


One Market, One Money: Evidence from Canada–United States Economic Integration

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1. INTRODUCTION

 ONE market, one money, is a simple but accurate way to describe the predominant political view of the European economic integration process. On the east side of the Atlantic Ocean, monetary integration has long been perceived as the natural complement to trade integration (Commission of the European Communities, 1990). The trade integration process started in the early 1950s. The first European attempts toward greater exchange rate stability followed immediately upon the collapse of the Bretton Woods system with the currency ‘snake’ in 1972 and the European Monetary System (EMS) in 1979. This process culminated in 1999 with the adoption of a common European currency, the euro. Separate currencies were seen as the last major impediment to the free exchange of goods among European trading partners. On the west side of the Atlantic, however, this view has rarely prevailed. Despite the fact that the trade integration process goes back as far as the 1965 Auto Pact and was given momentum by the 1989 Canada–US Free Trade Agreement (FTA), Canada has always maintained a flexible exchange rate regime with its principal trading partners during most of the period. The political will for monetary integration does not appear any stronger now than it was 40 years ago.^{1,2}

¹ This diagnosis is also shared by Eichengreen and Taylor (2003). The authors emphasise the role of political factors in explaining the lack of willingness for a North American monetary union.

² The adoption of a common currency in Europe has, however, raised concerns among economists in Canada about the desirability of a flexible exchange rate system. This in turn has induced a renewed interest in a monetary union between Canada and the United States (Courchene and Harris, 1999; and Beine and Coulombe, 2003).

In this paper, we verify empirically whether these opposing views from both sides of the Atlantic can be explained using economics. We rely on recent developments in the optimum currency area (OCA) theory. Since the seminal contribution of Mundell (1961), economists have studied the desirability of exchange rate stability and monetary unions across a set of countries, using the framework of the OCA approach. The traditional OCA theory placed an emphasis on a set of criteria to assess the benefits and costs of implementing a monetary union. Since the mid-1990s, the view regarding optimum currency areas has shifted to the issue of the endogeneity of OCA properties. Due to the decrease in transaction costs, trade and monetary integration processes might affect the OCA criteria and thus the net gains flowing from adopting a common currency. In other words, the evolution of the OCA properties, together with the increased degree of integration, implies a discrepancy between the *ex post* and the *ex ante* assessment of a currency union. For example, the net benefit of keeping a flexible exchange rate regime might increase with the trade integration process if the trading partners experience diverging industrial structures. If this scenario is correct, the new OCA approach might rationalise the lack of interest of North American leaders in the monetary integration process. However, the relevance of this scenario remains to be assessed; this is the primary aim of this paper.

Traditional OCA criteria are the degree of labour mobility, the degree of openness (McKinnon, 1963), and the similarity in industrial structures (Kenen, 1969). Subsequent literature has also emphasised new criteria such as the degree of financial integration and the existence of a fiscal transfer system among the member countries. While the degree of these criteria's operational properties has been questioned, the degree of asymmetric shocks or the extent of business cycle desynchronisation provides somewhat of a 'catch-all' criterion. Exchange rate adjustments are indeed called for in the presence of asymmetric shocks between the two countries. This measure has therefore been used extensively in numerous empirical studies (Bayoumi and Eichengreen, 1994, among others).

Quite recently, economists have been increasingly concerned about the endogenous nature of the OCA criteria (Mongelli, 2002; De Grauwe, 2003; and De Grauwe and Mongelli, 2004). The new economic geography literature provides a useful theoretical framework with which to tackle the relationship between the degree of asymmetric shocks and a deeper economic and financial integration. There are, however, two basic opposing views about the nature of this relationship. Krugman (1993) posits that the decrease in transaction costs leads to an increase in the degree of specialisation of member countries. This in turn magnifies the impact of idiosyncratic shocks, increasing the *ex post* costs of a monetary union between members. Frankel and Rose (1997 and 1998) have challenged this view by showing that increased integration between countries leads to greater correlation of the economic fluctuations.

In this paper, we take a new approach to assessing the relationship between trade integration and the OCA criteria. We focus on the evolution of the share of intra-industry trade (IIT) between Canadian provinces and the United States. We trace this evolution through the trade integration process that has existed since 1980 between Canada and the United States and through the use of variables that capture exchange rate developments. The relevance of this original approach is based on the first stylised fact unveiled in this paper, i.e., the share of IIT across the Canadian provinces is highly correlated with the degree of the provinces' business cycle correlation with the United States. We argue that focusing on the evolution of IIT rather than on the correlation of business cycles has two advantages. First, it sheds light on the driving mechanism that links trade openness and business cycle correlation. Second, the time dimension of the IIT can capture the dynamic effects of integration more accurately. Thus, investigating the evolution of IIT can shed light to some extent on the factors that improve or worsen the conditions necessary for a successful monetary union. From the results, we conclude that the real integration process between Canada and the United States, which was amplified by the FTA, has increased the share of IIT between the Canadian provinces and the United States. Canada therefore might now be closer to an optimum currency area with the United States than it was 25 years ago. Consequently, the evolution of OCA criteria cannot explain the prevailing political scepticism on further exchange rate stability. We explore other explanations in the last part of the paper.

The paper is organised as follows. Section 2 offers a brief review of the debate over monetary integration. It also stresses the importance of assessing how the share of IIT has evolved between Canada and the United States and thus clarifies the nature of our contribution. Section 3 outlines our analysis of the IIT evolution between Canada and the United States. Section 4 reports the results of the econometric study and draws the policy implications of the findings. Section 5 concludes.

