The FDI Chain: from Host to Parent
An Empirical Analysis

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Abstract

For countries in the process of development, it is commonly observed that the pattern of Foreign Direct Investment (FDI) varies over time. Previous trade literature has failed to develop a unified treatment of inward and outward FDI position of each country leading to a single measure of integration in the global FDI network. A novel analysis of national-level FDI flows reveals four clear phases in the relative strength of every country's roles as Host and Parent of FDI before a 'steady state equilibrium' is reached. We term this 4-stage dynamic transformation the 'FDI Chain'. The aim of the present paper is two-fold. First, we provide evidence on the existence of the sequence of stages proposed using data on FDI flows for 189 countries over the period 1970-2006, and develop the necessary framework to empirically identify the one each country is at any specific point in time. Second, we develop consecutive logit models to test factors motivating the process. We show that market and trade growth increases significantly the probability of transition through the initial stages of the Chain, although only a significant advantage in productivity and technology can motivate transitions to the final stages of integration in the global FDI network. The expansion of the global FDI network in geo-space resulting from this dynamic process points also at a number of issues for future research.

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1 Introduction

Trade flows, Private Capital flows and in particular Foreign Direct Investment (FDI) have been often proposed in the literature as indicators of a country's level of integration in the global economy (UNCTAD, 2007). Highly concentrated in western economies, FDI appears as the most sensitive indicator of the three. The world's top 30 host countries - mainly industrialized economies - account for 95% of total FDI inflows and 90% of stocks. The top 30 parent countries generate around 99% of outward FDI flows and stocks. A closer analysis of national-level data leads to the proposition of a 'Chain' of four stages in a country's metamorphosis from a net FDI 'importer' to FDI 'exporter'. We term this 4-stage transformation 'the FDI Chain', and consider it equivalent to a country's path towards integration in the global FDI network.

In the first stage, a country is relatively not attractive to foreign investors; We observe low inward FDI compared to GDP and very low outward relative to inward FDI. As the country's economy grows (second stage), its role as an FDI host strengthens. While it now attracts inward FDI, its domestic firms are not yet to invest abroad. In the second stage, we observe increasing inward FDI and an increased ratio of inward to outward FDI. In the third stage the country begins to metamorphose into an FDI Parent – i.e. a source of FDI. While it continues to attract FDI, domestic firms are now capable of investing abroad as well. Increasing outward FDI and a decreasing ratio of inward to outward FDI (outward stocks increasing faster than inward stocks) characterise this stage. In the fourth and last phase, one observes the balancing of a country's roles as FDI parent and host. The volume, as well as the speed of adjustment, of inward and outward stocks converges.

The idea of this sequence of stages is not new. Dunning (1981) was the first to observe this pattern, which he named the 'Investment Development Path' (IDP) and tried to explain based on principles of the international business literature. Dunning presented the IDP as evidence supporting the 'eclectic theory of international production', a conceptual framework explaining motivations of firms in terms of their Ownership, Location and Internalisation (OLI) advantages. The empirical part of that study, as well as the ones that followed, was mainly descriptive, with the exception of non-parametric tests of hypotheses on the IDP in Durán and Ubeda (2001). The idea was further elaborated in Dunning (1986), Dunning and Narula (1996), and has also been extended to incorporate trade in Dunning *et al.* (2001). Several other researchers in international business like J. Clegg for the UK, E.M. Graham for the US, T. Osawa for Japan, have applied the concept to analyses of specific cases of countries, all appearing in Dunning and Narula (1996).

Ragoussis (2007) consists of the first attempt to incorporate the sequence of stages in a country's metamorphosis from a net FDI 'importer' to FDI 'exporter'

in the international economics literature. The framework of the analysis differs substantially, that is why we refer to the process as the 'FDI Chain' instead of Dunning's 'Investment Development Path'. We build on two important novelties in the international economics literature. First, the departure from two-country theoretical models initiated in order to analyse more complex integration strategies of MNEs (for example see Yeaple, 2003). Second, the effort to explain FDI flows with reference to both host and parent country characteristics (see Blonigen *et al.*, 2005).

The general hypothesis introduced about the process generating the 4-stages of the 'FDI Chain' is the following: Initially, a country's industry is controlled by small domestic firms, with lower productivity than abroad. They cannot afford foreign expansion, and thus only serve the domestic market. If the market experiences unusually high growth, foreign firms serving the domestic market through exports seek to produce inside the country or acquire domestic firms, in order to replace increasing total transportation costs with the fixed cost of producing domestically. With higher productivity the cost of production of foreign investors is lower, thus their profit margins are higher. More FDI is placed in the country especially if the industry is growing (Stage 2). This happens at the expense of domestic firms. Competition is enhanced; the price of final goods falls reducing the profit margins of all firms. Consequently, the speed and volume of foreign entry declines. At the conclusion of stage 2 domestic firms are likely to have less market share than previously because of increased competition, thus less likely to engage in FDI projects abroad. Nevertheless, domestic firms can gradually benefit from knowledge-technology spillovers which result in a reduction of the productivity gap between themselves and foreign firms. The increased productivity of the domestic firms induces outward FDI activity to the rest of the world, which will be more intense to countries hosting firms with productivity disadvantages. Outward stocks are expected to increase with unusually high pace; thus the country moves to stage 3. Lastly, since one country's outward FDI is another country's inward FDI, by symmetry it is natural to expect that the same factors leading to a steady volume and growth of inward stocks in a host country are expected to lead to steady volume and growth of its outward stocks, after it strengthens its role as a parent of FDI. This leads to a balancing of stage 4 of the Chain as long as there no major growth shocks in the world.

The aim of the present paper is two-fold. First, we seek to prove the existence of the sequence of stages proposed, for the largest possible number of countries in the world and develop the necessary framework to empirically identify the one each country is at some specific point in time. Second, we aim to empirically test factors motivating the process, using the dataset created in the first part of the analysis.

In what follows we describe the framework for the identification of stages; outline the theoretical predictions for factors motivating the Chain; and present

the results of the empirical model testing the theory. The implications of the results and conclusions are left for the last section.

2 Identification of Stages

There are two kinds of FDI data available for our empirical analysis. One could analyse FDI data on either *stocks* (i.e. international investment positions) or *flows* (i.e. financial account transactions). Flows can be generally approached as changes in stocks; therefore estimates of FDI stocks are, by definition, a more complete measure of a country's strength of inward and outward position since they capture an accumulated trend. However, datasets on stocks are more restricted in terms of time and geographical coverage. In addition, while much empirical analysis to date has been undertaken using the former, changes in stocks could arise either because of net new flows or because of valuation changes and other adjustments (such as reclassifications) (Hattari *et al.*, 2007). To abstract from these valuation and other changes, and also in order to test our hypotheses using a significantly large dataset, we analyse data on FDI flows.

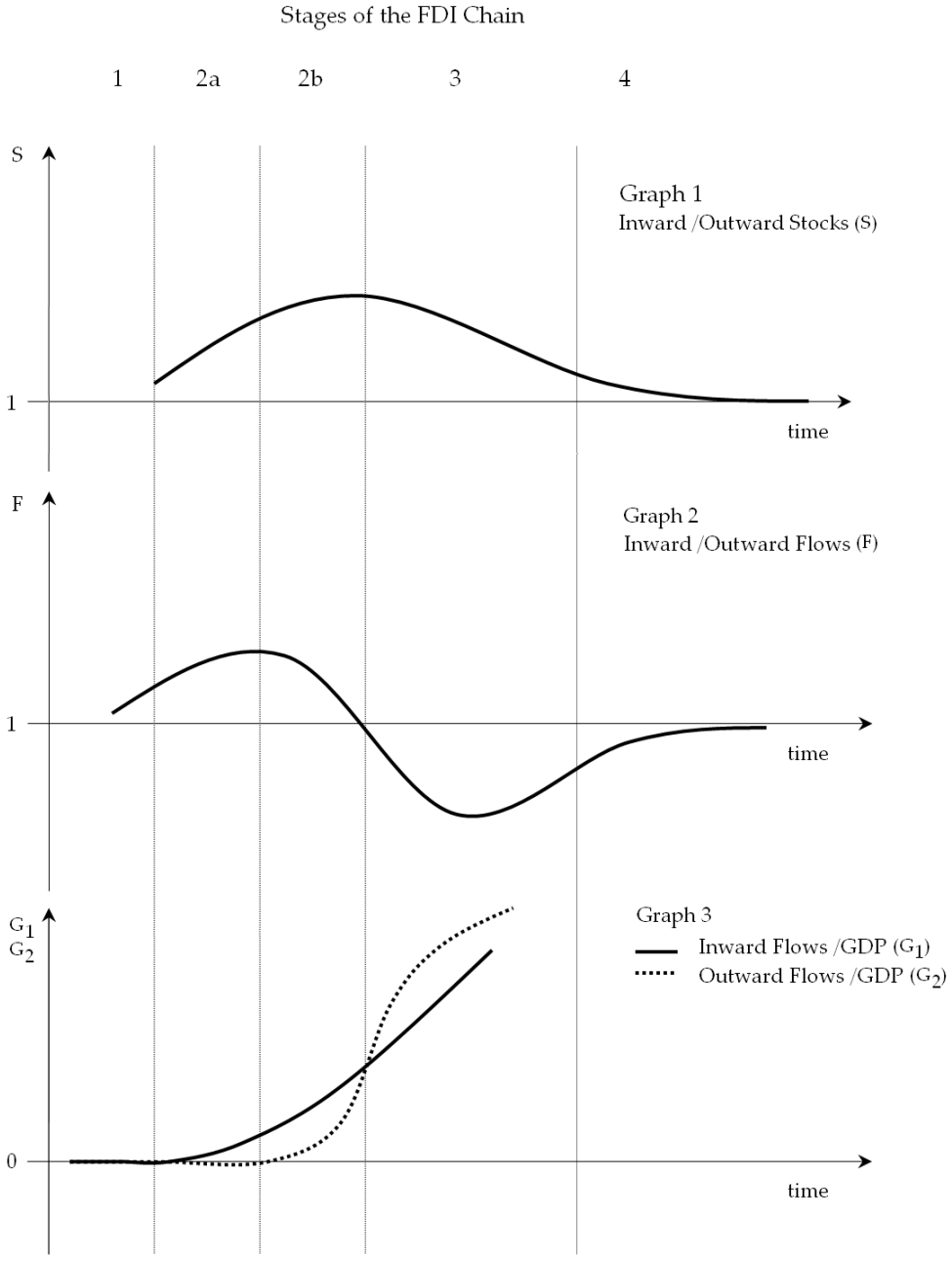
In order to identify the stage each country is at, we cannot use static observations. Static values of inward FDI, outward FDI or a measure of their relative position should be combined with a measure of their evolution. As a measure of relative position we choose the *ratio* of inward to outward flows. In total, the FDI Chain can be expressed in terms of the evolution of (i) the ratio of inward to outward stocks (ii) the ratio of inward to outward flows (iii) inward and outward flows separately (see figure 1 - graphs 1,2,3). The shape of the curves we expect to see is different for each case.

According to the Chain hypothesis, the ratio of inward to outward stocks over time should form an inverse U-shaped curve (see graph 1). We expect to see a significantly upward sloping curve when the country strengthens its role as a host (Stage 2); a significantly downward sloping curve when the country strengthens its role as a parent (Stage 3); and a flat curve close to the unit-axis when the country balances the two roles in a long-run equilibrium (Stage 4)[1].

The Chain hypothesis predicts that the ratio of inward to outward flows over time should follow the pattern illustrated in graph 2. We expect to observe values on the upper positive side of the graph (that is, significantly above the

[1]By using a logarithmic scale we can amplify changes when the ratio is small but also reduce meaningless fluctuations when the ratio is high. The differences in using the logarithmic instead of real scale of the ratio are (i) in the long-run balance axe which is at the value of 0 instead of 1 and (ii) in the fact that zero or negative values of FDI flows cannot be represented. FDI flows with a negative sign indicate that at least one of the three components of FDI (equity capital, reinvested earnings or intra-company loans) is negative and not offset by positive amounts of the remaining components. These are instances of reverse investment or disinvestment (UNCTAD, 2007). However, since cases of disinvestment are not of direct relelvance to our study, we will consider them hereafter as cases where there is no (that is zero) investment.

Figure 1: Representations of the FDI Chain



unit-axis, or the zero-log-axis) when the country strengthens its role as a host (Stage 2); values on the lower negative side of the graph (significantly below the zero-log-axis) when the country strengthens its role as a parent (Stage 3); and values close to the zero-log-axis when the country balances the two roles in a long-run equilibrium (Stage 4). The equivalence in graphing the evolution of stocks or flows becomes clear when we take into account the definition of flows as the change in stocks.

