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LATIN AMERICA IN THE REARVIEW MIRROR

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ABSTRACT

Latin American countries are the only Western countries that are poor and that aren't gaining ground on the United States. This paper evaluates why Latin America has not replicated Western economic success. We find that this failure is primarily due to TFP differences. Latin America's TFP gap is not plausibly accounted for by human capital differences, but rather reflects inefficient production. We argue that competitive barriers are a promising channel for understanding low Latin TFP. We document that Latin America has many more international and domestic competitive barriers than do Western and successful East Asian countries. We also document a number of microeconomic cases in Latin America in which large reductions in competitive barriers increase productivity to Western levels.

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1. Introduction

Various short-run crises—exchange rate crises, debt crises, inflation crises, balance-of-payment crises, financial crises—have dominated recent macroeconomic research about Latin America. This literature focuses on the causes of these crises and their short-run impact on macroeconomic fluctuations, taking the trend paths of macroeconomic variables as exogenous. Systematic analyses of Latin American macroeconomic trends have received much less attention.[1] This paper presents a comparative analysis of Latin American macroeconomic trends over the last 50 years using a neoclassical growth framework.

We first compare long-run Latin American macroeconomic performance to that in a number of other countries to provide a benchmark for what Latin America could have reasonably achieved. We make two sets of comparisons. We compare Latin America's long-run performance to that in a peer group of other Western market economies—the other countries with a large fraction of citizens of Western European descent. This comparison shows that *all* Western countries—including those with initial income levels reasonably similar to those in Latin America in 1950—have made substantial progress in catching up to the United States. In sharp contrast, no Latin American country has made any significant progress in catching up to the United States. We also compare Latin America to a number of East Asian countries that had initial income levels equal to or lower than those in Latin America in 1950. These countries also have had substantial catch-up. These comparisons motivate the question we address: Why can't Latin America catch up to its Western peer countries and to the successful East Asian countries?

To gain a better understanding of Latin America's stagnation, we decompose per capita GDP for Latin America and the other countries into two components: output per worker and employment as a fraction of the adult population. This comparison shows that Latin America's stagnation is primarily the consequence of a labor productivity failure; Latin American labor productivity has failed to gain any ground on U.S. labor productivity over the last 50 years. In contrast, the development successes of all the other countries are largely the consequence of labor productivity successes; labor productivity in all of these other countries is catching up to U.S. labor productivity. Understanding Latin America's relative stagnation

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[1]Elias (1992) is an exception.

requires understanding its relative productivity stagnation.

We report two main findings. First, we find that stagnant relative total factor productivity (TFP) is the key determinant of Latin America's relative income and labor productivity stagnation. Second, we find that a human capital difference is not the key determinant of Latin America's TFP gap, but that barriers to competition are a promising factor. We draw this latter conclusion because both the breadth and depth of Latin American competitive barriers far exceed those in the Western countries or in East Asia, and because there are a number of microeconomic cases in Latin America in which large changes in the size of competitive barriers are systematically followed by large productivity changes. In particular, big increases in barriers to competition are followed by large productivity decreases, and big decreases in these barriers are followed by large productivity increases.

The paper is organized as follows. Section 2 develops a neoclassical model for organizing our investigation. Section 3 compares Latin America's output to that in Europe and East Asia. Section 4 decomposes Latin American output into its labor productivity and employment components and investigates the source of low Latin American labor productivity. Section 5 quantifies how much of Latin America's TFP gap can be accounted for by human capital. Section 6 discusses theoretical models in which competitive barriers lead to low productivity. Section 7 documents that Latin America has erected a number of domestic and international barriers to competition that significantly exceed competitive barriers in either Europe or East Asia. Section 8 presents a number of empirical microeconomic cases that document how government policies that limit competition have significantly reduced TFP in some Latin American countries. Section 9 concludes.

2. A Neoclassical Framework

We use the neoclassical growth model to guide our analysis. In this closed economy model, there is a representative household for country i with the following objective function:

$$\max E_0 \sum \beta_i^t \{u_i(C_{it}, L_{it})\},$$

where β_i is the discount factor for country i, u_i is the preference for consumption and labor in country i in period t, C_{it} is consumption, and L_{it} is labor supply. The population is denoted

by N_{it} and is normalized to be one in period 0. The population of country i grows at the constant rate of n_i :

$$N_{it} = (1 + n_i)^t.$$

A constant returns to scale Cobb-Douglas technology produces output for consumption and investment:

$$A_{it} K_{it}^{\theta} L_{it}^{1-\theta} \geq C_{it} + X_{it},$$

where A_{it} is TFP, K_{it} is capital services, L_{it} is labor services, and X_{it} is investment. The law of motion for capital is given by

$$K_{it+1} = X_{it} + (1 - \delta)K_{it}, \ K_{i0} \text{ given.}$$

The process A_{it} is the product of two components, as in Parente and Prescott (2004):

$$A_{it} = \eta_{it} A_t, \ 0 < \eta_{it} \leq 1,$$

where A_t is the world technology frontier and η_{it} is the relative efficiency of country i in using that technology. For our empirical analysis, we will assume that U.S. TFP is a reasonable proxy for the world technology frontier, which implies that $\eta_{US} = 1$. For our purposes, the process generating A_t is unimportant, though at certain points we will find it convenient to assume that it grows at the constant rate γ. The relative efficiency term η is a key component in our model. For present purposes, we treat this as a parameter.

This simple model generates long-run income differences between countries through two channels: (1) through the relative efficiency term η and (2) through differences in the relative supplies of capital and labor, which in our model are governed by country-specific preference differences. Note that any factor that affects income in the long-run—such as tax distortions—will manifest itself as a change in either one or both of these two channels.[2] We

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[2] For example, capital income tax differences would show up as a difference in the relative discount factor,

will first use this model to gauge how important these two channels are for understanding Latin American macroeconomic development. We will then evaluate the deeper factors that lie behind the differences in efficiency or relative employment of the factors of production in Latin America.

3. Latin America's Persistent Economic Stagnation

This section examines Latin America's long-run macroeconomic performance, which we measure as per capita income relative to that of the world frontier (U.S. per capita income). Interpreting the income gap between Latin America and the United States requires a *benchmark* that lets us assess how large of a gap should be expected today, and how much this gap should have changed over the last 50 years.

We construct an empirical benchmark for assessing Latin American development. We do this by forming a set of peer group countries for Latin America and by measuring the income gaps in the peer group relative to the United States over the last 50 years. We treat the income gaps between the peer group and the United States as a benchmark for interpreting the income gap between Latin America and the United States.

The peer group is the countries that we assume are similar to Latin America in their ability to adopt and learn new technologies and that are similar in their preferences for market goods. In terms of the language of our model, this means we are looking for countries that have the ability to achieve similar levels of η_i and that have similar β_i and $u_i(C_i, L_i)$. Because Latin America is significantly populated by individuals of European descent, we define the peer group to be the other Western countries: the Western/Northern/Southern European nations, plus the countries that have been significantly populated by Europeans and in which European religion, language, and culture have been dominantly established.[3]

Our organizing view for this peer group is that since the Europeans who populated these regions established Western religion, language, and culture, then it should have been feasible for them to replicate the successful economies of the West. More specifically, this

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and labor income tax differences would show up as a difference in the relative preference for leisure.

[3]The peer group is Belgium, Canada, the United Kingdom, Spain, Portugal, Greece, France, Denmark, Sweden, Norway, Finland, Netherlands, Italy, Australia, Austria, Switzerland, New Zealand, Ireland, Iceland, Greenland, Germany, and the United States.

commonality leads us to assume that Latin America and the other Western countries should have the same innate ability to learn and adopt successful Western technologies, and that with similar cultures, they should have similar preferences for market goods.

