italy	2.5060	46.3885	61.0631	-7.4237
Japan	3.7115	56.1847	43.0436	0.7781
Netherlands	2.1573	34.7801	59.2918	5.6715
Norway	2.1179	33.9091	63.8805	2.0741
Portugal	3.5110	37.5909	59.8208	2.5933
Spain	5.1656	23.6865	64.4227	11.7885
Sweden	2.1768	47.8355	49.3911	2.6669
U.K.	2.8464	46.9936	44.6287	8.2956
All	2.6110	40.4063	54.9553	4.4574

Notes: Total variation is the sample variance in percentage terms of the cross-country relative price of the corresponding sectors. The relative shares denote the percentage of the specified component in the total variation.

Table B2-1. The Results of the Cross-Country Relative Price Volatility Regression for 1983-1994

	Model Specifications					
	1	2	3	4	5	6
Distance	0.0063**	0.0006	0.0006	0.0006	0.0006	0.0005
	(0.0004)	(0.0004)	(0.0008)	(0.0004)	(0.0004)	(0.0004)
Exchange Rate Volatility		1.0261**	1.0262**	1.0214**	1.0178**	1.0121**
		(0.0483)	(0.0484)	(0.0480)	(0.0486)	(0.0483)
$APCM_{i,j}^{k}$			0.0006			0.0022
			(0.0018)			(0.0018)
$VPCM_{i,j}^{k}$				0.0071**		0.0080**
				(0.0019)		(0.0021)
$CPCM_{i,j}^{k}$					0.0662*	0.0720*
					(0.0284)	(0.0288)
Adjusted R^2	0.5538	0.6692	0.6690	0.6760	0.6730	0.6809

Notes: The estimation results of equation (9) for 1983-1994 are presented. For all specifications, both country dummy and sector dummy variables are included. Heteroskedasticity-robust standard errors (White, 1980) are provided in parentheses. ** and * indicate statistical significance at, respectively, the 1% and 5% levels. See the text for definitions of the variables.

Table B2-2. The Results of the Cross-Country Relative Price Volatility Regression for 1983-1994

	Model Specifications					
	7	8	9	10	11	12
Distance	0.0000	0.0006	0.0009#	0.0004	-0.0002	-0.0000
	(0.0005)	(0.0004)	(0.0004)	(0.0006)	(0.0005)	(0.0006)
Exchange Rate Volatility	1.0180**	1.0174**	1.0949**	1.0980**	1.0166**	1.0759**
	(0.0492)	(0.0514)	(0.0575)	(0.0608)	(0.0489)	(0.0611)
$APCM_{i,j}^{k}$	0.0022	0.0022	0.0022	0.0022	0.0022	0.0022
	(0.0018)	(0.0018)	(0.0018)	(0.0018)	(0.0018)	(0.0018)
$VPCM_{i,j}^{k}$	0.0080**	0.0080**	0.0080**	0.0080**	0.0080**	0.0080**
	(0.0021)	(0.0021)	(0.0021)	(0.0021)	(0.0021)	(0.0021)
$CPCM_{i,j}^{k}$	0.0729*	0.0720*	0.0730*	0.0738**	0.0722*	0.0732*
	(0.0285)	(0.0287)	(0.0286)	(0.0284)	(0.0288)	(0.0286)
Adjacency	-0.0014#			-0.0013		-0.0006
	(0.0007)			(0.0016)		(0.0007)
Language		0.0003		-0.0017		-0.0000
		(0.0009)		(0.0009)		(0.0009)
Sea			-0.0036**	-0.0036**		-0.0025*
			(0.0012)	(0.0011)		(0.0012)
EEC					-0.0031**	-0.0025**
					(0.0008)	(0.0009)
EFTA					-0.0039*	-0.0032*
					(0.0015)	(0.0016)
Adjusted R^2	0.6813	0.6807	0.6830	0.6832	0.6847	0.6851

Notes: The estimation results of equation (9) for 1983-1994 are presented. For all specifications, both country dummy and sector dummy variables are included. Heteroskedasticity-robust standard errors (White, 1980) are provided in parentheses. ** and * indicate statistical significance at, respectively, the 1% and 5% levels. See the text for definitions of the variables.