There are three major problems in the representations described above. First, the evolution of the ratio of inward to outward FDI is useful in identifying the second, third, and fourth stage of the Chain; however it does not permit the identification of the first stage (that is, the stage when a country is relatively unattractive to foreign investors and whose firms are not able to invest abroad). The reason for the first weakness is that, when inward and outward flows are insignificantly small, their ratio can take any value with extremely volatility; therefore its value or trend provide no information. The second weakness of these representations is that they do not indicate a clear point in time when a country moves from the first to the second stage. We take a significantly upward sloping curve in the ratio of inward to outward stocks or flows as an indication that the country has already passed to stage 2; but since stage 1 cannot be clearly identified, the turning point cannot be identified either. The last inconvenience is that movements in the ratio of inward to outward FDI can be caused by both a change in inward or outward FDI. We can interpret a downward sloping trend in the ratio as an indication of increasing outward FDI, although it could equally be the result of a sharp decrease in inward FDI. This kind of information remains unclear in the graphs.

Separate representations of inward and outward flows become useful in solving these problems (see graph 3). After controlling for the size of each country by dividing flows with respect to GDP, the curves in the last graph allow to clearly identify stage 1 as the phase when there is practically no inward or outward FDI in the country. The point in time when inward FDI emerges indicates the starting point of stage 2.

A separate representation of inward and outward flows allows for one extra observation: we can clearly identify the point in time when outward FDI emerges, even if it is still weaker than inward. Although that point in time makes a qualitative difference, the country does not change a stage according to the definitions of stages we used so far. It still strengthens its role as a host, since inward flows are still higher than outward. In order to capture this difference, we separate the second stage to stages 2a and 2b. During stage 2a, a country increases its inward stocks without significant signs of outward FDI. On the other hand, during stage 2b the country's firms have started being countable outward investors, although still not strong enough for outward FDI flows to balance inward. In both cases, inward flows are higher than outward, so the ratio of inward to outward stocks

is positive.

Besides the advantages in identifying the first two stages, separate representations of inward and outward flows are not-so-clear in the identification and the path towards the long-run equilibrium. Once flows become high, convergence to stage 4 could be determined by the relative slopes of the separate curves and their evolution, which are difficult to measure. The path towards long-run equilibrium of stage 4 is therefore best captured by the ratio of inward to outward flows.

Overall, it becomes clear that both kinds of representations (separate or in ratios) have advantages and disadvantages and therefore both are useful in determining turning points in time as a country moves from the first to the final stage of the Chain.

2.1 The data

Data on FDI flows were obtained from the online database of the United Nations Conference on Trade and Development (UNCTAD)[2]. The dataset covers 196 economies of the world and provides yearly data on inward and outward FDI flows from 1970-2006, in US dollars at 2007 prices. Data on GDP were retrieved from the *International Macroeconomic Data Set* of the United States Department of Agriculture (USDA)[3] which provides data for real (adjusted for inflation) GDP, population, real exchange rates, and other variables for 190 countries. The dataset covers the period from 1969-2006 and data projected to 2017. We used an online conversion calculator[4] created in conjunction with the Oregon State University Political Science Department[5], to adjust the series to 2007 prices. The two datasets for FDI and GDP overlap for 187 countries and 37 years (1970-2006) which will be the focus of our analysis.

The sample for our analysis consists of 187 countries traced for 37 years; in total 6919 units of observation[6]. 546 of the total observations were excluded from the analysis because of political regimes non-compatible with investment

[2] `http://stats.unctad.org/FDI`

[3] `http://www.ers.usda.gov/Data/Macroeconomics/`
According to the documentation attached 'The GDP series starts with the 2000 US dollar GDP series in the latest edition of the World Bank's *World Development Indicators* and is filled in using other data sources such as *Oxford Economic Forecasting, Global Insight, Project Link*, and the International Monetary Fund's *International Financial Statistics*. Conversion to dollars is based on a fixed 2000 exchange rate. Further gaps in all of the data series are filled in by a process of interpolation, extrapolation, or back estimation.'

[4] Columbia Journalism Review `http://backissues.cjrarchives.org/resources/inflater.asp`

[5] Robert Sahr (Robert.Sahr@orst.edu)

[6] in 1031 out of these observations, one (or both) values of inward or outward flows was missing from the data. In each of these cases, if there was consistent evidence from years close to the missing observations then the observations were classified by interpolation according to that evidence. Otherwise the observations were classified as 'inconclusive'.

activities[7], regardless of whether or not observations were missing. Out of the remaining 6373 observations, 874 were classified as 'inconclusive' because of missing values or various other reasons explained in the notes of the Appendix II.

2.2 Application

With the exception of few countries, data on FDI flows are very volatile. It is often difficult to trace with certainty a long run upward or downward trend in the data. In order to circumvent this problem, we applied the Hodrick-Prescott Filter (Hodrick and Prescott, 1997) to flows and ratios, a method widely used by macroeconomists to obtain a smooth estimate of the trend component of a series[8].

The FDI inward and outward series were plotted in separate curves for each country along with their long-run trends, according to the model of figure 1 - graph 3. The ratio of inward to outward flows for each country was plotted in a logarithmic scale, along with its long-run trend, according to the model of figure 1 - graph 2. The two graphs were used to identify the points in time when countries are moving from one stage to the next[9].

After plotting the series, the separate inward and outward curves are used to

[7]In particular, countries with socialist regime where private entrepreneurial activity was not allowed were excluded from the analysis for the periods when the regime was applicable (alphabetically: Afghanistan (1979-1992); Albania (-1991); Armenia (-1991); Azerbaijan (-1991); Belarus (-1991); Bulgaria (-1990); China (-1982); Czech Republic (-1990); Estonia (-1991); Georgia (-1991); Hungary (-1989); Laos (-1986); Latvia (-1991); Lithuania (-1991); Moldova (-1991); Mongolia (- 1992); Poland (-1989); Romania (-1989); Russia (-1991); Slovakia (-1990); Ukraine (-1991); Vietnam (-1986). Countries officially declared as 'socialist' but included in the analysis were all the ex-Yugoslavian (alphabetically: Bosnia-Herzegovina; Croatia; FYR Macedonia ; Serbia; Slovenia) since the former federation was having economic relationships with the west, as well as African countries with 'socialist-dictatorships', which still also kept economic relationships with the west (aplhabetically: Angola; Benin; Congo; Ethiopia; Mozambique; Somalia).

[8]Technically, the reasoning for the formula is as follows: Let y_t for $t = 1, 2...T$ denote the logarithms of a time series variable. The series y_t is made up of a trend component, denoted by s and a cyclical component, denoted by c, such that $y = s + c$. Given an adequately chosen, positive value of λ, there is a trend component that will minimize

$$\sum_{t=1}^{T} (y_t - s_t)^2 + \lambda \sum_{t=2}^{T} ((s_{t+1} - s_t) - (s_t - s_{t-1}))^2 \quad (1)$$

The first term of the equation is the sum of the squared deviations which penalizes the cyclical component. The second term is a multiple λ of the sum of the squares of the trend component's second differences. This second term penalises variations in the growth rate of the trend component. The larger the value of λ, the higher is the penalty. As $\lambda \to \infty$, s approaches a linear trend. In our application, we chose $\lambda = 300$, a value which reduces the noise by enough so as to be able to inspect the stages without loss of information.

[9]The dataset and full set of graphs for the 187 countries of the analysis is available upon request to the author.

identify the point in time when a country starts becoming attractive to foreign investors. The clear start of a *consistently* upward sloping curve of inward flows is taken as the begining of stage 2a (see Appendix I, Figures 4 and 5 and 7 for specific examples). The clear start of a *consistently* upward sloping outward flows curve is taken as the begining of stage 2b (see Figures 5, 6, and 7 for specific examples). Figure 11 in Appendix I presents two cases of countries appearing with *inconsistent* fluctuations in inward (Nepal) and outward FDI (Côte d'Ivoire). It is important to note that our analysis focuses on significant changes in the slope of the curves; not primarily in the values they represent. For the cases where the turning point does not appear in the period analysed, we consider a country that ranks above a rough but consistent threshold of 0.5% inward flows/GDP and whose ratio of inward/outward FDI is increasing, to be in stage 2a (that is, the country is not considered to be unattractive to foreign investors). Similarly, if the turning point does not appear in the period analysed, then a country that ranks above a rough but consistent threshold of 0.5% outward flows/GDP and has a decreasing inward/outward FDI ratio is considered to be in stage 2b[10]. A country with outward flows consistently above inward, or in other words with a negative log-ratio of inward/outward FDI is considered to be at stage 3 (see figures 8, 9 and 10 for examples). Lastly, a consistent ratio of inward to outward FDI close to the zero-log-axis combined with non-zero inward and outward flows is considered a sign of stage 4.

The units of observation classified at one of the stages of the Chain according to the criteria proposed are 5499 out of the total number of 6373 observations (that is, 86% of the sample). Results for all countries are presented in Appendix II, followed by notes explaining the application for special cases of countries.

2.3 Results

The Chain hypothesis unifies the treatment of inward and outward FDI position of each country leading to a single measure of integration in the global FDI network. This single measure allows to visualise the network of integrated countries and trace its evolution in time. We can clearly see that, in the '70s, countries integrated into the global economy were concentrated in the core of Western Europe, and North America. In the '80s South East Asian countries started

[10]according to the model of Figure 1 - graph 2, stage 2b can be represented by a decreasing but positive log-ratio of inward to outward FDI flows. However, at the very begining of stage 2b, small and insignificant values of outward flows can have a major impact on the ratio as they start increasing. For example, if outward FDI increases from 0.01% to 0.02% of GDP then the ratio will drop by half, while flows in that direction are *still* insignificantly low. Therefore as long as the ratio of inward to outward FDI remains at a value above a rough threshold of 2.5 in the log-scale, then regardless of the slope of its curve, the country is classified at stage 2a (see Appendix I, Figure 7 for an example). A significant increase in outward FDI is in most cases linked to a downward sloping ratio at values of less than 2.5.

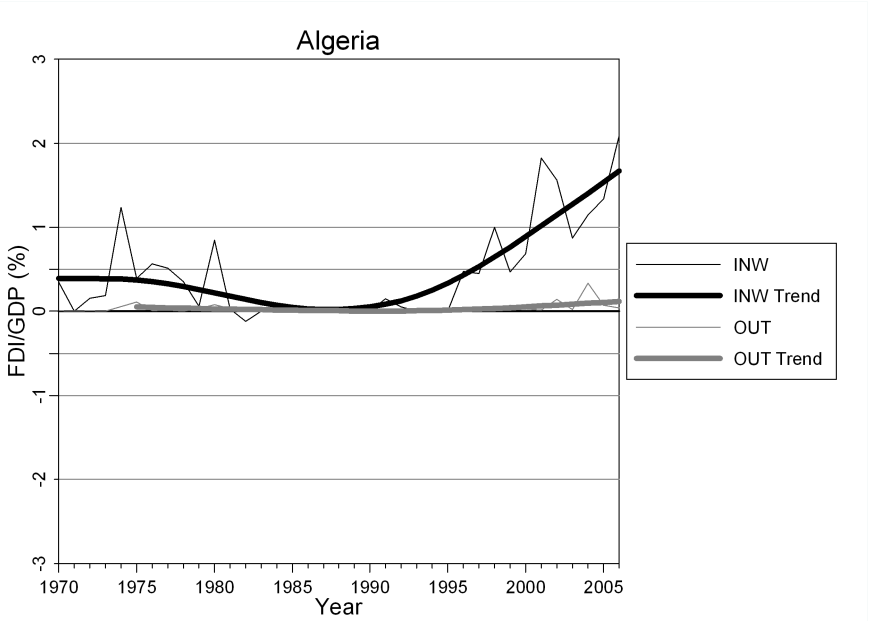


Figure 2: Algeria: Transition backwards from stage 2a to 1 (1981) and forward to 2a (1996)

moving up the Chain; in the '90s Southern Europe and South America followed, and the network keeps expanding spatially in Eastern Europe, the Middle East, Central America, India and China in our decade. Africa differs significantly to this picture. Almost all African countries are still at the stage of attracting FDI, and flows directed towards this continent in nominal terms are still very low. In terms of stages, from 1970-2006 we observe 29 cases in the world where there was clearly a move backwards in the FDI Chain (see Appendix II, Note 1). Africa hosts 19 of these cases, that is 2/3 of the total number, following shocks of many kinds. The pattern observed in terms of the evolution of inward and outward flows in many cases of African countries is presented in figure 2. The significant number of shifts backwards in the Chain in Africa is the result of numerous military interventions, civil wars, economic collapses, the seriousness of which cannot be compared to other continents (see Appendix II - Note 1). In the rest of the world, the patterns observed follow preponderantly the expected patterns of figure 1 (graphs 2, 3) although with some variations.

The first obvious observation we can make from the results is that the stage a country is at in the FDI Chain appears to be clearly correlated with its level of development. This trend confirms the initial observation by Dunning (1981). Clustering results suggest that among countries with roughly the same level of

development, the larger and the more industrialised the country, the faster it moves through the initial stages of the Chain, and the stronger is the prevalence of the third stage with respect to the previous ones (see Figure 3, cases of Spain and Portugal). The examples of the United States vs Canada, Norway vs Sweden, or France vs Germany are also characteristic (see results in Appendix II). Smaller countries do seem to pass through all the stages predicted as they develop, although the intensity of each stage is different. This observation seems to be strongly supporting empirical proposition 4 (see p.5).