Our assumption that similar cultures have similar preferences for market goods follows in part from Cole, Mailath, and Postlewaite (1992), who established a formal connection between culture and preference orderings. In their framework, cultural differences between countries can lead to differences in nonmarket rewards for market activities. There are self-enforcing social arrangements in their model in which nonmarket goods are allocated on the basis of wealth or income. This implies reduced form differences in preference orderings over market goods according to cultural differences and suggests a presumption that countries with similar cultures will have similar preferences for market goods.

By comparing Latin America to these peer countries, we will interpret income differences between Latin America and the peer group as idiosyncratic Latin American choices that differentially affect either the efficiency of production or the employment of the factors of production or both. We will use the term "policy choices" to broadly refer to these idiosyncratic Latin American effects.

Table 1 shows ethnic, language, and religion characteristics for Latin America's population.[4] The table shows that Latin America is a Western region by these characteristics—Latin America experienced substantial European immigration and widely adopted European languages and religion. Regarding culture, a number of scholars argue that Western culture has had a substantial impact on Latin America and, in some cases, nearly wiped out native cultures. (See Hoogvelt 2001 and the references therein.)

Figure 1 shows per capita income for Latin America and the other Western countries. Income is measured as a percentage of U.S. real GDP per capita (Maddison 2001). The figure shows that the Latin American countries are the poorest Western countries. In particular, note that Western European emigrants were able to transform the regions that became Canada, the United States, Australia, and New Zealand into rich countries. In contrast, Latin America was unable to replicate this Western success. The average Latin American

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[4]We include the major Latin American countries: Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Ecuador, Paraguay, Peru, Mexico, and Uruguay.

income is just 22 percent of U.S. income, compared to an average of 69 percent for the other Western countries.

We next assess how these relative income gaps have either narrowed or widened over time. Figure 2 shows per capita income between 1950 and 2000 for the population-weighted average of the Latin American countries and for the population-weighted average of the other Western countries that had similar income levels to Latin America in 1950. The figure shows that all the other poor Western countries have had significant catch-up over the last 50 years. The average European country in this group increased from 40 percent of U.S. income in 1950 to 67 percent in 2000. In contrast, Latin America lost ground, falling from 28 percent of the U.S. level in 1950 to 22 percent in 2000.

The figure also shows relative per capita income for some East Asian countries with initial income levels similar to or below the Latin American level in 1950. The data show that economic success can also be achieved by non-Western countries, and that Latin America is also significantly underperforming this group. The population-weighted average Asian country increased from 16 percent of U.S. income in 1950 to 57 percent in 2000. Latin America's underperformance relative to Asia is significant, because Latin America—as a Western country—should have had an advantage over Asia in copying and adopting the successful Western technologies and practices that made the West rich.[5]

Table 2 shows the average relative incomes for these three groups, and Figures 3–5 show relative incomes for each of the individual countries in the three groups over the 1950–2000 period. Figure 5 shows that not a single Latin American country has had any significant catch-up. The Latin American income gaps are just as wide, and for some countries wider, today as they were in 1950.

Perhaps the most striking feature of these data is the constancy of Latin America's relative stagnation. This "relative gap" measure of Latin American macroeconomic performance paints a different picture than that suggested by the more commonly used measure of GDP growth. In particular, the two measures tell a different story about post-1950 Latin

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[5]We chose those European and East Asian countries that had 60 percent or less of the U.S. per capita income level and increased their relative positions by at least 10 percentage points by 2001. The European countries are Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Norway, Portugal, and Spain. The Asian countries are Hong Kong, Japan, Korea, Malaysia, Singapore, Taiwan, and Thailand.

American performance. Latin America did have higher growth before 1980 than after. However, according to our preferred relative gap measure, there is no significant Latin American catch-up during the pre-debt crisis period (1950–80), because the U.S. economy grew faster during the earlier period as well. Output was 28 percent of the U.S. level in 1950 and 30 percent in 1980. There was, however, substantial catch-up in the other regions. The European countries rose from 40 percent of U.S. per capita income to 70 percent of U.S. per capita income, and the Asian countries rose from 16 percent of U.S. per capita income to 46 percent of U.S. per capita income over the 1950–79 period. Thus, while Latin America was treading water in the 1950s, 1960s, and 1970s relative to the United States, the rest of these countries were moving rapidly ahead.[6]

These data show that Latin America's long-standing stagnation is not the consequence of adverse shocks occurring in the post-debt crisis period. How long have these stagnation factors been in place? Maddison's (2001) data suggest they may have persisted over the last century. Table 3 shows relative Latin American income in 1900, 1950, 1980, and 2001. These data show that Latin America's stagnation has been the norm for the last 100 years. Latin American per capita income was 29 percent in 1900, almost exactly where it was in 1950 and slightly above where it was in 2001.[7] For the 10 countries that we have data for over this earlier period, per-adult income in 5 of these countries has remained roughly unchanged relative to the United States. Argentina and Chile lost substantial ground relative to the United States during this period. Argentinian income fell from 67 percent of the U.S. level in 1900 to 52 percent by 1950, and Chilean income fell from 48 percent to 40 percent of the U.S. level by 1950. Venezuela was the only country that gained ground, rising from 20 percent of the U.S. level in 1900 to 78 percent by 1950. This impressive gain (which was in part due to Venezuela's oil exports), however, was largely lost after 1950, as Venezuela returned to 30 percent of U.S. income by 2001.

It is also possible to make even longer-run relative income comparisons, though mea-

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[6]This pre-debt crisis stagnation also emerges in 11 of the 13 individual Latin American countries (except Mexico and Brazil). Hopenhayn and Neumeyer (2004) have recently argued that stagnation and then collapse more accurately describes the last 50 years for Latin America.

[7]We have data back to 1900 for all of our Latin American countries except Costa Rica, Boliva, and Paraguay, and these countries are small enough not to have substantially affected this average.

surement issues become more problematic. These data suggest an even longer period of stagnation or decline. Specifically, Sokoloff and Engerman (2000) estimate that Argentina was richer than the United States in 1800 and that Brazil, Chile, Mexico, and Peru had smaller relative income gaps in 1800 than they do today.

Latin America's relative stagnation is particularly puzzling when compared to the two other major stagnant regions—Africa and the Middle East. Like Latin America, neither of these two regions has gained ground on the United States in the last 50 years, but Africa and the Middle East are plagued by large, idiosyncratic development impediments, including AIDS (Africa), substantial civil conflict, ethnic cleansing, and repressive, nondemocratic institutions. Latin America has not been affected by these problems nearly as much as either Africa or the Middle East. Viewed in this light, Latin America is perhaps the most puzzling regional development failure of the last 50 years.[8]

4. TFP Is the Cause of Latin America's Stagnation

We evaluate Latin America's stagnant relative income by decomposing output per adult (Y/N) into two components: output per worker (Y/L) and the number of workers relative to the adult population (L/N):

$$\frac{Y}{N} = \frac{Y}{L}\frac{L}{N}.$$

This decomposition shows that Latin America's stagnation is the consequence of either low worker efficiency (Y/L) or low employment (L/N). Table 4 shows that employment is not the key factor accounting for Latin America's stagnation. Latin America's employment rate is on average about 70 percent as high as in Europe and in the United States. This gap is significant, but is clearly not large enough to account for the fact that Latin America has only 25 percent of U.S. per capita income.[9]

This finding implies that productivity is the key factor. Figure 6 establishes this by showing labor productivity for Latin America, Europe, and Asia between 1950 and 2000.

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[8]Barro's (1991) finding that a Latin American dummy variable in his growth regression exerts a larger negative effect than the African dummy variable is consistent with this view.

[9]Interesting studies of this labor supply gap include Heckman and Pages (2003) and Caballero et al. (2004).

These productivity data are measured relative to the U.S. productivity level. These data show that the primary reason behind the output catch-up in Europe and Asia is that labor productivity in these countries is catching up to the U.S. level. The figure also shows that Latin America's stagnation is because of stagnant productivity. In particular, Latin American productivity was 33 percent of the U.S. level in 1950 and 32 percent of the U.S. level in 1998. In contrast, European productivity rose from 39 percent of the U.S. level to 79 percent of the U.S. level in 1998, and Asian productivity rose from 15 percent of the U.S. level to 54 percent of the U.S. level over the same period.

