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NATIONALIZATIONS AND INVESTMENT FLOWS: A PANEL STUDY

by

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Nationalizations and Investment Flows: A Panel Study *

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Abstract: Nationalizations and flows of direct investment among developing countries are modelled as a two-equation block model. For the investment flow relations a least squares estimator is employed that takes fixed effects as well as serial correlation and heteroskedasticity into account. A fixed effect simultaneous equations linear probability model is developed for the dichotomous nationalization equation. It is found that nationalization in other countries increases investment, given that a country does not nationalize itself. By analyzing fixed effects, which capture the remaining country heterogeneity, we are able to demonstrate a positive relationship between the undertaking of direct investment and nationalization across countries. In addition, nationalization is related to external borrowing and high export prices.

*Steven Kobrin and Michael Minor are thanked for providing their data bases on nationalizations. AnnaMaria Bengtsson, Stockholm School of Economics, assisted in preparing the data. Financial support from The Swedish Research Council for the Humanities and Social Sciences is gratefully acknowledged.

between a country's development and the sectors in which nationalization occurs. Mohtadi (1990) explored the importance of rivalry between domestic and foreign firms for host country regimes. The developing countries serve mainly as hosts for direct investment, and try to earn as much as possible in this capacity.

In the long dominating theory of obsolescing bargain, Vernon (1971) and Moran (1974) prophesied that nationalization would increase over time, since the developing countries become more apt to run nationalized firms on their own, without having to accept overt or covert repatriation of profits abroad. This prediction turned out not to be correct, however. Nationalization more or less disappeared in the late 1970s, and policies to attract direct investment followed (UNCTC, 1988). Theoretical analyses have concluded that reputation effects discourage investments from countries which pursue the policy (Eaton and Gerzovitz, 1983). Moreover, many firms have adapted their behaviour, relocating investments which could become the easy prey of host country regimes (Moran, 1985). Still, it has not been possible to determine a linkage between nationalization and investment, or explain which countries actually nationalize. It is unknown, for example, whether countries which nationalize are relatively desirable destinations for direct investment, or relatively undesirable. Getting the answers to such questions is necessary for an understanding of whether the risk of nationalization still discourages direct investment from developing countries.

A fundamental limitation in the field is that the behaviour of each country has been studied separately. As demonstrated by Guisinger (1985) among others, different potential host countries are often alternative locations for investment projects. We should consequently expect competition among countries to obtain direct investment. The ability of firms to move, use transfer pricing, etc., limits countries' ability to tax profits (Doyle and van Wijnbergen, 1984; Andersson, 1991). This raises a motive for nationalization, since a firm is unable to repatriate profits once its ownership and control is canceled. It is true that far from all assets can be effectively

expropriated, however. Rather, a country must weigh the assets which can be taken against those which will be lost as a consequence of nationalization, including those that are discouraged in other investment project. The extent to which present and future investments are discouraged by nationalization is influenced by the behaviour of other countries, which are alternative locations for investment.[1]

On this basis, Andersson and Brännäs (1991, 1992) demonstrate some indications of pooled host country behaviour. However, there are no direct examinations of the connection between nationalization and investment across countries. Thus, we here set out to investigate the variation in both investment flows and the occurrence of nationalization across countries over time. The investment flow represents the behaviour of firms which supposedly maximize expected profits from the undertaking of investment, possibly in Third World countries. Projects are undertaken only if the expected profit net of tax compensates for the risk of nationalization. The occurrence of nationalization reflects the behaviour of countries which seek to increase their gains from foreign-owned enterprises by taking over control and ownership, at the same time reducing their ability to withhold other projects or attract new ones.

In the following, we explore the relationship between the actions of firms and countries in a two-equation model. Let us start by considering hypotheses and explanatory variables.

3 Hypotheses and Explanatory Variables

Setting up a two-equation model, we define our dependent variables as

— The flow of direct investment each period (y_{1t}).

