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THE DISCIPLINE OF IMPORTS IN THE LIGHT OF 1992: The case of Sweden

by

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ABSTRACT

The paper examines the constraint import competition imposes on the price–cost margins in Swedish manufacturing industries. It addresses two questions. Has the free trade agreement between the EC and EFTA reinforced the disciplinary effect of imports? Are there differences between imports of different origins? The results provide some support for intensified competition of the free trade agreement, even though the disciplinary effect of imports originating from the less developed countries is larger than of imports originating from the developed countries.

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1. Introduction

Even though it is not completely elucidated theoretical and empirical research indicate that import competition imposes a constraint on domestic firms' price–cost margins.[1] An underlying motive behind the creation of the European Community's (EC's) internal market by 1992 is to reinforce such a constraint. The 1992 programme aims, among other things, to remove barriers, essentially non–tariff barriers, that affect trade within the EC.

In 1973, Sweden and other members of EFTA concluded a free trade agreement together with the EC. The agreement can be one explanation as to why the share of manufacturing imports from the EC of the total consumption of manufacturing imports in Sweden has increased during the 1970s and 1980s.[2] One purpose of this paper is to examine whether the removal of tariffs, as a consequence of the free trade agreement, has reinforced the disciplinary effect. I am not only interested in the direct impact increased imports from the EC could have caused the price–cost margins. I am also concerned with the indirect effect of a reduction of trade barriers, i.e., the influence on the industrial price–cost margin given the share of imports of consumption from the EC.

Today, Sweden, the EC and EFTA are relatively closely integrated economically. There are, however, reasons to presume that market conducts aiming at undermine competition, for instance, various horizontal and vertical agreements and intra–firm trade, are more common within the EC and EFTA. This suggests that the disciplinary

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[1]For surveys of theoretical models and empirical studies of the discipline of imports see Geroski & Jacquemin (1981), Huveneers (1981), Jacquemin (1982) and Caves (1985).

[2]11.3 percent in 1970 and 16.2 percent in 1983. In this case the EC is defined as the original six members, i.e., Belgium, France, Italy, Luxemburg, the Netherlands and West–Germany.

effect of imports originating from the EC and EFTA is weaker than imports with its source outside these areas of tariff–free trade.[3] Reductions of trade barriers towards the world outside the EC and EFTA would then have a more dramatic competitive impact on the Swedish industrial price–cost margin than would be expected from the strive towards a deeper European integration within the framework of the EC and EFTA.

The paper is organized as follows. In Section 2, I theoretically motivate the presumed effect of imports on the domestic firms price–cost margins. On the basis of this the empirical models, in Section 3, are estimated. Section 4, finally, discusses conclusions and policy implications from the results.

2. The theoretical model

To illustrate the discipline of imports and as a theoretical foundation for my empirical studies I use a conjectural variation model developed by Urata (1984). In the model I allow for different conjectures for imports from different origins; the domestic firms may perceive different competitive pressure depending on from where the imports springs.

I assume there are k domestic firms in an industry producing a homogeneous product. The profit function of the domestic firm i (i = 1, . . ., k) is

$$\pi_i = pq_i - c_i q_i - F_i \tag{1}$$

[3]See Jacquemin & Sapir (1989). They examine the competitive effect on profits in manufacturing industries in the EC of extra–EC imports in comparision with intra–EC imports.

where π is the profit, p is the price and q is the output. F is fixed cost and c is constant marginal cost equal to average variable cost.

The demand function the domestic firms face is expressed by an inverse demand function

$$p = p(q) = p(q_d + q_{m1} + q_{m2}) \tag{2}$$

where $q_d = \sum_{i=1}^{k} q_i$, i.e., the quantity produced by domestic firms, q_{mn} is the quantity imported from n (n = 1, 2) and q is the total quantity demand.