This section investigates Latin American labor productivity by decomposing productivity into two pieces: physical capital per worker and the efficiency of production (TFP). We then evaluate the relative contribution of each of these components to Latin America's labor productivity gap. The relative size of these two factors is important for understanding why Latin American productivity is not catching up. If TFP is the dominant factor, then we should be formulating explanations for why production efficiency is so much lower in Latin America than in the United States. Alternatively, if low capital per worker is the dominant factor, then we should be formulating explanations for why capital formation is so much lower in Latin America than in the United States.

The Cobb-Douglas production function in our model yields the following expression for labor productivity:

$$(1) \quad \frac{Y_{it}}{L_{it}} = A_{it} \left(\frac{K_{it}}{L_{it}} \right)^{\theta}.$$

Latin America's relative labor productivity gap is thus determined by its TFP gap and its capital-labor ratio gap:

$$\frac{\left(\frac{Y_t}{L_t} \right)^{Latin}}{\left(\frac{Y_t}{L_t} \right)^{US}} = \frac{\left[\eta_t A_t \left(\frac{K_t}{L_t} \right)^{\theta} \right]^{Latin}}{\left[A_t \left(\frac{K_t}{L_t} \right)^{\theta} \right]^{US}} = \frac{1}{3}.$$

Before proceeding, note that TFP contributes to changes in labor productivity in two ways. There is a direct effect, as TFP shifts the production function, and an indirect effect,

9

as TFP impacts the capital-labor ratio. This latter impact is observed in the Euler equation that governs capital accumulation. Rewriting this equation yields

$$\frac{K_{t+1}}{L_{t+1}} = \left(\frac{(1+\gamma)(1+n)/\beta \frac{u_{ct}}{u_{ct+1}} - (1-\delta)}{\theta \eta A} \right)^{1/(\theta-1)},$$

where γ is the growth rate of frontier TFP, n is the population growth rate, u_c is the marginal utility of detrended consumption, β is the household's discount factor, ηA is TFP, and δ is the depreciation rate of capital. This shows that the capital-labor ratio is affected by the level of TFP, by parameter values, and by transitional dynamics associated with changes in the intertemporal marginal rate of substitution. The productivity decomposition between TFP and capital per worker thus needs to account for both the direct and the indirect contribution of TFP to labor productivity.

The first step in this decomposition is obtaining capital stock measures. Table 5 shows decade averages of the capital-to-output ratio for Europe, Asia, and Latin America relative to the United States. The data are from Nehru and Dhareshwar (1993). The table shows that Latin America's ratio has been roughly within 10 percent of the U.S. ratio since the 1960s. Asia is the only group in which there is evidence of a significant capital deficiency during the last 50 years. Asia's capital-ouput ratio was only 36 percent of the U.S. level in the 1950s, but increased to the U.S. level by the 1980s. These data suggest that a capital shortfall is not the major factor retarding Latin America's productivity.

We supplement these capital stock data with capital investment flow data from the World Bank (2002). These investment data also indicate that Latin America has about the same capital-output ratio as the United States. Table 6 shows the ratio of investment to GDP for the United States, Europe, and Latin America. The key point is that Latin America's investment share has been roughly constant and is also about the same as the U.S. investment share. The near constancy of these investment shares also suggests that both the United States and Latin America have been near their respective steady state growth paths. This steady state evidence implies the following relationship between investment and

the capital stock for both Latin America and the United States:

$$\left(\frac{I}{Y}\right) \approx (\delta + n + \gamma)\left(\frac{K}{Y}\right).$$

Moreover, since the investment shares are about the same for both regions, we have

$$(\delta + n + \gamma)^{Latin}\left(\frac{K}{Y}\right)^{Latin} \approx (\delta + n + \gamma)^{US}\left(\frac{K}{Y}\right)^{US}.$$

This expression implies that the capital-output ratios are about the same in the two regions, because the sum of these parameter values is about the same for the two regions. This is because the growth rate of frontier productivity is the same. The population growth rate in Latin America is slightly higher than in the United States, but Latin America probably has a slightly lower depreciation rate, since the fraction of its capital stock accounted for by rapidly depreciating information processing equipment is probably smaller than in the United States.[10]

The three observations that (1) Latin America and the United States have roughly the same capital-output ratios, (2) Latin American output per capita is about one-fourth of U.S. output per capita, and (3) Latin American employment per capita is about three-fourths of U.S. employment per capita mean that the Latin American capital-labor ratio is one-third of the U.S. level. This implies that Latin American TFP is about one-half of the U.S. TFP level.

We estimate that Latin America's 50 percent TFP gap accounts for virtually all of its labor productivity gap. The 50 percent TFP gap directly accounts for about two-thirds of the labor productivity gap, and we will next show that the indirect effect of TFP accounts for about the remaining one-third.

To see this, we make use of the fact that Latin America has been near its steady state growth path over the last 50 years, along with our assumption that the values for the parameters $\gamma, n, \delta, \theta$, and β are the same in the two regions.[11] The steady state Euler equation

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[10]The Latin American population growth rate is about 1.7 percent per year, compared to the U.S. population growth rate. See http://www.overpopulation.com/faq/basic_information/population_growth_rate/latin_america.html.

[11]Recall from above that the values of the parameters γ, n, and δ are about the same. Regarding θ, Gollin

implies that the Latin American capital-labor ratio gap is entirely accounted for by its 50 percent TFP gap:

$$(2) \quad \frac{\left(\frac{K}{L}\right)^{Latin}}{\left(\frac{K}{L}\right)^{US}} \approx \eta^{1/(\theta-1)} = 0.36.$$

TFP is the efficiency with which an economy uses its capital and labor services. The following sections evaluate some possible factors that might account for Latin America's TFP gap, including human capital and barriers to competition. We will focus our empirical evaluation on whether these factors can account for Latin America's 50-year relative TFP stagnation.

5. Human Capital Is Not a Major Factor

Our analysis has measured labor services as employment, without any adjustment for differences in human capital between regions. This suggests that differences in measured TFP across countries may in part be due to differences in human capital. It is important to know how much of Latin America's TFP stagnation is due to human capital, because optimal government policies, and how fast they impact the economy, may likely depend on how much of Latin America's TFP gap is due to human capital.

If human capital differences are the main stagnation factor, then we should observe Latin America's relative human capital stagnating and human capital in the European and Asian countries rapidly catching up to the United States. Moreover, a human capital-based explanation makes two other empirical predictions: (1) Latin America should have a very low ratio of human capital to output compared to the United States, and (2) Latin American TFP levels should be similar to those in the United States after adjusting TFP for human capital differences between the two regions. We will show that neither of these predictions is consistent with the data.

Regarding TFP as a stagnation factor, Table 7 shows relative human capital levels in

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(2002) shows that income shares are quite similar across countries once uniform accounting procedures are used to allocate entrepreneurial income. We assume that differences in β are small, because otherwise the rate of return to physical capital in Latin America would systematically be much higher than in the United States. We are unaware of evidence supporting this view.

1960 and 1990 for Latin America and the other regions using Bils and Klenow's (2000) human capital measures. The patterns in this table don't account for the very different patterns in output per worker over time between Latin America and the other regions, because human capital in *all* the regions is catching up to the U.S. level, and Latin America's increased the most. Specifically, Latin America's relative human capital increased by 19 percent between 1960 and 1990, Europe's increased by 12 percent, and Asia's increased by 9 percent. These changes suggest Latin America should have had the fastest catch-up of the three regions. This prediction stands in sharp contrast to the actual patterns of development.

The Bils-Klenow data suggest that human capital is not the factor that distinguishes the development successes in Europe and Asia from Latin America's stagnation. The fact that Latin America's relative output continues to decline, despite this significant increase in human capital, indicates that a different factor is driving down Latin American relative TFP and output. Moreover, the fact that Europe and Asia have gained 30 and 40 percentage points, respectively, on the United States, despite only about 10 percentage point catch-ups in human capital, suggests that another factor is driving these successful countries.