The fact that the majority of cases analysed confirms the sequence of stages predicted, allows us to accept with confidence the Chain hypothesis as a stylized fact. However, there are still important issues to be addressed. We confirmed that outward FDI follows inward, but we have not established any links to factors motivating this sequence. What has changed when a country moves from one stage to another? In what follows we develop an empirical model to test theoretical predictions on the impact of market size, productivity, or trade flows in the probability of transition from any stage to the next.

3 Theoretical predictions

The theoretical framework developed in Ragoussis (2007) points at four propositions to be empirically tested:

Proposition 1: *Market size and import volume affect positively the probability of transition from stage 1 to 2.*

As a market hosting less productive firms grows, imports supplied by foreign and more productive firms increase; therefore the incentive to replace increasing total transportation costs by a fixed cost of establishing production facilities inside the growing market (that is, undertake FDI) increases. The country passes to Stage 2.

Proposition 2: *Productivity and export volume affect positively the probability of transition from stage 2a to 2b.*

Inward FDI increases competition in the market and provokes productivity spillovers to domestic firms. Higher productivity for domestic firms motivates the emergence of outward FDI to growing foreign markets, hosting less productive firms.

Proposition 3: *Productivity affects positively the probability of transition from stage 2b to 3.*

The distinguishing feature of stage 3 is the fact that outward FDI flows expand to a level above inward, which can be explained within the same theoretical

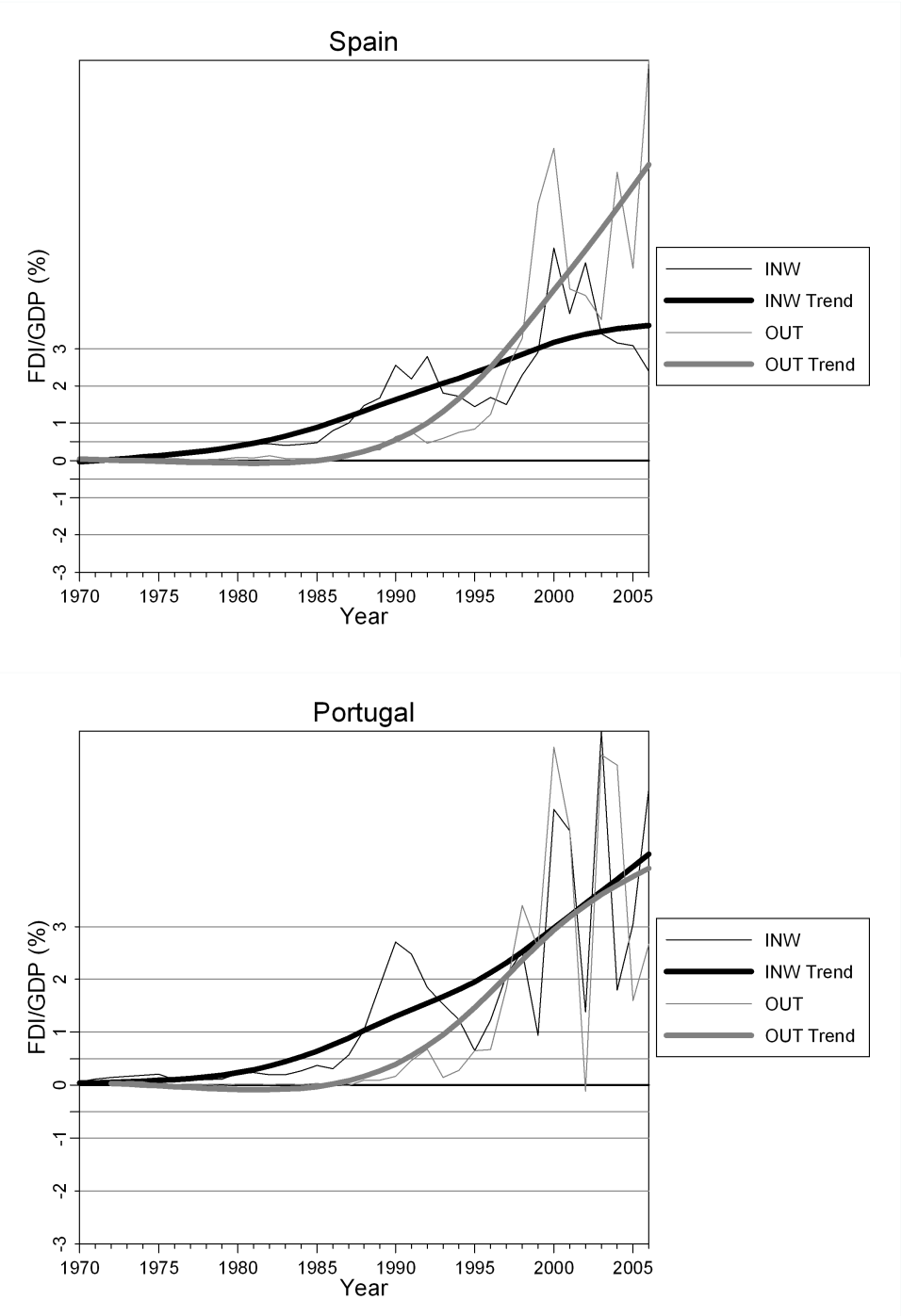


Figure 3: Variations of the pattern according to sizes of countries. Cases of Spain and Portugal

framework by an even higher productivity advantage of domestic firms.

Proposition 4: *Market size and level of industrialisation affect positively the probability of transition from any stage of the Chain to the next.*

This proposition can be linked to the 'spillover hypothesis' demonstrated in the theoretical analysis. According to that hypothesis, the time lag between the emergence of inward and outward FDI depends on the gap between the level of technology of foreign and domestic firms. If the gap is low (which is true for large industrialised countries receiving FDI from firms with a not-as-significant productivity advantage) the time lag for the emergence of outward FDI will be small; therefore the economy will pass through the initial stages rapidly, and the third stage will prevail compared to the initial ones.

As the global FDI network expands through this domino-process, and as long as there no major growth shocks in the world, the addition of new countries in the network should have an impact of diminishing importance on the relative position of inward to outward FDI. Therefore, a country's relative investment position is expected to converge. In theory, the evolution from stage 3 to 4 is determined by changes exogenous to the country; thus significant explanatory variables cannot be clearly predicted in that case. The issue remains to be tested.

4 Empirical Model

Studies testing the effect of different variables on inward or outward FDI flows have not been rare in the literature (for a detailed review see Lipsey, 2002). The novelty in our empirical testing lies in the use of the stage each country is at in the FDI Chain as our dependent variable. The stage captures information on (i) the relative position (ii) the magnitude and (iii) the trend in the evolution of inward and outward FDI flows. Note that in all stages except the first one, *both* inward and outward FDI flows increase. Therefore, all previous studies' conclusions on market factors having a positive effect on inward and outward FDI could potentially be valid in explaining a country's progress through the FDI Chain. However, we see that not all of them are equally significant in explaining the probability of transition of countries from one stage to the next.

4.1 Alternative Specifications

In our dataset we distinguish between 5 stages of the Chain (namely 1, 2a, 2b, 3 and 4). In order to test the probability of transition through the stages we need a discrete choice model (probit or logit) for more than two alternatives. The most popular options available are conditional, ordered, multinomial, and hierarchical (nested) probit or logit models.

Conditional models seek to explain the probability of a certain outcome in the dependent variable according to characteristics of the dependent variable itself[11]. In our case, conditional models would be an appropriate choice if we were trying to explain the probabilities of transition to another stage according to characteristics of stages, not of the countries in transition. On the other hand, ordered models are based on the assumption that the same set of independent variables has equivalent impact on the transition from any stage to the next one, a framework that does not allow to test our hypotheses. Consequently, simple multinomial models seem the most appropriate choice. However, the calculation of multinomial as well as conditional logit models is based on the axiom of 'Independence from Irrelevant Alternatives' (IIA), that is, we assume that each transition is made independently to its alternatives and therefore errors from the regression are i.i.d. In our case this is not true, since according to our hypothesis, the process we examine is of sequential nature; for example, transition to stage 3 happens only for countries already in stage 2b[12].

Contrary to multinomial logit models, the IIA is relaxed in the computation of multinomial probit or hierarchical (nested) logit models[13]. The former option is computationally extremely difficult, which has also been confirmed in our case. As for the latter option, in nested models, the IIA assumption holds only for choices within one nest; not for choices selected from different nests. In the case of our analysis, each nest would have to be formed within the *same* group of alternatives (stages 1, 2a, 2b, 3 and 4) since choices are being selected sequentially from the same set, which invalidates the assumption of the IIA holding inside nests. Consequently, this option proves to be inappropriate for our case.

In addition to these problems, it must be noted that we are using longitudinal data as our dependent and independent variables. All the above formulations would thus have to be adjusted to include treatment of unobserved effects, in order to avoid heterogeneity bias.

4.2 The Model

In light of the above problems, the empirical strategy we adopt breaks the estimation of the model in four steps. Each step corresponds to one transition in

[11] For example we use conditional models to explain the probability of an individual choosing to live in a certain neighbourhood, according to characteristics of the neighbourhood, not of the individual.

[12] Exceptions where we observe transitions backwards in the Chain exist under special circumstances of political or economic shocks (see Appendix II, Note 1). However, these cases do not change the sequential nature of the process, since countries move to the previous and not any stage of the Chain.

[13] Nested logit models are used to analyse sets of choices 'nested' within each of the choises of a higher level, which in turn are 'nested' within a each of the choises of some higher level and so on. The structure of the model proves to be ideal for the analysis of choices made by individuals in a sequential way.

the Chain. For each estimation we use the part of the sample that is relevant to the corresponding transition, that is, only countries in the previous and the next stage[14]. For example, when we model the probability of transition from stage 1 to 2a we exclude all observations of stages different to these two; we create a binary dependent variable y taking the value of 0 at the initial stage (that is, stage 1 in our example) and the value of 1 at the stage-outcome of the transition (2a in our example) and test the probability that transition occurs $P(y_{it} = 1)$ over a set of independent variables reflecting characteristics of the country at time t. We repeat the estimation for transitions 2a-2b, 2b-3 and 3-4. These empirical models are used to formally examine 'what has changed' when a country moves from one stage to another. The key factor justifying this strategy is the sequential nature of the process, since transitions have been confirmed to follow a predetermined path. If countries could move from one stage to *any* other in the Chain (which is not the case here) then the strategy would not be appropriate since a large number of binary combinations would have to be tested to cover all cases.

In our dataset we observe N countries for T time periods. For the subsample relevant to each transition, at each observation we record whether transition has occured or not ($y_{it} = 1$ as opposed to $y_{it} = 0$). Let $\mathbf{y}$ denote the $(N \times T) \times 1$ vector containing these binary observations. Let $\mathbf{x}$ denote the $(N \times T) \times k$ matrix of observations on $(k-1)$ covariates potentially explaining $\mathbf{y}$. We model the relationship between $\mathbf{y}$ and $\mathbf{x}$ using a unobserved effects logit specification

$$P(y_{it} = 1 \mid \mathbf{x_{it}}, \alpha_i) = \frac{\exp(\alpha_i + \mathbf{x_{it}}\beta)}{1 + \exp(\alpha_i + \mathbf{x_{it}}\beta)}, \quad i = 1, ..., N, \quad t = 1, ..., T \qquad (2)$$

This model makes the following assumptions: first, conditional on $(\mathbf{x_{it}}, \alpha_\mathbf{i})$, y_{it} is an independent Bernoulli random variable with probability given by (2); second, $P(y_{it} = 1)$ depends on $\mathbf{x_{it}}$ through the logistic function; third, $P(y_{it} = 1)$ is governed by both a vector β of k common ('structural') parameters and a unit-specific ('incidental') parameter α_i.

In the Fixed Effects (FE) specification of the model we consider the unit-specific parameters to be 'fixed'; thus we have two options in estimating β: (i) the unconditional Maximum Likelihood Estimator (MLE) and (ii) the conditional MLE. In the former approach we treat constants α_i as parameters to be estimated for each country, along with β. The estimators are obtained by maximising the unconditional likelihood function. This approach gives rise to the so called 'incidental parameters problem': for fixed T, the number of incidental parameters increases without bound as $N \to \infty$ making the estimators of β as well as α inconsistent. In the linear version of the model, in order to circumvent this problem we first-difference across time, and exclude the incidental parameters from

[14]The use of the whole sample instead (countries at any stage before, versus any stage after the transition) does not alter significantly the results. In fact, the trends shown in the aggregate model are accentuated by the use of subsamples.

the equation. In a non-linear case like ours, the second approach of conditional MLE provides a solution to the problem. In particular, the estimators here are obtained by conditioning the likelihood function on minimal sufficient statistics for the incidental parameters, and then maximizing the conditional likelihood function. In the logit case, such statistics can be

$$n_i = \sum_{t=1}^{T} y_{it} \tag{3}$$

This is a major advantage of the FE logit estimator compared to the probit estimator: by conditioning on n_i we do not need to make any assumptions on the distribution of α_i; the distibution of $(\mathbf{y_i} \mid \mathbf{x_i}, \alpha_i, n_i) = (\mathbf{y_i} \mid \mathbf{x_i}, n_i)$. However, note an important inconvenience of the FE approach: if there is no variation in $\mathbf{y_i}$ all elements of the vector are excluded from the analysis, since their values are captured as fixed effect across time.