Table B2-3. The Results of the Inflation Differential Variability Regression for 1983-1994

	Model Specifications					
	1	2	3	4	5	6
Distance	0.0001	0.0002	0.0002	0.0001	0.0002	0.0001
	(0.0002)	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)
Exchange Rate Volatility		-0.0068	-0.0065	-0.0111	-0.0104	-0.0153
		(0.0354)	(0.0355)	(0.0349)	(0.0357)	(0.0352)
$APCM_{i,j}^{k}$			0.0024#			0.0040**
			(0.0015)			(0.0014)
$VPCM_{i,j}^{k}$				0.0063**		0.0074**
				(0.0017)		(0.0017)
$CPCM_{i,j}^{k}$					0.0285	0.0331
					(0.0224)	(0.0216)
Adjusted R^2	0.5446	0.5443	0.5458	0.5569	0.5456	0.5634

Notes: The estimation results of equation (11) for 1983-1994 are presented. For all specifications, both country dummy and sector dummy variables are included. Heteroskedasticity-robust standard errors (White, 1980) are provided in parentheses. ** and * indicate statistical significance at, respectively, the 1% and 5% levels. See the text for definitions of the variables.

Table B2-4. The Results of the Inflation Differential Variability Regression for 1983-1994

	Model Specifications					
	7	8	9	10	11	12
Distance	-0.0001	0.0001	0.0001	-0.0001	-0.0000	-0.0003
	(0.0004)	(0.0003)	(0.0003)	(0.0004)	(0.0004)	(0.0005)
Exchange Rate Volatility	-0.0120	-0.0173	-0.0246	-0.0181	-0.0098	-0.0196
	(0.0357)	(0.0375)	(0.0390)	(0.0414)	(0.0362)	(0.0419)
$APCM_{i,j}^{k}$	0.0040**	0.0040**	0.0040**	0.0040**	0.0040**	0.0040**
	(0.0014)	(0.0014)	(0.0014)	(0.0014)	(0.0014)	(0.0014)
$VPCM_{i,j}^{k}$	0.0074**	0.0074**	0.0074**	0.0074**	0.0074**	0.0074**
	(0.0017)	(0.0017)	(0.0017)	(0.0017)	(0.0017)	(0.0017)
$CPCM_{i,j}^{k}$	0.0335	0.0330	0.0329	0.0335	0.0340	0.0340
	(0.0214)	(0.0216)	(0.0216)	(0.0344)	(0.0215)	(0.0215)
Adjacency	-0.0008			-0.0009		-0.0006
	(0.0006)			(0.0006)		(0.0006)
Language		-0.0001		0.0004		0.0004
		(0.0005)		(0.0006)		(0.0006)
Sea			0.0004	0.0006		0.0008
			(0.0007)	(0.0007)		(0.0008)
EEC					-0.0003	-0.0004
					(0.0006)	(0.0007)
EFTA					-0.0018	-0.0015
					(0.0012)	(0.0013)
Adjusted R^2	0.5636	0.5631	0.5632	0.5631	0.5635	0.5630

Notes: The estimation results of equation (11) for 1983-1994 are presented. For all specifications, both country dummy and sector dummy variables are included. Heteroskedasticity-robust standard errors (White, 1980) are provided in parentheses. ** and * indicate statistical significance at, respectively, the 1% and 5% levels. See the text for definitions of the variables.

Table B2-5. The Results of Exchange Rate Change – Inflation Differential Covariance Regression for 1983-1994

	Model Specifications					
	1	2	3	4	5	6
Distance	-0.0003**	-0.0002	-0.0002	-0.0002	-0.0002	-0.0002
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Exchange Rate Volatility		-0.0165	-0.0163	-0.0162	-0.0141	-0.0137
		(0.0185)	(0.0185)	(0.0185)	(0.0185)	(0.0185)
$APCM_{i,j}^{k}$			0.0009			0.0009
			(0.0005)			(0.0006)
$VPCM_{i,j}^{k}$				-0.0003		-0.0002
				(0.0006)		(0.0007)
$CPCM_{i,j}^{k}$					-0.0188*	-0.0194*
					(0.0085)	(0.0088)
Adjusted R^2	0.2254	0.2253	0.2269	0.2251	0.2468	0.2322

Notes: The estimation results of equation (12) for 1983-1994 are presented. For all specifications, both country dummy and sector dummy variables are included. Heteroskedasticity-robust standard errors (White, 1980) are provided in parentheses. ** and * indicate statistical significance at, respectively, the 1% and 5% levels. See the text for definitions of the variables.