This conclusion is robust to measuring human capital using average years of schooling. For example, the relative years of schooling in the population aged 25 and older in Latin America rose from 36 percent of the U.S. level in 1960 to 41 percent in 1990. During the same period, Europe's relative educational attainment fell from 69 percent of the U.S. level in 1960 to 63 percent in 1990, while our Asian countries rose from 62 percent in 1960 to 67 percent in 1990. As with the Bils-Klenow data, these changes do not account for why Europe and Asia are development successes, and why Latin America has stagnated.

Country-level schooling measures also support this view, because some Latin American countries have a higher average schooling attainment than many of the Asian and southern European development successes. In Argentina, Chile, and Uruguay, for example, the average years of schooling of the population aged 25 and over was 7.8, 6.2, and 6.7, respectively, in 1990, which exceed the average number of years of schooling of 3.6 years in Portugal, 6.3 years in Spain, and 5.5 years in Singapore. Despite more years of schooling, income in these Latin American countries is much lower than income in these other countries. Output per adult as a fraction of U.S. income in Argentina, Chile, and Uruguay was 29 percent, 36 percent, and

27 percent, respectively, in 2001, while relative per capita income in Portugal, Spain, and Singapore was 51 percent, 56 percent, and 75 percent, respectively.

A second reason that human capital is not the key factor is Latin America's relative ratio of human capital to output. Specifically, if human capital were the key factor, then Latin America should have a relatively low ratio of human capital to output, just as if physical capital were a major factor behind Latin America's low labor productivity, then Latin America should have a relatively low ratio of physical capital to output. In contrast, Latin America has a very high relative supply of human capital. In particular, the Bils-Klenow data imply that Latin America's human capital-output ratio is 140 percent higher than that in the United States. For comparison, we note that Europe's ratio is about the same as the U.S. ratio.

A third reason that human capital is not the central factor accounting for Latin America's TFP gap is because a large gap between the United States and Latin America remains after adjusting for human capital differences. Klenow and Rodriguez-Clare (1997) and Hall and Jones (1999) construct income level accounting in a single year for the countries in the Penn World tables, including Latin America. Hall and Jones (1999) find an average TFP level in our set of Latin American countries of 58 percent of the U.S. level in 1988, after adjusting for human capital. Klenow and Rodriguez-Clare, using 1985 data and some different procedures, find that these countries have an average of 67 percent of U.S. TFP. Averaging these two single-year TFP gaps suggests that human capital accounts for only about a quarter of the 50 percent postwar average Latin American TFP gap we calculated in the preceding section.

We conclude that human capital is not the major factor in explaining Latin America's TFP gap, nor does it appear to play an important role in Latin America's long-run stagnation. This is because while Latin American human capital is increasing over time, its labor productivity is falling. Our view that there is an alternative factor retarding Latin American development is similar to conclusions about the role of human capital in the development process reached by a number of other authors, including Prescott (1998), Easterly (2001), Parente and Prescott (2000, 2004), and Hendricks (2002). We consider this other factor to be inefficient production, either through the failure to adopt superior technologies, or through

14

the inefficient use of technologies. A key implication of this inefficient production view of low TFP—as opposed to the human capital view—is that productivity and output can rise quickly in response to higher efficiency. We will later see in a number of industry studies that this is indeed the case.

6. Latin American Stagnation and Competitive Barriers

A very old view, extending back to at least Adam Smith, argues that barriers to competition will discourage innovation. According to this view, countries that have more competitive barriers will be poorer. We will argue empirically that barriers to competition are at least part of the reason Latin American producers are systematically and persistently less efficient than U.S., European, and Asian producers.

Before conducting this analysis, we note that this channel between competition and productivity is one of the leading channels for understanding low productivity in the theoretical TFP literature. A number of economists are now developing formal models that generate low productivity as an outcome of competitive barriers. A key challenge in these models is to rationalize why societies choose to be unproductive. A major rationalizing element in these models is that a subset of society would be harmed by the adoption of superior technologies, and this subset has sufficient resources to successfully block their adoption. For example, Holmes and Schmitz (1995) present a model in which groups in an industry have the potential to block a new technology by political lobbying for new regulations. The group has skills tied to an old technology that will become obsolete if the new technology is adopted. The group decides whether to use its resources to block or to learn the new technology. The paper shows that the group is much less likely to block if the industry is subject to competition from other countries. Other papers that have developed models in which groups may choose to block technology adoption include Parente and Prescott (1994, 1999), Holmes and Schmitz (2001), Cozzi and Palacios (2003), Bridgman, Livshits, and MacGee (2004), and Herrendorf and Teixeira (2004).

In all of these papers, lowering competition reduces productivity through the channel of "X-inefficiency," in which an organization fails to produce at its minimum cost. However, there are other channels through which low competition can lead to low efficiency. For exam-

ple, the government may impede entry by more efficient firms in order to protect incumbent, low efficiency producers who politically support the government. This view is consistent with that of Sokoloff and Engerman (2000), who argue that the political elite are the leading groups in Latin America that restrict competition. In the next section we establish that Latin America erects significantly more competitive barriers than the successful countries in Europe and Asia. We will then show that changes in the degree of competitive barriers in Latin America have large and systematic effects on productivity.

7. Latin America Puts Up Significant Competitive Barriers

We now focus on government policies that restrict competition. We do this because of our view that policy is central for sustaining persistent competitive barriers. We will examine a number of different types of barriers that we categorize as either *international competitive barriers*, including tariffs, quotas, multiple exchange rate systems, and regulatory barriers to foreign producers, and *domestic competitive barriers*, including entry barriers, inefficient financial systems, and large, subsidized state-owned enterprises.

We will present evidence that shows that Latin America has constructed many international and domestic barriers that have closed off Latin America from both internal and external competition. Both the *breadth* and *depth* of Latin American barriers significantly exceed those in Europe and other successful countries. The breadth and depth of Latin American barriers are important, because the impact of competitive barriers rises nonlinearly with the number of barriers that are adopted. More specifically, competitive barriers are complements. For example, we will show that Latin America has regulations that significantly raise domestic entry costs. Moreover, we will show that Latin America also has had high tariffs, which protect Latin American producers from foreign competition. By insulating domestic producers from foreign competition, tariffs are a complementary noncompetitive factor that raises the noncompetitive effects of high domestic entry costs. Our documentation of Latin American barriers is consistent with Sokoloff and Engerman's (2000) overall view that politically connected groups in Latin America restrict competition.

A. Latin America's International Barriers: High Protectionism

Latin America has a long history of erecting international competitive barriers to protect domestic industries that date back to at least the late 1800s. (See Clemens and Williamson 2002 and Haber (forthcoming).) These barriers include quotas, multiple exchange rate systems, and, in particular, high tariffs.

We now present historical data on these barriers. Before we proceed, it is important to recognize that measuring the effective level of competitive barriers is difficult, not only because of the complementary interactive effects of multiple barriers discussed above, but also because of other measurement problems. For example, some tariff measures are the average of tariff revenue over the value of imports. This does not measure the extent of effective protection since the overall cost advantage secured by domestic producers from the tariff barrier is enhanced by tariffs on their product but lowered by tariffs on their inputs. Similarly, quota measures are typically the fraction of goods subject to a quota, but this fraction does not measure the extent to which the quota is distortionary.

Clemens and Williamson show that Latin American tariff rates were systematically higher than those in other parts of the world as far back as the 19th century. They report that Latin America had average tariff levels of 27 percent between 1870 and 1913, compared to an average level of 7 percent in Asia over the same period. Latin America's tariff rates rose substantially in the 20th century, particularly after World War II. There are large differences in the pattern of tariffs between Latin America and Europe during the post-World War II period that are consistent with Europe's rapid catch-up to the United States and that are also consistent with Latin America's stagnation.