We assume the firms i maximize their profit functions with respect to q_i. The first order condition is

$$\frac{\partial \pi_i}{\partial q_i} = p + \left[\frac{\partial p}{\partial q}\frac{\partial q}{\partial q_i} + \frac{\partial p}{\partial q}\sum_{i \neq j}\left(\frac{\partial q}{\partial q_j}\frac{\partial q_j}{\partial q_i}\right) + \frac{\partial p}{\partial q}\frac{\partial q}{\partial q_{m1}}\frac{\partial q_{m1}}{\partial q_i} + \frac{\partial p}{\partial q}\frac{\partial q}{\partial q_{m2}}\frac{\partial q_{m2}}{\partial q_i}\right] q_i \tag{3}$$

$$- c_i = 0$$

After some manipulation we obtain the Lerner index of firm i (L_i), i.e., the markup over price

$$L_i = \frac{p - c_i}{p} = \frac{q_i}{q_d}\frac{q_d}{q}(1 + \lambda_i^d + \lambda_i^{m1} + \lambda_i^{m2})\eta^{-1} \tag{4}$$

$$\lambda_i^d = d\sum_{i \neq j} q_j / dq_i \tag{5}$$

$$(6) \qquad \lambda_i^{mn} = dq_{mn}/dq_i \qquad n = 1, 2$$

where η is the demand elasticity ($-(dq/dp)(p/q)$), λ_i^d is the ith firm's conjecture about its domestic rivals' responses to a change in its output, and λ_i^{mn} is the ith firm's conjecture about its foreign rivals' (in n) responses to a change in its output.

Summing over the k firms gives the aggregated Lerner index, which can be considered as a measure of the degree of monopoly in the industry. The weighted Lerner index (L) below equals the price–cost margin at the industry level, i.e., profits (Π) plus fixed costs (F) to revenue (R) in the industry.

$$(7)\ L = \sum_{i=1}^{k} \frac{q_i}{q_d} L_i = \frac{pq_d - \sum_{i=1}^{k} c_i q_i}{pq_d} = \frac{\Pi + F}{R} = (1-m_1-m_2)H\eta^{-1}(1+\mu^d+\mu^{m1}+\mu^{m2})$$

H = the Herfindahl measure of domestic producer concentration = $\sum_{i=1}^{k} (q_i/q_d)^2$

m_n = the share of import originating from n of consumption = q_{mn}/q

We define

$$(8) \qquad \mu^d = \sum_{i=1}^{k} (q_i)^2 \lambda_i^d / \sum_{i=1}^{k} (q_i)^2$$

$$(9) \qquad \mu^{mn} = \sum_{i=1}^{k} (q_i)^2 \lambda_i^{mn} / \sum_{i=1}^{k} (q_i)^2 \qquad n = 1, 2$$

In order to describe a firm's conjectures – how it expects the domestic and the foreign rivals will react to a change in its output – we use a method by Clarke & Davies (1982).

$$(10) \qquad dq_j/q_j = \alpha(dq_i/q_i) \quad \text{for all } j \neq i \quad 0 \leq \alpha \leq 1$$

$$(11) \qquad dq_{mn}/q_{mn} = \varphi_n(dq_i/q_i) \quad n = 1, 2 \quad 0 \leq \varphi_n \leq 1$$

The parameters α and φ_n indicate degree of competition between producers. If α and $\varphi_n = 0$, Cournot conjectures are prevailing. α and $\varphi_n = 1$, on the other hand, imply perfect collusion. Hence, the less the value of α and φ_n, the lower the degree of implicit collusion.

Substituting into (7) gives an expression for the price–cost margin (PCM). Firstly, I insert (10) and (11) into (5) and (6), secondly, (5) and (6) into (8) and (9), and finally, (8) and (9) into (7).

$$(12) \qquad PCM = \frac{\Pi + F}{R} = (1-m_1-m_2)\left[(1-\alpha)H + \alpha\right]\eta^{-1} + (\varphi_1 m_1 + \varphi_2 m_2)\eta^{-1}$$

The lower the concentration of the domestic producers – the smaller H – and the larger the elasticity of demand (η), the less is the price–cost margin. α and φ_n, i.e., the behavior of the firms determine the influence of the imports (from n) share of consumption (m_n) on the price–cost margin. The larger φ_n, the smaller is the disciplinary effect of imports from n.[4] In my empirical models I will assume that α is given, but that φ_n will decrease when trade barriers are reduced towards the countries in n; the domestic firms perceive increased competition from the firms in these countries. The other hypothesis I will test is that φ_n differs for different country groups n.