2. MONETARY INTEGRATION AND INTRA-INDUSTRY TRADE

a. The Endogeneity of the OCA Criteria

The theory of the optimum currency area (OCA) has long been the usual approach for assessing the desirability of adopting a common currency. OCA criteria have been used extensively to investigate the advantages and disadvantages of the monetary integration process in Europe.³ While the traditional criteria developed by the OCA approach have been considered, most empirical studies

³ See Beine (1999), Mongelli (2002) and De Grauwe (2003) for surveys on this topic.

focused on the degree of asymmetric shocks among prospective members to assess the net costs resulting from the loss of the bilateral exchange rate as a stabilisation instrument. Indeed, a high degree of similarity in shocks (or, to put it differently, a high correlation between national cycles) lessens the need for bilateral exchange rate adjustments. This criterion has been used to investigate the European case (Bayoumi and Eichengreen, 1993, among others) as well as the North American (Beine and Coulombe, 2003), employing a variety of econometric techniques to measure the synchronisation of economic fluctuations.

As emphasised by Mongelli (2002) and De Grauwe and Mongelli (2004), the OCA properties are likely to be endogenous, that is, they might evolve as a result of deeper real and/or monetary integration. This point is of utmost importance because this endogeneity implies that the *ex ante* (before the implementation of the currency union) assessment of a monetary union might be quite different from the *ex post* evaluation (after the implementation of the currency union). In this respect, two opposite views have emerged in the literature.

The initial position – the so-called Krugman's view – states there is a positive relationship between trade integration and specialisation of production. This paradigm posits that the adoption of a common currency leads to an increasing degree of specialisation at the country or regional levels due to decreased trade costs. The new economic geography approach (Krugman, 1991) is the basis for the paradigm. It is supported by factual evidence of how Massachusetts' economic structure evolved (Krugman, 1993). In the long run, such a process results in a decreased correlation of national economic cycles. As argued recently by Kalemli-Ozcan et al. (2001), this real effect might also be amplified by financial integration between countries.⁴

Krugman's view has, however, been questioned by a number of authors such as Frankel and Rose (1997 and 1998). Frankel and Rose (1997) argue that the integration process should tend to increase the correlation of economic fluctuations between the partner countries if the integration process favours the exchange of different varieties of similar goods. According to this view, the lowering of trade costs results in an increase in the share of intra-industry trade (as opposed to inter-industry trade) between the integrated economies. In turn, the increase in trade flow allows demand shocks to be spread more easily across member countries, bringing about an increase in the correlation of economic cycles. The evidence favouring this view has been provided by Frankel and Rose (1997 and

⁴ We do not tackle the issue of the relationship between financial integration and business cycle correlation, however interesting. Nonetheless, we think that over the period under investigation, the trade integration process was by far the most important phenomenon and that financial integration between Canada and the United States has not evolved significantly over time. We leave that for future work.

1998) themselves and also by other authors such as Artis and Zhang (1999) among others. However, Frankel and Rose (1997 and 1998) consider a relationship between trade and the correlation of cycles. Since the investigated relationship is obviously of a reduced-form nature (as opposed to a structural relationship), they conjecture that the estimated impact comes from the variation of IIT driven by the integration process.

The issue of endogeneity of OCA properties is very important when assessing the desirability of a common currency between Canada and the United States. These two countries have gone through an extensive process of trade integration since 1980, a process accelerated by the FTA. Between 1988 and 1999, the international trade share in Canada (exports plus imports over GDP) increased from 0.53 to 0.82.⁵ A significant part of this increase was triggered by the striking decrease in the tariffs between the two trading partners.⁶ Because of the endogeneity of OCA properties, Canada might be much closer to fulfilling OCA criteria now than it was prior to the FTA. Some authors (Courchene and Harris, 1999; Harris, 2000; and Beine and Coulombe, 2003) have recently scrutinised the desirability of Canada–US monetary integration. These studies, while producing interesting insights, nevertheless fail to address the endogeneity issue. This paper aims at filling this gap by investigating the dynamics of the share of intra-industry trade between the Canadian provinces and the United States.

b. The Dynamics of IIT Between Canadian Provinces and the United States

Investigating how the correlation between economic cycles evolved is made difficult by the econometric complexity of capturing the degree of co-movement of economic fluctuations. Beine and Coulombe (2003) nevertheless attempted to carry out such an analysis by using rolling correlations of economic cycles. More precisely, the authors study the evolution of the correlation rolling over sub-periods of one year (four quarters), starting from the correlation between Canadian provincial cycles and the US cycle computed over an initial sub-period (1960–1980). While interesting, this procedure suffers from many weaknesses including the dependency over time of the correlations and the use of overlapping observations. Basically, these weaknesses flow from the fact that a correlation coefficient has to be measured from a relatively large number of observations and

⁵ Refer to Coulombe (2004) for an analysis of the causes and consequences of the increase in Canada's international trade share.

⁶ Coulombe (2004) finds that the estimated trade elasticity to tariffs lies between 9 and 11.5 over the 1981–1998 period. Beine and Coulombe (2004) show that a significant part of the reduction in the trade-weighted tariffs occurred before the implementation of the FTA, stressing the need to include a pre-FTA period in the statistical analysis.

the total number of observations at hand is limited. In this paper, we use an alternative approach: we investigate the evolution of the share of intra-industry trade between Canadian provinces and the United States over a period that is characterised by a strong increase in the degree of integration between Canada and the United States (1980–1998). Following Beine and Coulombe (2004), we use the regional (provincial) dimension, which allows the information set to be multiplied by combining the cross-sectional and the time-series information.