Between 1950 and 1980, Europe gained about 30 percentage points on the United States. Tariffs in European countries were low. This "golden age" of catch-up bypassed Latin America, however, which gained only 2 percentage points on the United States during this period. In contrast to those in Europe, Latin American tariffs were high. Table 8, reproduced from Taylor (1996), shows that Latin American tariffs were systematically and substantially higher than those in Europe during this period. The table shows Taylor's estimates for nominal protection for a number of Latin American countries and for the average of the European Economic Community. The table shows that Latin American tariffs are almost

always much higher than the EEC tariff across all categories of goods: consumer durables, consumer nondruables, semimanufactured goods, raw materials, and capital goods.

The EEC protection rates range between 1 percent and 13 percent, and the unweighted average tariff rate for the EEC countries is about 10 percent. In contrast, the unweighted average rate for five of the six Latin American countries ranges from 68 percent to 172 percent. Protection rates are particularly high on consumer goods, including rates of 176 percent in Argentina, 260 percent in Brazil, 328 percent in Chile, 247 percent in Colombia, and 114 percent in Mexico on nondurables. Protection rates are also surprisingly high on capital goods, including rates of 98 percent in Argentina, 85 percent in Brazil, and 45 percent in Chile. We view these rates as surprisingly high, because optimal tax theory in a number of models predicts that capital accumulation decisions should not be distorted in the long run. This theoretical conclusion implies that capital goods imports should not be subject to tariffs.

In addition to these high tariffs, Latin American countries also made significant use of quotas during this period. For example, Haber (forthcoming, p. 50) reports that the number of imported goods subject to quotas rose from 28 percent in 1956 to 74 percent by 1974.

Relatively high protectionism in Latin America persisted until the early 1990s. Loayza and Palacios (1997) show that average tariff rates in Latin America were about 38 percent between 1984 and 1987, compared to 16 percent for East Asia. Between 1988 and 1992, Latin American tariffs averaged 27 percent, compared to 15 percent in East Asia. By the mid-1990s, the two regions had roughly similar tariff rates. These authors also show that high nontariff protectionism also persisted until the mid-1990s.

Latin America's high protection levels should have closed off the region to competition and reduced international trade. We will next show that our development success countries in Europe and Asia tend to be much more open than Latin America. We define openness as the trade share, which is the sum of imports and exports divided by GDP. Following Eaton and Kortum (2002) and Alvarez and Lucas (2004), we plot the log of the trade share against the log of GDP. The idea here is that countries that are small—those that have small total GDPs—trade more than countries that have very large total GDPs. Figures 7–10 show these plots for the 1960s, 1970s, 1980s, and 1990s. Both the GDP and trade share data are decadal

averages, where $\overline{TS}_{it}$ is the decadal average trade share for country i and $\overline{GDP}_{it}$ is the decadal average GDP for country i. The figures also include a regression line for the cross-section of countries from the following regression that is estimated individually for each decade:

$$\overline{TS}_{it} = \alpha_0 + \alpha_1 \overline{GDP}_{it} + \varepsilon_{it}.$$

The figures systematically show that most of the Latin America countries are below the regression line, meaning they are less open than predicted by the statistical relationship, and most of the European and Asian countries are above the regression line, meaning they are more open than predicted by the statistical relationship. This means that the development success stories are persistently and systematically more open than the Latin American development failures.

This finding stands in contrast to the openness-growth literature, in which there is no clear-cut empirical relationship between these two variables.[12] The Holmes and Schmitz (1995) model provides two explanations for why there is a systematic relationship for our Latin American countries, but no systematic relationship in the openness-growth literature. This is because (1) the impact of openness depends critically on the level of domestic competitive barriers, and (2) the relationship between openness and productivity *levels* may be quite different from the relationship between openness and productivity *growth.*

Regarding the first explanation, lack of openness in the Holmes-Schmitz model is important only if a country also has high domestic competitive barriers. The next section documents that Latin America satisfies these criteria. The second reason is that there is an important connection between openness and productivity *levels* in the Holmes-Schmitz model, but not necessarily between *productivity growth* and openness. In the language of our model, this means openness can affect the level of η in a country, and this permanent change in η would be associated with temporarily higher growth associated with transitional capital accumulation dynamics. Our Latin American countries are therefore interesting because they have had low productivity, low openness, and high domestic barriers in each of the decades we

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[12]See Rodriguez and Rodrik (2001) for a survey of this literature and Rigobon and Rodrik (2004) for a very recent analysis that finds a small positive relationship between openness and growth.

consider. These are precisely the countries in which openness should matter for productivity growth, even if the productivity growth is just a temporary transition to a new level.

B. Latin America's Domestic Competitive Barriers: High Entry Barriers

Latin America has systematically higher domestic competitive barriers than the European and Asian successes, including (i) high entry costs, (ii) poorly functioning capital markets, and (iii) high costs of adjusting the workforce or building up an experienced workforce. Entry costs can be an important competitive barrier because they reduce the incentive for firms to enter an industry. Djankov et al. (2002) present data on the costs of starting businesses for 85 countries. The data are from 1997. They estimate the entry cost by summing the individual costs of all the requirements for establishing a "representative" business in the formal sector, including the opportunity cost of the entrepreneur's time, and the direct pecuniary cost of these requirements, such as filing fees and license fees.

Table 9 shows the total entry costs for Europe, Asia, and Latin America. The estimates show that the United States has the lowest entry costs and that Latin America has the highest entry costs. In particular, the total cost of entry is 80 percent of per capita GDP in Latin America, compared to just 1.7 percent in the United States. These data suggest that entry costs are indeed much higher in Latin America, and constitute a potentially important competitive barrier.

Poorly functioning capital markets that impede the capital accumulation of new entrants or smaller firms—and prevent them from competing with larger more established, and often more politically connected, firms—are a potentially important barrier to competition, particularly if entry costs are high and entrepreneurs are liquidity constrained. The extent of government ownership of banks is regarded as an important indicator of how bank lending is preferentially directed to politically connected enterprises. Table 10 shows that Latin America's government ownership share is higher than the European countries', and much higher than in our Asian countries or in the United States, where this share is zero. These data are from La Porta, Lopez-de-Silanes, and Shleifer (2002).

Latin America also has adopted labor market regulations that impede the ability of firms to acquire the efficient level and composition of their workforce. In summarizing the

results of a collection of studies on Latin American and Caribbean (LAC) labor markets, Heckman and Pages (2003) conclude that while the overall costs of labor market regulation are quite similar in LAC and OECD countries, the LAC countries impose these costs much more in the form of job security measures than in social security provisions. Heckman and Pages conclude that the higher LAC job security costs "likely impair productivity and adaption to new technology ..." (p. 38). In Table 11 we show one key aspect of the higher Latin American job security costs. That table documents that Latin America imposes much higher dismissal costs (measured in terms of months of the worker's wage) than Europe or Asia, or the United States where these costs are zero. High costs associated with reallocating workers from less productive to more productive enterprises could constitute an important barrier to competition. Davis and Haltiwanger (1992) have documented the large extent of this worker reallocation in the United States. Hopenhayn and Rogerson (1993) have shown in a quantiative-theoretic model that costly worker reallocation can have significant effects.

This section has examined a number of competitive barriers in Latin America, Europe, East Asia, and the United States. In every case, Latin America has the highest barriers. Given the complementary interactive effects between these barriers, we conclude that Latin America has much higher protection rates for their producers than Europe, East Asia, or the United States.

8. Microeconomic Evidence on the Impact of Competition

We now present microeconomic evidence from Latin America that shows how productivity and output change when there is a change in competition. Before proceeding, we note that a number of studies have documented that lack of competition and low productivity go hand-in-hand. (See McKinsey Global Institute 1994 and IMD 2004.) For example, the McKinsey studies show that productivity is high when firms face international competition. Baily and Solow (2001) review the McKinsey evidence and interpret this correlation between competition and productivity as one in which competition drives productivity:

> "An implication [of the McKinsey finding] is that some part of observed produc-
> tivity disadvantages reflects organizational slack or an unwillingness to change
> and innovate. This corresponds to the belief, expressed by managers, that when

21

pressed by competition they can 'take some of the cost out of the product'."