— The occurrence of nationalization each period (y_{2t}).

A possible linkage between these variables is a negative effect of nationalization on the undertaking of investment. As mentioned above, no such impact has been identified before. This applies both to the pattern of investment at a given point in

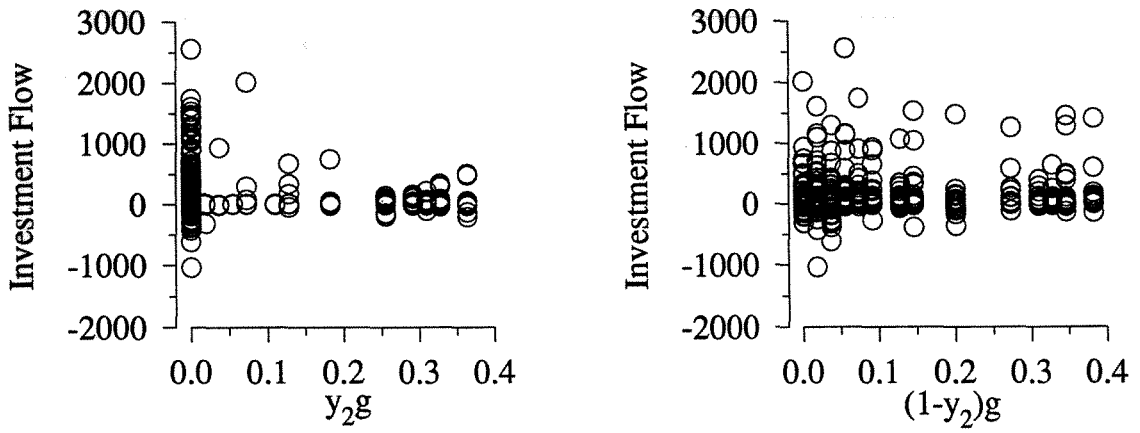

Figure 1: Investment flows vs. $y_2 g$ and $(1 - y_2)g$.

time, and to the flow of investment to individual countries over time.

We consider instead a multiplicative effect linking nationalization in other countries, which is denoted g_t, and a country's own nationalization behaviour (y_{2t}). Two variables $y_{2t}g_t$ and $(1 - y_{2t})g_t$ are constructed. Because a country may attract investment from other nationalizing countries, there should be a positive impact of g_t on y_{1t}. Given that a country nationalizes itself the effect should be smaller. This construction separates the impact of nationalization in other countries when a country nationalizes itself and when it does not do so. See also Figure 1, where the investment flows are plotted aginst the introduced split of the influence of other countries.

To control for other influences, we also consider variables previously examined in the literature, and for which data has been possible to obtain. It should be noted that the limited access to year-wise data for the many small developing countries included force us to leave out many potentially important variables. Among these is the tax rate, for which meaningful approximations are not possible to obtain. The usefulness of data on taxes is anyway reduced by a host country's ability to discriminate between individual projects through, e.g., the use of performance requirements

or subsidies. Several of the variables used below indirectly reflect a country's ability to tax profits, however.

The explanatory variables influence, through two possible channels, the occurrence of nationalization. These are associated with the ability to nationalize effectively, and/or the discouraging effects of nationalization. As will be seen, most of the variables may exert an ambiguous influence on nationalization, depending on which effect is the strongest. In addition, most variables are expected to influence the undertaking of direct investment as well. The explanatory variables are;

- The rate of growth (x_1) is expected to exert a negative impact on nationalization. As higher growth stimulates an expansion of investment, it reduces the repatriation of profits and thereby the motive for nationalization. The effect on the flow of direct investment should be positive.

- Export prices (x_2) should exert a positive impact on nationalization because they indicate the prevalence of rents which can be captured through nationalization. No particular effect is expected on the flow of investment.