Table B2-6. The Results of Exchange Rate Change – Inflation Differential Covariance Regression for 1983-1994

	Model Specifications					
	7	8	9	10	11	12
Distance	-0.0001	-0.0002	-0.0003**	-0.0003[#]	0.0000	-0.0001
	(0.0001)	(0.0002)	(0.0001)	(0.0002)	(0.0001)	(0.0001)
Exchange	-0.0150	-0.0173	-0.0597**	-0.0581**	-0.0132	-0.0478*
Rate	(0.0187)	(0.0192)	(0.0214)	(0.0222)	(0.0183)	(0.0224)
Volatility						
$APCM_{i,j}^{k}$	0.0009	0.0009	0.0009	0.0009	0.0009	0.0009
	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)
$VPCM_{i,j}^{k}$	-0.0002	-0.0002	-0.0002	-0.0002	-0.0002	-0.0003
	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)
$CPCM_{i,j}^{k}$	-0.0196*	-0.0195*	-0.0200*	-0.0201**	0.0191*	0.0196*
	(0.0088)	(0.0088)	(0.0088)	(0.0088)	(0.0088)	(0.0088)
ADJ	0.0003			0.0001		-0.0000
	(0.0002)			(0.0002)		(0.0002)
Adjacency		-0.0002		0.0003		0.0002
		(0.0003)		(0.0003)		(0.0003)
Language			0.0020**	0.0021**		0.0017**
			(0.0004)	(0.0004)		(0.0004)
Sea					0.0013**	0.0010**
					(0.0002)	(0.0002)
EEC					0.0010*	0.0008[#]
					(0.0004)	(0.0004)
EFTA	0.2323	0.2319	0.2455	0.2452	0.2439	0.2505

Notes: The estimation results of equation (12) for 1983-1994 are presented. For all specifications, both country dummy and sector dummy variables are included. Heteroskedasticity-robust standard errors (White, 1980) are provided in parentheses. ** and * indicate statistical significance at, respectively, the 1% and 5% levels. See the text for definitions of the variables.

Table B2-7. Relative Price Volatility by Sectors and Countries for 1984-1994

ISIC	U.S.	Australia	Austria	Belgium	Canada	Denmark	Finland	France	Germany	Greece
31	2.9315	4.2152	1.0609	1.2425	2.1072	1.0310	1.3013	1.0405	1.2590	1.8059
32	2.0579	3.6045	0.9067	1.3874	2.1951	1.3172	1.4925	1.1215	1.0850	1.0519
33	2.9397	4.5469	1.2662	1.5086	2.8163	1.7266	2.4552	1.4698	1.4112	1.7124
34	2.0675	2.5193	1.1770	1.5599	2.0733	1.0486	1.9264	1.3674	1.1832	1.3488
35	2.3697	3.0871	1.3640	1.4692	2.5680	1.2425	1.8798	1.5211	1.3253	1.3136
36	2.2495	2.9818	1.0610	1.2646	1.9319	1.4028	1.9853	1.0409	1.1139	1.1713
37	2.5890	3.8455	1.8539	2.7561	2.6572	3.3946	2.0026	1.6757	1.9222	1.6908
38	2.1122	2.7478	1.1013	1.2653	2.1612	0.9106	1.4654	0.9120	0.9801	1.1566
39	2.4184	4.1656	n.a.	2.6427	2.8877	1.7541	1.6272	2.2969	1.6263	2.8784
31-39	2.3546	3.5195	1.2239	1.6710	2.3742	1.5350	1.7940	1.3769	1.3209	1.5614

(Table B2-7 continued)

ISIC	Italy	Japan	Netherla-nds	Norway	Portugal	Spain	Sweden	U.K.	All
31	1.0376	1.8187	1.4437	1.4272	1.5343	1.1149	1.5871	1.8469	1.6259
32	1.2505	1.4664	1.4308	0.9602	1.5233	1.0111	1.3476	1.5322	1.4857
33	1.4509	1.8431	1.7218	1.6584	2.8016	1.4059	1.9073	2.9432	2.0881
34	1.3004	1.6829	1.2500	1.3538	3.6663	1.1535	1.2490	1.5772	1.6391
35	1.1429	1.8995	1.0430	1.3433	3.2770	1.3188	1.7824	2.1656	1.7840
36	1.1569	1.6581	1.1674	1.7776	1.4227	1.1657	1.2956	1.4496	1.5165
37	1.8175	2.3271	1.5098	4.0830	3.7455	1.6954	1.8529	2.6741	2.4496
38	0.9420	1.3165	1.0008	0.9903	1.2055	0.8830	1.0282	1.5030	1.3157
39	2.1832	1.8972	2.5891	1.6182	2.8082	2.4389	2.5688	1.9553	2.3739
31-39	1.3593	1.7669	1.4544	1.6907	2.4403	1.3470	1.6181	1.9608	1.8016

Notes: The figures represent sample variances of sectoral relative prices of the specified sectors and countries. Sectors are denoted by their international standard industry classification (ISIC) codes in the first column.