To assess the relevance of our approach, we first document the relationship between the share of IIT and the degree of cycle correlation. IIT occurs when two trading partners exchange different varieties of similar products. IIT thus differs from inter-industry trade that involves the trade of products of a different nature. The share of IIT between two economies reflects the extent to which the production structure between the two trading partners is similar. In this respect, IIT might be viewed as a direct way of measuring the similarity in production structures, which is one of the main OCA criteria put forward by Kenen (1969). In turn, similar export structures produce a similar exposure to external shocks and are therefore thought to lead to more correlated business cycles. The share of IIT, instead of using measures of cycle synchronisation that are defined over a particular period, exhibits a time-series dimension since it can be measured for just one point in time. Investigating its dynamics therefore allows us to study the evolution of the OCA properties over time in relation to the increase in the degree of trade integration between Canada and the United States.

We next compute the cross-correlation between the average level of the IIT shares for the 10 Canadian provinces with the United States and the level of the correlation between the corresponding provincial cycle and the US one. The share of IIT is computed as usual using the Grubel-Lloyd index. We use a high level of sectorial desegregation, namely the SIC 4 level, involving 290 and 213 sectors for the all-sectors and the manufacturing cases respectively.

At the national level, the share of IIT between Canada and the United States obviously increased over the period from 1980 to 2001 (see Figure 1). This means that, on the whole, Canada and the United States tended to trade an increasing share of similar goods. This pattern is clear for the manufacturing sector but is also true for the all-sectors case that includes trade in primary products. For the purposes of the econometric investigation, the index is also computed separately from the bilateral flows (imports and exports) between each Canadian province and the United States, observed at a sectorial level. We also computed, from annual data for the 10 provinces, the average level of the Grubel-Lloyd index across time for the 1980–2001 period. The average levels confirm the high degree of heterogeneity of Canadian provinces with respect to the nature of the trade structure. It varies from about six per cent (proportion of IIT) for provinces such as Newfoundland and Prince Edward Island to about 59 per cent for Ontario.

FIGURE 1
Evolution of Intra-industry Trade Between the Canadian Provinces and the United States,
Mean Level

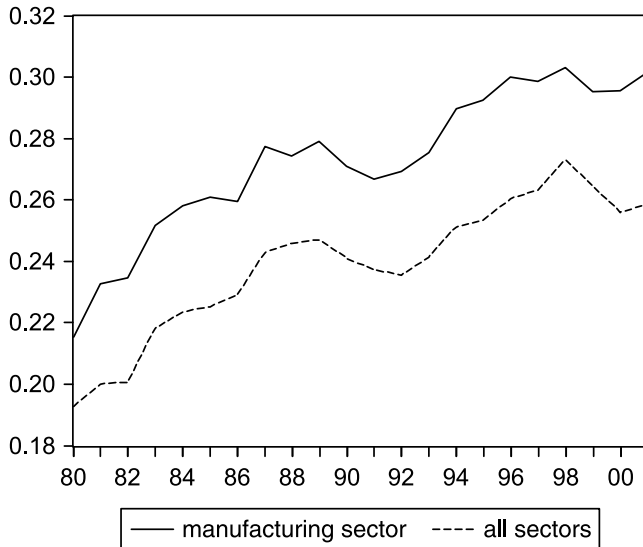
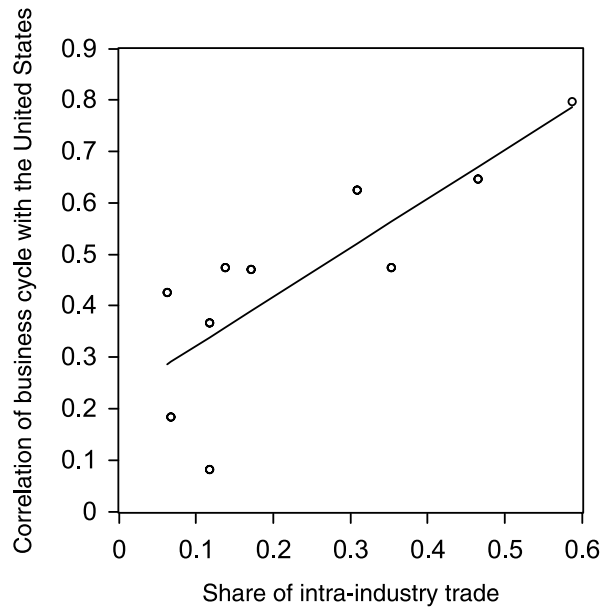


Figure 2 relates the mean Grubel-Lloyd indexes to the cycle's correlations of Canadian provinces with the United States over the 1960–2000 period. These correlations are extracted from Beine and Coulombe (2003).⁷ We also use the correlations computed for the 1980–2000 period that matches our period of definition of the Grubel-Lloyd indexes and get very similar results. The positive association between the Grubel-Lloyd index and the correlation of business cycles is striking, as is seen in Figure 2. We find the correlation between the Grubel-Lloyd indexes and the synchronisation of cycles amounts to 0.73 and 0.81 depending on the sample used to compute this latter measure. The high degree of these correlations suggests that the similarity of trade structure as measured by IIT is highly related to the correlation of economic cycles between trading partners. With the similarity of traded goods, demand shocks can be spread equally across countries, increasing the correlation of economic fluctuations. But it should be noted that these preliminary measures are computed from a very small number of observations (10 data points) directly related to the number of Canadian provinces. In the rest of the paper, we aim at investigating the

⁷ Beine and Coulombe (2003) use two types of filters to extract the economic cycles, namely the HP filter (using different values of the smoothing parameter) as well as the band-pass filter. We compute here the correlation between cycles using the HP filters with a smoothing parameter equal to 1,600 (the usual value chosen when treating quarterly data).

