NBER WORKING PAPER SERIES

GROWTH AND CONVERGENCE IN THE ASIA-PACIFIC REGION: ON THE ROLE OF OPENNESS, TRADE AND MIGRATION

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Working Paper 5276

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
Cambridge, MA 02138
September 1995

This paper was prepared for the conference, "International Trade and Migration in the APEC Region" organized by the Bureau of Immigration, Multicultural and Population Research and the University of Melbourne, and held at the University of Melbourne, Parkville, Vic., Australia, July 10-11, 1995. An abridged version of this paper will appear in *International Trade and Migration in the Asia-Pacific Region*, edited by Peter J. Lloyd and Lynne S. Williams (Oxford University Press, 1996 forthcoming). I wish to thank Andrew Warner for sharing his data and for helpful discussions. I am solely responsible for all errors. This paper is part of NBER's program in the Historical Development of the American Economy. Any opinions expressed are those of the author and not those of the National Bureau of Economic Research.

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ABSTRACT

This paper examines the relationship between openness, trade, and migration in the Asia-Pacific region during the post-1970 period. Conventional reduced-form empirical-growth specifications are augmented by an appeal to structural modelling, an extension that reveals a rich set of interactions between policy, distortions, factor accumulation and growth. A broad array of openness measures play a major role in the successful growth performance of the Asia-Pacific region, a key channel being the distortion-investment nexus. In contrast, the results suggest little role for migration as a quantitatively significant growth determinant, at least at the macro level, which is no surprise in this area of historically low net migration rates. However, I find that within-sample prediction for the Asia-Pacific region is harder to achieve -- "good luck" as well as "good policy" played a part.

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1. INTRODUCTION

Following a renaissance in the theory of economic growth in the 1980s, much effort has recently been devoted to the empirical analysis of economic growth and convergence. Whilst the number of empirical studies has grown, however, it is harder to say whether their findings have converged.

Just as "new" growth theory sought to extend the basic Ramsey-Solow-Swan frameworks to endogenize and examine the various channels of the growth process, so the empirical work has extended its scope beyond mere growth accounting into ever more refined econometric models of growth determinants—with models designed to confront the endogenous or exogenous behavior of investment, human capital, population and fertility choices, financial development, foreign investment, even democracy and politics. As each new channel is explored, new mechanisms seem to be unearthed and validated.[1]

Still, skeptics may ask how general patterns derived from broad cross-section analyses can help us better understand specific development cases: the residuals from even the best empirical work still leave a large measure of ignorance. It can be reasonably argued that the inferences from cross-section comparative analysis might be

[1] Major theoretical contributions in this "new" growth tradition include the works of Lucas (1988) on human capital; Romer (1986; 1989; 1990) on technological change and economies of scale; Becker et al. (1990) and Becker and Barro (1988) on fertility; Barro (1990) on government; Rebelo (1991) on policy analysis and growth; and Grossman and Helpman (1991) on dynamic comparative advantage. Major empirical efforts began with work on *unconditional* convergence by Abramovitz (1986) and Baumol (1986), following Maddison (1982). Studies of *conditional* convergence include the studies by Kormendi and Meguire (1985); Dowrick and Nguyen (1989); Barro (1991); and Mankiw et al. (1992). For a recent survey of the field see Romer (1994), or the textbook treatment of Barro and Sala-i-Martin (1995).

best combined with more detailed studies of individual region or country experiences to offer a more complete explanation of the growth process.[2]

In this paper I consider the implications of recent findings in empirical growth research, and ask what made for winners and losers in the Asia-Pacific region, with special reference to open economy forces and factor markets. I begin with a brief look at the fundamental theoretical treatment of economic growth as a dynamical systems problem, with reference to the question of empirical design. I then discuss the specific empirical design I employ in this paper, which places an emphasis on structural rather than reduced form estimation so as to better explore growth mechanisms. I briefly review the data to be used, which is widely available from standard sources. The results are then discussed, and some interpretations suggested before the conclusion.

2. THEORETICAL CONSIDERATIONS

In its most general possible formulation, a theoretical growth model is simply a dynamical system, describing the evolution of a set of state variables x and a set of control variables u over points in time t.

The state variables follow trajectories x_t and include conventional economic stock variables—like factor endowments such as physical and human capital, and population; they could also include "technology" suitably measured, say, as total factor productivity. Conventionally, and since it is a function of these state variables, output is often included as another implicit state variable, as it is the major growth variable of interest. Control variables u_t may be endogenously determined and include the conventional economic flow variables—the decision variables that influence the evolution of the stock variables; these include investment in the accumulation of physical or human capital, fertility and migration choice as it affects population growth, research as it affects technology, and so forth. The control variables affect the rate of change of the state variables through what I will term a "laws-of-motion" equation

$$(1) \qquad dx_t/dt = f(u_t; a),$$

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[2] Pack (1994) offers a critical view of the empirical achievements of the new growth school, and concludes that the ubiquitous international cross-country growth regressions have many shortcomings. It is well-known that they are poor explanators of the variance in growth rates and are highly sensitive to sample selection and specification choice (Levine and Renelt 1992; Easterly, et al. 1993). Pack suggests further scrutiny of individual country experience, informed by comparative perspectives and the testable implications of new growth theory, with a view to exploring in more detail the mechanisms of economic growth. Examples of careful studies of individual country experience in such a vein for the APEC region include Young (1992) on Singapore and Hong Kong, and Rodrik (1994) on Taiwan and Korea.

where a is a set of environmental parameters, putatively exogenous variables that might also affect the evolution of the state variables, including economic policies such as taxes and institutional structures such as property rights.

Often, attention is given to only one element on the left-hand side of (1). When dx_t/dt is just the growth rate of output $d\ln y_t/dt$, and the controls u_t are the growth rates of inputs $d\ln v_t/dt$, essentially (1) reduces to the production function once-differentiated, and its estimation. When that estimation is direct, it is called growth accounting, which amounts to weighting the various input growth contributions to output growth and deriving a residual measure of total factor productivty growth.[3] However, when such estimation is econometric, it leads to what I will term a "growth accounting" regression

(1a) $d\ln y_t/dt = \alpha_0 + \alpha_1 d\ln v_t/dt + \alpha_2 a + \varepsilon_t.$

This approach has been used in the recent empirical growth literature.[4] However, it suffers from a potential weakness; as the "new" growth theory stresses, the controls u_t are probably endogenous variables determined according to some behavioral rule. The full characterization of that endogeneity is indeed the hallmark of new growth theory.[5] Thus, equation (1) should be complemented by a "behavioral" equation, rounding out the description of the dynamical system, of the form

(2) $u_t = g(x_t; b)$

which describes the endogenous control choices u_t as a function of current state x_t and another set of putatively exogenous environmental parameters b.

The dynamical system is fully described by (1–2); theoretical attention is then given to an analysis of the (possibly multiple) equilibria and trajectories of the system. Econometrically, (1–2) should be viewed as a system of simultaneous equations, and

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[3] The major contributions to the growth accounting literature include the methodological basis provided by Abramovitz (1956) and Solow (1956), complemented by a major empirical tradition running from Denison (1967) through to Jorgensen (1995). For obvious reasons, growth accounting, in itself, may be suggestive of growth mechanisms, but supplies no theory of economic growth *per se* (Barro and Sala-i-Martin 1995, chap. 10).

[4] Notable empirical contributions in this vein have come from Dowrick and Nguyen (1989) and Mankiw, Romer and Weil (1992), two papers firmly in the Solovian tradition.

[5] "Old" growth theory is not synonymous with exogenous growth. Of course, in the simple neoclassical growth model of Solow (1956) and Swan (1956), the savings rate, and, hence, accumulation in the closed economy are exogenous. However, the seminal contribution of Ramsey (1928) produced the first endogenous growth model, one where saving and accumulation follow an optimization rule. See Barro and Sala-i-Martin (1995, chaps. 1 and 2). "New" growth theory has now expanded the family of control variables subject to endogenous determination.

(1a) should be estimated with care for simultaneity bias arising from endogenous controls. In its own right, (2) may be usefully estimated as a "behavioral" regression

(2a) $u_t = \beta_0 + \beta_1 x_t + \beta_2 b + \eta_t$

to provide details of the channels through which state variables and environmental parameters affect controls (e.g., factor accumulation) and, hence, growth.

Still, a delicate question remains: which variables a and b are truly exogenous to the system? Clearly, empirical work can implement some standard tests to address this problem, but the specification may not be obvious. A popular and convenient, albeit costly, escape route exists; namely, to ignore the challenge of modeling the endogenous processes altogether, and retreat to a reduced form specification. Integrating the dynamical system (1–2) forward over time yields a "trajectory" equation

(3) $x(T) = h(x(0); a, b)$.

Such an approach may be applied to the trajectory of output to derive a reduced form "trajectory regression" where state evolution (in this case, the growth rate of output) depends only on initial conditions $x(0)$ and environmental parameters:

(3a) $d\ln y_t/dt = \gamma_0 + \gamma_1 x(0) + \gamma_2 a + \gamma_3 b + \xi_t$.

The attraction of the last specification is clear; the initial conditions are predetermined and the endogeneity problem is finessed since the controls u do not enter. There is a cost: a specification like (3a) cannot reveal the channels through which the environment affects growth. The benefit is that (3a) might suggest some relevant environmental parameters which affect growth, and hence inspire investigation of likely channels through which such forces might operate.

3. EMPIRICAL DESIGN

It is fair to say that empirical work often embraces several different formulations in an attempt to describe the growth process fully. However, a cursory glance at the empirical growth literature reveals a myriad of formulations of the type (1a–3a) and even some hybrids. For example, omitted variables in one study often show up as highly significant in alternative studies, and in such cases it is hard to know which hypothesis to accept. In some cases authors have developed a hybrid approach to estimating (1a–3a), including some endogenous variables in a reduced form (3a), but not others; or, alternatively, adding some controls to the growth accounting regression (1a), but not others. Estimation of behavioral regressions (2a) is quite scarce in the current literature, yet remains the only way to identify the channels through which the economic environment affects growth. A serious problem is that of replication and robustness—one study may find a partial correlation but only when omitting variables

found to be important in another study. This has been especially true in the case of political indicators as dependent variables (Levine and Renelt 1992).

My empirical design follows three approaches, corresponding to specifications (1a–3a). I begin by estimating the simplest specification, the reduced form (3a), which may serve to identify important exogenous influences on the the growth rate, albeit with no indication of the mechanism through which such forces operate. As a second step, I estimate a structural growth regression of the form (1a), looking first at the obvious flow (control) variables for factor accumulation. I then extend the specification to admit environmental variables. I also allow endogenous controls, employing two-stage least squares (2SLS) to estimate (1a–2a). Endogeneity tests suggest few simultaneity problems, however.[6] In a third step, estimation of the behavioral regression (2a) yields insights into growth mechanisms—how economic environment affects growth indirectly through control variables in the structural equations.

4. DATA

I now describe the variables I employ in the various specifications. All data is publicly available in electronic form from three major sources: the *World Data* file compiled by the World Bank (1994); the latest Penn World Table due to Heston et al. (1994); and Barro and Lee's (1994) compilation of panel data. The raw data unit of observation is an individual country in a single calendar year. The data sets cover a broad cross-section of countries in the postwar period (207 countries for 1950–1992 in the World Bank source).[7] For this study, I constructed a pooled cross-county data set as averages for four successive five-year periods 1970–74, 1975–79, 1980–84,and 1985–89.[8]

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[6] The use of simultaneous equation methods (such as 2SLS, IV, or SUR) to address the econometric problem of endogenous controls is widespread (Barro and Sala-i-Martin 1995, chap. 12). However, the costs and benefits of such a technique are rarely considered. For example, specification tests are rarely used to test the IV estimation against OLS, as in the simple Hausman test for simultaneity (Pindyck and Rubinfeld 1981, 303–4). The full information properties of 2SLS must cause it to dominate OLS asymptotically in large samples. However, it is not clear that in the small-sample situations encountered in the empirical growth literature that the IV specification choice is not made at the cost of inefficiency. In such scenarios, OLS may fit better and may be preferred (Greene 1993, 615–6). See below.