- GDP/capita (x_3) has an ambiguous influence on nationalization. Jodice (1980) argued that it is positively related to a host country's capacity to gain from natural resource industries under domestic ownership. Bergsten et al. (1978), among others, have instead suggested that a host country's ability to extract gains from foreign firms under foreign ownership increases with the level of income. Concerning the flow of investment we expect a positive impact.

- The stock of direct investment (x_4) may exert a negative impact on nationalization because a greater stock suggests that there is more direct investment to discourage. Alternatively, the impact may be positive because there are more potential targets available. The impact on the flow of investment should be positive, since reinvestment of profits is an important source of investment funds.

- GDP (x_5) may, again, exert an ambiguous impact on nationalization. A positive effect is expected because a larger market makes other countries less close substitutes

for the location of investment projects. Alternatively, a negative effect may arise because a larger economy tends to have more direct investment. Concerning the flow of investment, there should be a positive impact.

- External indebtedness (x_6) is included for the years 1974 - 1978 when interest rates were low and credit available. A negative impact may be expected on nationalization because pursuing the policy would have made it more difficult for a country to obtain credit on favourable terms. On the other hand, commercial borrowing signal a great need of foreign exchange earnings, which may show up in a positive relationship.

4 Data

The data on nationalizations of foreign affiliates have been obtained from Kobrin, who assembled them for UNCTC for 1960 - 1979, and Minor who updated them for 1980 - 1985. The unit of analysis is an 'act' of nationalization, which comprises the taking of any number of firms in an industry in a country in a year. The data were collected on a firm-by-firm basis, and later aggregated into acts. Although there is some problem of data reliability subsequent to 1976, this data base allows for the most comprehensive coverage possible for 1960 - 1985 as a whole.

For several reasons, an 'act' represents the most reasonable unit of aggregation that is available in the case of nationalization. Counting the number of firms taken is meaningless as some firms are very small and some are big. The dollar value of the assets taken would have been a good candidate, but there is no such information available. Neither is there any information about the amount of compensation, some of which has been covert. By focusing on acts, we analyse the discrete choice between harming or not harming a country's reputation. Thus, we view any act of nationalization as a signal that a country is prepared to nationalize some direct investment, while the amount taken is critically influenced by factors we can not

observe, e.g., indivisibilities due to the nature of investment, and host countries' availability of technology and entrepreneurial capacity.

Concerning investment and explanatory variables, year-wise values have been obtained from various secondary sources.[2] In order to allow for an inclusion of as many countries as possible, the test period has been limited to 1970 - 1985. There are 56 countries for which data have been fully available. Missing values is a minor problem, as only a few observations are incomplete.

5 Econometric Model

The model consists of the two blocks of equations

$$\begin{aligned} y_{1it} &= \alpha_{1i} + \beta_{11} y_{2it} g_{it} + \beta_{12}(1 - y_{2it}) g_{it} + \beta_{13} x_{3it} + \beta_{14} x_{4it} \\ &\quad + \beta_{15} x_{5it} + \epsilon_{1it} \end{aligned} \tag{1}$$

$$\begin{aligned} \eta_{2it} &= \alpha_{2i} + \beta_{21} x_{1it} + \beta_{22} x_{2it} + \beta_{23} x_{3it} + \beta_{24} x_{4it} + \beta_{25} x_{5it} \\ &\quad + \beta_{26} d_t \; x_{6it} + \beta_{27} g_{it} + \epsilon_{2it}. \end{aligned} \tag{2}$$

where $i = 1, \ldots, m$ indicates the country and $t = 1, \ldots, T$ the time period.

The nationalization pressure, η_{2it} , can only be observed in a dichotomous form, i.e.

$$y_{2it} = \begin{cases} 1, & \eta_{2it} \geq 0 \\ 0, & \eta_{2it} < 0 \end{cases} \tag{3}$$

is the observed nationalization decision.