FIGURE 2
Business Cycle Correlation and Intra-industry Trade Between the 10 Canadian Provinces and the United States



evolution of the IIT over time and across provinces and relating such evolution to the surge in the trade integration with the United States.

Another important argument for studying the evolution of the share of IIT in the context of the monetary arrangements between countries is related to the potential negative impact of exchange rate volatility on trade. As emphasised by Eichengreen and Taylor (2003), trade volumes are much more sensitive to exchange rate fluctuations when the partner countries trade mostly in similar products. This was an important point in favour of the European monetary unification since many European countries tended to exchange differentiated products (see Fontagné and Freudenberg, 1999, among others). Similarly, in the case of a high proportion of IIT, the economies of the trading partners are much more affected by ‘beggar-thy-neighbour’ type of policies, i.e., active exchange rate management aimed at weakening the domestic currency with respect to those of the trading partners. Therefore, patterns of increasing degrees of IIT imply either increasing costs of keeping a flexible exchange rate with your principal trading partner or an increasing exposure to risks related to large swings in the bilateral exchange rates. The constant complaints of Canadian manufacturing exporters about the appreciation of the Canadian currency *vis-à-vis* its US counterpart – such as that observed since the beginning of 2004 – reflect the perceived high degree of sensitivity to exchange rate volatility.

3. THE ECONOMETRIC ANALYSIS

a. Combining Cross-sectional and Time-series Information

We study the interaction between the share of the IIT and the trade integration process between Canada and the United States. Following Beine and Coulombe (2004), we conduct the analysis at the provincial level. This approach stems from the fact that detailed Canadian trade data are available on a yearly basis since 1980 and that, as emphasised in our earlier paper, the Canadian provincial economies are heterogeneous with respect to various dimensions related to the trade integration process. First, the provinces vary greatly in both the nature of their trade flows (as documented by the different values of the Grubel and Lloyd measures) and the size of the bilateral trade flows with the United States. Second, the Canadian provinces, because of the difference in their economic structures, face a different integration process with the United States. This is clearly documented in Beine and Coulombe (2004) showing the different dynamics in the provincial trade-weighted tariffs. Provinces that are highly specialised in the production of primary products (on which there were almost no tariffs in 1980) – such as Alberta and Saskatchewan – were already quite integrated. This is in contrast to other provinces such as Newfoundland or Quebec that export goods initially relatively more protected by tariffs. The high degree of heterogeneity across Canadian provinces calls for combining the time-series and the cross-sectional information. This is done by estimating a dynamic panel data model that explains the evolution of the share of IIT of the 10 Canadian provinces over the 1980–1998 period. Note that the sample under study is limited by the availability of tariff data. This period, however, has been characterised by a strong increase in trade flows between Canada and the United States.

As in Beine and Coulombe (2004), we measure the intensity of trade integration through the evolution of the provincial trade-weighted tariffs with the United States. The trade-weighted tariffs are computed as the average tariff faced by a province given its export structure. Several comments are in order. First, initial tariff levels differ greatly across industries. Second, the tariffs decreased at different speeds over the full period, depending on the industry involved. Third, while the implementation of the FTA in 1989 brought about a strong decrease in bilateral tariffs, the lowering of these tariffs had begun well before that time. This implies that it is important to include the pre-FTA period in our investigation. Fourth, using trade-weighted tariffs as an independent variable in our empirical analysis ensures that our variable capturing the trade integration process is exogenous with respect to the Grubel and Lloyd measures. Other candidates, such as the bilateral trade flows used in other studies, are clearly endogenous variables. This method is important to ensure correct econometric estimates of the effects of the trade integration process.

b. The Econometric Model

We estimate the following dynamic panel data model

$$\begin{aligned} \Delta GL_{i,t} = & \alpha_i + \lambda GL_{i,t-1} + \rho \Delta GL_{i,t-1} + \beta \tau_{i,t-1} + \phi \Delta \tau_{i,t} + \delta_i |mis_i| \\ & + \kappa z_{i,t} + \theta z_t + [\pi t] + \varepsilon_{i,t} \end{aligned} \quad (1)$$

in which $GL_{i,t}$ is the log of the Grubel-Lloyd index capturing the share of intra-industry trade between the Canadian province i and the United States observed at time t ; Δ is the first-difference operator; $\tau_{i,t}$ is equal to the log of 1 plus the trade-weighted tariff of province i at time t ; $|mis_i|$ is the absolute value of the degree of the misalignment of the Canadian dollar exchange rate *vis-à-vis* the US dollar. The degree of misalignment is computed as the deviation of the exchange rate from the equilibrium exchange rate, assuming that the latter corresponds with the level of purchasing power parity. It should be emphasised that the model allows this degree of misalignment to exert asymmetric effects across provinces on the share of IIT. This asymmetric effect stems once again from the difference in economic structures across the Canadian provinces. The $z_{i,t}$ are control variables that vary both across provinces and over time. We have used the provincial cycles that were extracted from Beine and Coulombe (2003). The z_t variables capture controls that vary only over time. We have included the US cycle (also extracted from Beine and Coulombe, 2003) and the volatility of the Canadian-US dollar exchange rate, measured by the realised volatility computed from daily exchange rate returns. The effects of the z_t and $z_{i,t}$ variables are not reported in the following tables due to space constraints. However, it should be emphasised that the κ and the θ parameters were in general not found to be significantly different from zero in most regressions conducted in this study. Regression (1) also allows for the inclusion of time dummies (the πt term) in order to eliminate purely time-series effects common to all provinces. In this case, the z_t variables were not included in the set of controls.