[7] Data sources and descriptions are given in an appendix available from the author upon request. The analysis of these data sources is ubiquitous in the empirical growth literature (Dowrick and Nguyen 1989; Barro 1991; De Long and Summers 1991; Levine and Renelt 1992; Mankiw, Romer and Weil 1992; Barro and Sala-i-Martin 1995).

[8] The choice of five-year averaging is *ad hoc*, but some underlying variables are not observed annually. This is true of many demographic variables derived from decadal censuses. Treating the data as annual time series is unwarranted: many data points are simply interpolations. Thus it makes sense to average and perform analysis at a lower frequency. At an extreme one can average over several decades and estimate for periods, such as 1960–1985 as a whole (Dowrick and Nguyen 1989; Barro 1991;

4.1. State variables

4.1.1. Dependent variable

- *GY:* The growth rate (rate of change of natural log) of per capita GDP in purchasing power parity units. The standard variable chosen as the explicandum in most empirical growth studies, and viewed as a function of changes in endowments and production technology.[9]

4.1.2. Independent variables—initial conditions

- *LNY0:* The natural log of initial GDP per capita. Expected to influence growth if convergence forces operate, either directly or indirectly (via accumulation).[10]
- *PYR+SYR+0:* Initial years of primary and secondary schooling per person in the population. A proxy for the initial stock of human capital in the economy.[11]

Mankiw, Romer and Weil 1992). Others have worked with decadal averages (Barro and Sala-i-Martin 1995, chap. 12) or five-year averages (Brander and Dowrick 1994).

[9] However, it is also true that several studies have focused on alternative dependent variables, notably real output per worker or worker-hour (Maddison 1982; 1989; 1991), and real wages (Williamson 1995).

[10] Such effects can be a manifestation of the advantages of backwardness and a cause of technological catching-up (Gerschenkron 1962; Abramovitz 1986). A negative coefficient implies a form of mean reversion in the sample, and has been termed β-convergence (Barro and Sala-i-Martin 1992). β-convergence is neither a necessary nor sufficient condition for σ-convergence, the tendency of sample dispersion to diminish. The classic example of this is Galton's fallacy, invoked as a cautionary tale concerning the implications of cross-country growth regressions for the leveling of the distribution of cross-country income levels (Friedman 1992; Quah 1993). Thus regressions may say something about growth determinants, but to the extent that they omit shocks and propagations which also affect the cross-section distribution, they tell only a partial story: an analysis of σ-convergence patterns should complement the analysis. The β-convergence hypothesis is also problematic—sample selection bias and errors-in-variables can encourage false acceptance (Abramovitz 1986; De Long 1988).

[11] Several models suggest that transitional dynamics along trajectories depend critically on the initial endowments of physical and human capital (Uzawa 1965; Lucas 1988; Caballe and Santos 1993; Mulligan and Sala-i-Martin 1993; Barro and Sala-i-Martin 1995, chap. 5). Numerous authors have introduced controls of this form in empirical studies of conditional convergence (Barro 1991; Mankiw, Romer and Weil 1992; Barro and Sala-i-Martin 1995, chap. 12). Measurement problems are serious. The international comparison of schooling is fraught with quality incomparabilities. These are probably most serious for tertiary education data, omitted here, but still problematic for secondary and primary data. Alternative indirect measures based on earnings may be useful (Mulligan and Sala-i-Martin 1995). The latest attempt to create a cross-country database of human capital statistics was by Barro and Lee (1993). Besides years of schooling and enrollment rates, an alternative human capital measure sometimes used is the literacy rate (Barro 1991).

4.2. Endogenous control variables

4.2.1. Factor accumulation

- *P+S*: The average enrollment rate in primary and secondary schools. A proxy for human capital accumulation, expected to have a positive impact on growth.[12]
- *CI*: The ratio of real gross investment to real GDP at constant international prices. A proxy for capital accumulation, and expected to have a positive impact on growth through capital deepening and embodied new technology.[13]
- *GPOP*: The growth rate (rate of change of natural log) of population, expected to have a negative impact on growth via capital dilution, congestion of fixed factors (diminishing returns in non-accumulable inputs), or congestion externalities.[14]
- *FDIXY*: The ratio of foreign direct investment going into the country (capital account credits) to GDP. Expected to affect growth positively if inbound FDI embodies the catching-up process of technology transfer from rich (high productivity) to poor (low-productivity) countries.[15]

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[12] The caveats applied to the measurement of initial stocks of human capital also apply here. Note that there has been some variation in the literature concerning the appropriate use and interpretation of enrollment rates versus schooling stocks in growth regressions, analogous to their representing proxies for accumulation or initial conditions (Barro 1991; Mankiw, Romer and Weil 1992).

[13] In structural estimates of growth determinants, the total investment share of output variable has repeatedly been found to have a significant positive association with growth. Its coefficient measures the rate of return to capital, and is typically around 10%–20% per annum (Kormendi and Meguire 1985; Barro 1991; De Long and Summers 1991; Mankiw, Romer and Weil 1992; Brander and Dowrick 1994). This is one of the most robust results in the entire literature (Levine and Renelt 1992).

[14] By definition this variable is the sum of the rate of natural increase and the net immigration rate, both of which may be modeled as endogenous variables. Models of the structural equation of migration usually posit a positive relation between level of income per capita (or wages) and the rate of immigration, usually subject to transportation and adjustment costs. Models of fertility choice may have a nonmonotonic relationship depending on the opportunity costs of children and their value as "normal goods" (Barro and Sala-i-Martin 1995, chap. 9); interactions with human capital accumulation may also give rise to multiple equilibria, associated with a quality-quantity trade-off in family size (Becker and Barro 1988; Becker, Murphy and Tamura 1990). In various empirical studies, the population effect may appear as the population growth rate as here, or sometimes as the fertility rate (Kormendi and Meguire 1985; Dowrick and Nguyen 1989; Barro 1991; Levine and Renelt 1992; Mankiw, Romer and Weil 1992; Brander and Dowrick 1994).

[15] Several authors have suggested that FDI may be an important mechanism for technology transfer, and hence catching up. These ideas can be incorporated into complex models of learning and knowledge diffusion. De Gregorio and others have proposed using FDI data to capture this effect (Findlay 1978; Jovanovic and Rob 1989; Romer 1990; Grossman and Helpman 1991; Segerstrom 1991; De Gregorio 1992; Romer 1993; Borensztein, De Gregorio and Lee 1995).

4.3. Environmental variables

4.3.1. Natural resource endowments

- *PNXI:* A measure of primary product net export intensity (ratio of primary product net exports to GDP). In a Heckscher-Ohlin-Vanek sense, measures the relative abundance of natural resources embodied in primary products in any country relative to the world resource endowment. May affect growth via dynamic comparative advantage.[16]

4.3.2. Demographic structure

- *POP15+0, POP65+0:* Initial share of population aged under 15, over 65. A control for the initial demographic structure of the economy. May have dynamic growth effects if demography affects investment or human capital accumulation.[17]

4.3.3. Government and politics

- *G*: The share of government spending in GDP at current domestic prices. A proxy for the size of government , and hence overall tax rates. Both the activity of government and the public finance distortions might have adverse growth effects.[18]
- *PNQ:* Political non-qualifier country in the Sachs-Warner (1995) classification. A country fails the test ($PNQ=1$) if it has a socialist economic structure, suffers from extreme domestic unrest, or is characterized by extreme deprivation of civil or political rights. The variable is time-invariant 1970–89 for each country.[19]

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[16] The use of a control for resource abundance is suggested by Sachs and Warner (1994; 1995). Their measure differs in that they use gross exports (not net), and normalize relative to total exports (not GDP). Dynamic comparative advantage suggests that learning-by-doing or other externalities may give growth and welfare advantages to countries which specialize in manufacturing because of protection or natural autarky, or by dint of endowments or scale (Ethier 1982; Krugman 1987; Young 1991). This idea has been formalized in a model of growth and industrialization by Matsuyama (1992).

[17] On the labor supply effect, there is a robust cross-country partial correlation between the "labor content" of the population (e.g., share aged 15–64) and investment ratios, even after controlling for price distortions and other determinants of investment (Brander and Dowrick 1994; Taylor 1994a).

[18] The best known model is that of Barro, which has some empirical support (Barro 1990; 1991). Other studies have considered measuring the impact of fiscal policy on growth in a number of ways. However, the overall evidence is mixed. The association of fiscal variables and growth, both direct and via the investment channel, remains fragile (Levine and Renelt 1992; Easterly and Rebelo 1993).

[19] Political variables have been constructed and widely used by Barro and his collaborators (Barro 1991; Barro and Lee 1994; Barro and Sala-i-Martin 1995). However, the significance and robustness of their role as explanators of growth performance remains controversial (Levine and Renelt 1992). Political variables may not be exogenous, however: Alesina et al. (1992) explore political instability as an endogenous variable simultaneously determined with economic performance.

4.3.4. Price distortions and openness

- *LNPIPY*: The relative price of capital goods, calculated as the natural log of the ratio of the PPP for investment to the PPP for GDP. The PPPs are relative to the U.S. Expected to be lower in more open economies with freely traded capital goods. Expected to have negative impact on investment activity and, hence, on growth.[20]
- *BMPL*: The natural log of one plus the black-market premium on the exchange rate for the currency. A price distortion likely to have dynamic effects to the extent that it lowers investment by raising the price of (imported) capital goods, and to the extent that it impairs financial intermediation and the capital market efficiency more generally.[21]
- *OWTI*: Own-weight tariff incidence, a measure of average tariff rates in the economy. Another price distortion likely to have dynamic effects should it apply to imported capital goods, raising prices and creating disincentives for investment.[22]
- *ONQ*: Openness non-qualifier country in the Sachs-Warner (1995) classification. A country fails the test ($ONQ=1$) if it has high quota incidence on imports, a high proportion of exports handled by state export monopolies, a socialist economic structure, or has a black-market premium above 20% on average in the 1970s or 1980s. The variable is time-invariant 1970–89 for each country.

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[20] The robust negative correlation of investment prices and quantities has been seen as confirmation of a downward-sloping investment demand curve, and as the likely channel through which many price distortions affect growth (Jones 1992; Brander and Dowrick 1994; Taylor 1994a; Taylor 1994b). The impact of distortions on economic growth is widely reported (Agarwala 1983; Edwards 1992; Easterly 1993; Edwards 1993).The fact that measures of trade policy including such distortionary effects are not significant growth determinants when the investment share is included in any specification reinforces our suspicion that endogenous investment response is indeed the principal channel (Levine and Renelt 1992). Unfortunately the misspecification of price distortions of this kind is common: too often a variable *PPI* or *PPIDEV* is misused, based on the natural log of the Heston-Summers investment PPP. Such use of absolute prices like *PPI* dates back to Barro (1991), but has been widespread. These are absolute price levels. As Higgins (1993) has pointed out, what matters for investment is the holding return on capital, which is a function of the price of investment *relative* to output, as in the present paper. The point is general, and also applies to foreign investment with the addition of exchange-rate risk.

[21] This is an alternative price distortion variable also used in empirical growth analysis (Barro and Sala-i-Martin 1995, chap. 12). However, it likely has different properties than the relative price of capital, being less linked to "real" distortions such as tariffs, and more linked to monetary distortions such as exchange controls or severe exchange risk, inflation risk or other forms of financial repression. An alternative to a binary indicator of financial repression (Roubini and Sala-i-Martin 1992).

[22] Yet another measure of price distortions, which might plausibly affect the relative price of capital, and hence investment, as noted above (Jones 1992; Barro and Sala-i-Martin 1995, chap. 12).