The fixed effects α_{1i} and α_{2i} reflect countrywise heterogeneity that is not picked up by other variables. The equation in (1) may compactly be written as

$$y_{1it} = \alpha_{1i} + x_{1it} \; \beta_1 + \epsilon_{1it}. \tag{4}$$

By assuming a fixed effect we limit the generalizability of the results to the studied countries (e.g., Hsiao, 1986, ch. 3). The results are generalizable in the time direction, however. This limitation is not a serious one as all developing countries with a significant amount of direct investment are part of the study.

The investment flow equation is nonlinear in y_{2t}, since $y_{2t}g_t = (y_{2t} \otimes I_m)[(m-1)^{-1}1_m 1'_m - I_m]y_{2t}$, where $\otimes$ is the Kronecker product. On the other hand the present nonlinear form

$$y_{2it}g_{it}\beta_{11} + (1 - y_{2it})g_{it}\beta_{12} = g_{it}\beta_{12} + y_{2it}g_{it}(\beta_{11} - \beta_{12}) \tag{5}$$

is linear in y_{2t} when $\beta_{11} = \beta_{12}$. In this case the nationalization behaviour of country i has only an indirect effect channelled through the other countries in the same period.

We may write equation (2)

$$\eta_{2it} = \alpha_{2i} + x_{2it}\ \beta_2 + \epsilon_{2it}\ . \tag{6}$$

The operationalization of this model has forced us to clarify the nature of the dependence between countries. Let y_{2t} denote the $(m \times 1)$-vector of y_{2it} at time t, so that simultaneity of various types is obtained when y_{2t} is premultiplied with an $(m \times m)$ parameter matrix A_0. For identifiability the diagonal elements of A_0 are throughout restricted to be one.

Two main types of specification appears reasonable to consider. First, Andersson and Brännäs (1990) considered the impact of lagged nationalizations in all other countries on the current nationalization decision of each country. That construction used the proportion of countries at time $t-1$. In the simultaneous context this corresponds to a structure of A_0;

$$A_0 = I_m - \beta_{27}[I_m - (m-1)^{-1}1_m 1'_m] \tag{7}$$

where I_m is the $(m \times m)$ identity matrix and 1_m is an $(m \times 1)$ unit vector. If the only unknown parameter β_{27} in A_0 is equal to zero there is no dependence between

countries. In the specification (2), the off-diagonal elements of A_0 are restricted to be equal.

It is possible to generalize the structure of A_0 in various ways. One alternative is to allow for dependence between countries within a group (e.g., within a continent), whilst not allowing for dependence across groups. In such a case, the y_{2t} vector may be arranged to give A_0 a block-diagonal structure, $A_0 = I_m - \underline{\alpha}_0 \otimes J$. As an illustration, we consider the case of four groups, then $\underline{\alpha}_0 = diag(\alpha_{01}, \ldots, \alpha_{04})$ and $J = diag(I_{m_1} - 1_{m_1}1'_{m_1}, \ldots, I_{m_4} - 1_{m_4}1'_{m_4})$, where m_j $(j = 1, \ldots, 4)$ denotes the number of countries in each group. To test for equal dependence within groups we test $\underline{\alpha}_0 = \beta_{27} I_4$. When $\underline{\alpha}_0 = 0$ there is no dependence within any group.

The variable $g_{it} = (m-1)^{-1} \sum_{j \neq i} y_{2jt}$ is the proportion of nationalization in other countries in year t. This yields the structure (2) implied by A_0 in (7). The d_t is a dummy variable taking the value one for the period 1974 - 1978.

The covariance matrix $(2mT \times 2mT)$ of the stacked (over T time units and m countries) disturbance term is

$$\Omega = Cov \begin{pmatrix} \epsilon_1 \\ \epsilon_2 \end{pmatrix} = \begin{pmatrix} \Omega_{11} & \Omega_{12} \\ \Omega_{21} & \Omega_{22} \end{pmatrix}. \tag{8}$$

Different assumptions are possible about the blocks of the Ω matrix. We allow for the possibility that the disturbance terms in the two equations are correlated, i.e. that the blocks $\Omega_{12} = \Omega'_{21} = \sigma_{12} I$. This implies a simultaneous block structure for the system. Whenever $\sigma_{12} = 0$, the system takes a block recursive structure.