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[4]This can easily be seen, for instance, if we assume Cournot conjectures among domestic producers, i.e., $\alpha = 0$. Urata (1984) shows that the effect of the imports share of consumption is ambiguous. The sufficient condition for the sign of the relationship is $\partial PCM/\partial m_n \gtreqless 0$ if $H + \alpha(1-H) \lesseqgtr \varphi_n$.

3. The profits equation

In order to determine the impact of imports on profits (the price–cost margin) in my cross–industry study – the industries i are defined on the four–digit level of SNI – I postulate the following equation

$$(13) \qquad PCM_i = \beta_0 + \underset{(+)}{\beta_1} EFFI_i + \underset{(+)}{\beta_2} CR4_i + \underset{(-)}{\beta_3} IMC_i + \epsilon_i$$

where

$$PCM = \text{price–cost margin} = \frac{\text{value added} - \text{payroll}}{\text{value added}}$$

EFFI = motive power of installed machinery per employee 1979

CR4 = four–firm concentration ratio 1978

IMC = share of imports of consumption; consumption = sales value + import – export

Former studies of price–cost margins have utilized different measures of the dependent variable. Most common is a measure similar to mine but with sales value in the denominator. An argument, put forward by Hart & Morgan (1978), for deflating with net output is that the use of sales value may bring in spurious influences of prices of raw materials, duties, subsidies and changes in the amount of work given to other establishments. Since the numerator of PCM (value added – payroll) both consists of pure profits and capital compensation, I have to control for capital intensity. The motive power of installed machinery per employee (EFFI) is a proxy for capital intensity in an industry; the larger EFFI, the greater the price–cost margin (PCM). I presume that the Herfindahl index is positively correlated with the four–firm concentration ratio

(CR4) and use the latter as a measure of concentration.[5] My hypothesis is thus that there is a positive relationship between CR4 and PCM. Finally, from (12) we realize that the less the share of imports of consumption (IMC), the greater is PCM.

The models are estimated by ordinary least square (OLS). It has been asserted, among others by Pugel (1980) and Jacquemin & Sapir (1989), that there may exist a simultaneity problem in considering price–cost margins (PCM) and share of imports of consumption (IMC). According to the model in Section 2, I expect that import penetration affects profits negatively. However, a reverse relationship is plausible: large profits in an industry attract foreign firms to supply the domestic market. A consequence of simultaneous determination of profits and import penetration is that OLS estimates will be biased and inconsistent. Therefore, a test of exogenity of IMC is performed.[6] My test fulfills the criteria necessary for obtaining acceptible estimates from OLS of the β's in equation (13).

3.1 The disciplinary effect of the free trade agreement

We can identify two channels through which a reduction of trade barriers may influence the price–cost margins. Firstly, since it is reasonable to assume that the share of imports of consumption increases when trade barriers are torn down, there is a direct effect of the free trade agreement if the coefficient for the share of imports of consumption is significant. The direct effect arises in our theoretical model when m_n increases. Secondly, I assume that a reduction of trade barriers changes the domestic firms' conjectures.

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[5]The data on CR4 was found in Stålhammar (1989b). Stålhammar (1989a, 1989b) are two Swedish studies using a similar methodology but address other questions.

[6]For a description and the result of the test see Appendix 1.

After the free trade agreement Swedish firms have perceived intensified competition from firms located within the EC. In the theoretical model this indirect effect is the result of a reduction in φ_n.

To test whether the free trade agreement has affected the price–cost margins indirectly I make use of an intercept and slope dummy model

$$(14) \qquad PCM_{it} = \sum_{t=69}^{87} \beta_0^t + \sum_{k=1}^{2} \beta_k X_{ki} + \beta_3^a Z\, IMC_{it} + \beta_3^b (1-Z)\, IMC_{it} + \epsilon_{it}$$

where X is the industry variables, EFFI and CR4, spread out over the time period under investigation and ϵ_{it} are zero mean, normally distributed errors. The study covers the period 1969 – 1987. In order to capture macroeconomic influences on the price–cost margins, for instance business cycles and devaluations, I allow the intecept to vary between years. The free trade agreement between the EC and EFTA come into force 1973. In (14), $Z = 0$ when $t < 73$ and $Z = 1$ when $t \geq 73$. Accordingly, a comparision of the coefficients β_3^b and β_3^a – the influence of the share of imports before (b) and after (a) the free trade agreement – gives an idea of the indirect effect of the share of imports on the price–cost margin, i.e., the effect given the share of imports. Table 1 contains the result.