4.3.5. Financial intermediation and monetary instability

- *GXR:* The rate of depreciation of the currency, measured as the growth rate (rate of change of the natural log) of the exchange rate in currency units per U.S. dollar. A proxy for monetary instability, which might affect growth negatively through instability and risk costs of financial intermediation felt in the capital market.[23]
- *LLY*: The ratio of liquid liabilities in the financial system to GDP. A proxy for the size of the financial sector, and a measure of financial development. Expected to have positive effects of lower transactions costs and enhanced allocative efficiency in the capital market, and hence to promote accumulation and growth.[24]

5. RESULTS

5.1 Growth determinants and unconditional convergence

The empirical growth literature began with findings on *unconditional* convergence for groups of high-income economies like Maddison's sixteen (Maddison 1982; Abramovitz 1986; Baumol 1986), and Table 1 replicates the basic findings. Here, I begin by estimating (3a) with $x(0) = \{\ln y(0)\}$, and no other controls besides initial income. Regression 1 reproduces the standard result that, despite the unconditional convergence seen in the sample of currently-high-income countries (a tautology, of course) expanding the sample to middle- and low-income countries suggests a tendency toward divergence in the world economy (in the β-convergence sense).

A recent innovation by Sachs and Warner suggests we think of qualifying criteria for membership in the "convergence club" based on political conditions and the degree of openness in the economy as measured by the *PNQ* and *ONQ* variables—two important aspects of the economic environment thought to affect growth performance

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[23] Other studies have used the rate of domestic inflation as a proxy for monetary instability and financial repression (Kormendi and Meguire 1985; De Gregorio 1992; Roubini and Sala-i-Martin 1992). The choice of exchange-rate growth or inflation are equivalent in the longer run when purchasing power parity holds beyond short-run deviations; current research suggests a "short" four-year half life for PPP deviations (Frankel and Rose 1995; Taylor 1995).

[24] Various authors have stressed the importance of financial intermediation for growth—that is, of separating the problem of capital accumulation from the problem of capital mobilization and allocation (Gurley and Shaw 1955; Davis 1963; McKinnon 1973; Shaw 1973). Such insights can be readily incorporated into endogenous growth models (Greenwood and Jovanovic 1990; Bencivenga and Smith 1991). Recent empirical work has sought to capture these effects (King and Levine 1993b; 1993a). The variable used here follows King and Levine; an alternative measure of financial development, the reserve ratio, has also been tried (Roubini and Sala-i-Martin 1992).

(Sachs and Warner 1994; 1995).[25] Regressions 2 and 3 augment the specification and replicate the Sachs-Warner findings for the pooled data used here—unconditional convergence is strong in the set of qualifiers (1.5% per annum) and weak in the set of non-qualifiers (0.3% per annum); the divergence result of Regression 1 follows from pooling across these sets (see also Figures 1.1–1.3). Regression 4 cuts the problem another way, by introducing dummy variables (*ONQ* and *PNQ*) into the unconditional convergence test, and is more suggestive: the growth penalty is most severe for openness non-qualification (3.2% per annum lost on the growth rate) versus the penalty for political non-qualification (0.8% per annum).

The augmented results suggest that trade policy and other environmental attributes, as they affect openness (*ONQ*), are more critical for growth and convergence than the nature of the political regime (*PNQ*). These patterns also obtain for the Asia-Pacific group of countries in Regressions 5 and 6: even in this small sample, unconditional divergence is the norm, until allowance is made for the Sachs-Warner criteria—once again the problem is "fixed" and the group shows convergence *ceteris paribus* for qualifiers and non qualifiers (around 1.8% per annum).

5.2 Growth determinants and conditional convergence: reduced-form estimation

Illustrative as these results are, they only push back further the quest of the study: if openness and political conditions matter for growth, then *how* do they matter? Do they act as exogenous or endogenous forces? And through what channel(s) do they inhibit growth—investment? human capital accumulation? technological change? population growth? all of the above?

If we posit exogenous environmental variables underlying the classification of *ONQ* and *PNQ*, then a natural way to begin is by introducing these underlying variables into a full reduced-form estimation of the type (3a). This I attempt in Table 2 for my full sample of countries in the pooled data.[26] The results are encouraging but not overwhelming, with a poor measure of fit (R^2=.31). Note that I retain the *PNQ* variable as an explanator since for the present study I am more concerned to identify the channels through which openness affects growth, not politics.[27]

In fact, in this expanded regression with many more controls than the Table 1 regressions, the *PNQ* variable is insignificant as an explanator of growth. Focus shifts to

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[25] Sachs and Warner work with a single cross-section 1970–89. In the present case, I utilize their definitions of qualifying countries (*ONQ*=1 and *PNQ*=1) and consider all other countries to be non-qualifiers (Sachs and Warner omit several countries with insufficient data).

[26] Estimation is by OLS for this unbalanced panel.

[27] Many are engaged in work on the politics-growth nexus (Alesina, et al. 1992; Barro 1994).

the openness criteria, which always seemed the more powerful in explaining growth, even in Table 1. Here, openness is no longer a binary choice variable (*ONQ*), but includes measures of black-market currency premia (*BMPL*), tariffs (*OWTI*), and exchange-rate depreciation (*GXR*). The regression includes other distortion measures like the relative price of capital (*LNPIPY*), and the size of government (*G*); and controls for financial development (*LLY*) and resource abundance (*PNXI*). All the above controls are contemporaneous, and also included are initial conditions for the stocks of human capital (*PYR+SYR+0*) and demographic structure (*POP15+0*, *POP65+0*). In sum, I include here any variable which might be construed as a candidate exogenous parameter in a reduced-form regression.

The results are striking—*conditional* convergence operates at about 1.6% per annum, and, of the controls, only the set of distortion measures matter in a significant way—and, of those, tariffs have minimal import. This characterization is true in terms of statistical significance and in terms of the more important quantitative significance revealed by the ANOVA sums of squares. By the latter criteria the measure of our ignorance is large, a residual sum of squares equal to 0.185 out of a total of 0.269. Of the explained part, the first order contributions derive from the conditional convergence effect (*LNY0*) and distortions (*BMPL, G, GXR*), each around 0.010. Other effects are an order of magnitude smaller, or smaller still.

5.3 Growth determinants and conditional convergence: structural estimation

Thus, taken at face value, the results offer little support for claims that a principal trade distortion like tariffs retard growth, or that financial development enhances growth, or that resource endowments may lead to dynamic comparative disadvantage. Such a perspective, is, I will argue, flawed. In many ways, the reduced form Regression 7 gets us only marginally closer to an answer to the problem of "why growth rates differ" than did Regressions 1–6. For although it suggests that distortions matter, we want to know how they matter. That is a structural question—it asks how the environmental and state variables affect evolution: how the behavioral equations shift in response to perturbation. We need to ask how environment affects accumulation, investment, population growth. We also need to know whether our exogeneity assumptions are justified in estimating (3a). This demands an estimation of structural growth with care being taken to allow for simultaneity.

Table 3 presents structural "growth accounting" regressions, which naïvely estimate (1a) for physical and human capital inputs (*P+S, CI*) and population growth (*GPOP*), with only a catch-up term (*LNY0*). We expect the first two variables to enhance

growth, the latter two to repress it. Regressions 8 and 9 are simple benchmarks which suggest a 17% return on capital (for the full sample and the Asia-Pacific group) and a labor share of less than one half (for Asia-Pacific, imprecisely estimated). The partial correlations for *GY* versus *CI* and *GPOP* are shown in figures 2.1 and 2.2. Human capital accumulation is not associated with growth in the full sample, although it is in the Asia-Pacific sample, which compels us to account for the accumulation of all three factors for the present case study.

The subsequent regressions in Table 3 confront a number of related hypotheses. Regression 10 replicates findings which suggest that foreign direct investment has a much higher social rate of return than other forms of investment (De Gregorio 1992; Borensztein, De Gregorio and Lee 1995). Regression 11 warns that this result is highly sensitive to sample selection—it disappears when Botswana and Singapore are dropped from the sample.[28] Clearly, this hypothesis warrants further scrutiny.

Regressions 12–14 reintroduce controls and sample splits to allow for the political and openness qualifying variables (*ONQ, PNQ*) to play a role here. The results are broadly supportive of the basic points: investment in physical capital has a return of about 15%–17%, though possibly lower in richer (qualifying) countries, as we might expect in a simple growth model (the rich got rich, in part, by exploiting and dissipating those returns). Population growth congests resources and has a negative effect of growth—though less in the case of richer countries, suggesting there a more elastic supply of technology, perhaps, to help overcome Malthusian pressures. Of the qualifying variables, again *ONQ* appears to matter more (2% per annum growth cost) than *PNQ* (1% growth cost). Henceforth, I will focus on Regression 9 (confined to the Asia-Pacific sample) for further study. To the extent that this deviates from Regression 8, note, it suggests both slope and intercept differences in the structural growth equation for the Asia-Pacific subset.

Where are we now? We have a reduced form suggesting that distortions are major environmental determinants of growth (*a* or *b* variables). And we know from the structural growth equation that factor accumulation matters for growth. Could that be the channel through which distortions operate? An augmented structural equation is helpful, as in Table 4, Regression 15. Here environmental controls are added to (1a),

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[28] These same two countries are almost always investment and growth extreme points, with high leverage in many regressions of this type. For example, Botswana has led to problems of inference and some controversy when investment was disaggregated another way, machines versus non-machines (De Long and Summers 1991; De Long and Summers 1993; Auerbach 1994). Singapore, like its NIC partners, has also been noted as an unusual high-investment case (Young 1992; 1993; 1994).

or, equivalently, endogenous accumulation variables are added to the structure of (3a) as seen in Table 2, Regression 7. In Regression 16, I even admit explicit endogeneity, including some of the distortion and environment variables we might expect to be co-determined, e.g. financial development (*LLY*), black-market premia (*BMPL*) and the price of capital (*LNPIPY*).[29] In the end this mattered little, because a specification test rejects 16 in favor of 15; this is no surprise since the fit of 16 is so much worse—asymptotic gains of the 2SLS estimator are not seen in these small samples, and the efficient estimator is OLS; simultaneity bias appears insignificant using the standard Hausman test.[30] Quantitatively what do the results reveal? Regression 15 contrasts with Regression 7 in that the admitted controls *CI* and *GPOP* are significant; and in that *LNPIPY* is no longer significant.

This result suggests that the *LNPIPY* distortion may indeed act via an endogenous channel, most likely through investment demand. The distortion-investment-growth nexus is again highlighted (Agarwala 1983; Barro 1991; De Long and Summers 1991; Jones 1992; Taylor 1992; 1994b). The question now remains—how does that channel work? And are there other important channels by which the environment affects putatively endogenous variables such as those just considered? Which are the key distortions from a statistical standpoint? And, quantitatively, can they explain divergent performance within and outside the Asia-Pacific region?

5.4 Growth determinants: behavioral equation estimation

Only a structural estimation of growth determinants as in (2a) can hope to answer such questions and Table 5 tries to do just that. Regression 17–22 estimate the "behavioral equations" for the proximate determinants of six endogenous variables in the system (*CI, GPOP, P+S, BMPL, LLY, LNPIPY*). The first three regressions can then be coupled with information on the marginal contribution to growth of the various factor inputs (Regression 8 for Asia-Pacific) to help us identify what made the region such a fast-growth area, and what made the four NICs especially fast growers. All six of these regressions were estimated with 2SLS, and Hausman simultaneity tests were employed to eliminate all except the significantly endogenous right-hand side variables (denoted †). The fit in all cases is quite respectable (only the last equation has an R^2 below .5, and that is .29).

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[29] As instruments I use the lagged initial values (1965–69) of the endogenous variables. These are "good" instruments to the extent that the explanators have more persistence across time than does the explicandum, the rate of growth itself, which seems to be the case (Easterly, et al. 1993).

[30] In this test, residuals from the first stage of 2SLS are included in the OLS specification and tested for significance (Pindyck and Rubinfeld 1981, 303–4). Endogenous variables are denoted with a †.

5.4.1 Investment

Regression 17 pinpoints some key determinants of investment. The coefficient of *LNY0* is negative: richer countries would be expected to have high capital intensity and lower marginal product of capital in the standard growth model, hence less investment. A higher initial stock of human capital *PYR+SYR+0* also discourages further accumulation, as might be expected with unbalanced growth paths in the two-sector models of growth. Children constitute a major investments drag, consistent with a labor supply on investment demand via *POP15+0*. The aged pose no such threat via *POP65+0*. The size of government (*G*) *per se* does not lower investment, but all other distortions do, including *BMPL, OWTI, GXR,* and most emphatically *LNPIPY*, the price of capital, as expected. A poor financial system (small *LLY*) inhibits capital accumulation significantly, as expectedif intermediation and efficiency are inhibited in the capital market. A natural resource comparative advantage (*PNXI* high) inhibits investment, as would be the case if primary product manufacture were less capital intense. Physical capital accumulation also rises to complement rapid human capital accumulation (*P+S*) and to offset capital dilution via high population growth rates (*GPOP*).