Table B2-8. Decomposition of Cross-Country Relative Price Volatility for 1983-1994

A. By Sector

	$Var(\Delta q_{i,j}^k)$	$\frac{Var(\Delta e_{i,j})}{Var(\Delta q_{i,j}^k)}$	$\frac{Var(\Delta p_i^k - \Delta p_j^k)}{Var(\Delta q_{i,j}^k)}$	$\frac{-2Cov(\Delta e_{i,j}, \Delta p_i^k - \Delta p_j^k)}{Var(\Delta q_{i,j}^k)}$
31: Food, beverages and tobacco	1.6259	69.4770	26.8677	3.6516
32: Textiles, apparel and leather	1.4857	76.0337	25.1461	-1.1798
33: Wood products and furniture	2.0881	54.0982	31.8582	14.0435
34: Paper, paper products and printing	1.6391	68.9146	39.8439	-8.7586
35: Chemical products	1.7840	63.3172	45.5482	-8.8654
36: Non-metallic mineral products	1.5165	74.4890	26.8640	-1.3530
37: Basic metal industries	2.4496	46.1137	67.5898	-13.7036
38: Fabricated metal products	1.3157	85.8577	18.2027	-4.0604
39: Other manufacturing	2.3739	47.5846	51.36529	-0.6477
31-39:	1.8016	62.6984	39.5123	-2.4150

B. By Country

	$Var(\Delta q_{i,j}^k)$	$\frac{Var(\Delta e_{i,j})}{Var(\Delta q_{i,j}^k)}$	$\frac{Var(\Delta p_i^k - \Delta p_j^k)}{Var(\Delta q_{i,j}^k)}$	$\frac{-2Cov(\Delta e_{i,j}, \Delta p_i^k - \Delta p_j^k)}{Var(\Delta q_{i,j}^k)}$
U.S.	2.3546	80.4189	21.3696	-1.7444
Australia	3.5195	74.4714	26.8531	-1.1943
Austria	1.2239	64.6951	38.7483	-3.0609
Belgium	1.6710	46.9314	46.2879	6.4440
Canada	2.3742	77.9509	28.2192	-6.0573
Denmark	1.5350	49.6259	46.2527	3.7824
Finland	1.7940	57.4051	41.0171	1.4336
France	1.3769	59.4371	36.8070	3.3781
Germany	1.3209	61.5833	34.9869	3.0119
Greece	1.5614	64.3160	46.9525	-11.2965
Italy	1.3593	64.9607	36.4946	-1.7323
Japan	1.7669	74.6463	27.9622	-2.7329
Netherlands	1.4544	56.5937	45.6510	-2.5931
Norway	1.6907	44.0346	53.2479	2.6087
Portugal	2.4403	49.3370	75.7356	-25.0540
Spain	1.3470	65.3413	44.2342	-9.7136
Sweden	1.6181	52.5839	43.1499	4.1223
U.K.	1.9608	64.2311	29.4943	6.1600
All	1.8016	62.6984	39.5123	-2.4150

Notes: Total variation is the sample variance in percentage terms of the cross-country relative price of the corresponding sectors. The relative shares denote the percentage of the specified component in the total variation.

Appendix C

Results from the “new” and “old” industry classification schemes

C1: 1971-1994, ISIC Revision 2

C2: 1971-1998, ISIC Revision 3

Table C1-1. The Results of the Cross-Country Relative Price Volatility Regression: 9-Country Sample under the ISIC Revision 2, 1971-1994

	Model Specifications					
	1	2	3	4	5	6
Distance	0.0020#	-0.0003	-0.0003	-0.0004	-0.0003	-0.0003
	(0.0011)	(0.0011)	(0.0011)	(0.0010)	(0.0011)	(0.0009)
Exchange Rate Volatility		1.3494**	1.4751**	1.4419**	1.3437**	1.5533**
		(0.1987)	(0.1878)	(0.1947)	(0.1898)	(0.1879)
$APCM_{i,j}^{k}$			0.0055			0.0117**
			(0.0036)			(0.0040)
$VPCM_{i,j}^{k}$				0.0126**		0.0243**
				(0.0041)		(0.0062)
$CPCM_{i,j}^{k}$					0.0052	0.0404
					(0.0730)	(0.0795)
Adjusted R^2	0.4164	0.4895	0.4905	0.5339	0.4878	0.5927