For the Ω_{11} block we employ a structure that allows for diagonal blocks, possibly with different variances for different countries. In addition, we recognize the potential prevalence of a first order autoregressive serial correlation generated by

$$\epsilon_{1it} = \rho_i \, \epsilon_{1it-1} + u_{it} \, . \tag{9}$$

Since, $V(\epsilon_{1it}) = \sigma_i^2/(1-\rho_i^2)$, where $V(u_{it}) = \sigma_i^2$, heteroskedasticity may arise both from ρ_i and σ_i^2.

The structure of Ω_{22} is considered below.

6 Estimation

To simplify the estimation of the model system above, we assume block recursiveness ($\sigma_{12} = 0$). This assumption is substantiated by empirical evidence; see below.

For the investment flow equations, we adopt the conventional procedure of first removing the fixed effects by subtracting means from variables. We have

$$y_{1it} - \bar{y}_{1i} = (x_{1it} - \bar{x}_{1i})\beta_1 + (\epsilon_{1it} - \bar{\epsilon}_{1i}) \ , \tag{10}$$

where

$$\bar{y}_{1i} = T^{-1} \ \Sigma_{t=1}^{T} \ y_{1it} \ , \ \bar{x}_{1i} = T^{-1} \ \Sigma_{t=1}^{T} \ x_{1it} \ , \text{ and } \bar{\epsilon}_{1i} = T^{-1} \ \Sigma_{t=1}^{T} \ \epsilon_{1it} \ .$$

The ordinary least squares (OLS) estimator is used to estimate β_1 in (5). The resulting estimated residuals are used to estimate ρ_i for the individual countries. After a Prais-Winsten type transformation for each country and OLS estimation on the transformed data we may estimate ${\sigma_i}^2$ (assumed constant within countries). Finally, a weighted least squares estimator is used to produce the final estimates.[3]

The estimated countrywise fixed effects for the investment flow equations are obtained from

$$\hat{\alpha}_{1i} = \bar{y}_{1i} - \bar{x}_{1i}\hat{\beta}_1 \ . \tag{11}$$

Concerning the nationalization equation, we are severely restricted in our choice of a feasible estimator due to the simultaneity between countries. The simultaneous equations linear probability model[4] makes two-stage least squares (2SLS) or instrumental variable estimation attractive. The present specification with fixed effects can still be conveniently estimated. The estimator of Heckman and MaCurdy (1986) is extended to include fixed effects. The estimator is consistent. To estimate the associated covariance matrix, the White (1980) consistent estimator is utilized. Estimates of the fixed effects are obtained as a by-product.

7 Results

Table 1 reports the parameter estimates for the investment flow equation. While we present results of LS estimation, we will discuss the results in terms of the Prais-Winsten and heteroskedasticity transformed (PW-HET) model. As can be seen, this rendered most estimates significant.

Table 1: Estimates (t-values) for investment flow equation (LS indicates estimation with fixed effects and t-values evaluated by White's heteroskedasticity consistent standard errors, PW-HET indicates the Prais-Winsten, weighted LS estimator with fixed effects).