5.4.2 Population growth

Regression 18 explores the determinants of population growth. The results are consistent with the view that fertility choice may embody elements of a quality-quantity trade-off, in that population growth seems to be negatively correlated with human capital stocks and flows. This is suggestive of possible multiple equilibria consistent with high- and low-human capital development paths (Becker, Murphy and Tamura 1990). Interestingly, population growth does seem to be positively associated with natural resource endowments (*PNXI*), which would be consistent with theories of agricultural labor supply within the household, and also theories of saving (asset accumulation) via investment in children.

5.4.3 Human capital accumulation

Regression 19 reinforces support for the quality-quantity trade-off, in that *GPOP* is negatively correlated with human capital accumulation measured by enrollments (*P+S*). A large share of children in the population is associated with high enrollments too, as expected. Rich countries (high *LNY0*) have higher enrollments too, again suggesting multiple-equilibria possibilities. In a rare positive impact, high government spending *G* does spill over into economic growth to the extent that it promotes human capital accumulation. Human capital accumulation *P+S* complements investment *CI*, just as vice versa (see above).

5.4.4 Black-market premium

Regression 20 examines the determinants of the black-market premium (*BMPL*) in an attempt to identify the details of the distortions-growth nexus. In keeping with our characterization of *BMPL* as not directly tied to commercial policy, tariffs (*OWTI*) have little impact on *BMPL*. However, *BMPL* is associated with big government (*G*) and, most robustly of all, with monetary instability (*GXR*). Both seem highly plausible; to the extent that big government is associated with intervention in the form of currency controls or other distortions in the financial system, and to the extent that exchange risk is driven by expectations of devaluation of the currency, both variables should have predictive power for the black-market premium. Not unexpectedly, higher-income economies tend to have lower *BMPL*, though the effect is not highly significant.

5.4.5 Financial depth

Regression 21 investigates the determinants of financial depth measured by *LLY*. Financial development is associated with high incomes (*LNY0*)—possibly reflecting a demand for financial services as a normal good. The relationship, however, is far less than one-for-one, which is consistent with a parallel correlation of productivity levels in financial services—one allowing, for example, higher money velocities in richer countries. It is also readily apparent that increased investment (*CI*), an activity which is largely predicated on financial intermediation, is strongly associated with increased financial depth. A more educated population (*PYR+SYR+0*) appears to require fewer financial services, *ceteris paribus*, perhaps reflecting more sophistication on the part of the consumers of financial products. Black-market premia are associated with a greater need for financial services, perhaps unsurprising given the commonly observed speculative and arbitraging booms in monetary transactions in cases of hyperinflation or monetary crisis (e.g., in Latin America). Trade policy seems to matter, in that tariffs (*OWTI*) are associated with reduced financial depth.[31] There appears to be a negative association between monetary instability measured by *GXR* and financial depth, as might be expected given the increased risk in financial markets: this effect offsets the aforementioned influences on *LLY* mediated via *BMPL* possibly due to speculation and arbitrage. Countries with comparative advantage in primary products (*PNXI*) appear to have lower financial depth, which seems intuitively obvious—much saving and investment in agriculture and other primary sectors is outside the scope of financial

[31] It is not clear what the mechanism might be, except to say that throughout economic history financial development has almost always flourished first amongst the mercantile and commercial sectors of any economy, so that a dynamic effect of trade on financial development seems plausible.

intermediaries, taking the form of land improvement, changes in stocks. In addition, the fertility choice issues noted above imply the possibility of children as an asset-accumulation choice in the quantity-quality fertility trade-off (*PNXI* is associated with higher population growth, in Regression 18): that is, children as assets may substitute for financial assets and intermediation.

5.4.6 Relative price of capital

Regression 22, finally, examines the determinants of the relative price of capital, seen to be such a vital determinant of investment demand in Regression 17. As expected, *LNPIPY* is associated with the presence of distortions at various points in the economy. About one quarter of any tariff-rate change passes through into relative investment prices, which is unsurprising in that a large share of contemporary investment is in the form of tradable machinery and equipment. About one sixth of any change in the black-market premium also passes through to *LNPIPY*. The most robust association, however, is between the broad measure of public finance distortions (G) and the investment price, suggesting that beyond trade and the black-market premium, distortions and government interventions at many levels in the economy are associated with higher investment prices.

5.5 Why do growth rates differ?

Table 5 confirms our intuition regarding some of the channels by which environmental variables affect each other and affect economic growth performance. Hypothesis tests suggest significant interaction between measures of openness and other distortions and highly proximate determinants of growth such as factor accumulation. Yet if these forces matter, how much do they matter?

Table 6 tries to confront the question of quantitative, rather than statistical significance. In two exercises I compare the variables involved in the structural regression for three samples: the world beyond the Asia-Pacific region, the 4 fast-growing Asia-Pacific NICs (Korea, Taiwan, Singapore and Hong Kong), and the other Asia-Pacific economies. I want to examine the questions: why was the Asia-Pacific region a fast growth region relative to the rest of the world? and why, within the Asia-Pacific region, were the NICs such a fast growth group relative to the rest of the region? That is, what might explain winners and losers at the international and regional levels?

As noted earlier, it is commonplace to address this question via a reduced-form approach. The merit of a structural approach, however, is that we can dissect the linkages between growth and its determinants more finely. Table 6 explores the shifts

in each of the structural equations (Regressions 17–22) in the three samples. To that end, Panel (a) shows the sample means of the variables in each case. The basic finding here is that in almost every dimension, the Asia-Pacific region enjoys advantages relative to the rest of the world: lower population growth, lower distortions, higher investment rates, a deeper financial structure, higher levels and growth rates of human capital, and so on. Moreover, the NIC group enjoys even more of these advantages than the rest of the Asia-Pacific group, for the most part. We might say that in terms of growth characteristics, the NICs appear Asia-Pacific, only more so.

The signs appear hopeful that we might have some success explaining how growth rates differ across the three samples. Growth rates averaged 1.2% per annum outside Asia-Pacific, but were 2.4% in the non-NIC Asia-Pacific economies, and 6.5% in the four NICs. And increasing growth rates across these groups seem to match improving growth attributes. Is that confirmed by experiment? Panels (b) and (c) embody a natural counterfactual exercise: if we were to impose non-Asia-Pacific characteristics, would all of the growth differentials be eliminated? This exercise is done at the level of the structural equations, where the first six columns assess the shift in an endogenous control variable (*CI, GPOP, P+S, BMPL, LLY, LNPIPY*) as a function of its determinants. The final column assess the growth impact using the shifts in factor accumulation given by the first three columns, and using the coefficient estimates of the Asia-Pacific structural growth equation (Regression 9).

The results for the NICs (Table 6, Panel (c)) are quite pleasing. The major sources of high investment in the NICs were labor supply effects (*POP15+0*, a low dependency rate), distortions (*BMPL, OWTI,* and *LNPIPY*), and human capital accumulation complementarities, which offset low rates of capital-dilution arising from population growth (*GPOP*). Investment differences are over-explained by these variables. The major source of low population growth was through endowments, that is, natural resource scarcity (proxied by *PNXI*). High human capital investment was in turn driven in large part by quality-quantity fertility trade-offs, enough to offset the small cohort of school age. Low black-market premia stemmed principally from small government distortions and a relatively favorable political climate. High financial depth derived mostly from high investment demand. Capital price distortions were driven largely by small government distortions, and a little by black-market and tariff effects.

Overall, the structural shifts (NIC versus non Asia-Pacific) could explain about a 25% rise in *CI*, about a 2% drop in *GPOP*, and about a 0.7 rise in *P+S*; this compares to actual differences between the two samples. In accounting for growth, these effects compound to explain about a 7% difference in growth rates in the two samples, similar

in order of magnitude to the actual 5.3% difference. In the final row we see that the major impact on *GY* is due to investment (*CI*), accounting for a 4.1% difference in the growth rate; human capital accumulation (*P+S*) accounts for 1.6%, and population growth (*GPOP*) 1.2%. Examining the final column (*GY*) suggests that major sources of fast NIC growth were rapid human capital accumulation (*P+S*) encouraging investment and discouraging population growth; low capital goods prices and black-market premia (*LNPIPY, BMPL*) encouraging investment; and low dependency rates (*POP15+0*) also encouraging investment.

5.6 Openness, Trade and growth

Going beyond the reduced form, for the NICs at least, has illuminated something of the workings of the growth mechanism. Openness plays a major role, then, since openness criteria (using a broad concept of openness) do matter—distortions in the currency system (*BMPL*), in imported goods (*OWTI*), and especially capital goods (*LNPIPY*) account for much of the differences in growth rates. Unfortunately, this conclusion does not extend so well to the rest of the Asia-Pacific group when it is compared with the world beyond (Table 6, Panel (b)). Here the same growth determinants over-explain growth differentials by a large amount.

By this reckoning, the non-NIC parts of the Asia-Pacific region ought to have been growing almost as fast as the NICs in comparison with the rest of the world, around 5% per annum faster, whereas in reality they only grew about 1.2% per annum faster. This underscores the general measure of our ignorance embedded in all of our regressions and findings. The unexplained variance remains high—good "luck" (unexplained residual growth) can matter as much as good policy. We can claim some success in explaining why Asia-Pacific has been a fast growing region relative to the rest of the world; fathoming what made for winners and losers *within* the Asia-Pacific region remains a challenge.[32]

5.7 Migration and growth

So much then for openness and economic growth, a linkage which seems to be of vital importance for Asia-Pacific economic performance. It remains to be asked, in keeping with the aim of this paper, whether migration, as a force in population growth, also mattered for economic growth in the region. Table 7 sketches an answer to that question, which leans toward rejecting the hypothesis that migration mattered very

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[32] Winners and losers there indeed were, as is evidenced by the absence of σ-convergence is Asia-Pacific just as in the world at large (Appendix Table A1). And this holds despite evidence of conditional β-convergence at various levels.

much for *aggregate* economic growth. This table exploits the United Nations data on population growth and natural increase to impute net migration rates.[33] How can we measure the growth impact of migration?

A natural counterfactual is to imagine a "no net migration" scenario in which population growth rates are adjusted by subtracting actual net migration rates. This procedure has been applied in the context of mass migrations in the late nineteenth century from the Old World to the New to argue that international migration can play a potentially huge role in explaining long-run convergence patterns in the world economy (Taylor and Williamson 1994). Unfortunately, a similar finding is unlikely to be unearthed in the postwar data, at least here for the Asia-Pacific region: the net migration rates are simply too low. Only three countries have absolute net migration rates above 2 per thousand—Australia (7 per thousand) and Hong Kong (7) as receivers; Fiji (–4) as a sender (Table 7, Column 1). For historical comparison, in the period 1900–10 the following countries *all* had absolute net migration rates over 2 per thousand—Argentina (25), Australia (14), Brazil (3), Canada (23) and the United States (10) on the receiving side; Belgium (–2), Denmark (–3), Great Britain (–7), Ireland (–8), Italy (–18), the Netherlands (–5), Norway (–7), Portugal (–6), Spain (–7), and Sweden (–4) on the sending side.[34] Furthermore, the turn of the century was an era of lower population growth rates.

Thus, postwar experience, in historical perspective, is a period of population growth being driven primarily by natural increase, with migration accounting for a small share. This is certainly the case for the Asia-Pacific region, with the exception of Australia, Hong Kong, and Fiji (Table 7, Column 2). Applying the coefficient of Regression 9 to the net migration rates (Table 7, Column 3) reveals the weak aggregate growth impact of migration in this region in the contemporary period: in absolute size the growth rate impacts are less than 0.06% per annum, with the three exceptions; for Australia and Hong Kong, inflows might have cost 0.4% per annum in growth terms (a nontrivial share of total growth, especially for Australia). For Fiji, emigration was worth a net gain of 0.5% per annum in growth rate (again a nontrivial contribution, at least

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[33] The data includes population growth rates, and crude birth and death rates for five year periods since 1950 (United Nations 1993). The UN attempts to reconcile these figures, where possible, with corroborating information on international population movements. The net migration rate is calculated residually here, as population growth rate minus crude birth rate plus crude death rate. Note that data on Taiwan is not included in the UN records, hence we relabel NIC4 as NIC3 in the following discussion.