The attractive feature of this econometric model is that it disentangles the short-run from the long-run effects of the trade integration process. The short-run effect of tariffs is given by the ϕ parameter while the long-run impact of openness is captured by the value of $(-\beta/\lambda)$.⁸ We distinguish between the all-sectors case and the manufacturing sector. The model is estimated using annual data from 1980–1998 for the all-sectors case and from 1980–1996 for the manufacturing case. In the two cases, the sample under study is limited by the availability of tariff data at the industry level.

⁸ Equation (1) is an error correction model (ECM) with the following structure:

$$\Delta GL_{i,t} = \lambda GL_{i,t-1} + \beta X_{i,t} + \rho \Delta GL_{i,t-1} + \phi \Delta X_{i,t}$$

where X is the vector of independent variables. When λ is negative, the dynamic system converges to a long-run equilibrium where $\Delta GL_{i,t} = \Delta GL_{i,t-1} = \Delta X_{i,t} = 0$ and $GL_{i,t} = GL_{i,t-1} = GL_i^*$, the long-run equilibrium. The long-run solution of the ECM is: $GL_i^* = -(\beta/\lambda)X_i^*$.

TABLE 1
Dynamics of Intra-industry Trade – Grubel-Lloyd (all sectors)

<i>Dependent variable: $\Delta \log(\text{GL}_{i,t})$</i>								
	<i>(1) GLS</i>		<i>(2) SUR</i>		<i>(3) GLS</i>		<i>(4) SUR</i>	
$\log(\text{GL}_{i,t-1})$	-0.306***	(0.050)	-0.395***	(0.041)	-0.367***	(0.052)	-0.660***	(0.050)
$\log(\text{TW}_{i,t-1})$	-2.035**	(1.021)	-2.620***	(0.692)	0.950	(2.009)	-6.638***	(1.273)
$\Delta \log(\text{TW}_{i,t})$	2.110	(3.743)	-3.781**	(1.567)	-3.702	(5.110)	-2.469	(1.673)
MA – AB _t	1.624**	(0.631)	1.722***	(0.632)	1.546***	(0.555)	1.876***	(0.582)
MA – BC _t	0.507***	(0.152)	0.592***	(0.177)	0.479***	(0.127)	0.606***	(0.186)
MA – MB _t	-0.071	(0.340)	-0.030	(0.332)	-0.076	(0.294)	-0.250	(0.297)
MA – NB _t	0.008	(0.447)	0.052	(0.557)	0.016	(0.407)	0.060	(0.061)
MA – NF _t	-1.143	(0.836)	-1.121	(1.110)	-1.266	(0.817)	-1.321	(1.033)
MA – NS _t	0.867	(0.650)	-0.875	(0.585)	-0.995	(0.606)	-1.041*	(0.605)
MA – ON _t	0.115	(0.157)	0.156	(0.172)	0.022	(0.202)	0.084	(0.184)
MA – PE _t	0.184	(1.157)	0.269	(1.215)	0.184	(1.287)	0.287	(1.408)
MA – QC _t	-0.454*	(0.235)	-0.441**	(0.180)	-0.453***	(0.159)	-0.809***	(0.148)
MA – SK _t	0.903**	(0.365)	1.047**	(0.462)	0.867**	(0.336)	1.312**	(0.592)
Long-run effect of tariffs	-6.65**		-6.63***		2.59		-10.06***	
R^2	0.291		0.246		0.299		0.147	
Adj. R^2	0.192		0.141		0.201		0.027	
S.E. of R	0.189		0.189		0.188		0.199	

Notes:

Sample: 1980–1998, 180 observations. All regressions include province fixed effects. Time dummies are also used in columns (3) and (4). Estimation techniques: iterated feasible generalised least-squares (GLS), seemingly unrelated regression (SUR). White heteroscedasticity standard errors are shown in parentheses. * = significant at the 10 per cent level; ** = significant at the 5 per cent level; *** = significant at the 1 per cent level. Provinces are Alberta (AB), British Columbia (BC), Manitoba (MB), New Brunswick (NB), Newfoundland (NF), Nova Scotia (NS), Ontario (ON), Prince Edward Island (PE), Quebec (QC) and Saskatchewan (SK).

4. RESULTS AND IMPLICATIONS FOR MONETARY INTEGRATION

Tables 1 and 2 present the results of regression of equation (1) for the all-sectors case and the manufacturing case respectively. In each table, four types of results are presented. Columns 1 and 2 (respectively, 3 and 4) report the results obtained without (respectively, with) the inclusion of the time dummies. Results in columns 1 and 3 are obtained using the iterated feasible general least-squares estimation method; results in columns 2 and 4 are obtained using the seemingly unrelated regressions approach.⁹

⁹ See Beine and Coulombe (2004) for a discussion of the properties of these techniques.