Table 1 The discipline of Swedish imports 1969 – 1987

Motive power of installed machinery per employee (EFFI)	0.002 (13.24) /10.01/	$\beta^{69}-\beta^{80}$	–0.108 (–5.31)	$\beta^{78}-\beta^{80}$	–0.031 (–1.76)
Four–firm concentration ratio (CR4)	0.103 (8.70) /7.74/	$\beta^{70}-\beta^{80}$	–0.106 (–5.15)	$\beta^{79}-\beta^{80}$	–0.002 (–0.13)
Share of imports of consumption 1969–1972 (IMC6972)	–0.064 (–2.32) /–2.04/	$\beta^{71}-\beta^{80}$	–0.098 (–4.77)	$\beta^{81}-\beta^{80}$	0.011 (0.62)
Share of imports of consumption 1973–1987 (IMC7387)	–0.098 (–8.60) /–8.79/	$\beta^{72}-\beta^{80}$	–0.086 (–4.14)	$\beta^{82}-\beta^{80}$	0.040 (2.29)
β^{80}	0.521 (34.92)	$\beta^{73}-\beta^{80}$	–0.052 (–2.97)	$\beta^{83}-\beta^{80}$	0.063 (3.52)
		$\beta^{74}-\beta^{80}$	–0.020 (–1.13)	$\beta^{84}-\beta^{80}$	0.062 (3.52)
		$\beta^{75}-\beta^{80}$	–0.035 (–1.98)	$\beta^{85}-\beta^{80}$	0.066 (3.78)
		$\beta^{76}-\beta^{80}$	–0.037 (–2.11)	$\beta^{86}-\beta^{80}$	0.073 (4.14)
		$\beta^{77}-\beta^{80}$	–0.033 (–1.89)	$\beta^{87}-\beta^{80}$	0.075 (4.30)
Adjusted R–square (R^2)			0.381		
Number of observations (n)			1330		

In parentheses are t–values and between slashes are t–values corrected for heteroscedasticity. To correct for heteroscedasticity I use White's (1980) method.

All coefficients have the expected sign and are significant. The intercept dummies have a substantial impact on $\bar{R}^2$; it increases from 0.210 to 0.381. The coefficient $\beta^{82}-\beta^{80}$ is significant; probably, an effect of the Swedish devaluations 1981 and 1982. Since the share of imports of consumption affects PCM negatively and the share has increased, as a result of reduced trade barriers, I conclude that the free trade agreement has reinforced the disciplinary effect on the price–cost margins. However, β_3^a is not significantly different from β_3^b, which means that there is no indirect effect of the agreement.[7]

3.2 The disciplinary effect of imports of different orgins

From (12) we realize that the disciplinary effect of imports differs for imports from different origins if the conjectures φ_1 and φ_2 differ. Our hypothesis is that imports from the EC and EFTA (EES) exert a weaker disciplinary impact on price–cost margins than imports originating outside EES.[8] Two reasons for that can be pointed out.[9] Firstly, if the import consist of much intra–firm trade the disciplinary effect is less, since domestic firms with a multinational base exercise control over the import. According to Swedenborg et al. (1988), almost all export from affiliates of Swedish multinational firms to Sweden 1986 came from developed countries (99 percent), and especially from the EES countries. Secondly, market conducts aiming at reducing competition, such as various horizontal and vertical agreements, may have been more successfully adopted within EES.

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[7] $\beta_3^b - \beta_3^a = 0.033$ /1.05/, t–value corrected for heteroscedasticity between slashes.

[8] A proposal set out in the negotiations between the EC and EFTA is that members of the two organizations should form the European Economic Space (EES). Tariffs on manufacturing trade is already abolished, whereas a lot of non–tariff barriers still exist.

[9] These factors were stressed by Jacquemin & Sapir (1989).