However, Baily and Solow acknowledge that the correlation is open to an alternative interpretation: more productive industries choose to compete globally. The possibility of different interpretations of this barrier-productivity correlation is much less of an issue when the approach of Galdon and Schmitz (2002) and Schmitz (2004) is used. They conduct industry-level analyses in which there is a large, exogenous change in competition, and in which productivity is easy to measure both before and after the competitive change. For example, Schmitz (2004) finds that when Minnesota iron ore producers faced increased foreign competition brought about by exogenous changes in the world steel market, their work practices (the rules that governed employee tasks) changed to achieve a 100 percent increase in labor productivity.

We follow this approach here by presenting industry cases in which there are large and exogenous government policy changes that significantly affect the level of competition. Some of these cases will show what happens when anti-competitive policies are adopted. We first present two cases that show the adoption of nationalization policies that destroy competition by eliminating international firms from an industry are associated with large and permanent productivity and output losses. We then present five cases that show the adoption of policies that foster competition are associated with large productivity and output gains. The pro-competitive policies include the privatization of state-owned enterprises, the elimination of trade impediments, such as quotas, and the elimination of restrictions on the entry of international firms.

We will show that the different policy changes affect two types of competitive barriers. We call the first type of barrier *entry impediments,* which keep high productivity firms out of an industry. We call the second type of barrier *incentive impediments,* which reduce the incentives for firms within an industry to be efficient.

A. Eliminating Competition in the Venezuelan Oil Industry

We now provide an important case where nationalization eliminated foreign competition and reduced productivity substantially in a major sector. Our discussion draws on recent work by Restuccia and Schmitz (2004). Before World War II, Venezuela had substan-

tial foreign investment in its oil industry. This policy changed with the election of the Accion Democratica (AD) party in 1945. The party pushed for greater Venezuelan sovereignty in the industry, culminating in decisions in the late 1950s to terminate international rights to extract oil beyond 1983. This meant a de facto nationalization of the industry at that date. Not surprisingly, this policy change led to a decline in foreign investment in the industry. This declining investment then led the AD party to nationalize the industry earlier. The nationalization of the Venezuelan oil industry was completed on January 1, 1976. Although industry officials fought to retain foreign managers after the nationalization, the government preferred to sever all international ties and largely succeeded in driving out most of the industry's foreign experts.

Figure 11 shows output and labor productivity in the Venezuelan oil industry before and after nationalization. Before 1970, output and productivity rose considerably, growing at rates of about 4.5 percent and 7.5 percent, respectively. Output and productivity began to decline after 1970 and fell sharply just before the nationalization. By the time of the nationalization in the mid-1970s, productivity had returned to its 1964 level and output had returned to its 1957 level.

Output and productivity continued to fall after the nationalization. By 1985 productivity had fallen over 70 percent from its 1970 peak, and was at its 1955 level. Output fell 53 percent between its peak in 1970 and 1985, and was also at its 1955 level. It is striking that the large output loss was accompanied by an increase in employment, which suggests that the local managers were not nearly as efficient at running the operation as the foreign managers. Moreover, this output loss is not the result of OPEC policies; many OPEC members increased their output considerably in the 1970s and 1980s, which stands in sharp contrast to Venezuela's production during this period. Output and productivity recovered modestly after the 1985 trough, but remained well below their peak levels. By 1995, which is the ending year for our data, output had returned only to its 1963 level, and productivity had returned only to its 1960 level.

We conclude that nationalization of the Venezuelan oil industry, which eliminated the efficient international management of the industry, led to large productivity and output losses. Restuccia and Schmitz argue that a significant fraction of this productivity loss was

due to the loss of international expertise.

B. Eliminating Competition in the Venezuelan Iron Industry

Restuccia and Schmitz (2004) also show that Venezuela followed a similar nationalization policy with its iron ore industry, with similar results. Figure 12 shows output and labor productivity in the Venezuelan iron ore industry before and after nationalization. The output and productivity patterns mirror those from the oil industry. Both output and productivity rose significantly until just before nationalization, with output growing at 6.1 percent per year and productivity growing at 11.5 percent per year from 1953 to 1974. Both output and productivity fell 50 percent between 1974, which is just before the nationalization, and 1976, which is the first year after nationalization. By 1983, output was 62 percent below its 1974 peak level and productivity was 58 percent below its peak level. As in the case of oil, output and productivity recovered modestly, but remained well below their pre-nationalization peaks. By 1995, both output and productivity were 30 percent below their 1974 levels.

We now turn our attention to the impact of policy changes that increase competition.

C. Allowing Entry in Chile's Copper Industry

We first show that bringing foreign competition to Chile's copper industry is associated with a large and permanent increase in productivity and output. We will show that Chile's policy change, which reversed its 1971 nationalization of the industry, reduced both entry and incentive impediments.[13]

Copper is a major Chilean industry, accounting for about one-third of exports and about 10 percent of GDP. In 1971, the largest Chilean copper mines, accounting for about 85 percent of production, were nationalized and subsequently operated by a government-owned firm, Codelco. Ten percent of Codelco's revenues were paid directly to the military. The remaining output was produced by small, privately owned mines. The key outcome of the nationalization is that Codelco faced very little foreign or domestic competition. Despite some reforms by Pinochet to encourage foreign investment in the 1980s, there was very little

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[13]The material in this section draws from Aydin and Tilton (2000), Garcia, Knights, and Tilton (2000, 2001), and Tilton (2002). We thank John Tilton for providing us with his data.

foreign entry, and Codelco maintained its very high market share.[14]

In 1990, the Pinochet government was replaced by a civilian government that was committed to supporting reforms, and at about the same time, copper prices rose. This led to a substantial increase in foreign entry. Figures 13 and 14 show how output, productivity, and Codelco's industry share changed with the introduction of foreign competition. Total copper output increased 175 percent between 1990 and 2000, which is a growth rate of over 11 percent, compared to a growth rate of about 4.5 percent between 1970 and 1990. Much of this output increase came from entrants, as Codelco's output share dropped from 75 percent in 1990 to 33 percent by 1999. Figure 14 shows that productivity increased substantially after the introduction of foreign competition. Productivity increased by a factor of more than 3.5 over the 1990s, which is a growth rate of 14 percent per year, compared to a growth rate of 3.5 percent per year before 1990. Garcia, Knights, and Tilton (2001) show that about 30 percent of the productivity gain was from higher efficiency at individual mines, while 70 percent of the gain was from shifting location, that is, from the production of new entrants. The fact that productivity grew faster than output indicates that the industry was able to produce more output with fewer workers.

Figure 15 shows that Chile's rapid post-reform productivity growth significantly reduced the labor productivity gap between Chile and the United States. Before the reform, Chile's relative productivity deteriorated from 41 percent of the U.S. level to about 30 percent of the U.S. level. After the reforms, Chilean productivity increased from 30 percent of the U.S. level to 82 percent of the U.S. level over a 10-year period.

The figure also shows that U.S. productivity was roughly unchanged for five years before the reforms and for five more years after the reforms. This fact suggests there were no frontier technological breakthroughs, which provides further evidence that competitive reforms were the main cause of Chile's large productivity catch-up. This suggests that the new, private entrants increased productivity by (1) mining better deposits, (2) using a superior technology (that was available before 1990), or (3) having better expertise. The important

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[14]The Constitutional Mining Law, adopted in 1982, ostensibly provided foreign investors protection in the event of future confiscations, but the law came under attack by the political opposition. Perhaps not surprisingly, there was very little new foreign investment in the industry.

point is that all of these factors were available to Latin America before the reform. The competitive reforms also led to a productivity increase at Codleco, which owned and operated four large mines. Between 1990 and 1997, productivity rose by 37, 70, 70, and 84 percent at these mines. These large productivity gains suggest that the nationalization policy also dulled the incentives for incumbent producers to be efficient. Despite Codelco's productivity gains, there was a significant reallocation of production from Codelco to the most efficient producers. This large loss of market share suggests that Codelco may not have survived in any form had it not been able to realize these efficiency gains after the industry reforms.