In the Random Effects (RE) specification we do not treat α_i as 'fixed'; we treat the incidental parameters instead as an unobservable random variable drawn along with $(\mathbf{y_i}, \mathbf{x_i})$, which adds a fourth assumption to the three standard ones of the unobserved effects specification:

$$\alpha_i \mid \mathbf{x_i} \sim \text{Normal}\left(0, \sigma^2\right) \tag{4}$$

Given this last assumption, we need to use integrals in order to exclude the idiosyncratic effect, which makes the model computationally more difficult than the FE logit[15]. The advantage of this estimator is that in its calculation, we do not have to drop all the invariant observations across time. This yields in substantially larger samples for our hypotheses to be tested. In cases where both the fixed and random effects estimations are feasible, we report both results, which however do not differ significantly.

4.3 Explanatory variables

In order to test our hypotheses we used data published by the World Bank as the *World Development Indicators*, 2005[16]. In particular we choose the following as explanatory variables: Gross Domestic Product (GDP) converted to 2000 US$; Annual growth of GDP; Imports as a percentage of GDP; Exports as a percentage of GDP; Annual growth of imports; Annual growth of exports; Trade (volume) as a percentage of GDP; Change in the Exchange Rate (expressed in units of locals currency per US$); Military Expenditure as a percentage of GDP; and lastly, GDP per unit of labor force (created from variables of GDP, and estimates of labor force of each country). Each variable aims in testing the impact of a

[15] For a more detailed discussion on the method see Wooldridge, 2002

[16] `www.worldbank.org/data/`

different factor motivating the FDI Chain: GDP is used as a measure of the size of the market; imports and exports to test the trade-substituting motive for FDI predicted by the theory; trade volume as a measure of openness of the economy; the change in the exchange rate is used to control for the structural correlation between FDI and imports/exports required for zero balance of payments; military expenditure as a proxy variable, negatively correlated with geo-political safety which affects decisions to invest; GDP per unit of labor force as a general measure of productivity of the labor force in the country.

In selecting the explanatory variables, the trade-off between sophistication of the measure used and the availability of data proves to be a major issue. On average, the more sophisticated the variable used, the less expanded datasets are in terms of countries and periods covered. For example, in order to test the impact of productivity of the labour force on the probability of transition through the Chain, we can use (i) Total Factor Productivity (TFP) data, which are only available for developed countries (ii) data on GDP per hour worked in the economy, available at most for 40 countries in the world, or (iii) data on GDP per unit of the labour force which is the most general measure, available for most countries after 1950. We chose the third option because it allows us to exploit a significantly larger part of the dataset created as a dependent variable. The limitations rising from such choices are obvious, but as a first step, results can still give signals of support or rejection of the hypotheses initiated. More sophisticated datasets can be used in future research to show limitations of our scenario.

4.4 Results

In Table 1 we present the results for the ML estimators of β calculated over our preferred specification; that is, the effect of each element of $\mathbf{x}$ on the log-odds ratio, which is not directly interpretable. In Table 2 we present the results for the marginal effects of each element of $\mathbf{x}$ on the probability of transition to the next stage of the process, which is interpretable.

$$\frac{\partial P\left(y_{it}=1 \mid \mathbf{x_{it}}, n_i\right)}{\partial x_{it}} \tag{5}$$

Marginal Effects are calculated at values of $\mathbf{x_{it}}$ yielding $P \simeq 0.5$, and assuming that the idiosyncratic effect = 0. The choice of where to calculate the marginal effects is crucial since, in RE models, calculation at standard choices of $\mathbf{x} = \bar{\mathbf{x}}$, or $\mathbf{x} = 0$ often yields non-interpretable results. In FE models choosing calculation at $\mathbf{x} = 0$, is sufficient to yield $P \simeq 0.5$.

We report results for both fixed and random effects. According to the Hausmann test, FE is preferable at the 1% level for transitions 1-2a, and 2a-2b with a χ^2 statistic of 18.85 and 45 respectively (which however are not extreme). The

Maximum Likelihood Estimators of β								
	Transition through stages							
	1-2a	1-2a	2a-2b	2a-2b	2b-3	2b-3	3-4	3-4
	FE	RE	FE	RE	FE	RE	FE	RE
GDP (billions USD)	0.035956***	0.027231***	0.484220***	0.076802***	.	0.054739***	.	0.005266***
	(0.006592)	(0.005099)	(0.071653)	(0.011304)	.	(0.006639)	.	(0.00055)
GDP growth (%)	0.020800*	0.021163*	0.033551	0.000314	.	-0.159343	.	-0.424969***
	(0.011301)	(0.011489)	(0.030153)	(0.025855)	.	(0.111000)	.	(0.138308)
Δ(Exchange Rate)	-1.83743***	-1.91306***	0.3847518	-0.671139	.	2.45141	.	-2.44812
	(0.427808)	(0.4248577)	(1.04323)	(0.867371)	.	(3.34345)	.	(3.49933)
Imports (%GDP)	0.046129***	0.050368***	-0.006749	0.0105072	.	-0.081232	.	-0.555689***
	(0.010048)	(0.009678)	(0.018849)	(0.017093)	.	(0.113504)	.	(0.166449)
Exports (%GDP)	0.011413	0.021599*	-0.004691	0.053636***	.	0.214164	.	0.792288***
	(0.011902)	(0.010963)	(0.021762)	(0.017808)	.	(0.101212)	.	(0.170499)
GDP per Labor (thousands USD)	0.064338	0.014907	0.557124***	0.967772***	.	0.719950***	.	0.921629***
	(0.032745)	(0.029263)	(0.153833)	(0.056964)	.	(0.083770)	.	(0.083613)
C		0.538127		-26.2089***	.	-48.4422***	.	-69.0957***
		(0.559457)		(1.398771)	.	(2.91807)	.	(3.612515)
Log Likelihood	-554.1108	-816.4997	-156.5540	-441.5521	.	-86.26853	.	-66.4427
ρ		0.8390		0.9899	.	0.9869	.	0.9937
Observations	1254	2613	981	2560	.	907	.	421
Countries	51	129	43	138	.	64	.	19
Standard errors in perentheses with significance at the *** 1%, ** 5%, * 10%								

Table 1: Logit estimators of β

Marginal Effects on the Probability of transition to the next stage								
assuming the idiosyncratic effect = 0 and calculated at values of $\mathbf{x}$ yielding $P \simeq 0.5$								
	Transition through stages							
	1-2a	1-2a	2a-2b	2a-2b	2b-3	2b-3	3-4	3-4
	FE	RE	FE	RE	FE	RE	FE	RE
GDP (billions USD)	0.008989***	0.006807***	0.121055***	0.019200***	.	0.013684***	.	0.001316***
	(0.00165)	(0.00127)	(0.01791)	(0.00283)	.	(0.00163)	.	(0.00014)
GDP growth (%)	0.005200*	0.005290*	0.008388	0.000078	.	-0.039835	.	-0.106242***
	(0.00283)	(0.00288)	(0.00754)	(0.00646)	.	(0.02775)	.	(0.03457)
Δ(Exchange Rate)	-0.459359***	-0.478264***	0.096187	-0.167784	.	0.612851	.	-0.612031
	(0.10695)	(0.10613)	(0.26081)	(0.21684)	.	(0.83589)	.	(0.87479)
Imports (%GDP)	0.011532***	0.012592***	-0.001687	0.002626	.	-0.020308	.	-0.138922***
	(0.00251)	(0.00242)	(0.00471)	(0.00427)	.	(0.02838)	.	(0.04157)
Exports (%GDP)	0.002853	0.0054399*	-0.001172	0.013409***	.	0.053541	.	0.198072***
	(0.00298)	(0.00274)	(0.00544)	(0.00445)	.	(0.02529)	.	(0.04255)
GDP per Labor (thousands USD)	0.016084	0.003726	0.139281***	0.241942***	.	0.179987***	.	0.230407***
	(0.00819)	(0.00732)	(0.03846)	(0.01424)	.	(0.02101)	.	(0.02097)
Standard errors in perentheses with significance at the *** 1%, ** 5%, * 10%								

Table 2: Logit marginal effects on the probability of transition

FE specification could not appropriately fit the data for transitions 2b-3 and 3-4 since convergence was not achieved during the ML estimation (probably due to a flat likelihood function). Estimates of β in the last two cases, are only reported for a RE specification.

The results are consistent to our hypotheses. Market size, growth as well as imports are significant factors for a country's first step higher up the Chain, that is, its transition out of unattractiveness to foreign investors. On the other hand, productivity is highly significant in the transition to later stages 2b and 3, where countries start and ultimately strengthen their roles as an FDI parent. In the RE specification we also see exports becoming highly significant and imports insignificant when outward FDI starts emerging from a country, as expected from the theory. The effect is robust after controlling for changes in the exchange rate. In the FE specification, exports are not significant in explaining that transition, although the latter reflects calculation over a lot smaller sample (43 vs 138 countries tested with RE). The size of GDP is significant in explaining the probability of transition to any stage of the Chain, confirming our empirical proposition 4. However, the variable appears a lot more significant in explaining transition from stages 2 to 3 than the initial one from 1-2a. The result could be due to GDP growth capturing a part of the effect and appearing significant in the latter case.

Concerning the transition to a long-run equilibrium (stage 4), we see all variables being significant except from the change in the exchange rate. It is interesting to note that the coefficient for market size is positive, although the coefficient for market growth appears negative. Imports seem to have a significantly negative impact in the probability of transition to stage 4, whereas exports a significantly positive, as expected for later stages of the Chain. Lastly, productivity appears with a highly positive impact in the process as well. Note however that these results reflect calculation over a sample of 19 countries, only 10 out of which make it to the final stage.

Some of the variables initially selected were excluded from the analysis for various reasons. Trade volume (%GDP) was excluded as highly collinear to imports and exports, while not adding more information than the two variables. Specifications including just trade volume, or just imports and exports were tested in terms of fitness to the data and did not present large differences. Growth of the trade variables (exports and imports) did not add to the analysis, as they were always insignificant as well highly collinear with other variables. Military expenditure, although significant, was excluded from the analysis because its dataset was very restricted compared to datasets for the rest of the variables, resulting in a large part of information being excluded from the analysis.

An important point to mention concerning our results is the fact that the idiosyncratic effect seems to be capturing most of the variance in the probability of transition to any stage of the Chain. The nature of our dataset contributes to this result by not providing many points of transition through stages, although

a percentage of $\rho = 98\%$ or 99% is in any case high. Consequently, as it becomes apparent in Table 2, the marginal effects of the explanatory variables on the probability of transitions are in most cases small in size. The idiosyncratic effect appears 'deterministic' in the nature of this process, which is an interesting result to interpret.

5 Conclusions

The main contribution of the Chain hypothesis as a concept is the unification of the treatment of inward and outward FDI position of each country leading to the creation of a single measure of integration in the global FDI network. The overall purpose of our analysis is to demonstrate and explore differences in the dynamics of transition to higher levels of integration.

In this paper we proceed in a detailed empirical analysis of five clear stages defining the FDI Chain. The stage each country is at captures information on (i) the relative position (ii) the magnitude and (iii) the trend in the evolution of inward and outward FDI flows. After formalising the stages, we develop the necessary framework to empirically identify the one each country is at, using separate representations as well as log-ratios of inward and outward FDI flows across time. In order to explain the transition from the initial to the final stage, we develop consecutive logit models to test factors motivating the process. We show that market and trade growth increases significantly the probability of transition through the initial stages of the Chain, although only a significant advantage in productivity and technology can motivate transitions to the final stages of integration in the global FDI network. All empirical hypotheses following the theoretical analysis on the Chain are confirmed by the data. In our analysis, limitations rise from choices of simplified explanatory variables as well as model specifications, both of which ultimately aim in using the largest possible amount of information available. However, as a first step, our results give credible signals of support of the hypotheses initiated. More sophisticated datasets can be used in future to show limitations of our scenario.

Apart from refining the current analysis, future research can focus on the spatial side of the FDI Chain. Our clustering results suggest that the geographical position of a country has an important effect on the stage it is at, regardless of its level of development or size. There are indications that a neighbouring country moving higher up the Chain has a positive impact in the transition of the domestic economy to higher stages. These indications form an interesting hypothesis to test. Further to that, in this paper we have initiated and established a sequence in the attraction and creation of FDI, ignoring the factor 'where': FDI from where, and where to? Formalising and empirically testing spatial stages observed in the expansion of the FDI network will be an interesting extension of both the theory and empirical evidence on the Chain.

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Appendix I

Representations of the FDI Chain

Each figure corresponds to the case of one country (namely Albania, Chile, Brazil, Greece, France, Denmark, Nepal, Côte d'Ivoire) and consists of two graphs. The first graph presents the separate curves of inward and outward FDI/GDP along with their long-run trends (HP filter curves), according to the model of Figure 1 - graph 3. The second graph presents the ratio of inward to outward flows for each country in a logarithmic scale, along with its long-run trend, according to the model of Figure 1 - graph 2.