TABLE 2
Dynamics of Intra-industry Trade – Grubel-Lloyd (manufacturing sector)

<i>Dependent variable: $\Delta \log(\text{GL}_{i,t})$</i>								
	<i>(1) GLS</i>		<i>(2) SUR</i>		<i>(3) GLS</i>		<i>(4) SUR</i>	
$\log(\text{GL}_{i,t-1})$	-0.425***	(0.055)	-0.463***	(0.036)	-0.441***	(0.055)	-0.329***	(0.019)
$\log(\text{TW}_{i,t-1})$	-2.635***	(0.869)	-4.063***	(0.666)	-4.316**	(2.181)	-3.101***	(0.656)
$\Delta \log(\text{TW}_{i,t})$	0.671	(3.067)	-4.787***	(1.189)	-5.170	(3.771)	-10.855***	(0.844)
MA – AB _t	0.420	(0.666)	0.489	(0.797)	0.440	(0.626)	0.483	(0.777)
MA – BC _t	0.078	(0.200)	0.085	(0.225)	0.209	(0.231)	0.014	(0.320)
MA – MB _t	-0.243	(0.559)	-0.197	(0.433)	-0.220	(0.471)	-0.067	(0.375)
MA – NB _t	-0.275	(0.832)	-0.140	(1.031)	-0.224	(0.835)	-0.145	(1.107)
MA – NF _t	-0.956	(1.420)	-1.022	(1.715)	-1.004	(1.432)	-0.863	(-0.862)
MA – NS _t	-1.111	(1.014)	-1.043	(0.935)	-1.106	(0.969)	-1.188	(0.930)
MA – ON _t	0.223	(0.174)	0.262	(0.255)	0.207	(0.171)	0.171	(0.177)
MA – PE _t	3.419**	(1.463)	3.692**	(1.668)	3.549**	(1.452)	3.094	(1.662)
MA – QC _t	-0.737***	(0.252)	-0.682**	(0.277)	-0.708***	(0.247)	-0.613	(0.250)
MA – SK _t	0.911**	(0.456)	0.881*	(0.513)	0.811*	(0.424)	0.660	(0.453)
Long-run effect of tariffs	-6.20***		-8.78***		-9.79**		-9.43***	
R^2	0.325		0.295		0.340		0.265	
Adj. R^2	0.216		0.182		0.235		0.147	
S.E. of R	0.203		0.203		0.200		0.203	

Notes:

Sample: 1980–1996, 160 observations. All regressions include province fixed effects. Time dummies are also used in columns (3) and (4). Estimation techniques: iterated feasible generalised least-squares (GLS), seemingly unrelated regression (SUR). White heteroscedasticity standard errors are shown in parentheses. * = significant at the 10 per cent level; ** = significant at the 5 per cent level; *** = significant at the 1 per cent level. Provinces are Alberta (AB), British Columbia (BC), Manitoba (MB), New Brunswick (NB), Newfoundland (NF), Nova Scotia (NS), Ontario (ON), Prince Edward Island (PE), Quebec (QC) and Saskatchewan (SK).

a. Trade, IIT and the Endogeneity of OCA Criteria

The key point emerging from the analysis of Tables 1 and 2 is that the long-run effect of tariffs on the share of IIT is negative and significant, at least at the five per cent level, in seven regressions out of eight. These results lead us to conclude that there is a positive long-run relationship between trade integration (a decrease in trade costs) and the share of IIT in Canadian provinces. Depending on the regression method and the inclusion of time dummies, the long-run elasticity ranges between six and ten. This means that, on average, the decrease in the trade-weighted tariffs between Canada and the United States has brought about a significant increase in the share of intra-industry trade between the two countries. This result is consistent with the findings of Torstensson (1996), obtained for Sweden in 1989, documenting a negative relationship between IIT and trade barriers. The results shown in Table 2 suggest that this effect is robust in the

manufacturing sector. We nevertheless found the effect was less robust when the primary products are included in the analysis since the trade-weighted tariff variable is not significant for the regression in the third column of Table 1. This can be explained by the fact that primary products are more homogeneous and less subject to two-way trade. In various regression set-ups, insignificant results (and sometimes with the opposite sign) for the effect of tariff changes – as in column 3 of Table 1 – were found only when time dummies were entered in the all-sectors case. This suggests that the positive impact of the reduction of tariffs on the proportion of IIT found in this case (i.e., when time dummies are not introduced in the analysis, as in columns 1 and 2 of Table 1) might be driven by the general reduction over time of the tariffs common to all provinces. This effect is eliminated with the cross-sectional demeaning procedure associated with the introduction of time dummies.

On the whole, our results concur with the analysis of Frankel and Rose (1997 and 1998). Using a panel of 20 countries over 30 years, Frankel and Rose find that countries with closer trade links tend to have more correlated business cycles. As mentioned earlier, they nevertheless conjecture that this positive effect is driven by the increase in the proportion of IIT but do not test for it. Our findings support this conjecture. We find that the North American integration process tended to increase the share of IIT between Canada and the United States in the long run. This increase in the proportion of IIT tends in turn to make Canadian provincial economic cycles more correlated with the US cycle. To the extent that the degree of co-movement of cycles is the main criterion to determine whether adopting a common currency by separate countries is desirable, our results show that the North American trade integration process has improved the conditions under which the adoption of the US dollar by Canada becomes profitable. Whether such an adoption would actually become profitable still needs to be discussed further. However, this analysis suggests that Canada and the United States are closer today from an optimum currency area standpoint than they were 25 years ago. Our main results also suggest that, due to the increase in the share of IIT, international trade flows might have become more sensitive to fluctuations in the Canada–US dollar exchange rate. This is a major point given the importance of bilateral trade with the United States for the Canadian economy and the level of historical exchange rate volatility over the recent period. Briefly, our findings regarding the positive effect of the integration process on IIT suggest not only that the need for a flexible exchange rate regime has decreased but also that the costs induced by a floating exchange rate might have increased.