Notes: The estimation results of equation (9) using the data under ISIC Revision 2 are presented. The sample consists of Belgium, Canada, Denmark, Finland, Italy, Japan, Netherlands, Norway, and the U.K The sample period is 1971-1994. For all specifications, both country dummy and sector dummy variables are included. Heteroskedasticity-robust standard errors (White, 1980) are provided in parentheses. ** and * indicate statistical significance at, respectively, the 1% and 5% levels. See the text for definitions of the variables.

Table C1-2. The Results of the Cross-Country Relative Price Volatility Regression: 9-Country Sample under the ISIC Revision 2, 1971-1994

	Model Specifications					
	7	8	9	10	11	12
Distance	-0.0011	-0.0007	-0.0002	-0.0010	-0.0007	-0.0005
	(0.0011)	(0.0009)	(0.0009)	(0.0011)	(0.0011)	(0.0014)
Exchange Rate Volatility	1.4828**	1.5377**	1.7004**	1.7009**	1.5275**	1.7963**
	(0.1944)	(0.1880)	(0.2175)	(0.2281)	(0.1943)	(0.2758)
$APCM_{i,j}^{k}$	0.0118**	0.0116**	0.0109**	0.0105*	0.0116**	0.0100*
	(0.0040)	(0.0040)	(0.0040)	(0.0041)	(0.0040)	(0.0041)
$VPCM_{i,j}^{k}$	0.0243**	0.0242**	0.0240**	0.0238**	0.0242**	0.0236**
	(0.0061)	(0.0062)	(0.0062)	(0.0061)	(0.0061)	(0.0061)
$CPCM_{i,j}^{k}$	0.0329	0.0351	0.0503	0.0445	0.0389	0.0541
	(0.0790)	(0.0795)	(0.0787)	(0.0778)	(0.0785)	(0.0762)
Adjacency	-0.0037#			-0.0017		0.0037
	(0.0020)			(0.0025)		(0.0042)
Language		-0.0034*		-0.0036#		-0.0059*
		(0.0015)		(0.0021)		(0.0025)
Sea			-0.0022	-0.0029#		-0.0035#
			(0.0016)	(0.0017)		(0.0020)
EEC					-0.0003	0.0002
					(0.0021)	(0.0024)
EFTA					-0.0039	-0.0072#
					(0.0025)	(0.0043)
Adjusted R^2	0.5947	0.5950	0.5934	0.5967	0.5925	0.5965

Notes: The estimation results of equation (9) using the data under ISIC Revision 2 are presented. The sample consists of Belgium, Canada, Denmark, Finland, Italy, Japan, Netherlands, Norway, and the U.K The sample period is 1971-1994. For all specifications, both country dummy and sector dummy variables are included. Heteroskedasticity-robust standard errors (White, 1980) are provided in parentheses. ** and * indicate statistical significance at, respectively, the 1% and 5% levels. See the text for definitions of the variables.

Table C1-3. The Results of the Inflation Differential Variability Regression: 9-Country Sample under the ISIC Revision 2, 1971-1994

	Model Specifications					
	1	2	3	4	5	6
Distance	0.0002	0.0002	0.0000	0.0001	0.0001	0.0000
	(0.0007)	(0.0008)	(0.0008)	(0.0007)	(0.0008)	(0.0006)
Exchange Rate Volatility		-0.0099	0.0902	0.0777	0.0560	0.2096#
		(0.1529)	(0.1279)	(0.1438)	(0.1330)	(0.1199)
$APCM_{i,j}^{k}$			0.0012			0.0067*
			(0.0026)			(0.0029)
$VPCM_{i,j}^{k}$				0.0120**		0.0198**
				(0.0032)		(0.0052)
$CPCM_{i,j}^{k}$					-0.0616	-0.0440
					(0.0633)	(0.0622)
Adjusted R^2	0.5066	0.5050	0.4756	0.5780	0.5079	0.6151

Notes: The estimation results of equation (11) using the data under ISIC Revision 2 are presented. The sample consists of Belgium, Canada, Denmark, Finland, Italy, Japan, Netherlands, Norway, and the U.K The sample period is 1971-1994. For all specifications, both country dummy and sector dummy variables are included. Heteroskedasticity-robust standard errors (White, 1980) are provided in parentheses. ** and * indicate statistical significance at, respectively, the 1% and 5% levels. See the text for definitions of the variables.