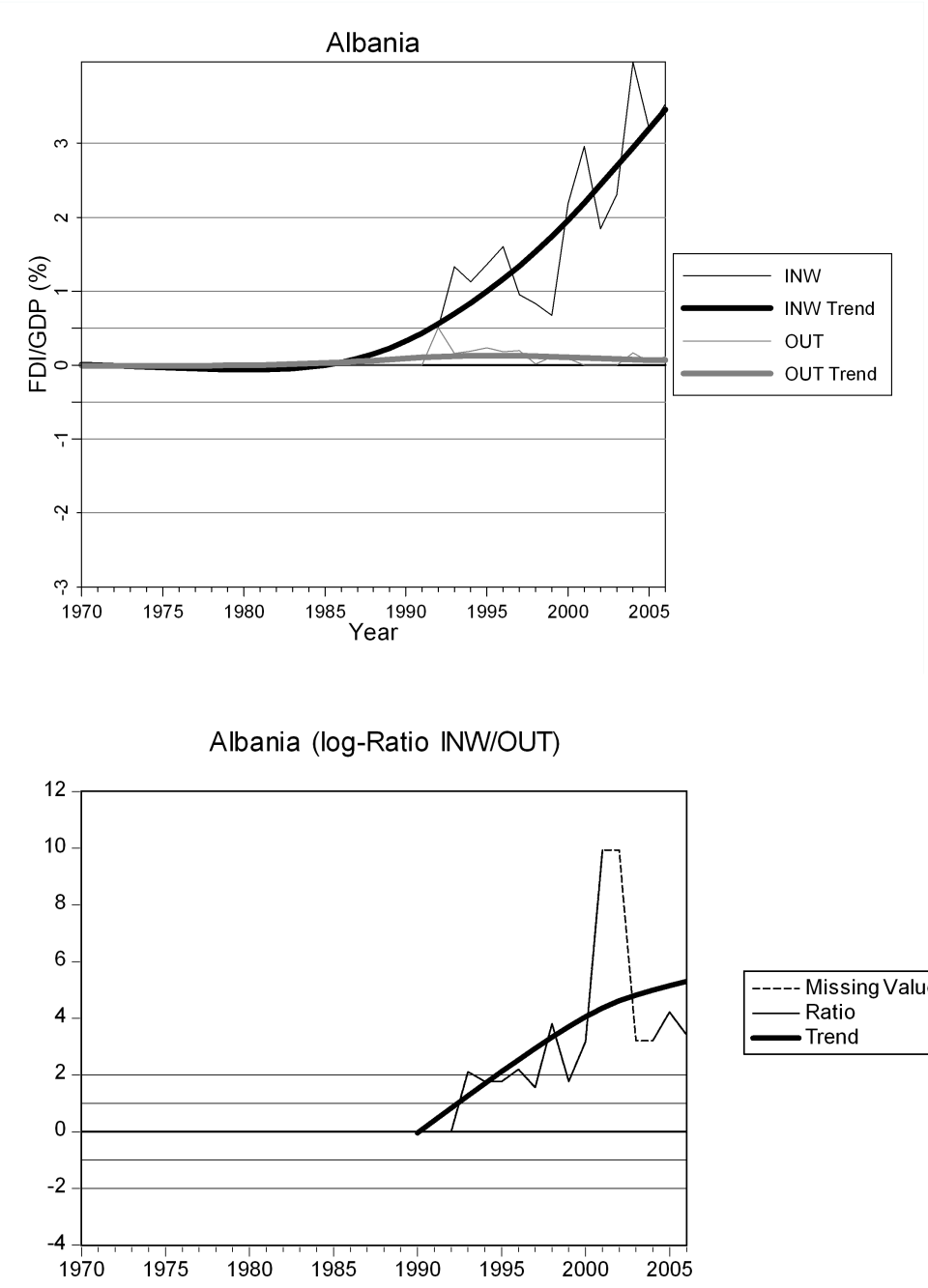


Figure 4: Albania: Transition from 1-2a (1992)

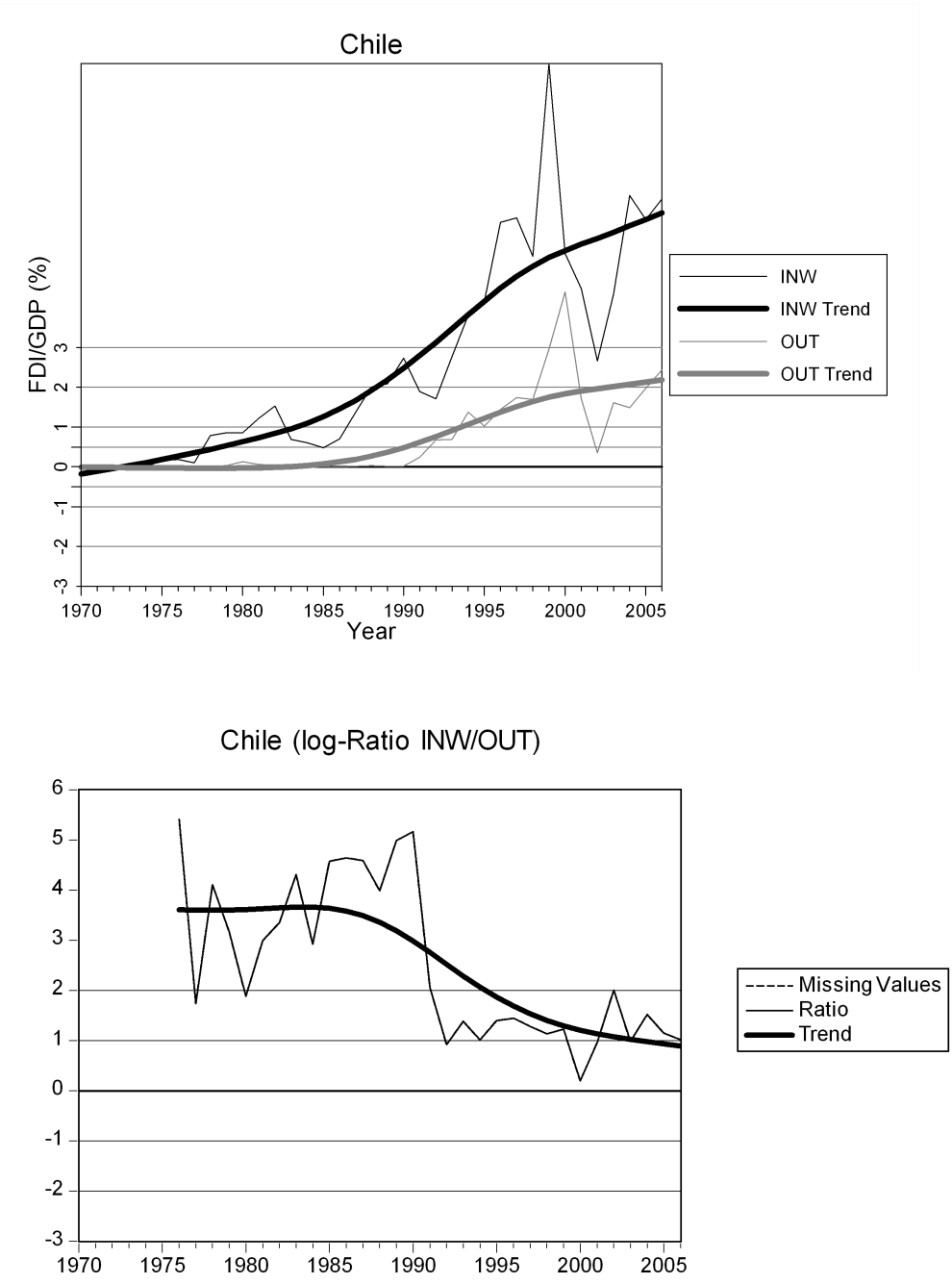


Figure 5: Chile: Transition from 1-2a (1976) and 2a-2b (1991)

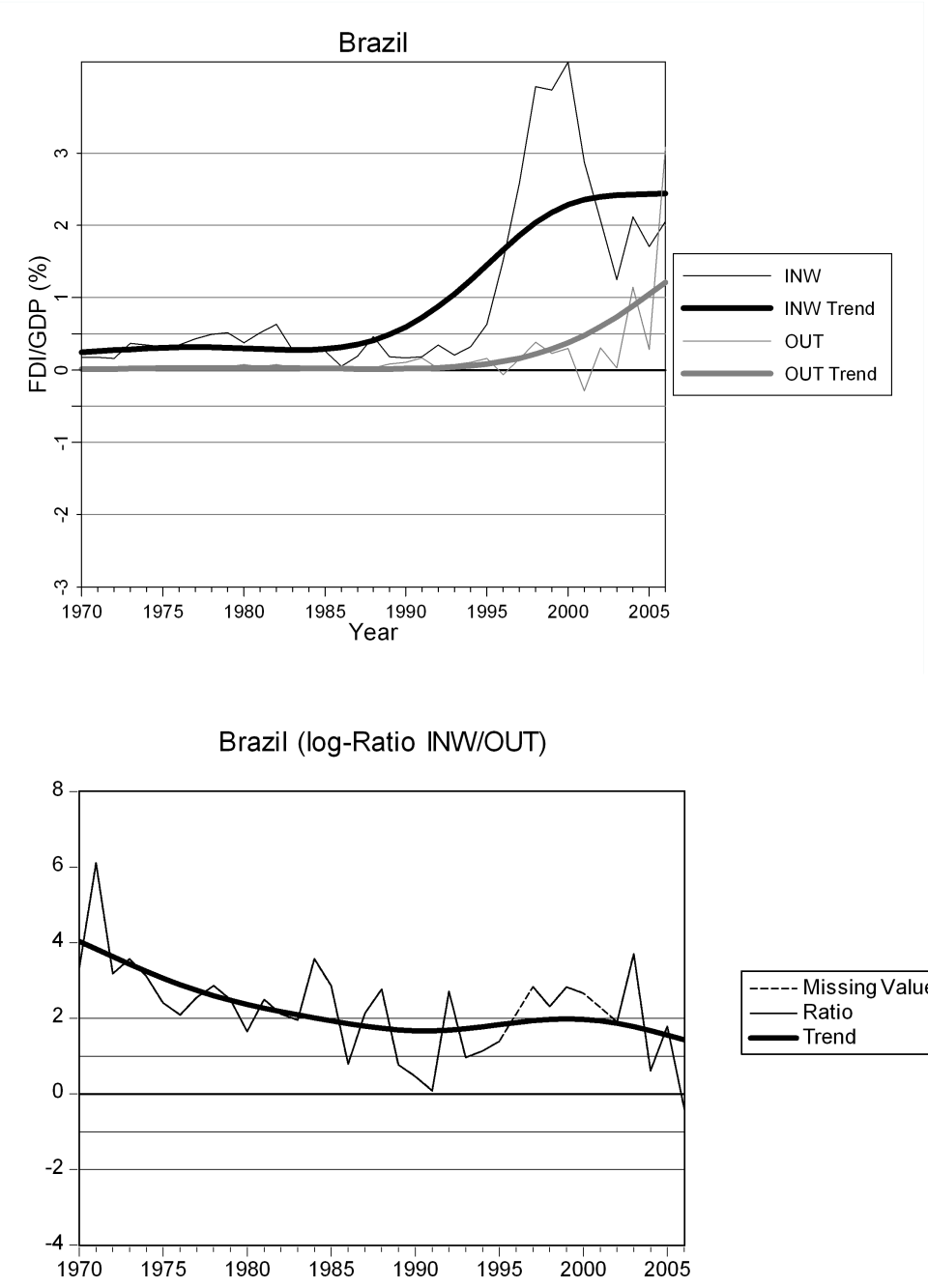


Figure 6: Brazil: Transition from 2a-2b (1997)