[34] In fact, only two countries out of Taylor and Williamson's (1994) sample of 17 fail to make this list: France (–0.15) and Germany (–0.43).

for Fiji). In the region as a whole, migration had a trivial impact on growth rates (–0.01% per annum).

Overall, integration in international labor markets appears to have mattered much less than integration in other markets—financial markets and money markets, traded goods markets, capital goods markets, and so on. Yet several concerns and caveats should be aired. First, the migration counterfactual is a partial equilibrium exercise. As Taylor and Williamson (1994) argued, when capital is free to chase labor, then the impact of immigration on growth is muted. This would serve to downplay the impact of migration even more in the present case. Second, the counterfactual assumes no change in population growth rates under the counterfactual: any Walker effect or other feedback mechanism could also diminish the impact of migration on growth, another bias in the downward direction. Third—does this imply that free migration would have scarcely any growth impact? Probably not, since migration is subject to strict policy control in the present era (in contrast to the late nineteenth century); the counterfactual is subject to the Lucas critique in that any change in migration policy would certainly entail different migration responses. Fourth, even if migration mattered little for aggregate economic growth, it likely mattered a great deal for distribution, and the relative incomes of different groups, the returns to different skills, and the wages in different occupations; such effects can never be captured in the empirical growth framework adopted here, but matter critically for the political economy of migration and migration restriction.

6. CONCLUSION

This study has attempted to distill the key content of the empirical growth literature relevant to the question of how openness, trade and migration has affected growth and convergence in the Asia-Pacific region. I surveyed a large body of impressive work, yet found the conventional reduced-form approaches wanting in terms of insight into precise growth mechanisms. Instead I added a structural approach to estimating the components of the dynamical system of economic growth. This shed some light on the mechanics of economic growth in the Asia-Pacific region. To summarize:

- Relatively high investment rates were the key to high growth rates in the region, contributing several percentage points to the predicted growth rate. Of lesser order were gains due to human capital accumulation and low population growth. These findings complement direct growth accounting analysis (Young 1992; 1993; 1994).
- The main cause of high investment rates, in turn, appeared to be human capital complementarities, a low dependency rate, and low distortions (Edwards 1992;

Jones 1992; Easterly 1993; Brander and Dowrick 1994; Taylor 1994b; Taylor 1994a; Sachs and Warner 1995). The role of distortions underscores the importance of openness for growth, but should be broadly construed to include commercial, financial and monetary policies (Edwards 1992; Easterly 1993; Sachs and Warner 1995).

- Much of investment in the developing economies takes the form of imported capital goods, so the high-investment environment might properly be termed "import-oriented" growth. Foreign direct investment did not appear to be of special import here, however. Of course trade balance constraints then entail the export-growth correlation that has received far more, yet possibly misplaced, attention (De Long and Summers 1991; Levine and Renelt 1992; Rodrik 1994).
- Little support could be found for the hypotheses that financial depth or natural resource endowments affected growth, though both were statistically significant as determinants of several structural equations. For example, Asia-Pacific's financial depth did augment investment rates considerably. Natural resource scarcity in the region also appeared to reduce investment, raise population growth and inhibit financial development, but only by small amounts (King and Levine 1993b; 1993a; Sachs and Warner 1994; 1995).
- All the same, good luck seems to matter in addition to good policy. The NICs appear to have superior growth performance, as predicted. Yet the rest of the Asia-Pacific region disappoints in that its actual growth rate is far below that predicted (Easterly, et al. 1993).
- In an era of relatively restricted migration, it is unsurprising that migration played little part as a determinant of growth and convergence. The postwar era stands in marked contrast to the pre-World War One period of free, mass migrations when labor movement from poor to rich regions was part of the convergence dynamic (Taylor and Williamson 1994). Despite such caveats, openness and integration in other markets may be a partial substitute for labor mobility. The results provide no guide to the possibly rapid convergence that might ensue in the event of a free migration policy being adopted.

7. REFERENCES

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Table 1
Growth Determinants and Unconditional Convergence

Regression no.	1	2	3
Dependent variable	*GY*	*GY*	*GY*
Sample	all	SWqual	SWnonqual
N	494	136	358
R squared	.06	.21	.06
SEE	0.0364	0.0218	0.0377
Constant	−0.0083 (0.66)	0.1674 (7.31)	0.0310 (1.80)
LNY0	0.0028 (1.75)	−0.0154 (5.91)	−0.0033 (1.43)

Regression no.	4	5	6
Dependent variable	*GY*	*GY*	*GY*
Sample	all	Asia-Pacific	Asia-Pacific
N	432	60	48
R squared	.15	.00	.49
SEE	0.0326	0.0315	0.0231
Constant	0.0919 (5.10)	0.0275 (0.69)	0.1959 (4.80)
LNY0	−0.0069 (3.37)	0.0008 (0.17)	−0.0177 (3.69)
ONQ	−0.0318 (6.91)		−0.0779 (5.97)
PNQ	−0.0080 (2.08)		0.0290 (2.04)

Notes:
See text and appendix.

Table 2
Growth Determinants and Conditional Convergence: Reduced Form Estimation

Regression no.	7	
Dependent variable	*GY*	
Sample	all	
N	250	ANOVA
R squared	.31	Sums of
SEE	0.0279	Squares
Constant	0.2147 (4.56)	0.0598
LNY0	–0.0156 (3.69)	0.0106
PYR+SYR+0	0.0001 (0.11)	0.0000
POP15+0	–0.0906 (1.55)	0.0019
POP65+0	–0.1455 (1.20)	0.0011
PNQ	–0.0033 (0.66)	0.0003
BMPL	–0.0213 (4.22)	0.0139
OWTI	–0.0063 (0.57)	0.0003
G	–0.0009 (3.01)	0.0070
LNPIPY	–0.0214 (3.56)	0.0099
GXR	–0.0332 (3.89)	0.0118
LLY	0.0035 (0.40)	0.0001
PNXI	–0.0129 (0.78)	0.0005
Residual		0.1847
Total		0.2686

Notes:
See text and appendix.

Table 3
Growth Determinants and Conditional Convergence:
Structural Equation Estimation

Regression no.	8	9
Dependent variable	*GY*	*GY*
Sample	all	Asia-Pacific
N	461	56
R squared	.19	.21
SEE	0.0329	0.0283
Constant	0.0961 (5.85)	0.1151 (2.34)
LNY0	–0.0117 (4.45)	–0.0178 (2.69)
P+S	–0.0020 (0.34)	0.0236 (1.45)
CI	0.0017 (7.51)	0.0017 (2.37)
GPOP	–0.8716 (5.94)	–0.6071 (0.89)

Regression no.	10	11
Dependent variable	*GY*	*GY*
Sample	all	excl. Singapore & Botswana
N	312	306
R squared	.16	.13
SEE	0.0313	0.0313
Constant	0.0508 (2.34)	0.0472 (2.15)
LNY0	–0.0054 (1.59)	–0.0049 (1.43)
P+S	–0.0081 (1.14)	–0.0069 (0.97)
CI	0.0015 (5.24)	0.0014 (4.72)
FDIXY	0.2046 (1.84)	0.0967 (0.73)
GPOP	–0.6708 (3.65)	–0.6458 (3.47)

Regression no.	12	13	14
Dependent variable	*GY*	*GY*	*GY*
Sample	all	SWqual	SWnonqual
N	413	133	328
R squared	.26	.32	.15
SEE	0.0305	0.0199	0.035
Constant	0.1579 (7.63)	0.2177 (8.15)	0.0975 (4.95)
LNY0	–0.0188 (6.14)	–0.0272 (6.82)	–0.0114 (3.49)
P+S	0.0034 (0.56)	0.0221 (2.52)	–0.0083 (1.23)
CI	0.0015 (6.41)	0.0007 (2.36)	0.0017 (5.97)
GPOP	–0.4475 (2.71)	–0.1159 (0.64)	–0.8734 (4.19)
ONQ	–0.0224 (4.73)		
PNQ	–0.0102 (2.74)		

Notes:
See text and appendix.

Table 4
Growth Determinants and Conditional Convergence:
Augmented Structural Equation Estimation

Regression no.	15	16	15 v. 16
Dependent variable	*GY*	*GY*	
Sample	all	all	
N	244	236	Hausman
R squared	.37	.31	Endogeneity
SEE	0.0269	0.0285	Test
Method	OLS	2SLS	(p value)
Constant	0.1807 (3.76)	−0.3847 (0.69)	
LNY0	−0.0182 (4.06)	0.1107 (1.03)	
PYR+SYR+0	0.0003 (0.24)	0.0060 (0.74)	
POP15+0	0.0003 (0.01)	0.8614 (1.12)	
POP65+0	−0.0859 (0.71)	−1.9065 (1.67)	
PNQ	−0.0027 (0.56)	−0.0585 (1.32)	
BMPL	−0.0190 (3.76)	0.2075 (1.16)†	0.46
OWTI	−0.0005 (0.05)	0.0950 (1.00)	
G	−0.0010 (3.35)	0.0001 (0.11)	
LNPIPY	−0.0096 (1.28)	0.0715 (0.59)†	0.83
GXR	−0.0272 (3.14)	−0.1336 (1.73)	
LLY	0.0021 (0.21)	−0.1418 (1.01)†	0.62
PNXI	−0.0184 (1.13)	0.1699 (1.23)	
P+S	0.0024 (0.25)	−0.3172 (1.06)†	0.97
CI	0.0011 (2.76)	0.0062 (0.83)†	0.46
GPOP	−0.5539 (2.15)	−20.6041 (1.31)†	0.62

Notes:
See text and appendix.

Table 5
Growth Determinants:
Behavioral Equation Estimation

Regression no.	17	18	19
Dependent variable	*CI*	*GPOP*	*P+S*
Sample	all	all	all
N	236	225	230
R squared	.74	.54	.85
SEE	4.562	0.0083	0.1657
Constant	73.7032 (4.84)	0.0334 (3.44)	−1.2867 (4.44)
LNY0	−14.0049 (3.69)	0.0012 (0.77)	0.3001 (9.63)
PYR+SYR+0	−1.0449 (3.26)	−0.0008 (1.65)	0.0402 (4.69)
POP15+0	−100.9020 (4.01)		2.2437 (4.48)
POP65+0	143.7300 (2.35)		−3.6764 (4.26)
PNQ	5.7502 (3.20)	0.0011 (0.74)	0.0039 (0.13)
BMPL	−23.2958 (3.85)		
OWTI	−12.4540 (3.85)		
G	−0.0407 (0.56)	0.0001 (0.74)	0.0070 (3.74)
LNPIPY	−16.1287 (7.07)†		
GXR	9.8495 (2.64)		
LLY	18.5170 (5.38)	−0.0029 (1.09)	−0.2283 (3.12)†
PNXI	−17.8299 (3.06)	0.0234 (4.84)	0.2272 (2.08)
P+S	39.2374 (4.22)†	−0.0186 (3.96)†	
CI		0.0002 (1.45)	0.0090 (4.38)
GPOP	2059.0300 (3.81)†		−38.3005 (7.72)†

Regression no.	20	21	22
Dependent variable	*BMPL*	*LLY*	*LNPIPY*
Sample	all	all	all
N	143	223	236
R squared	.52	.51	.29
SEE	0.1891	0.2029	0.3414
Constant	0.4788 (1.31)	−0.3757 (1.56)	−0.1911 (3.23)
LNY0	−0.0648 (1.44)	0.0701 (2.00)	
PYR+SYR+0	−0.0032 (0.23)	−0.0173 (1.97)	
POP15+0			
POP65+0			
PNQ	0.1816 (3.19)	−0.0124 (0.30)	
BMPL		0.0788 (2.06)	0.1654 (2.16)†
OWTI	−0.0449 (0.33)	−0.2262 (2.80)	0.2772 (2.26)
G	0.0106 (3.17)	0.0022 (0.94)	0.0219 (6.64)
LNPIPY			
GXR	0.4751 (5.99)	−0.2110 (2.97)	
LLY			
PNXI	−0.0124 (0.07)	−0.3661 (3.14)	0.2390 (1.34)
P+S			
CI		0.0189 (4.39)†	
GPOP			

Notes:
See text and appendix.