We conclude that pro-competition policy reforms that encouraged foreign competition significantly increased productivity in the Chilean copper mining industry by allowing high productivity producers to enter and by changing the incentives facing the incumbent producers. In particular, this case shows that even large and persistent productivity gaps in quantitatively important sectors can be eliminated quickly when policy fosters competition.

D. Reversing Quotas in Brazil's Computer Industry

We now show how eliminating a zero quota policy in Brazil's computer industry is associated with a large increase in output and productivity. We will show that lifting the import ban on foreign-produced computers reduced both entry and incentive impediments in the industry. Our discussion draws on work by Luzio and Greenstein (1995) and Botelho et al. (1999).

In 1977, Brazil embarked on a "market-reserve" policy for its personal computer and minicomputer producers. This meant that only PCs and minicomputers produced by Brazilian-owned firms could be legally sold in Brazil.[15] While there undoubtedly were illegal purchases of imports by small firms and individuals, Luzio and Greenstein document that the black market was not a practical choice for large firms. The policy thus insulated Brazilian computer producers from foreign competition, and the policy also featured entry barriers to new firms through a maze of bureaucratic requirements. The policy also provided protection for upstream component producers through domestic content laws that required Brazilian computer makers to use domestically produced components, including silicon chips, picture

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[15]There were some provisions for production by local firms in joint venture with foreign firms.

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tubes, and other standard parts. The prices of these Brazilian components were two to five times higher than international prices. The policies also restricted entry into the component supply industries. (See Luzio and Greenstein 1995, p. 624.)

Under the quota policy, the Brazilian computer producers were not competitive with international producers. Brazilian computer prices were 70 to 100 percent above international prices after the policy was adopted. Support for this policy evaporated, and after the 1990 presidential election, President Collor phased out this market-reserve policy by 1992. The new policy eliminated the quota, included tariffs of about 30 percent, and provided some tax incentives for foreign firms to produce PCs in Brazil (Botelho et al. 1999, pp. 9–10). The abandonment of the zero quota policy coincided with large price declines, large output increases, and large productivity increases. Computer prices fell 43 percent per year from 1990 to 1992, compared to an 18 percent annual decline before Collor's election. Moreover, prices fell substantially immediately after Collor's election.

Luzio and Greenstein use these price declines to infer productivity changes in Brazil's computer industry. They estimate that Brazil had a 6-year relative technological gap to the United States in 1989. That is, the efficiency of Brazil's producers in 1989 was equivalent to U.S. producers in 1983. Since productivity growth in the U.S. computer industry has been estimated to be around 30 percent per year,[16] this means that Brazil had only about 20 percent of the U.S. productivity level in 1989 prior to the reforms. Brazil was able to eliminate one-third of its productivity gap, however, between 1990 and 1992. This is striking, given the very rapid productivity advancements occurring in the United States.

The policy reform also is associated with a large increase in domestic production. From 1992 to 1998, output increased by about 100 percent, compared to just a 33 percent increase from 1985 to 1992.[17] (See Botelho et al. 1999, Fig. 1.) This post-1992 output increase is probably understated because the sales figures are measured in dollars, and prices were falling much faster after 1992 than during the 1985–92 period.

Imports rose 150 percent with the new policy, but despite this increase in foreign

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[16]Source: http://www.bls.gov/opub/ted/2000/Dec/wk1/art02.htm.

[17]The figures we have for local production are for computer hardware, which includes PCs, minicomputers, mainframes, and peripherals. Foreign mainframe production was allowed in Brazil before 1992.

competition, many of the Brazilian firms were able to successfully compete. Following the policy change, 6 of the top 10 producers were Brazilian firms. We conclude from this case that increasing competition led to large productivity and output advances. The fact that Brazilian firms raised productivity substantially and quickly after the removal of the quota policy suggests that the quota policy retarded the incentives for firms to be efficient.

E. Privatizing State-Owned Enterprises: Brazilian Iron Ore

We next analyze the privatization of the Brazilian iron ore industry. Our discussion draws on the work of Schmitz and Teixeira (2004). We will show that the privatization of this industry removed both entry and incentive impediments and substantially raised productivity.

Brazilian iron ore was historically produced by both state-owned enterprises and private firms. In 1990, SOEs accounted for about 60 percent of production and private firms about 40 percent. The state-owned portion of the industry was composed of two firms: CSN (Cia. Siderurgica Nacional) and CVRD (Companhia Vale do Rio Doce). Almost all of the SOEs' production was accounted for by CVRD, which at that time was the largest iron ore producer in the world. CSN was primarily a steel producer and owned only one small iron ore mine. Privatization began in 1991 when CSN sold its small mine to private investors. Plans to sell CVRD also began in the early 1990s, and this led CVRD to change its organization structure in preparation for privatization.

One of the key organizational changes was in the rules that governed the allocation of tasks across employees. Prior to privatization, work rules placed significant limitations on the number of tasks a worker could perform. Specifically, workers had specialized job classifications that permitted them to perform only a very small set of tasks. For example, machine operators were prohibited from making any adjustments or repairs to their machines, even though some of these repairs were trivial. Schmitz and Teixeira argue that this work rule policy depressed productivity through similar channels as in Schmitz' (2004) study of the U.S.-Canadian iron ore industry.

These work rule restrictions were removed when CVRD prepared for privatization in the early 1990s. Schmitz and Teixeira (2004) report that interviews with company and union officials indicate that the threat of privatization weakened the union, which led to the changes

in work rules. The privatization of CVRD was completed in 1997 when it was purchased by local entrepreneurs.

Figure 16 shows output and productivity in the industry between 1971 and 1997. Note that there was almost no productivity growth between 1973 and 1990. Productivity begins to grow at the onset of privatization, culminating in a 30 percent increase in 1997 when the privatization of CVRD is completed. Productivity grew about 140 percent between 1990 and 1997, and output grew about 30 percent during this period. As in the case of the Chilean copper industry, the Brazilian iron ore industry produced more output with significantly fewer workers following the policy reform.

Figure 17 decomposes overall industry productivity into the productivity at CVRD's northern and southern operations and the productivity of the private producers.[18] Productivity at both of the CVRD divisions began growing in 1993, and productivity in the private mines began growing in 1995. The productivity at all three sets of plants grew between 110 and 130 percent between 1990 and 1998. The increase in CVRD's productivity is the result of removing the entry impediments in the industry, as a more efficient group of managers operated the mines following the privatization. The increase in productivity at the incumbent private mines is the result of removing efficiency impediments in the industry, as these mines had to compete with a more efficient CVRD.

We conclude from this case that privatizing the industry led to large productivity gains both at the newly privatized firms and at the firms that had to compete with the privatized firms.

F. The Large-Scale Privatization of Mexican SOEs

We now explore larger-scale Latin American privatizations. We begin with Mexico's privatization of most of its SOEs, which began in 1983. Our discussion draws on work by La Porta and Lopez-de-Silanes (1999). We will present data that show privatization of state-owned businesses is associated with large output and productivity gains.

Prior to the early 1980s, state-owned enterprises (SOEs) played a significant role in the Mexican economy. They accounted for about 14 percent of GDP and about 38 percent

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[18]Data are available only beginning in 1986.

of capital investment. These state-owned enterprises operated in a wide range of industries in manufacturing, mining, and services. Within manufacturing, these enterprises included producers in textiles, chemicals, heavy machinery and equipment, electronics, autos, and transport equipment.

These enterprises, however, were very inefficient. They received transfers and subsidies totaling 13 percent of GDP, which means they were just barely positive value-added organizations. After 1983, almost all of these enterprises were sold to private bidders. La Porta and Lopez-de-Silanes (1999) analyze the impact of this privatization process by studying the pre- and post-privatization performance of 170 Mexican state-owned enterprises in 49 industries. The privatizations occurred over the 1983–91 period. They find that output and productivity rise substantially following privatization. Mean real sales rise 54 percent, and median real sales rise 68 percent. What is even more striking is that these large output increases occur despite large labor reductions. Figure 1 in their paper shows that the average employment level of these enterprises fell by more than half after privatization.