To test whether Swedish imports from EES has a less pro–competitive effect than imports originating outside EES I utilize the same model as in (14). I estimate the following model for 1983

$$(15) \qquad PCM_i = \beta_0 + \sum_{k=1}^{2} \beta_k X_{ki} + \beta_3^e IMC_i^e + \beta_3^{ne} IMC_i^{ne} + \epsilon_i$$

where i denotes industry, PCM is profits, IMC_i^e is the EES import intensity and IMC_i^{ne} is the non–EES import intensity. X are the industry variables EFFI and CR4, and ϵ_i are zero mean, normally distributed errors. If the non–EES import intensity has a significantly stronger negative influence than the EES import intensity, i.e., $\beta_3^{ne} < \beta_3^e$, my hypothesis is confirmed. Equation (1) in Table 2 shows the result. In equation (2) I divide the Swedish imports into imports originating from developed countries (DCs) and less–developed countries (LDCs) and in equation (3) into imports from Japan and Asian NICs and other countries.

Table 2 The discipline of Swedish imports 1983

Variable	(1)	(2)	(3)
Motive power of installed machinery (EFFI)	0.002 (3.24) /2.92/	0.002 (3.39) /2.89/	0.002 (3.32) /2.95/
Four–firm concentration ratio (CR4)	0.121 (2.70) /2.30/	0.106 (2.37) /2.00/	0.114 (2.56) /2.16/
Share of imports from EES of consumption (IMCe)	–0.033 (–0.62) /–0.61/		
Share of imports from non–EES of consumption (IMCne)	–0.174 (–2.17) /–2.85/		
Share of imports from DCs of consumption (IMCdc)		–0.052 (–1.32) /–1.36/	
Share of imports from LDCs of consumption (IMCldc)		–0.281 (–2.23) /–4.05/	
Share of imports from Japan and Asian NICs of consumption (IMCjn)			–0.239 (–2.30) /–4.38/
Share of imports from other countries of consumption (IMCnjn)			–0.045 (–1.13) /–1.05/
Constant	0.561 (17.08) /22.79/	0.571 (18.03) /27.29/	0.565 (17.71) /23.14/
Adjusted R–square ($\bar{R}^2$)	0.339	0.350	0.348
Number of observations (n)	70	70	70

In parentheses ( ) are t–values and between slashes / / are t–values corrected for heteroscedasticity. To correct for heteroscedasticity I use White's (1980) method.

The coefficients for the industry variables have all the expected signs and are strongly significant. The relative strength of import discipline on profits in Swedish manufacturing industries seems to differ between imports from different origins. However, even though the estimate for non–EES imports is significant but not for EES imports, the difference between these parameter estimates is not significant.[10] On the other hand, the imports to Sweden from LDCs is significantly more effective in the narrowing of price–cost margins than the imports from DCs.[11] There is also a significant difference between imports from Japan and the Asian NICs and other countries.[12]

4. Concluding comments

The effect on industrial price–cost margins of the structure of an industry, e.g., concentration, is a thoroughly explored area in the industrial organization litterature.[13] It has been asserted that the competitive discipline of imports is conditional upon non–competitive behavior among domestic producers. Various studies have confirmed an interactive influence of concentration and imports share of consumption on profits; the disciplinary effect of imports is larger the more concentrated the industries.[14] This

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[10] $\beta_3^{e} - \beta_3^{ne} = 0.140$ /1.63/, t–value corrected for heteroscedasticity between slashes. Problems with multicollinearity may prevail since the correlation between IMCe and IMCne is 0.47.

[11] $\beta_3^{dc} - \beta_3^{ldc} = 0.228$ /2.93/. The correlation between IMCdc and IMCldc is 0.27.

[12] $\beta_3^{njn} - \beta_3^{jn} = 0.194$ /2.97/. The correlation between IMCjn and IMCnjn is 0.30.

[13] See Schmalensee (1989) for a critical survey.

[14] Jacquemin, de Ghellinck and Huveneers (1980) and Turner (1980)

study proceeds a step further. Besides structural features of an industry and imports in general, it indicates that imports from different origins have different impact on the industrial price–cost margins.[15]

The results entail some trade policy implications. In general, imports seems to intensify competition and therefore narrow the price–cost margins. Swedish imports have significantly influenced the profits in the manufacturing industries during the period 1969–1987. This implies that the policy towards a removal of non–tariff barriers in trade between Sweden and the EC – one purpose of the Swedish harmonizing to EC's internal market – may further reduce the opportunities of Swedish firms to exercise monopoly power. Presumably, the total effect will be less than of the free trade agreement, but, for instance, in some service industries, as banking and insurance, a considerable impact may be anticipated. Another reasonable implication of the results is that even more important, regarding the attainment of intensified competition, is to strive for less protectionism in general, and in particular, in our trade policy towards the LDCs. Finally, a warning is justified against erecting trade barriers against Japan and the Asian NICs.