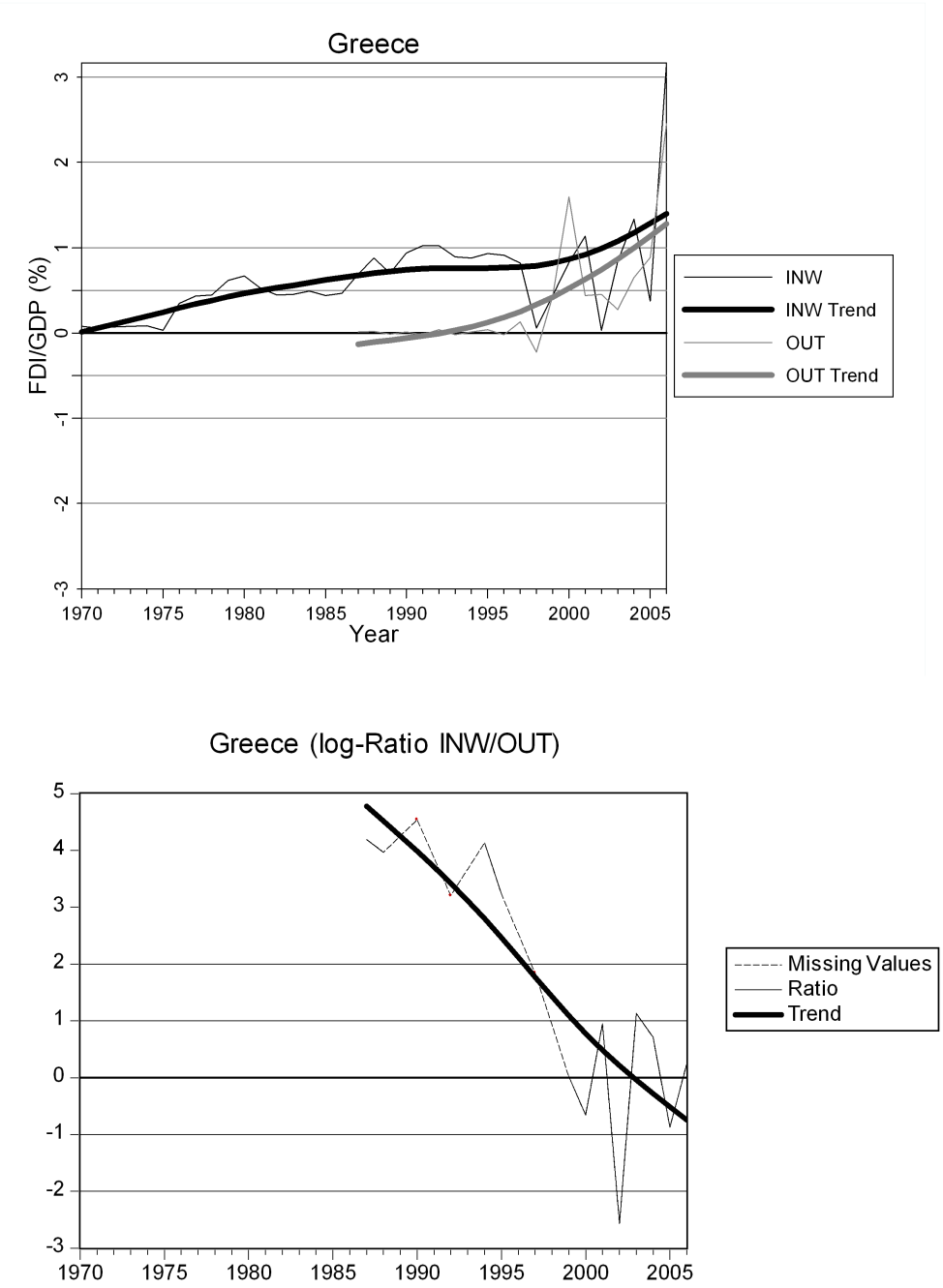


Figure 7: Greece: Transition 1-2a (1976) and 2a-2b (1999). Marginal signs of transition to stage 3 (2005)

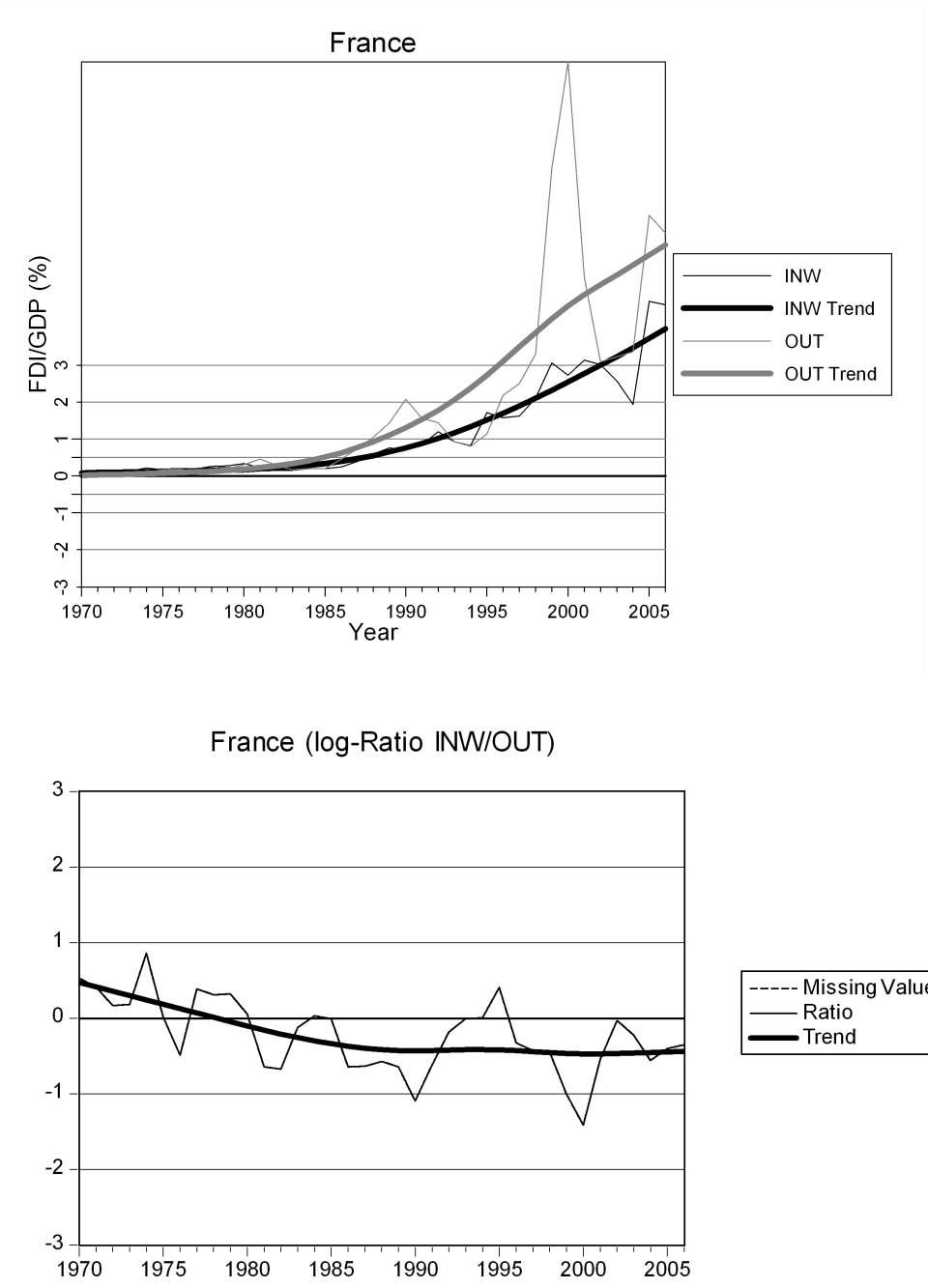


Figure 8: France: Transition 2b-3 (1981)

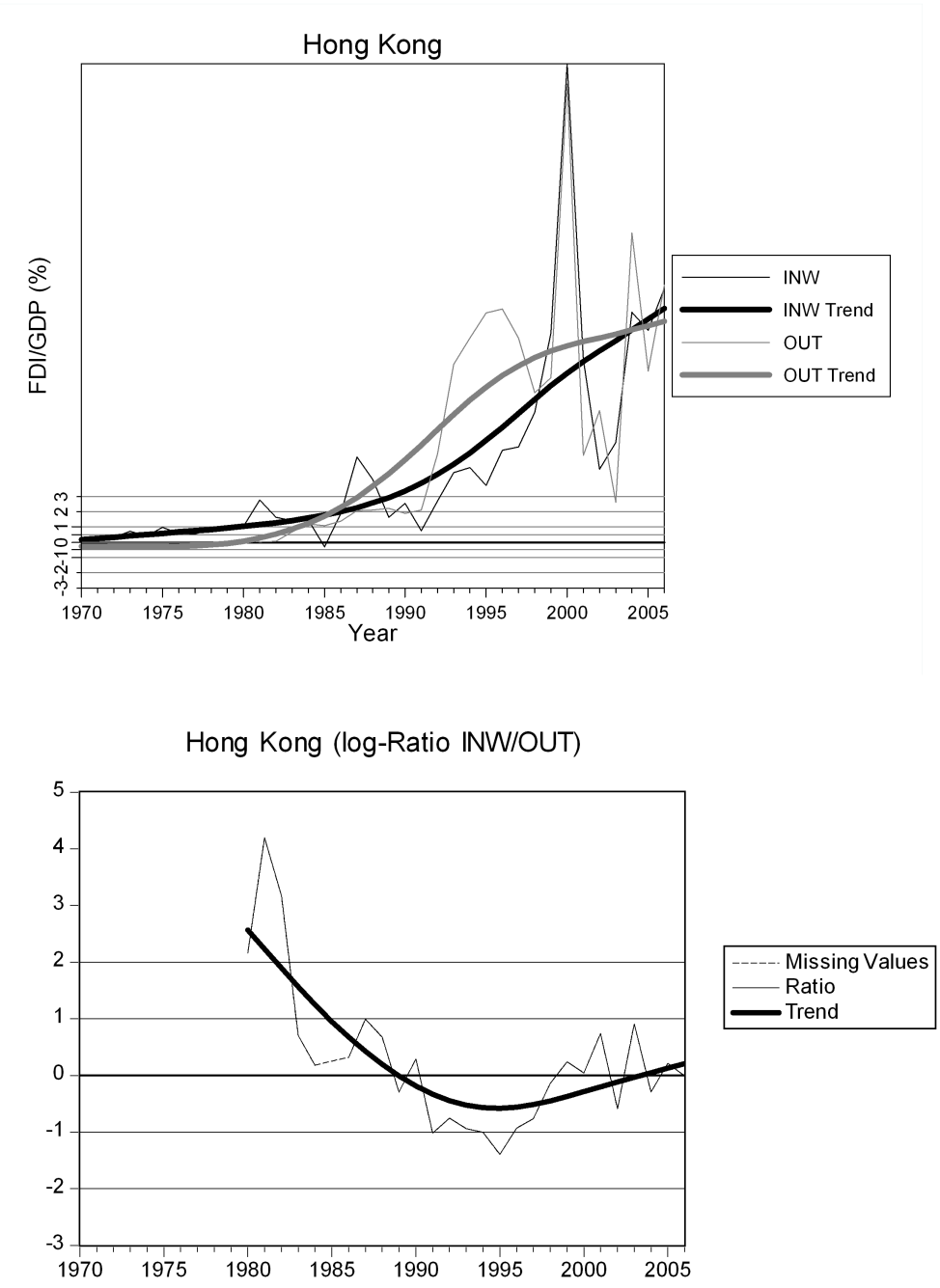


Figure 9: Hong Kong: Transition from 2a-2b (1983), 2b-3 (1991) and 3-4 (1999)

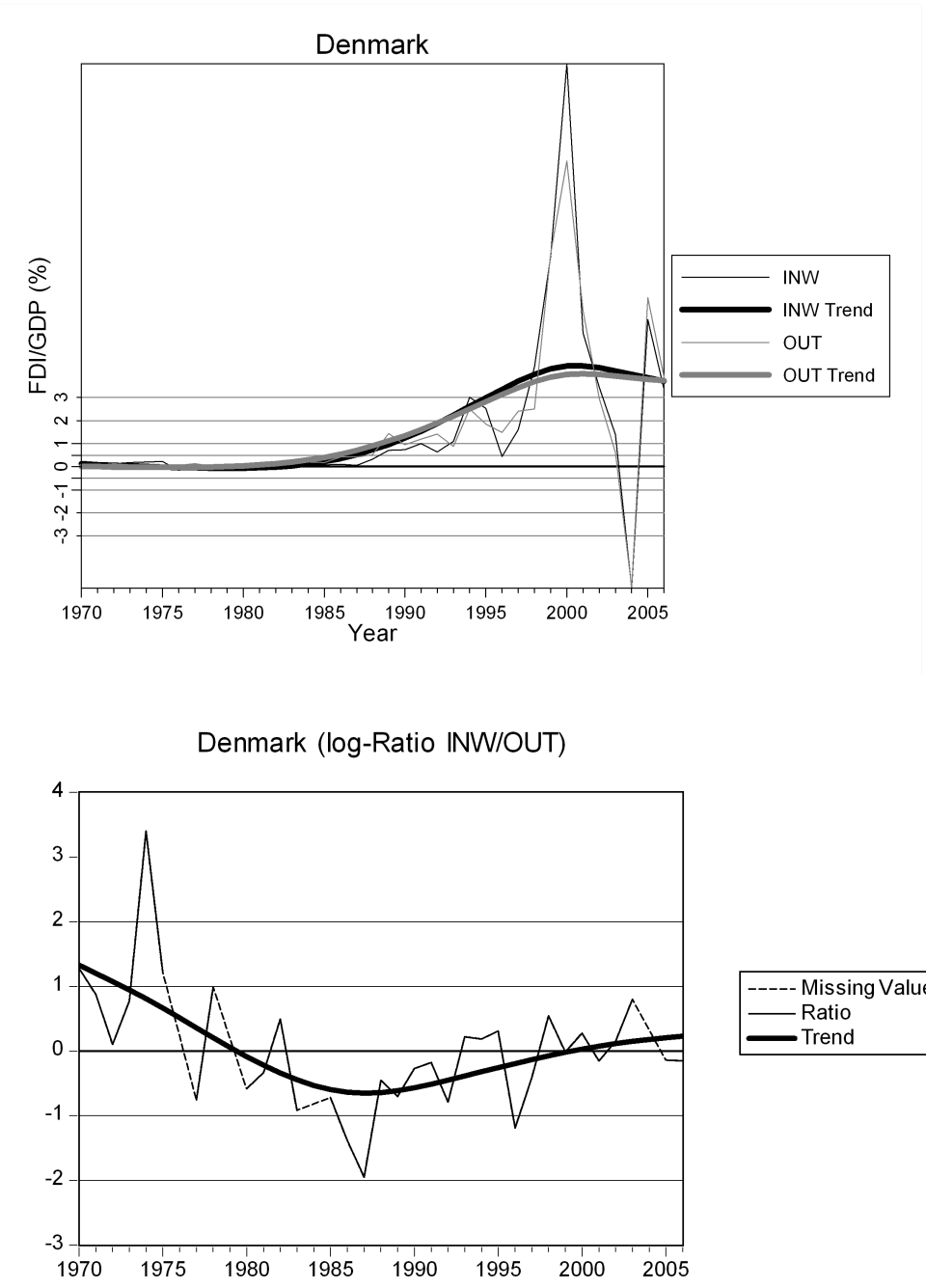


Figure 10: Denmark: Transition from 2b-3 (1976) and 3-4 (1992)