Table C1-4. The Results of Exchange Rate Change – Inflation Differential Covariance Regression: 9-Country Sample under the ISIC Revision 2, 1971-1994

	Model Specifications					
	1	2	3	4	5	6
Distance	0.0000	0.0003	0.0002	0.0003	0.0002	0.0002
	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)
Exchange Rate Volatility		-0.1796**	-0.1924**	-0.1820**	-0.1438**	-0.1718**
		(0.0491)	(0.0528)	(0.0505)	(0.0515)	(0.0556)
$APCM_{i,j}^{k}$			-0.0021*			-0.0025**
			(0.0008)			(0.0009)
$VPCM_{i,j}^{k}$				-0.0003		-0.0022*
				(0.0007)		(0.0009)
$CPCM_{i,j}^{k}$					-0.0334**	-0.0422*
					(0.0107)	(0.0165)
Adjusted R^2	0.1301	0.1605	0.1797	0.1585	0.1761	0.2098

Notes: The estimation results of equation (12) using the data under ISIC Revision 2 are presented. The sample consists of Belgium, Canada, Denmark, Finland, Italy, Japan, Netherlands, Norway, and the U.K The sample period is 1971-1994. For all specifications, both country dummy and sector dummy variables are included. Heteroskedasticity-robust standard errors (White, 1980) are provided in parentheses. ** and * indicate statistical significance at, respectively, the 1% and 5% levels. See the text for definitions of the variables.

Table C1-5. The Results of Exchange Rate Change – Inflation Differential Covariance Regression: 9-Country Sample under the ISIC Revision 2, 1971-1994

	Model Specifications					
	7	8	9	10	11	12
Distance	0.0004	0.0003	0.0001	0.0004	0.0002	0.0002
	(0.0003)	(0.0002)	(0.0002)	(0.0003)	(0.0002)	(0.0003)
Exchange	-0.1501**	-0.1673**	-0.2197**	-0.2182**	-0.1658**	-0.2541**
Rate	(0.0571)	(0.0555)	(0.0673)	(0.0702)	(0.0571)	(0.0818)
Volatility						
$APCM_{i,j}^{k}$	-0.0025**	-0.0024**	-0.0022*	-0.0021*	-0.0024**	-0.0019*
	(0.0009)	(0.0009)	(0.0009)	(0.0009)	(0.0009)	(0.0009)
$VPCM_{i,j}^{k}$	-0.0022*	-0.0022*	-0.0021*	-0.0020*	-0.0022*	-0.0020*
	(0.0010)	(0.0009)	(0.0009)	(0.0009)	(0.0009)	(0.0009)
$CPCM_{i,j}^{k}$	-0.0399*	-0.0407*	-0.0455**	-0.0436**	-0.0421*	-0.0473**
	(0.0074)	(0.0164)	(0.0164)	(0.0164)	(0.0166)	(0.0169)
Adjacency	0.0011*			0.0005		-0.0011
	(0.0005)			(0.0006)		(0.0010)
Language		0.0009*		0.0010[#]		0.0017*
		(0.0004)		(0.0005)		(0.0006)
Sea			0.0007	0.0009[#]		0.0011[#]
			(0.0004)	(0.0005)		(0.0005)
EEC					-0.0000	-0.0002
					(0.0006)	(0.0006)
EFTA					0.0012*	0.0022*
					(0.0006)	(0.0011)
Adjusted R^2	0.2148	0.2144	0.2124	0.2201	0.2103	0.2207

Notes: The estimation results of equation (12) using the data under ISIC Revision 2 are presented. The sample consists of Belgium, Canada, Denmark, Finland, Italy, Japan, Netherlands, Norway, and the U.K The sample period is 1971-1994. For all specifications, both country dummy and sector dummy variables are included. Heteroskedasticity-robust standard errors (White, 1980) are provided in parentheses. ** and * indicate statistical significance at, respectively, the 1% and 5% levels. See the text for definitions of the variables.