Table 6
Sample Statistics and Growth-Rate Differences Within and Outside the Asia-Pacific Region

(a) Sample Means of Variables

Variables	Non Asia-Pacific	Non-NIC4 Asia-Pacific	NIC4	Non-NIC4 Asia-Pacific minus Non Asia-Pacific	NIC4 minus Non Asia-Pacific
Asia-Pacific	0	1	1		
NIC4	0	0	1		
GY	0.0121	0.0241	0.0654	0.0121	0.0533
LNY0	6.9727	7.9812	8.3867	1.0084	1.4140
PYR+SYR+0	1.5260	5.5190	5.4259	3.9930	3.8999
POP15+0	0.4598	0.3606	0.3262	–0.0992	–0.1336
POP65+0	0.0331	0.0503	0.0447	0.0172	0.0116
PNQ	0.8000	0.3333	0.0000	–0.8000	–0.4667
BMPL	0.3971	0.0442	0.0332	–0.3529	–0.3639
OWTI	0.2425	0.1619	0.0565	–0.0806	–0.1860
G	23.3930	16.9702	10.4088	–6.4228	–12.9843
LNPIPY	0.7555	0.2349	0.1406	–0.5206	–0.6149
GXR	0.0155	0.0250	0.0020	0.0095	–0.0135
LLY	0.3652	0.5441	0.5786	0.1790	0.2134
PNXI	0.0320	0.1013	–0.0425	0.0693	–0.0745
P+S	0.7706	1.4550	1.6719	0.6844	0.9013
CI	13.8610	21.9083	27.0525	8.0473	13.1915
GPOP	0.0285	0.0186	0.0157	–0.0099	–0.0128

(b) Growth Determinants: Non-NIC4 Asia-Pacific versus Non-Asia-Pacific

	difference in:						
due to:	*CI*	*GPOP*	*P+S*	*BMPL*	*LLY*	*LNPIPY*	*GY*
LNY0	–14.1232	0.0012	0.3026	–0.0653	0.0707		–0.0177
PYR+SYR+0	–4.1722	–0.0030	0.1604	–0.0130	–0.0691		–0.0015
POP15+0	10.0063		–0.2225				0.0118
POP65+0	2.4749		–0.0633				0.0027
PNQ	–4.6002	–0.0009	–0.0031	–0.1453	0.0099		–0.0074
BMPL	8.2208				–0.0278	–0.0584	0.0140
OWTI	1.0041			0.0036	0.0182	–0.0223	0.0017
G	0.2616	–0.0004	–0.0452	–0.0681	–0.0143	–0.1405	–0.0003
LNPIPY	8.3962						0.0143
GXR	0.0937			0.0045	–0.0020		0.0002
LLY	3.3139	–0.0005	–0.0409				0.0050
PNXI	–1.2354	0.0016	0.0157	–0.0009	–0.0254	0.0166	–0.0027
P+S	26.8545	–0.0127					0.0536
CI		0.0013	0.0723		0.1523		0.0009
GPOP	–20.3540		0.3786				–0.0258
sum explained	16.1411	–0.0135	0.5546	–0.2843	0.1126	–0.2046	0.0488
actual difference	8.0473	–0.0099	0.6844	–0.3529	0.1790	–0.5206	0.0121
difference in:							
GY	0.0276	0.0082	0.0131				

Table 6
(c) Growth Determinants: NIC4 versus Non Asia-Pacific

Variables	*CI*	*GPOP*	*P+S*	*BMPL*	*LLY*	*LNPIPY*	*GY*
LNY0	−19.8023	0.0017	0.4243	−0.0916	0.0992		−0.0248
PYR+SYR+0	−4.0749	−0.0029	0.1567	−0.0127	−0.0675		−0.0015
POP15+0	13.4839		−0.2998				0.0159
POP65+0	1.6698		−0.0427				0.0018
PNQ	−2.6834	−0.0005	−0.0018	−0.0848	0.0058		−0.0043
BMPL	8.4778				−0.0287	−0.0602	0.0145
OWTI	2.3164			0.0084	0.0421	−0.0516	0.0040
G	0.5289	−0.0009	−0.0913	−0.1376	−0.0289	−0.2840	−0.0007
LNPIPY	9.9179						0.0169
GXR	−0.1331			−0.0064	0.0029		−0.0002
LLY	3.9517	−0.0006	−0.0487				0.0060
PNXI	1.3275	−0.0017	−0.0169	0.0009	0.0273	−0.0178	0.0029
P+S	35.3641	−0.0168					0.0706
CI		0.0021	0.1185		0.2497		0.0015
GPOP	−26.2901		0.4890				−0.0333
sum explained	24.0542	−0.0197	0.6871	−0.3237	0.3018	−0.4136	0.0693
actual difference	13.1915	−0.0128	0.9013	−0.3639	0.2134	−0.6149	0.0533
difference in:							
GY	0.0411	0.0120	0.0162				

Notes:
See text and appendix.

Table 7
Net Migration Rates for the Asia Pacific Region, 1970–90 (% per annum)

	NMRT 1970–90	*NMRT/GPOP* 1970–90	growth impact 1970–90	*NMRT* 1970–75	*NMRT* 1975–80	*NMRT* 1980–85	*NMRT* 1985–90
Australia	0.67	0.43	–0.40	0.53	0.69	0.59	0.85
Hong Kong	0.66	0.36	–0.40	0.74	1.31	0.42	0.18
Indonesia	0.11	0.05	–0.07	0.32	0.11	0.00	0.01
Thailand	0.08	0.04	–0.05	0.34	0.11	0.17	–0.30
Singapore	0.05	0.04	–0.03	0.12	0.09	–0.01	0.00
Japan	0.02	0.02	–0.01	0.07	0.02	0.02	–0.04
Papua New Guinea	0.00	0.00	0.00	–0.01	0.00	0.01	0.00
China	0.00	0.00	0.00	0.01	0.00	0.00	–0.01
New Zealand	–0.02	–0.03	0.02	0.55	–0.71	0.05	0.01
Korea	–0.03	–0.02	0.02	0.01	–0.19	–0.14	0.18
Malaysia	–0.04	–0.01	0.02	–0.15	0.00	0.00	0.01
Solomon Islands	–0.16	–0.05	0.10	–0.42	–0.27	0.05	0.01
Philippines	–0.16	–0.06	0.10	–0.10	–0.21	–0.17	–0.15
Fiji	–0.88	–0.53	0.54	–0.60	–0.83	–0.69	–1.41
Asia-Pacific	0.02	0.01	–0.01	0.10	0.01	0.02	–0.05
NIC3	0.23	0.14	–0.14	0.29	0.40	0.09	0.12

Notes:
See text and appendix.

Table A1
Sigma Convergence

	All (N=106)	Asia-Pacific (N=14)
1970	0.944	0.853
1975	0.969	0.848
1980	0.993	0.829
1985	1.031	0.853
1989	1.079	0.893
1990	1.092	0.902

Notes:
See text and appendix.

Table A2
Sample Countries and Coding

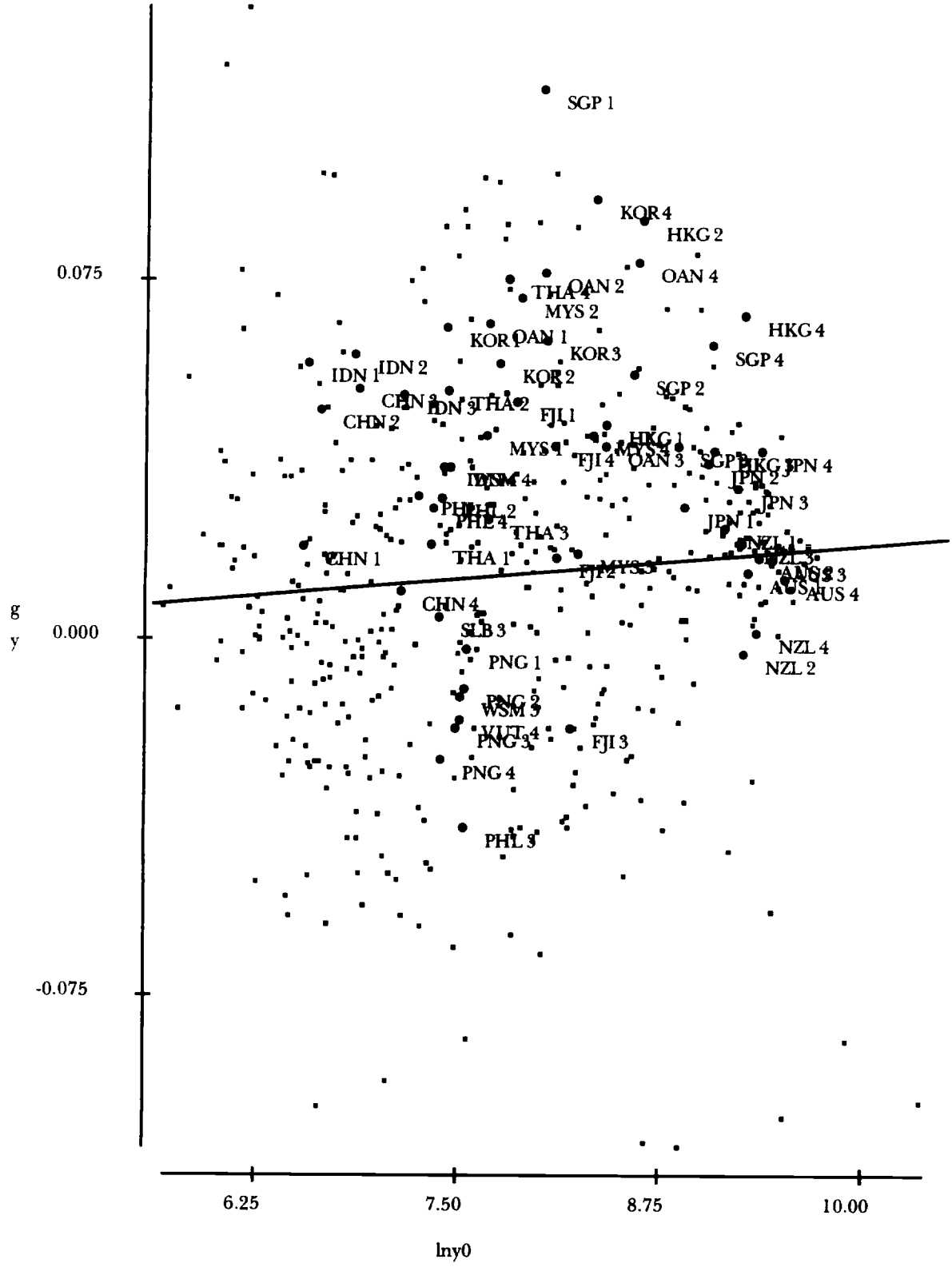
Country	SH Code	WB Code	Asia-Pacific	NIC4	*ONQ*	*PNQ*
Algeria	1	DZA	0	0	1	1
Angola	2	AGO	0	0	1	1
Benin	3	BEN	0	0	1	1
Botswana	4	BWA	0	0	1	0
Burkina Faso	5	HVO	0	0	1	1
Burundi	6	BDI	0	0	1	1
Cameroon	7	CMR	0	0	1	1
Cape Verde	8	CPV	0	0	na	1
Central African Rep.	9	CAF	0	0	1	1
Chad	10	TCD	0	0	1	1
Comoros	11	COM	0	0	na	na
Congo	12	COG	0	0	1	1
Egypt	13	EGY	0	0	1	0
Ethiopia	14	ETH	0	0	1	1
Gabon	15	GAB	0	0	1	1
Gambia	16	GMB	0	0	1	0
Ghana	17	GHA	0	0	1	1
Guinea	18	GIN	0	0	1	1
Guinea-Bissau	19	GNB	0	0	1	1
Cote d'Ivoire	20	CIV	0	0	1	0
Kenya	21	KEN	0	0	1	0
Lesotho	22	LSO	0	0	1	0
Liberia	23	LBR	0	0	na	1
Madagascar	24	MDG	0	0	1	0
Malawi	25	MWI	0	0	1	1
Mali	26	MLI	0	0	1	1
Mauritania	27	MRT	0	0	1	1
Mauritius	28	MUS	0	0	0	0
Morocco	29	MAR	0	0	0	0
Mozambique	30	MOZ	0	0	1	1
Niger	31	NER	0	0	1	1
Nigeria	32	NGA	0	0	1	0
Rwanda	33	RWA	0	0	1	1
Senegal	34	SEN	0	0	1	0
Seychelles	35	SYC	0	0	na	na
Sierra Leone	36	SLE	0	0	1	0
Somalia	37	SOM	0	0	1	1
South Africa	38	ZAF	0	0	1	0
Sudan	39	SDN	0	0	na	na
Swaziland	40	SWZ	0	0	1	0
Tanzania	41	TZA	0	0	1	1
Togo	42	TGO	0	0	1	1
Tunisia	43	TUN	0	0	1	0
Uganda	44	UGA	0	0	1	1
Zaire	45	ZAR	0	0	1	1
Zambia	46	ZMB	0	0	1	0
Zimbabwe	47	ZWE	0	0	1	1
Bahamas, The	48	BHS	0	0	na	na
Barbados	49	BRB	0	0	0	0