Variable	LS	LS	PW-HET
$y_2 g$	-39.45	—	6.84
	(0.71)		(1.79)
$(1-y_2)g$	-2.35	—	11.27
	(0.05)		(3.55)
x_1	0.1697	0.1609	-0.0144
	(0.20)	(0.20)	(0.36)
x_3	0.0758	0.0754	0.0110
	(4.06)	(4.04)	(2.50)
x_4	0.0419	0.0421	0.0487
	(2.36)	(2.41)	(4.85)
x_5	-0.0002	-0.0019	-0.0005
	(1.45)	(1.45)	(1.67)
R^2	0.53	0.53	—

The multiplicative impact of nationalizations in the country itself and in other countries ($y_2 g$), exerts a weak impact, significant only on the 10 per cent level. When a country did not nationalize itself but others did $[(1 - y_2)g]$, however, there was a strongly positive and significant impact in the case of the PW-HET estimator. In view of expression (5) there is a significant and positive effect of nationalization in other countries (g), while the estimate $\hat{\beta}_{11} - \hat{\beta}_{12} = -4.43$ reflects the negative impact on investment flows of the country's own nationalization. The estimate is not significantly different from zero, however.

The stock of investment (x_4) and GDP per capita (x_3) both exert significant and positive effects on the flow of investment. The effect of GDP (x_5) is unexpectedly negative, but is significant only at the 10 per cent level; see further below. The growth rate (x_1) has no significant effect.

From the large variation in the fixed effects it follows that there is a good deal of country heterogeneity, cf. Figure 2. With respect to $\hat{\rho}_i$, the range of estimates makes the use of a common ρ unreasonable. It also indicates the importance of using a Prais-Winsten transformation on this data set.

The estimates of the nationalization equation are given in Table 2. The signs are unchanged between 2SLS and LS. The occurrence of nationalization in other countries (g) was found to exert a positive and significant effect on nationalization. This is in line with the suggested interdependence in the nationalization behaviour of different countries, i.e. countries nationalize when their competitors do. Meanwhile, we have seen that nationalization in other countries increased a country's investment flow more when it did not nationalize itself. This suggests that nationalizations do relocate investment flows to other countries. A country would then prefer to nationalize when many other countries nationalize as well, in order to minimize the amount of direct investment which is discouraged.

Concerning the other explanatory variables, external borrowing (x_6) exerts a positive and significant influence, suggesting that countries which were piling up

Table 2: Estimates (t-values) for nationalization equation with fixed effects.

Variable	2SLS	LS
x_1	-0.25e-2	-0.12e-2
	(1.41)	(0.66)
x_2	0.98e-3	0.23e-2
	(2.03)	(6.02)
x_3	0.22e-4	0.17e-4
	(0.55)	(0.42)
x_4	0.15e-4	0.87e-5
	(0.94)	(0.52)
x_5	-0.40e-5	-0.47e-5
	(2.43)	(2.78)
dx_6	0.15e-2	0.23e-2
	(1.91)	(2.97)
g	1.2549	—
	(4.36)	
$\overline{R}^2$	0.15	0.11
% correct	85.6	84.3
predictions		

debts nationalized as well. As discussed above, this indicates that nationalization is motivated by a great need of foreign exchange earnings, spurring both borrowing and nationalization. This is not to say that large debt burdens are compatible with nationalization regimes over extended periods of time. In Andersson and Brännäs (1991), increased borrowing was found to shorten the time period that countries kept nationalizing in the late 1970s. High indebtedness may eventually make it impossible for a country to continue nationalizing and at the same time continue to attract direct investment. Concerning the other variables, the export price (x_2) exerted the expected positive impact on nationalization, while the size of the economy (x_5) exerted a negative impact. None of the other variables were significant.

The correlation between the residuals of the two equations is as low as -0.08. This indicates that the system is indeed block recursive.

As mentioned above, we do not expect to capture all relevant country-data through our explanatory variables. For this reason, it is important to consider the presence of fixed effects, which contain additional information. We estimate the fixed effects for each country in the investment equation and in the nationalization equation, and plot the two against each other. The result is shown in Figure 2, which demonstrates an interesting pattern.

Most countries are found at the origin in Figure 2, meaning that the explanatory variables explain both the nationalization behaviour of countries and the investment behaviour of firms. For some countries there are substantial deviations, however. As can be seen, there is a positive relationship between the two fixed effects (correlation coefficient 0.48). Those countries which nationalized more (less) than expected from our estimations also received more (less) investments than expected.