Table C2-1. The Results of the Cross-Country Relative Price Volatility Regression: 9-Country Sample under the ISIC Revision 3, 1971-1998

	Model Specifications					
	1	2	3	4	5	6
Distance	0.0015*	0.0002	0.0000	0.0002	0.0003	0.0002
	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)
Exchange Rate Volatility		1.3586**	1.4037**	1.3828**	1.3437**	1.3922**
		(0.1429)	(0.1782)	(0.1415)	(0.1440)	(0.1804)
$APCM_{i,j}^{k}$			-0.0035			0.0016
			(0.0029)			(0.0034)
$VPCM_{i,j}^{k}$				0.0083**		0.0101**
				(0.0022)		(0.0029)
$CPCM_{i,j}^{k}$					0.1097*	0.1136*
					(0.0554)	(0.0524)
Adjusted R^2	0.6082	0.6764	0.7152	0.6880	0.6807	0.7329

Notes: The estimation results of equation (9) using the data under ISIC Revision 3 are presented. The sample consists of Belgium, Canada, Denmark, Finland, Italy, Japan, Netherlands, Norway, and the U.K The sample period is 1971-1998. For all specifications, both country dummy and sector dummy variables are included. Heteroskedasticity-robust standard errors (White, 1980) are provided in parentheses. ** and * indicate statistical significance at, respectively, the 1% and 5% levels. See the text for definitions of the variables.

Table C2-2. The Results of the Cross-Country Relative Price Volatility Regression: 9-Country Sample under the ISIC Revision 3, 1971-1998

	Model Specifications					
	7	8	9	10	11	12
Distance	0.0001	0.0000	0.0002	0.0003	-0.0007	-0.0004
	(0.0007)	(0.0006)	(0.0006)	(0.0007)	(0.0008)	(0.0008)
Exchange Rate Volatility	1.3887**	1.3605**	1.4505**	1.4080**	1.4314**	1.4418**
	(0.1865)	(0.1966)	(0.1882)	(0.1995)	(0.1743)	(0.1859)
$APCM_{i,j}^{k}$	0.0016	0.0016	0.0015	0.0015	0.0014	0.0014
	(0.0034)	(0.0034)	(0.0034)	(0.0034)	(0.0034)	(0.0035)
$VPCM_{i,j}^{k}$	0.0101**	0.0102**	0.0099**	0.0099**	0.0097**	0.0096**
	(0.0029)	(0.0029)	(0.0029)	(0.0029)	(0.0029)	(0.0030)
$CPCM_{i,j}^{k}$	0.1134*	0.1142*	0.1111*	0.1136*	0.1227*	0.12361*
	(0.0530)	(0.0526)	(0.0526)	(0.0533)	(0.0521)	(0.0533)
Adjacency	-0.0002			0.0021		0.0027
	(0.0027)			(0.0032)		(0.0033)
Language		-0.0010		-0.0025		-0.0029
		(0.0014)		(0.0016)		(0.0019)
Sea			-0.0020#	-0.0022*		-0.0018*
			(0.0010)	(0.0011)		(0.0016)
EEC					-0.0024#	-0.0023
					(0.0014)	(0.0015)
EFTA					-0.0028	-0.0003
					(0.0020)	(0.0030)
Adjusted R^2	0.7319	0.7323	0.7348	0.7340	0.7350	0.7342

Notes: The estimation results of equation (9) using the data under ISIC Revision 3 are presented. The sample consists of Belgium, Canada, Denmark, Finland, Italy, Japan, Netherlands, Norway, and the U.K The sample period is 1971-1998. For all specifications, both country dummy and sector dummy variables are included. Heteroskedasticity-robust standard errors (White, 1980) are provided in parentheses. ** and * indicate statistical significance at, respectively, the 1% and 5% levels. See the text for definitions of the variables.

Table C2-3. The Results of the Inflation Differential Variability Regression: 9-Country Sample, under the ISIC Revision 3, 1971-1998

	Model Specifications					
	1	2	3	4	5	6
Distance	0.0006	0.0004	0.0002	0.0004	0.0004	0.0004
	(0.0004)	(0.0004)	(0.0003)	(0.0004)	(0.0004)	(0.0004)
Exchange Rate Volatility		0.2108#	-0.0065	0.2374*	0.2089#	0.2225#
		(0.1242)	(0.0355)	(0.1206)	(0.1257)	(0.1231)
$APCM_{i,j}^{k}$			-0.0083**			-0.0042#
			(0.0019)			(0.0022)
$VPCM_{i,j}^{k}$				0.0091**		0.0080**
				(0.0018)		(0.0021)
$CPCM_{i,j}^{k}$					0.0142	-0.0014
					(0.0504)	(0.0456)
Adjusted R^2	0.5835	0.5856	0.7106	0.6147	0.5846	0.7288

Notes: The estimation results of equation (11) using the data under ISIC Revision 2 are presented. The sample consists of Belgium, Canada, Denmark, Finland, Italy, Japan, Netherlands, Norway, and the U.K The sample period is 1971-1998. For all specifications, both country dummy and sector dummy variables are included. Heteroskedasticity-robust standard errors (White, 1980) are provided in parentheses. ** and * indicate statistical significance at, respectively, the 1% and 5% levels. See the text for definitions of the variables.