Canada	50	CAN	0	0	0	0
Costa Rica	51	CRI	0	0	1	0
Dominica	52	DMA	0	0	na	na
Dominican Rep.	53	DOM	0	0	1	0
El Salvador	54	SLV	0	0	1	1
Grenada	55	GRD	0	0	na	na
Guatemala	56	GTM	0	0	1	1
Haiti	57	HTI	0	0	0	1
Honduras	58	HND	0	0	1	0
Jamaica	59	JAM	0	0	1	0
Mexico	60	MEX	0	0	i	0
Nicaragua	61	NIC	0	0	1	1
Panama	62	PAN	0	0	na	1
St.Lucia	63	LCA	0	0	na	na
St.Vincent & Grens.	64	VCT	0	0	na	na
Trinidad & Tobago	65	TTO	0	0	1	0
United States	66	USA	0	0	0	0
Argentina	67	ARG	0	0	1	1
Bolivia	68	BOL	0	0	1	1
Brazil	69	BRA	0	0	1	0
Chile	70	CHL	0	0	1	0
Colombia	71	COL	0	0	1	0
Ecuador	72	ECU	0	0	1	1
Guyana	73	GUY	0	0	1	0
Paraguay	74	PRY	0	0	1	0
Peru	75	PER	0	0	1	0
Suriname	76	SUR	0	0	na	na
Uruguay	77	URY	0	0	1	0
Venezuela	78	VEN	0	0	1	0
Afghanistan	79	AFG	0	0	na	na
Bahrain	80	BHR	0	0	na	na
Bangladesh	81	BGD	0	0	1	1
Myanmar (Burma)	82	BUR	0	0	1	1
China	83	CHN	1	0	1	1
Hong Kong	84	HKG	1	1	0	0
India	85	IND	0	0	1	0
Indonesia	86	IDN	1	0	0	0
Iran, I.R. of	87	IRN	0	0	1	1
Iraq	88	IRQ	0	0	1	1
Israel	89	ISR	0	0	1	1
Japan	90	JPN	1	0	0	0
Jordan	91	JOR	0	0	0	0
Korea	92	KOR	1	1	0	0
Kuwait	93	KWT	0	0	na	na
Malaysia	94	MYS	1	0	0	0
Nepal	95	NPL	0	0	1	0
Oman	96	OMN	0	0	na	na
Pakistan	97	PAK	0	0	1	0
Philippines	98	PHL	1	0	1	1
Saudi Arabia	99	SAU	0	0	na	na
Singapore	100	SGP	1	1	0	0
Sri Lanka	101	LKA	0	0	1	1
Syria	102	SYR	0	0	1	1
Taiwan	103	OAN	1	1	0	0
Thailand	104	THA	1	0	O	1

United Arab Emirates	105	ARE	0	0	na	na
Yemen, N. Arab	106	YEM	0	0	0	0
Austria	107	AUT	0	0	0	0
Belgium	108	BEL	0	0	0	0
Cyprus	109	CYP	0	0	0	0
Denmark	110	DNK	0	0	0	0
Finland	111	FIN	0	0	0	0
France	112	FRA	0	0	0	0
Germany, West	113	DEU	0	0	0	0
Greece	114	GRC	0	0	0	0
Hungary	115	HUN	0	0	1	1
Iceland	116	ISL	0	0	na	na
Ireland	117	IRL	0	0	0	0
Italy	118	ITA	0	0	0	0
Luxembourg	119	LUX	0	0	0	0
Malta	120	MLT	0	0	0	0
Netherlands	121	NLD	0	0	0	0
Norway	122	NOR	0	0	0	0
Poland	123	POL	0	0	1	1
Portugal	124	PRT	0	0	0	0
Spain	125	ESP	0	0	0	0
Sweden	126	SWE	0	0	0	0
Switzerland	127	CHE	0	0	0	0
Turkey	128	TUR	0	0	1	0
United Kingdom	129	GBR	0	0	0	0
Yugoslavia	130	YUG	0	0	1	1
Australia	131	AUS	1	0	0	0
Fiji	132	FJI	1	0	na	na
New Zealand	133	NZL	1	0	0	0
Papua New Guinea	134	PNG	1	0	1	0
Solomon Islands	135	SLB	1	0	na	na
Tonga	136	TON	1	0	na	na
Vanuatu	137	VUT	1	0	na	na
Western Samoa	138	WSM	1	0	na	na

Notes:
See text and appendix.

Figure 1.1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OAN 4
OAN 2
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MYS 2
HKG 4
KOR 1
OAN 1
KOR 3
SGP 4
IDN 1
IDN 2
KOR 2
SGP 2
CHN 2
IDN 3
THA 2
FJI 1
CHN 2
HKG 1
MYS 1
FJI 4
OAN 3
JPN 4
JPN 2
JPN 3
JPN 1
THA 3
CHN 1
THA 1
FJI 2
AUS 4
g
y
0.000
CHN 4
SLB 3
NZL 4
PNG 1
NZL 2
PNG 2
WSM 3
VUT 4
PNG 3
FJI 3
PNG 4
PHL 3
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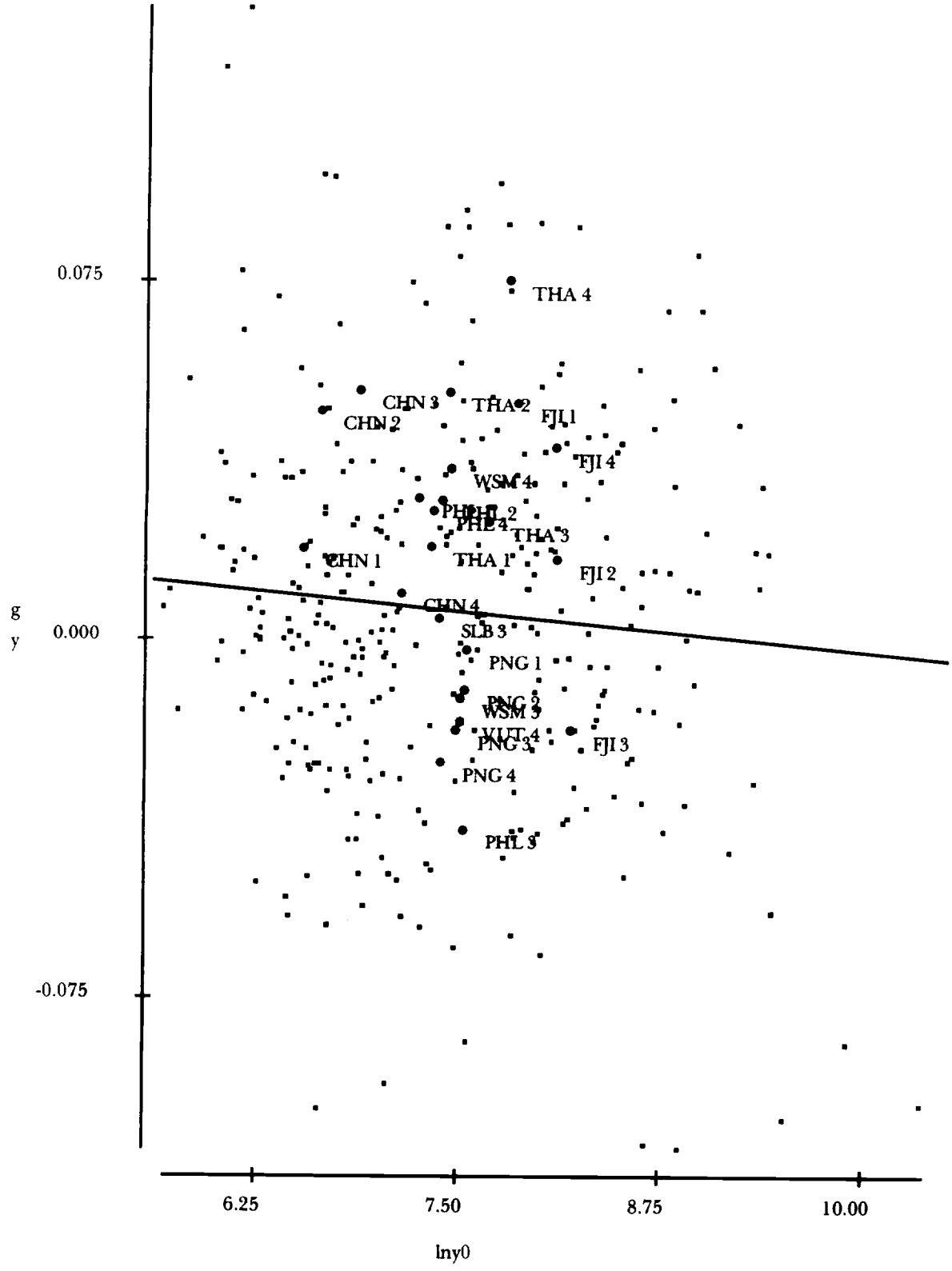
7.50
8.75
10.00
lny0