Looking at the individual observations, large fixed effects were associated with countries that are "large" in terms of both size and population. Indeed, all these countries must be regarded as regional powers, which could not easily by overshadowed by their neighbors. India, Brazil and Indonesia, for example, are among the

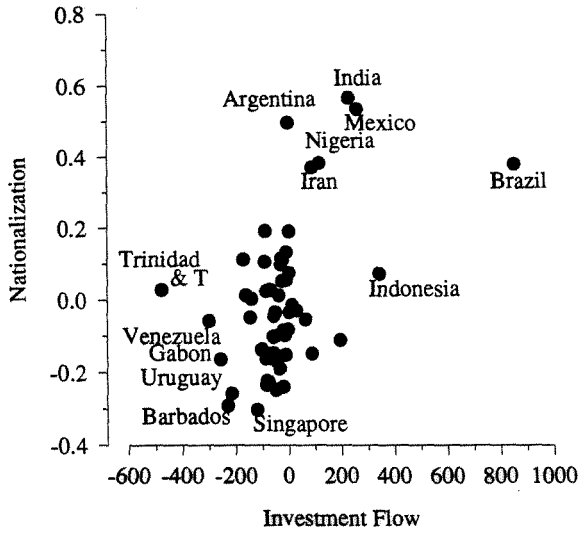

Figure 2: Fixed effects of nationalization equation vs. fixed effects of investment flow equation.

largest countries in the Third World by virtually any standards (China is not included since it did not have any direct investment in the period of study). Nigeria, Mexico and Iran are the prime political and economic powers in their respective regions. Argentina, finally, is the largest country in Latin America after Brazil. The countries with small, fixed effects, on the other hand, were throughout without a dominant position within their respective regions. This is not to say that they were hosts for less direct investment, as countries like Singapore and Trinidad and Tobago no doubt are major destinations.

Thus, the properties of our remaining country heterogeneity enable us to demonstrate a positive link between nationalization and investment flows at the peak of the policy. Those countries which nationalized to a relatively great extent also attracted a relatively great amount of direct investment. It should also be noted that the fixed effects seem to have absorbed all the explanatory power of GDP, which may explain the negative influences of this variable in the estimations.

8 Concluding Remarks

Estimators for panel data with fixed country effects were utilized to arrive at our conclusions about investment flow and nationalization and their codependence. For the nationalization equation the simultaneous linear probability model estimator was extended. By relating the fixed effects to country size an interesting pattern emerge. Large countries nationalize more than predicted by explanatory variables, but still receive more investment than expected. Obviously, the direct and indirect costs of nationalization are offset by large profits in these markets. For small countries, profits are small and the costs caused by the countries nationalization behaviour have to be kept small.

The results of this paper are first and foremost of historical interest. There have been major changes in business conditions in the last decades, which make it much more difficult today for developing countries to acquire profitable control over direct investment. Nevertheless, one should not completely neglect the potential costs of a positive relationship between nationalization and investment for indebted economies, which experience favourable export prices. That such a link prevailed in the past may still caution investors to be careful in developing countries. In effect, that may then prevent many investment projects in developing countries. If this is the case, the risk of nationalization may still play in blocking development in the Third World.

Notes

1 Given strategic complementarities, meaning that an increase in one player's strategy increases the optimal strategy of another player, coordination problems may give rise to multiple equilibria (Cooper and John, 1988). The prevalence of multiple equilibria in the market for direct investment is given some support in Andersson (1991).

2 Data for flows and stocks of investment have been obtained from UNCTC (1983 and 1988), OECD, and The World Bank. The explanatory variables are based on the United Nations (1977/1983/1986), the International Monetary Fund, the World Bank, and United Nations data printouts.

3 See, e.g., Kmenta, 1986, ch. 12, for additional technical details.

4 This assumption implies heteroskedasticity, i.e. that Ω_{22} has nonconstant diagonal elements.

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