Table C2-4. The Results of Exchange Rate Change – Inflation Differential Covariance Regression: 9-Country Sample under the ISIC Revision 3, 1971-1998

	Model Specifications					
	1	2	3	4	5	6
Distance	0.0000	0.0001	0.0001	0.0001	0.0000	0.0001
	(0.0002)	(0.0002)	(0.0002)	(0.0003)	(0.0002)	(0.0002)
Exchange Rate Volatility		-0.0738	-0.1071#	-0.0726	-0.0674	-0.0848
		(0.0448)	(0.0564)	(0.0450)	(0.0448)	(0.0571)
$APCM_{i,j}^{k}$			-0.0024**			-0.0029**
			(0.0008)			(0.0011)
$VPCM_{i,j}^{k}$				0.0004		-0.0010
				(0.0005)		(0.0010)
$CPCM_{i,j}^{k}$					-0.0477*	-0.0575**
					(0.0160)	(0.0172)
Adjusted R^2	0.1336	0.1373	0.1524	0.1356	0.1646	0.1935

Notes: The estimation results of equation (12) using the data under ISIC Revision 2 are presented. The sample consists of Belgium, Canada, Denmark, Finland, Italy, Japan, Netherlands, Norway, and the U.K The sample period is 1971-1998. For all specifications, both country dummy and sector dummy variables are included. Heteroskedasticity-robust standard errors (White, 1980) are provided in parentheses. ** and * indicate statistical significance at, respectively, the 1% and 5% levels. See the text for definitions of the variables.

Table C2-5. The Results of Exchange Rate Change – Inflation Differential Covariance Regression; 9-Country Sample under the ISIC Revision 3, 1971-1998

	Model Specifications					
	7	8	9	10	11	12
Distance	0.0001	0.0001	0.0000	0.0000	0.0004#	0.0001
	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)
Exchange Rate Volatility	-0.0821	-0.0702	-0.1246*	-0.1019#	-0.0964#	-0.1246*
	(0.0587)	(0.0618)	(0.0580)	(0.0612)	(0.0543)	(0.0570)
$APCM_{i,j}^{k}$	-0.0029**	-0.0029**	-0.0028**	-0.0028**	-0.0029*	-0.0028*
	(0.0011)	(0.0011)	(0.0010)	(0.0011)	(0.0011)	(0.0011)
$VPCM_{i,j}^{k}$	-0.0010	-0.0010	-0.0008	-0.0008	-0.0009	-0.0007
	(0.0010)	(0.0010)	(0.0009)	(0.0010)	(0.0010)	(0.0010)
$CPCM_{i,j}^{k}$	-0.0574**	-0.0578**	-0.0558**	-0.0570**	-0.0606**	-0.0595**
	(0.0172)	(0.0172)	(0.0165)	(0.0167)	(0.0166)	(0.0165)
Adjacency	0.0002			-0.0009		-0.0014
	(0.0002)			(0.0008)		(0.0009)
Language		0.0004		0.0012*		0.0015*
		(0.0004)		(0.0005)		(0.0006)
Sea			0.0013**	0.0015**		0.0017**
			(0.0003)	(0.0003)		(0.0005)
EEC					0.0008*	0.0006
					(0.0004)	(0.0004)
EFTA					0.0013*	-0.0009
					(0.0005)	(0.0008)
Adjusted R^2	0.1907	0.1930	0.2327	0.2372	0.2074	0.2399

Notes: The estimation results of equation (12) using the data under ISIC Revision 2 are presented. The sample consists of Belgium, Canada, Denmark, Finland, Italy, Japan, Netherlands, Norway, and the U.K The sample period is 1971-1998. For all specifications, both country dummy and sector dummy variables are included. Heteroskedasticity-robust standard errors (White, 1980) are provided in parentheses. ** and * indicate statistical significance at, respectively, the 1% and 5% levels. See the text for definitions of the variables.

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