Figure 1.2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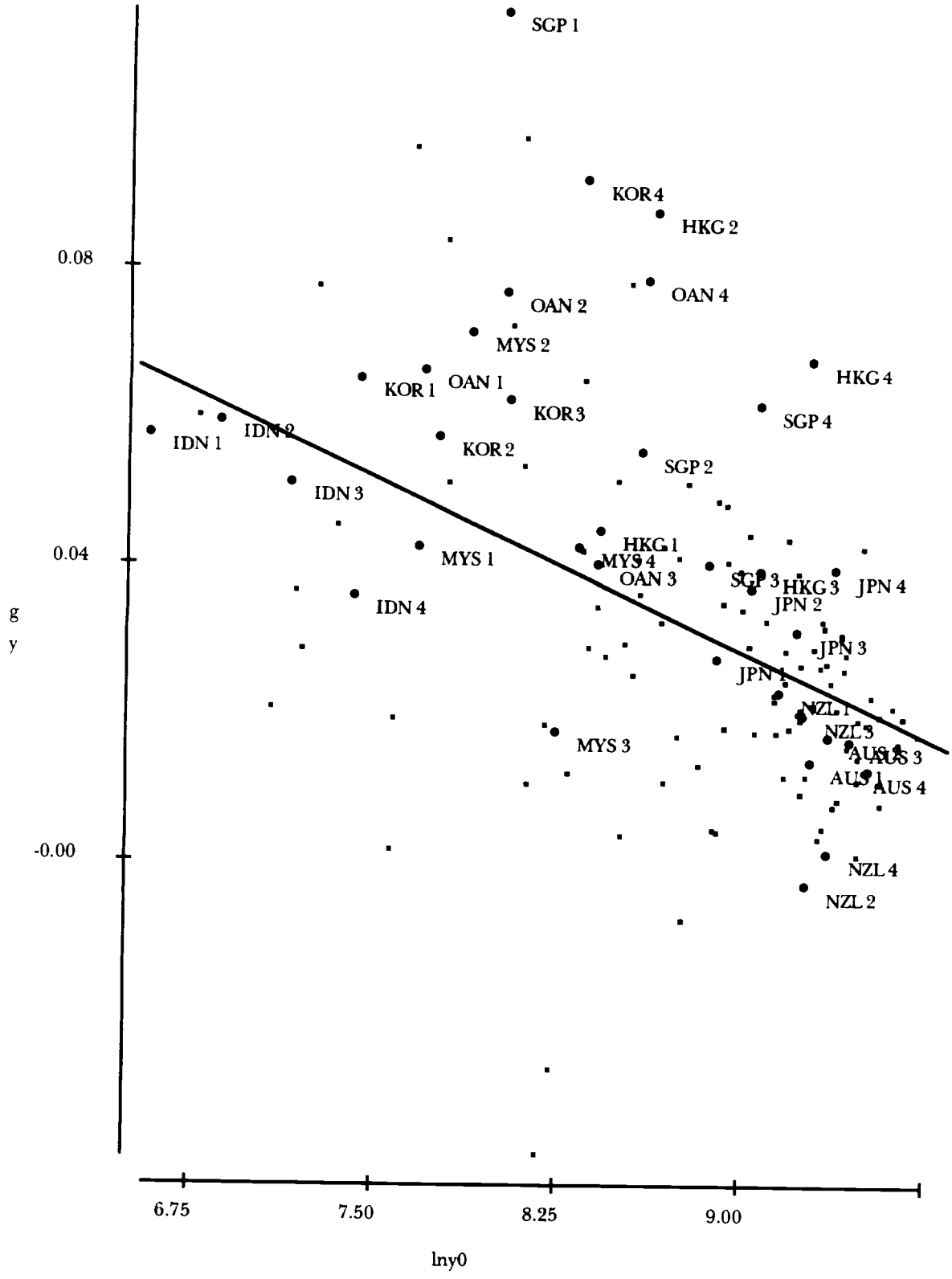
0.000
-0.075
g
y
THA 4
CHN 3
THA 2
FJI 1
CHN 2
FJI 4
WSM 4
PHL 2
PHL 4
THA 3
CHN 1
THA 1
FJI 2
CHN 4
SLB 3
PNG 1
PNG 2
WSM 3
VUT 4
PNG 3
FJI 3
PNG 4
PHL 3
6.25
7.50
8.75
10.00
lny0

Figure 1.3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OAN 4
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HKG 4
KOR 1
OAN 1
KOR 3
SGP 4
IDN 1
IDN 2
KOR 2
SGP 2
IDN 3
HKG 1
0.04
MYS 1
MYS 4
OAN 3
SGP 3
HKG 3
JPN 4
JPN 2
IDN 4
g
y
JPN 3
JPN 1
NZL 1
NZL 3
MYS 3
AUS 3
AUS 1
AUS 4
-0.00
NZL 4
NZL 2
6.75
7.50
8.25
9.00
lny0

Figure 2.1

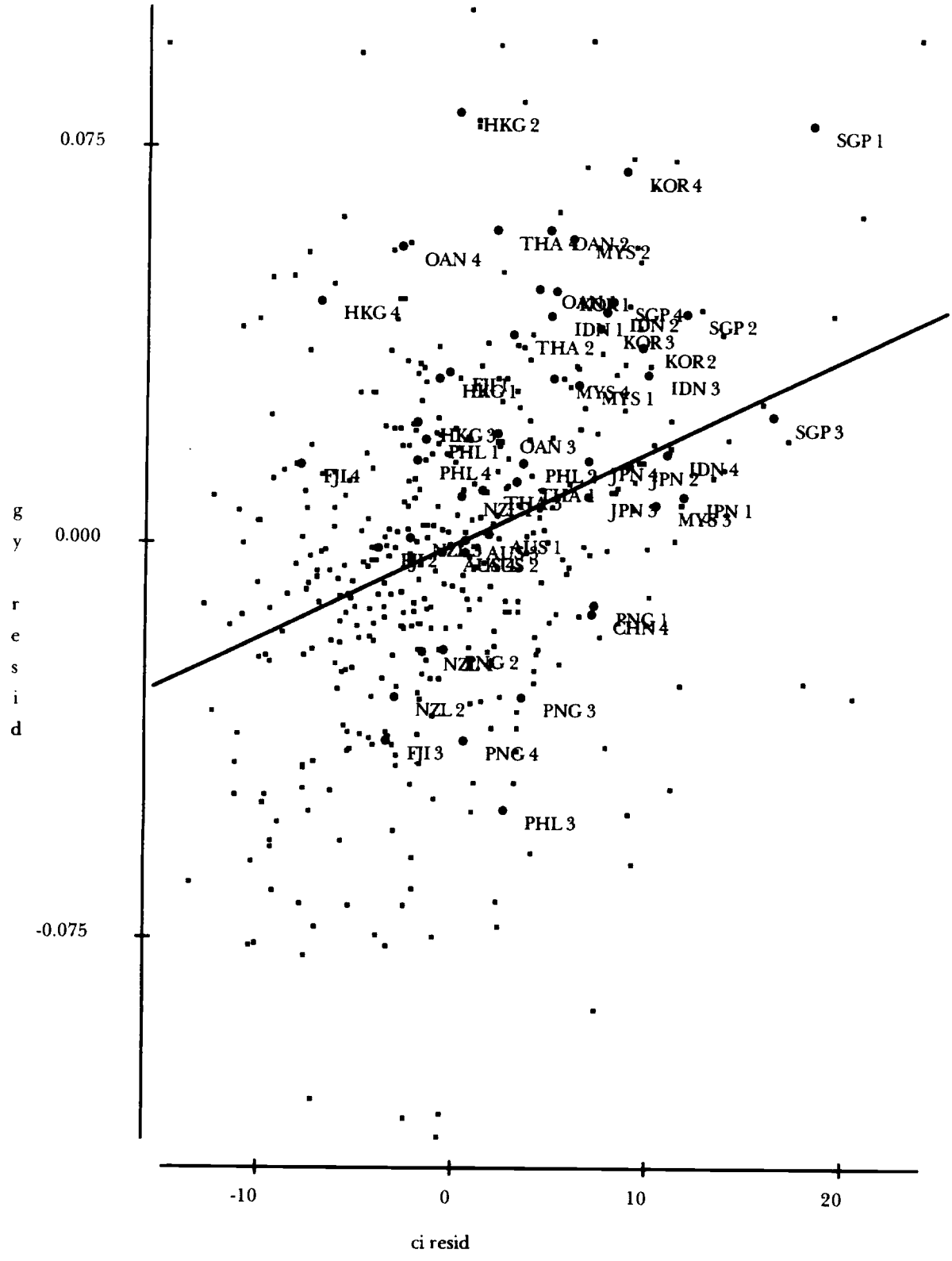
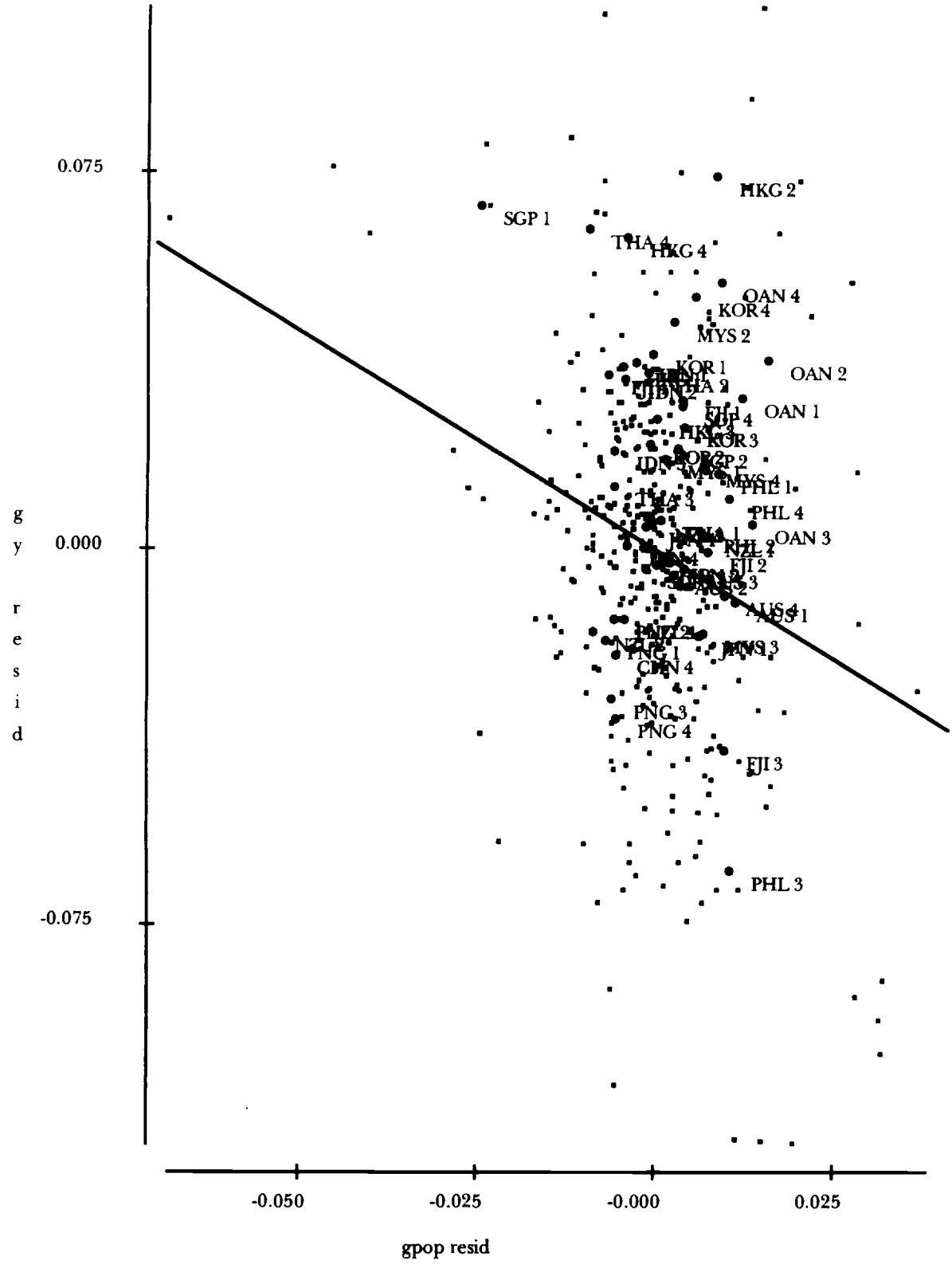

0.075
0.000
-0.075
g
y
r
e
s
i
d
-10
0
10
20
ci resid
HKG 2
SGP 1
KOR 4
THA 2
OAN 2
MYS 2
OAN 4
HKG 4
SGP 4
IDN 1
IDN 2
SGP 2
KOR 3
THA 2
KOR 2
IDN 3
MYS 1
SGP 3
HKG 3
PHL 1
OAN 3
IDN 4
FJI 4
PHL 4
PHL 2
JPN 4
JPN 2
JPN 3
JPN 1
MYS 3
PNG 1
CHN 4
NZL 2
PNG 3
FJI 3
PNG 4
PHL 3

Figure 2.2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g
y
r
e
s
i
d
SGP 1
HKG 2
THA 4
HKG 4
OAN 4
KOR 4
MYS 2
KOR 1
OAN 2
OAN 1
KOR 3
PHL 1
PHL 4
OAN 3
FJI 2
PNG 1
PNG 3
PNG 4
FJI 3
PHL 3
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-0.025
-0.000
0.025
gpop resid