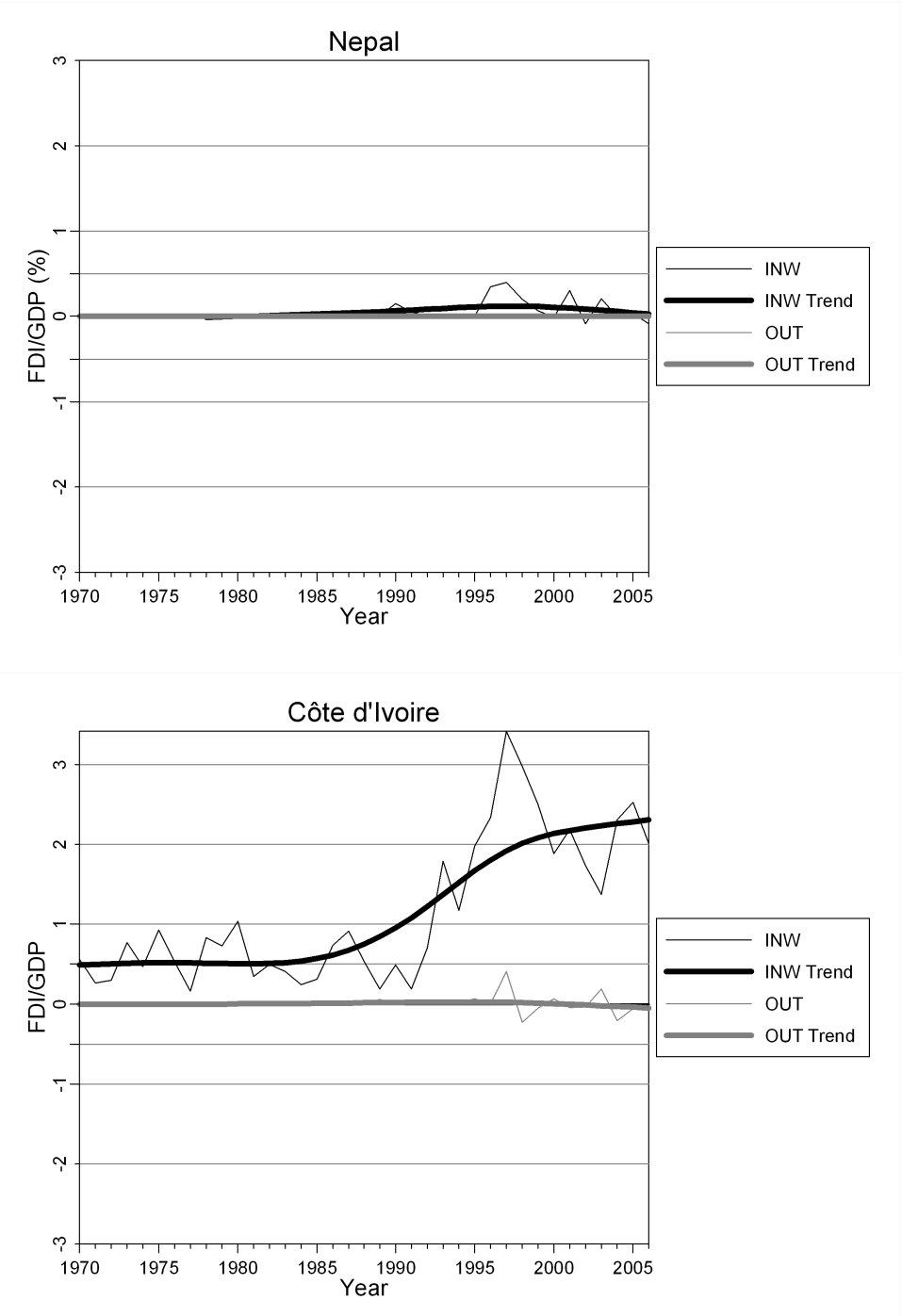
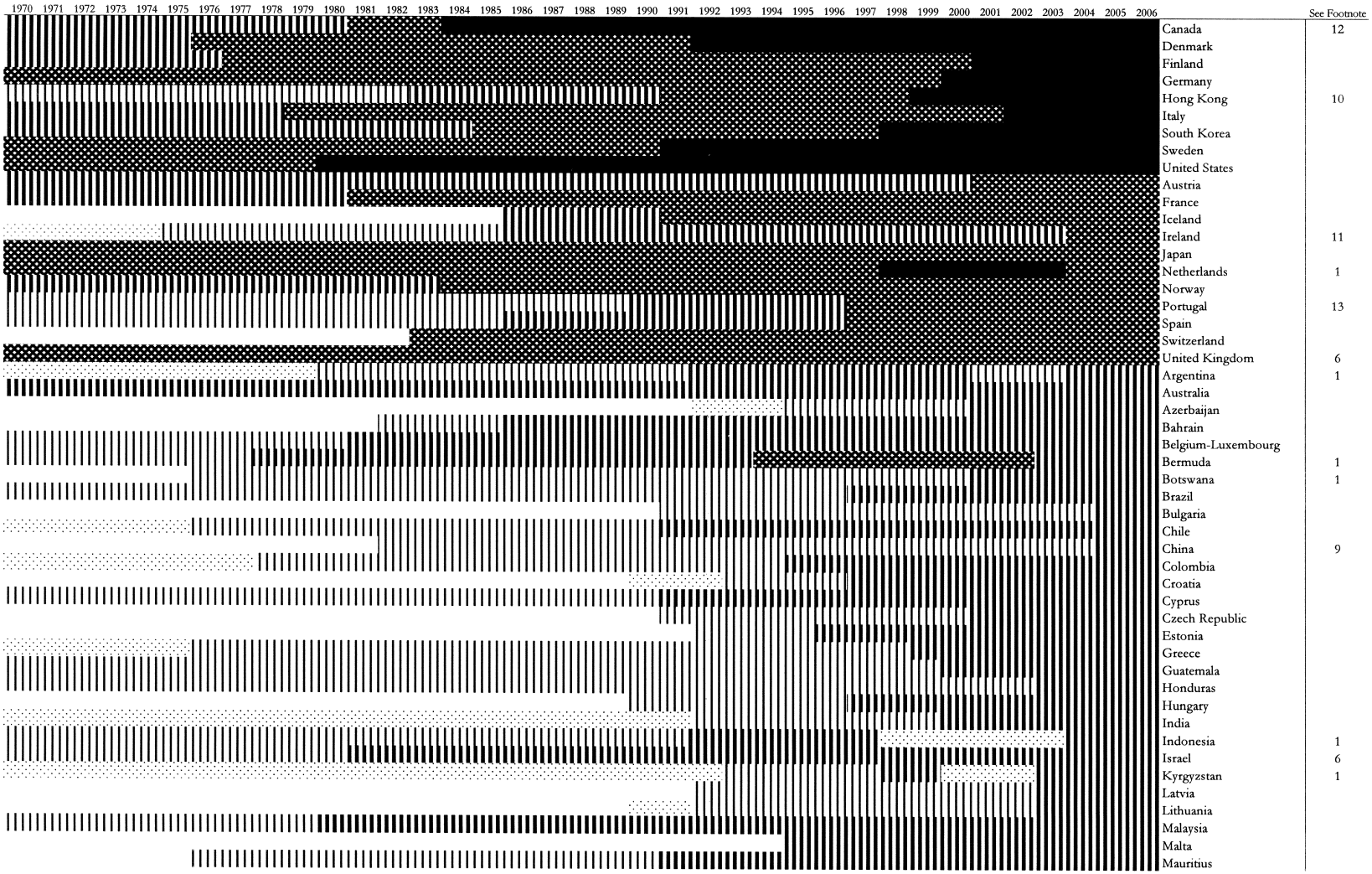


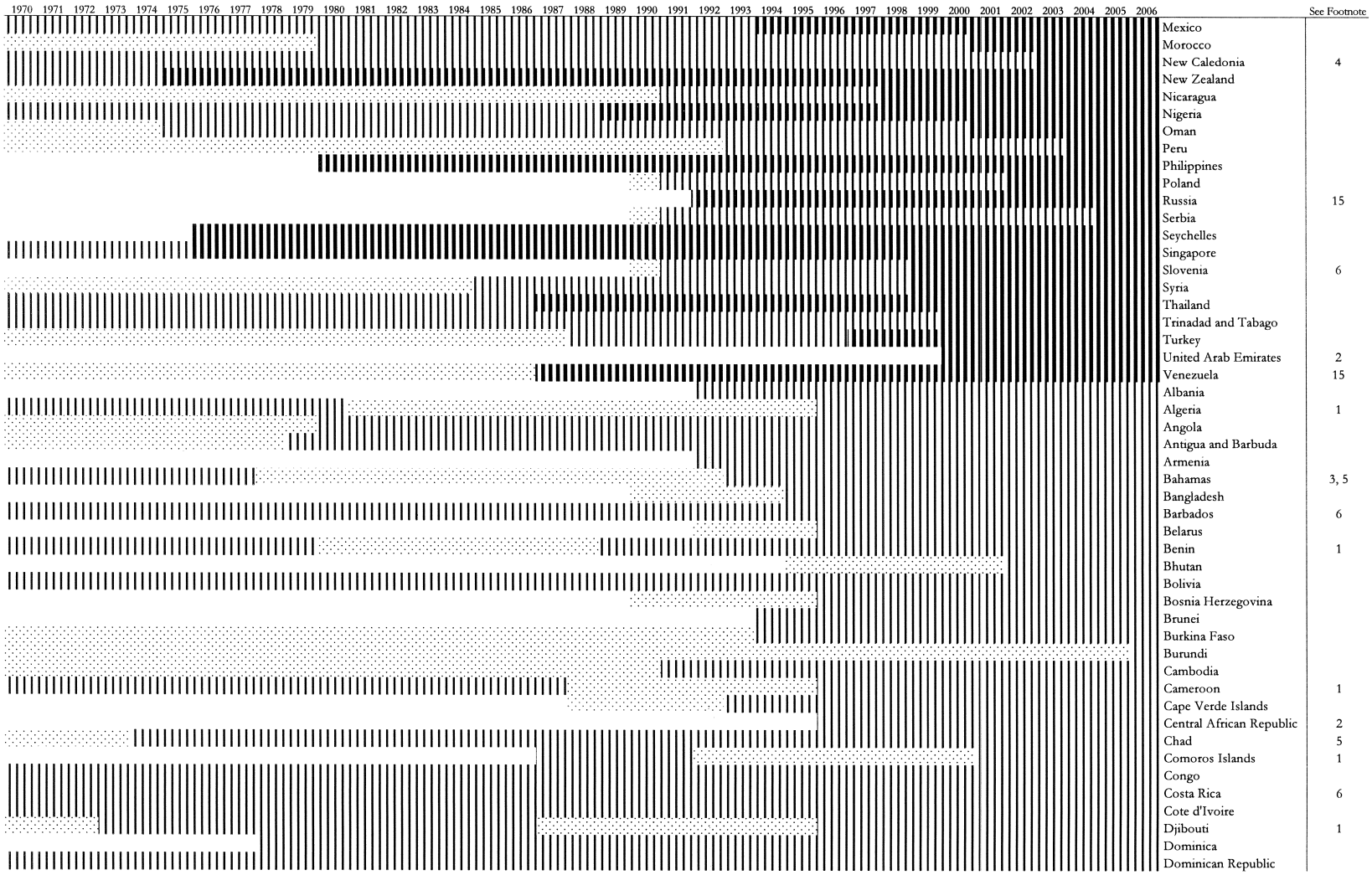
Figure 11: Cases of inconsistent fluctuations in Inward FDI (Nepal) and Outward FDI (Côte d'Ivoire)