The adoption of a common currency by itself could also favour these conditions through further reducing trade costs between the two countries. The use of separate currencies whose values fluctuate against each other generates costs for domestic exporters and importers, for instance, in terms of price uncertainty. Anderson and van Wincoop (2004) discuss extensively the computation of tariff

equivalents for the use of separate and floating currencies. Their discussion suggests that a tariff equivalent with an average level of 14 per cent is a reasonable estimate of these currency barriers. These of course depend to a certain extent on the level of exchange rate volatility. However, the European experience during the 1980s suggests that even a low level of volatility in the exchange rate involves significant costs for the international exchange of goods and services. This point was a strong argument in favour of a common currency rather than the implementation of fixed exchange rates.¹⁰

Given that the implementation of the FTA in 1989 led to a decrease in tariffs of about two per cent on average, this means that adopting a common currency would trigger a significant additional reduction in trade costs. The additional specific impact of currency union on trade flows has also been studied by Rose (2000) who estimated that eliminating separate currencies tends to multiply trade volumes by a factor of three. While the subsequent literature has adopted other statistical approaches to account for potential weaknesses in this initial estimation, there is now a general consensus in favour of the strong effects of currency union on bilateral trade flows.¹¹ In this view, we can expect the adoption of a common currency between Canada and the United States would drive these two countries closer to an optimum currency area. In other terms, our findings suggest that while Canada and the United States do not necessarily form an OCA *ex ante*, they could become an OCA *ex post*.

b. The Impact of Misalignment

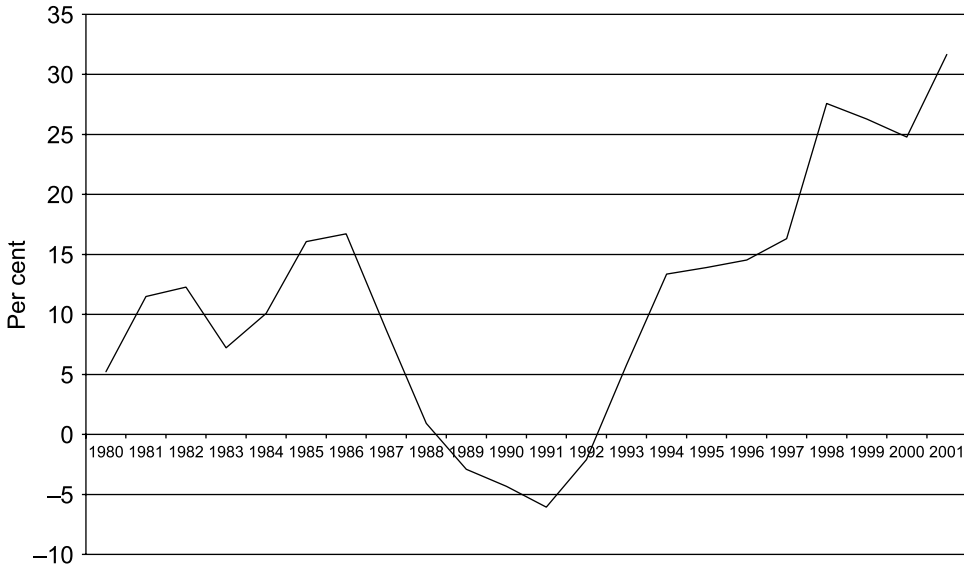
Another interesting result of our analysis is the asymmetric impact of the degree of misalignment of the Canadian dollar with the US dollar. This asymmetric effect is specific to the all-sectors case (Table 1), suggesting that the impact occurs with the variation of trade involving primary products. Interestingly, our estimation results suggest that an increase in the degree of misalignment of the exchange rate tends to increase the share of IIT for the three Western provinces of British Columbia, Alberta and Saskatchewan. These three provinces tend to specialise in the production and export of primary products (various types of mining for British Columbia; oil and gas for Alberta; grain, potash, oil and gas for Saskatchewan).

During our investigation period, estimates of the misalignment degree show the Canadian dollar was undervalued against the US dollar most of the time (see Figure 3). This means that using the absolute value of the misalignment leads

¹⁰ Another argument was that fixed exchange rates are subject to currency crises, like the ones observed in 1992 and 1993 for a subset of the currencies taking part in the European Monetary System.

¹¹ On this point, refer to Alesina, Barro and Tenreyro (2002).