[15]A similar result is obtained by Jacquemin & Sapir (1989) where "extra–EC imports were found to exercise a more powerful impact than intra–EC imports."

Appendix: Is OLS appropriate?

The method I use to answer that question is the same as in Geroski (1982). The postulated equation for the price–cost margin is

$$\text{(A.1)} \qquad PCM_i = \beta_0 + \underset{(+)}{\beta_1} EFFI_i + \underset{(+)}{\beta_2} CR4_i + \underset{(-)}{\beta_3} IMC_i + \mu_i$$

I assume that the imports share of consumption (IMC) is generated by the following equation

$$\text{(A.2)} \qquad IMC_i = \gamma_0 + \underset{(?)}{\gamma_1} EFFI_i + \underset{(?)}{\gamma_2} TI_i + \underset{(-)}{\gamma_3} IUVI_i + \underset{(+)}{\gamma_4} PCM_i + \epsilon_i$$

A high price–cost margin (PCM) in an industry is an incentive for foreign firms to supply goods on the domestic market. I consider motive power of installed machinery (EFFI) and shrae of technicians of labor force (TI) as measures of factor intensities, physical and human capital intensities, and according to the factor proportions theory, they affect the import. IUVI is the inverted import unit value, a proxy for the significance of transport costs in an industry. The larger IUVI, the greater the negative influence of transport costs on imports, and thus, the less is IMC.

If IMC is endogenous, estimation of (A.1) by OLS gives rise to biased and inconsistent parameter estimates of the true vales of the β's. On the other hand, if the system in (A.1) and (A.2) can be simplified to

$$PCM_i = \beta_0 + \beta_1 EFFI_i + \beta_2 CR4_i + \beta_3 IMC_i + \mu_i$$

(A.3) $$IMC_i = \gamma_0 + \gamma_1 EFFI_i + \gamma_2 TI_i + \gamma_3 IUVI_i + \gamma_4 PCM_i + \epsilon_i$$

and

$$E(\mu_i, \epsilon_i) = 0$$

I will, however, obtain acceptable estimates of the β's. Hence, the necessary restrictions for OLS to be an appropriate method to estimate (A.1) are that $\gamma_4 = 0$ and $cov(\mu, \epsilon) = 0$.

To test this hypothesis let us assume that IMC_i consists of a systematic component (IMC_i^*) and a random component (v_i). The systematic component is determined by all exogeneous variables in the system.

(A.4) $$IMC_i^* = \gamma_0 + \gamma_1 EFFI_i + \gamma_2 TI_i + \gamma_3 IUVI_i + \gamma_5 CR4_i$$

(A.5) $$v_i = \gamma_4 PCM_i + \epsilon_i$$

If $\gamma_4 \neq 0$ and/or $E(\mu_i, \epsilon_i) \neq 0$, PCM_i is correlated to v_i. By using the OLS estimates of the reduced form in (A.4) I obtain estimates of v_i ($\hat{v}_i$)

(A.6) $$\hat{v}_i \equiv IMC_i - \hat{IMC}_i^* = IMC_i - \hat{\gamma}_0 - \hat{\gamma}_1 EFFI_i - \hat{\gamma}_2 TI_i - \hat{\gamma}_3 IUVI_i - \hat{\gamma}_5 CR4_i$$

Whether correlation between PCM_i and v_i exists can then be tested in (A.7)

(A.7) $$PCM_i = \beta_0 + \beta_1 EFFI_i + \beta_2 CR4_i + \beta_3 IMC_i + \theta v_i + \tilde{\mu}_i$$

If $\theta = 0$, there is no correlation, and it is appropriate to use OLS to estimate (A.1). In my study $\theta = 0.11$ /0.66/, which means that OLS gives consistent estimates of the β's in equation (13).

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