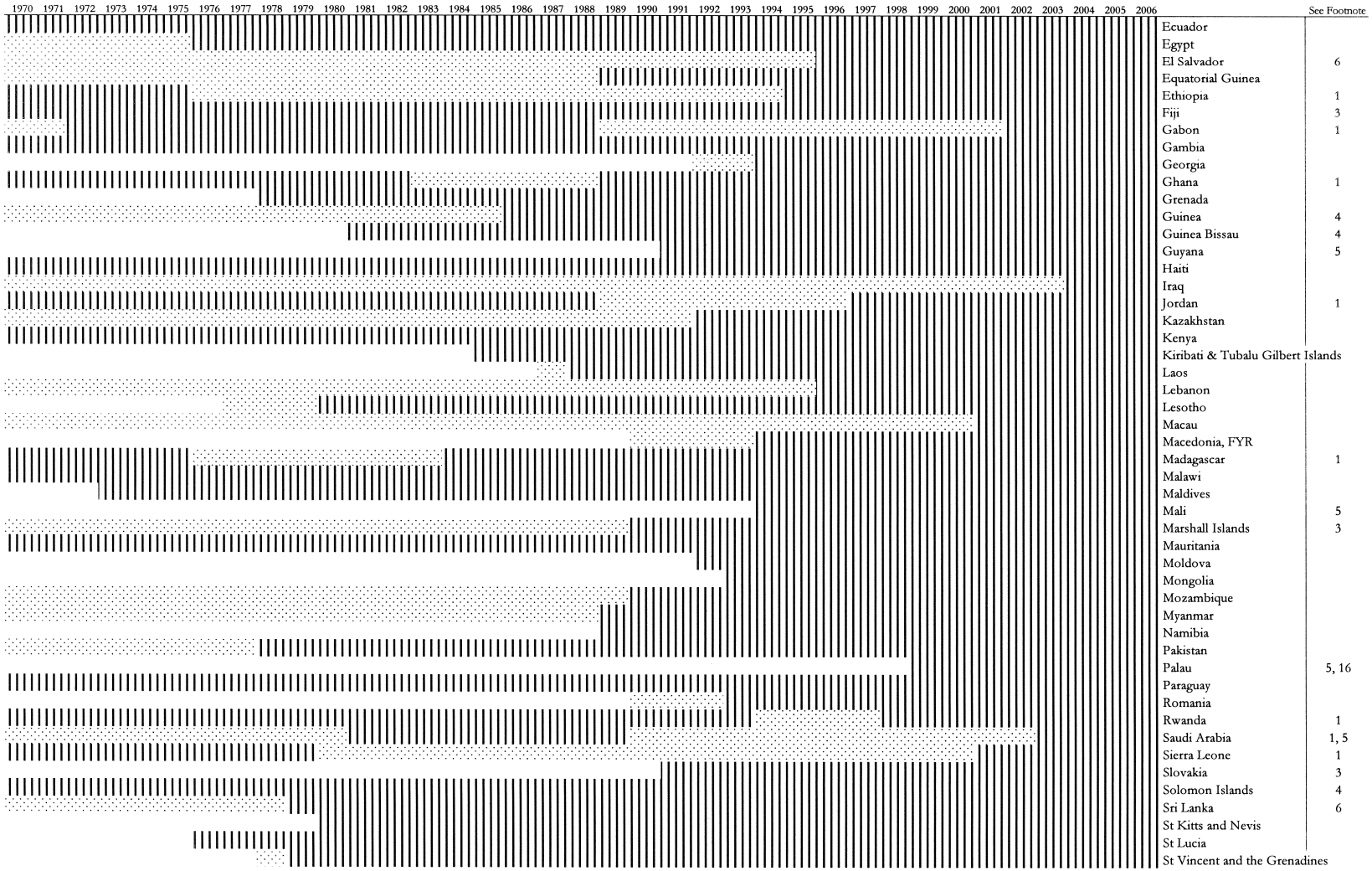
Appendix II

Clustering Results 1970-2006

Results are presented in a matrix form. Rows correspond to countries and columns to years. Each cell has a pattern corresponding to the stage country i is estimated to be at time t (for the exact correspondance see key at the end of the matrix). Moving from left to the right in a row, we see the stages a country is at from 1970 to 2006. Changes in patterns allow us to see the years when transitions have occured. Countries are ranked vertically according to the stage they were in year 2006. Countries being at the same stage in 2006 are further ranked alphabetically. Numbers to the right of the countries' list lead to numerated notes at the end of the Appendix, providing further explanations on the identification of stages for specific cases of countries.


1970 1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006
See Footnote
Canada 12
Denmark
Finland
Germany
Hong Kong 10
Italy
South Korea
Sweden
United States
Austria
France
Iceland
Ireland 11
Japan
Netherlands 1
Norway
Portugal 13
Spain
Switzerland
United Kingdom 6
Argentina 1
Australia
Azerbaijan
Bahrain
Belgium-Luxembourg
Bermuda 1
Botswana 1
Brazil
Bulgaria
Chile
China 9
Colombia
Croatia
Cyprus
Czech Republic
Estonia
Greece
Guatemala
Honduras
Hungary
India
Indonesia 1
Israel 6
Kyrgyzstan 1
Latvia
Lithuania
Malaysia
Malta
Mauritius


1970 1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006
See Footnote
Mexico
Morocco
New Caledonia 4
New Zealand
Nicaragua
Nigeria
Oman
Peru
Philippines
Poland
Russia 15
Serbia
Seychelles
Singapore
Slovenia 6
Syria
Thailand
Trinadad and Tabago
Turkey
United Arab Emirates 2
Venezuela 15
Albania
Algeria 1
Angola
Antigua and Barbuda
Armenia
Bahamas 3, 5
Bangladesh
Barbados 6
Belarus
Benin 1
Bhutan
Bolivia
Bosnia Herzegovina
Brunei
Burkina Faso
Burundi
Cambodia
Cameroon 1
Cape Verde Islands
Central African Republic 2
Chad 5
Comoros Islands 1
Congo
Costa Rica 6
Cote d'Ivoire
Djibouti 1
Dominica
Dominican Republic


1970 1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006
See Footnote
Ecuador
Egypt
El Salvador 6
Equatorial Guinea
Ethiopia 1
Fiji 3
Gabon 1
Gambia
Georgia
Ghana 1
Grenada
Guinea 4
Guinea Bissau 4
Guyana 5
Haiti
Iraq
Jordan 1
Kazakhstan
Kenya
Kiribati & Tubalu Gilbert Islands
Laos
Lebanon
Lesotho
Macau
Macedonia, FYR
Madagascar 1
Malawi
Maldives
Mali 5
Marshall Islands 3
Mauritania
Moldova
Mongolia
Mozambique
Myanmar
Namibia
Pakistan
Palau 5, 16
Paraguay
Romania
Rwanda 1
Saudi Arabia 1, 5
Sierra Leone 1
Slovakia 3
Solomon Islands 4
Sri Lanka 6
St Kitts and Nevis
St Lucia
St Vincent and the Grenadines


1970 1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006
See Footnote
Sudan
Suriname 5
Tajikistan
Tanzania
Togo
Tonga 4
Tunisia
Turkmenistan
Uganda
Ukraine 6
Uruguay 1
Uzbekistan
Vanuatu
Vietnam
Zaire 1
Zambia
Afghanistan
Cuba
Eritrea 1
Iran 1
Jamaica
Micronesia 16
Nepal
Puerto Rico
Sao Tome and Principe 1
Swaziland 1
Yemen 5
Zimbabwe 1
Belize 8
French Polynesia 5
Kuwait 7
Liberia 2
Libya 2
Niger 2
Panama 2
Papua New Guinea 2
Samoa 1
Senegal 2
South Africa 14
Key
Missing/ Inconclusive/ or Excluded from the analysis
Stage 1
Stage 2a
Stage 2b
Stage 3
Stage 4

Notes

1. Countries where we clearly observe a transition backwards in the Chain, in most cases linked to periods of political and economic anomaly (alphabetically): Algeria (1981-1995) openness restrictions in the 80s and civil war in the 90s; Argentina (2001-2003) debt moratorium followed by severe political and economic crisis; Bahamas (1978-1992); Benin (1980-1990) consequences of the establishment of a socialist-military regime; Botswana (1991-1994); Cameroon (1988-1995) economic crisis leading to decade-long recession; Comoros Islands (1992-2000) constant drop of inward flows since 1987 due to political instability; Djibouti (1987-1995) instability preceding, and period of the civil war; Eritrea (2004-2006) constant drop of inward flows since the end of the war with Ethiopia in 2000; Ethiopia (1976-1995) military intervention and installation of 'socialist dictatorship'; Gabon (1992-1998) debt moratorium followed by economic crisis; Ghana (1983-1988) crisis following political instability and large population movements; Indonesia (1998-2003) political crisis and its consequences; Iran (1981-2002) islamic revolution and its consequences, war with Iraq, followed by severe social problems in the 90s; Jordan (1987-1996) economic crisis followed by destabilisation in the Middle East; Kyrgyzstan (2000-2002); Madagascar (1976-1983) military intervention and installation of 'socialist dictatorship'; Netherlands (2004-2006) and Bermuda (2003-2006) affected more by the global growth slow-down than other developed countries; Rwanda (1994-1997) civil war and its consequences; Samoa (2000-2006); Sao Tome and Principe (2004-2006) military intervention and its consequences; Saudi Arabia (1990-2002) destabilisation in the Middle East; Sierra Leone (1980-1999) dictatorship followed by civil war in the 90s; Swaziland (1996-2006) severe social problems and cease of growth; Uruguay (1980-1984) economic crisis following political instability; Zaire (1987-1997) escalated political instability preceding the first Congo war and Mobutu's exile; Zimbabwe (1977-1986) political instability and civil war; Zimbabwe (1997-2007) economic collapse.

2. Countries where we observe high inward and outward investment activity with respect to GDP but extremely volatile, making it impossible to track the transition between stages (alphabetically): Central African Republic; Liberia; Libya; Niger; Panama; Papua New Guinea; Senegal; United Arab Emirates (1970-1999).

3. Countries where we observe outward investment activity, although volatile around the zero axis and without consistent upward trend: Bahamas (1978-1992); Fiji (1984-2006); Marshall Islands (2003-2006); Slovakia (1996-2006).

4. Countries where inward flows are not consistently above zero but their trend is upward sloping because of the number and size of positive observations: New Caledonia; Guinea (1974-2001); Guinea Bissau (1980-2001); Solomon Islands; Tonga.

5. Countries where inward flows are not consistently above zero and their trend is not upward sloping because the number and size of positive observations are not sufficient to indicate stage 2a: Bahamas (1978-1992); Chad (1970-1995); French Polynesia; Guyana (1970-1989); Mali (1971-1993); Palau (1970-1998); Saudi Arabia (1970-1980); Suriname (1970-2001); Yemen. These countries occasionally record

some outward flows. Overall the results are classified as 'inconclusive' during the periods indicated.

6. Countries where we observe marginal signs of passing to the next stage of the Chain, yet to be confirmed in the next few years (stage indicated in the parenthesis): Barbados (2b); Costa Rica (2b); El Salvador (2b); Sri Lanka (2b); Ukraine (2b); Israel (3); Slovenia (3); United Kingdom (4).

7. Kuwait (1975-1989) is the only country where we observe high outward investment flows combined with insignificant inward. Kuwait appears with extremely volatile outward and insignificant inward investment flows after the first Gulf War. Overall its evidence is classified as 'inconclusive'.

8. Belize's pattern of FDI follows an original pattern of increasing inward and declining outward flows since its independence, without an obvious political or economic justification.

9. China's pattern of FDI is largely determined by the timing of political reforms. The introduction of private sector reforms in the 80s led to both inward and outward flows, although major restrictions to inward FDI kept their flows below potential. The pattern initially observed in terms of balance of the two roles of Host and Parent corresponds to patterns of more developed countries only because of restrictions in inward flows. After the 1992 reforms, we see an impressive increase in inward FDI flows to their potential values, while outward flows keep increasing in the same pace as before.

10. Hong Kong's signs of passing to stage 4 in 1998 coincides with its return to China. The change might have therefore had exogenous causes. The long run trend remains to be confirmed.

11. Ireland's trend curve of the inward/outward flows ratio is mainly shaped by two extreme negative outliers in 1989 and 2005.

12. Canada's ratio of inward/outward flows does not give clear signs on the distinction between stages 3 and 4. There is a marginal bias of the ratio towards the parent side after stage 2b; however we observe a stability around the zero axis since 1984. In our classification we put more weight on the stability of the ratio in concluding that the country has reached stage 4.

13. Portugal is considered to have passed to stage 3 after 1997 although the negativity of its inward/outward flows ratio is not stable since then. This change remains to be confirmed in the next few years.

14. South Africa's pattern of FDI is largely determined by the timing of political reforms. The introduction of Anti-Apartheid economic sanctions by the international community in the 80s led to inward FDI being kept below potential. The pattern initially observed in terms of balance of the two roles of Host and Parent in the 80s corresponds to patterns of more developed countries most probably just because of restrictions in economic relationships with other western countries. After the 1995 and the resolution of Apartheid, we see an impressive increase in

inward FDI flows possibly to their potential values, while outward flows fall to even negative values.

15. In Russia and Venezuela we find no signs of stage 2a. They are the only two cases of countries where inward and outward FDI flows expand simultaneously, without a time lag between them, after the countries exit the first stage of unattractiveness to MNEs.

16. Micronesia appears with one extremely negative outlier in inward flows for 1996; Palau with one very positive for 1997. Excluding these values from the countries' samples we observe no significant trend in neither inward or outward flows for Micronesia, and only a significant inward trend for Palau only after 1999.