FIGURE 3
Degree of Misalignment of the CAD-USD Exchange Rate



to roughly the same results as using the level itself. In other terms, our $|mis_t|$ variable captures the absolute degree of misalignment about as well as the degree of undervaluation of the Canadian dollar. The results of Table 1 suggest that a rise in the undervaluation of the Canadian currency leads to some substitution in the primary products exported and imported by the three Western provinces. In other terms, exchange rate developments might have brought about some trade diversion between Canadian provinces.¹²

It is significant that the previous effect of misalignment is observed only for a subset of provinces. Furthermore, there is some evidence that the opposite effect occurs in Quebec (a higher degree of misalignment leading to a lower share of IIT between Quebec and the United States). These results confirm that exchange rate developments exert asymmetric effects on the provincial economies in Canada. In this respect, the results are fully consistent with the conclusions of Beine and Coulombe (2003). Once again, this can be ascribed to the very high degree of heterogeneity of economic structures of Canadian provinces. This is the case, for instance, with respect to the share of primary products in the total provincial exports. To illustrate this point, Table 3 lists the ratio of primary to manufacturing exports from the Canadian provinces to the United States. The numbers in this

¹² Refer to Coulombe (2004) for an analysis of the relationship between international and intra-national trade in Canada. He defines the intra-national trade diversion as a rise in international trade at the expense of intra-national trade.

TABLE 3
Ratio of Primary to Manufacturing Exports to the United States of Canadian Provinces;
Average, 1980–2001

Alberta	2.512
British Columbia	0.136
Manitoba	0.258
New Brunswick	0.099
Newfoundland and Labrador	0.240
Nova Scotia	0.291
Ontario	0.013
Prince Edward Island	0.457
Quebec	0.041
Saskatchewan	3.131

Note:

Primary exports refer to SIC 4 industries with a 0 as the first number. Manufacturing refers to SIC 4 industries with either 1, 2 or 3 as the first number.

table illustrate well the huge cross-sectional variance of the ratio. Provinces' averages range from peaks of 3.131 and 2.512 for Saskatchewan and Alberta respectively to lows of 0.013 and 0.041 for Ontario and Quebec.

5. CONCLUSION: THE CHOICE OF AN EXCHANGE RATE REGIME IN CANADA

In this paper we have investigated the extent to which the trade integration process, initiated at the beginning of the 1980s, has moved Canada and the United States closer to an optimum currency area. Building on the recent literature on the endogeneity of the optimum currency area criteria (Frankel and Rose, 1997 and 1998), we have focused on the relationship between the share of intra-industry trade and the trade integration process. The evolution of the share of IIT between the Canadian provinces and the United States reflects the similarity in the production structure and refers directly to the OCA criterion advanced by Kenen (1969). Incidentally, we find that, on average, the business cycles of provinces with a higher share of IIT are more synchronised with those of the United States. Our main findings support the view that the integration process of the last 25 years, accelerated by the 1989 FTA, has tended to increase the share of IIT between Canadian provinces and the United States in the long run.

Our results tend to support the early findings of Frankel and Rose (1997 and 1998) and clearly reject the validity of the 'specialisation hypothesis' advanced by Krugman (1991 and 1993). To the extent that using flexible exchange rates generates significant trade costs (Anderson and van Wincoop, 2004), the adoption of a common currency between Canada and the United States could further improve the conditions under which a monetary union generates positive net gains.

We also find that the separation of the Canadian dollar from its equilibrium level – the so-called degree of misalignment – exerts asymmetric effects on the structure of IIT across provinces. We find that the trade structure of the Western Canadian provinces, which specialise more in producing and exporting primary products, is more affected by exchange rate developments. This finding is fully in line with the previous analysis of Beine and Coulombe (2004) that shows Canadian regions are affected differently by the evolution of the bilateral exchange rate between Canada and the United States.

Overall, the results of our analysis indicate that, from the pure OCA criteria perspective, Canada and the United States are closer today to an optimum currency area than they were 25 years ago. The results also suggest that Canadian exporters could have become, on average, more vulnerable to the fluctuations of the Canadian dollar *vis-à-vis* its US counterpart. Does this mean that Canada should necessarily adopt the US dollar? The answer is no. The OCA approach disregards important aspects that should be considered when a country gives up a flexible exchange rate system.

There are several different arguments that support Canada's retention of a flexible exchange rate regime. First, a flexible exchange rate regime permits Canada to keep an independent monetary policy. Since 1991, this autonomy has allowed the Bank of Canada to gear its monetary policy toward inflation control. In contrast, adopting the US dollar would imply that control of short-run interest rates and money supply has been transferred to the US Federal Reserve. In the medium and long term, the Federal Reserve would therefore determine the Canadian inflation rate. This might result in important costs, given the increasing discrepancy in the fiscal policies of the two countries. Since 2000, the US federal government has had high fiscal imbalances while the Canadian federal government has succeeded in generating a sequence of budget surpluses since the mid-1990s. The significant degree of divergence in the fiscal policy stance of both countries suggests that the choice of a common monetary policy might be unmanageable. The pure OCA approach that we have adopted in our analysis clearly sets aside this important consideration.

There are also political aspects to the debate. Since 2001, the international situation has clearly deteriorated and the integration process between Canada and the United States has obviously slowed down. This implies that the rise in the share of IIT and the convergence in economic cycles have come to a halt. Whether this development is temporary or permanent is difficult to answer. However, the uncertainty of the future international situation does not favour a monetary reform of this type.

While there are arguments for keeping a flexible exchange rate regime in Canada, our analysis nevertheless suggests that, from an OCA perspective, the economic opportunity costs of keeping an independent monetary policy have increased since 1980. This follows from the fact that the increased economic

integration between the two countries has favoured the convergence of economic structures. We could also speculate that eliminating the currency barrier would also bring the two economies closer in terms of OCA properties if this further integration exerts the same effect on the economic structures. In our view, this is an important point to consider when balancing the pros and cons of maintaining a flexible exchange rate regime.

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