Other performance measures also improve substantially after privatization. Tax collections from these enterprises rise from -4.6 percent of pre-privatization sales to 8.4 percent of post-privatization sales. The median ratio of operating income to sales rises from -2 percent before privatization to 9 percent afterward, and the median ratio of net income to sales rises from -13 percent to 7 percent. Both of these post-privatization profitability ratios are comparable to those of publicly traded, private firms in Mexico, and nearly 60 percent of these increases in income are accounted for by higher productivity.

Since the reforms occur during a period of rapid economic growth in Mexico, the authors also compare post-privatization performance of the SOEs with the performance of incumbent private firms. This comparison also shows that the recently privatized firms had much larger output and productivity gains than the incumbent private firms. It is worth nothing that La Porta and Lopez-de-Silanes did not try to account for the impact of privatization on the performance of the private incumbent firms, or the broader impact of the policy change on the aggregate economy. Analyzing these indirect effects would have led to even higher estimates of the effects of the privatization reforms.

We conclude that the privatizations led to large increases in productivity and output

for a significant fraction of the economy by removing entry impediments. As in the case of the Chilean copper industry and the Brazilian iron ore industry, output expanded substantially with significantly fewer workers.

G. The Large-Scale Privatization of Argentinian SOEs

Argentina also privatized many of its SOEs in the 1990s. Galiani et al. (2001) study the privatization of these state enterprises. In contrast to Mexico, most Argentinian state-owned enterprises were large vertically integrated "natural" monopolies (e.g., electricity, transport, and communications). When the government sold the enterprises, it often kept the monopoly structure in the industry to make the firm attractive to prospective buyers. Hence, the productivity consequences of privatization might not have been as large under this strategy.

Galiani et al. use a method very similar to that used by La Porta and Lopez-de-Silanes (1999) in their study of Mexican privatizations. Even though many transferred enterprises continued to operate as a monopoly (albeit a private one), large performance gains resulted. The increases were not as large as in the more competitive Mexican cases, but were still significant. They find a median increase in labor productivity of 46 percent. They also find unit costs declined 10 percent and production rose 25 percent.

There is a common theme in these seven cases: policy changes that substantially affect the amount of competition faced by Latin American producers significantly and systematically change productivity. In particular, these cases suggest that Latin America indeed can achieve Western productivity levels when competitive barriers are removed.

9. Conclusion

Latin America is a development outlier. This is because it is the only group of Western countries that are not already rich, or that have not gained significant ground on U.S. income levels in the last 50 years. In contrast, Latin America is falling further behind the United States and the other economic successes. Latin America is a development failure because its TFP has failed to catch up. Our analysis suggests that its TFP stagnation is not due to a human capital stagnation, but is rather due to idiosyncratic and long-standing Latin American choices that have impeded either the adoption of superior technologies or the most efficient use of technologies.

We have argued that competitive barriers are a promising route for understanding Latin America's large and persistent productivity gap. This is because Latin America systematically sets up significantly more impediments to competition than the United States, Europe, or East Asia, and these impediments are associated with low productivity. Specifically, we found that Latin American policy changes that eliminated competition are associated with large and permanent declines in productivity and output, and conversely that Latin American policy changes that increased competition are associated with large increases in productivity and output in a set of industries.

The key implication of our findings is that Western-level productivity success is indeed feasible for these Latin American producers. In particular, when competitive barriers are eliminated and Latin American producers face significant foreign competition, they are able to replicate the high productivity levels of other Western countries. The key open question is whether increasing competition in other Latin American industries would also lead to such large productivity and output gains. More work is needed to address this question, but if the answer is yes, then understanding the reasons Latin America has set up so many competitive barriers is central. Potentially interesting avenues for addressing this latter question may include high inequality, as documented by Sokoloff and Engerman's (2000) and Acemoglu et al.'s (2004) general arguments about institutional design.

We hope that these findings stimulate further work on the importance of competitive barriers in Latin America. A number of other industries could be analyzed using this approach, including the privatization of the steel industry. We also hope that this stimulates work on identifying and evaluating other possible stagnation candidates. Our findings also have implications for these other factors. In particular, they suggest that any candidate factor must satisfy two criteria: (1) it must work through TFP, and (2) it needs to have been in place for at least the last 50 years. Candidate explanations that do not have these two characteristics are not likely to be the major culprits.

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Table 1. Percentage of Latin American Population

of Western Descent, Language and Religion

	Descent*	Language**	Religion***
Argentina	97	99	96
Bolivia	45	61	95
Brazil	93	95	80
Chile	95	97	100
Colombia	92	94	90
Costa Rica	94	99	92
Ecuador	65	82	95
Mexico	69	98	95
Paraguay	95	59	90
Peru	52	80	90
Uruguay	96	98	69
Venezuela	89	99	98
Average†	84	94	89

*Descent: the fraction of the population that is white or mixed-white. Data are from Gall (2004).

**Language: the fraction of the population that speaks a Western European language. (These fractions are likely understated, because they do not count individuals who did not have formal education, but who may still speak one of these languages.) Data sources are: Argentina, Brazil, Chile, Colombia, Costa Rica, Ecuador, Uruguay, and Venezuela: ethnologue.com (the total number of people speaking a Western-European language) and Maddison 2001 (total population); Bolivia: the share of Spanish speakers in the total population (age 6 or higher), 2001 Census, Instituto Nacional de Estadistica (INE); Mexico: the share of Spanish-speakers in the total population (age 5 or higher), Instituto Nacional de Estadistica, Geografia e Informatica (INEGI); Paraguay: the fraction of the population that speaks Spanish, Portuguese, English, German, Italian, or French, 1992 Census, Direccion General de Estadisticas, Encuestas y Census (DGEEC); Peru: the share of the population whose native tongue is Spanish (age 5 or higher), 1993 Census, Instituto Nacional de Estadistica e Informatica (INEI).

***Religion: the fraction of the population affiliated with Western religions, that is, Christianity and Judaism. Data are from CIA (2004).

†Averages were obtained using 2003 population weights (CIA 2004).

Table 2. GDP per Capita Relative to the U.S.

(Regional Averages for Selected Countries)

Year	Europe	Asia	Latin America
1950	0.40	0.16	0.28
1980	0.70	0.46	0.30
2001	0.67	0.55	0.22

Table 3. Latin American

GDP per Capita Relative to the U.S.

Year	1900	1950	1980	2001
Argentina	0.67	0.52	0.44	0.29
Bolivia	-	0.20	0.14	0.09
Brazil	0.17	0.17	0.28	0.20
Chile	0.48	0.40	0.31	0.36
Colombia	0.24	0.23	0.23	0.18
Costa Rica	-	0.21	0.26	0.22
Equador	-	0.19	0.22	0.14
Mexico	0.33	0.25	0.34	0.25
Paraguay	0.25	0.18	0.18	0.11
Peru	0.20	0.24	0.23	0.13
Uruguay	0.54	0.49	0.35	0.27
Venezuela	0.20	0.78	0.55	0.30
Average*	0.29	0.28	0.31	0.22

*The average is computed using all of the available data in each year and is population weighted.

Table 4. Employment Rates by Region
(Regional Averages for Selected Countries)

Year	Europe	Asia	Latin America	U.S.
1950	0.43	0.41	0.34	.40
1973	0.42	0.44	0.31	.41
1998	0.41	0.49	0.35	.48

Table 5. Capital-to-Ouput Ratios by Decade Average
Relative to the U.S.*

	1950s	1960s	1970s	1980s
Europe	0.79	0.91	1.03	1.12
Asia	0.36	0.51	0.77	0.98
Latin America	0.83	0.88	0.89	1.07

Table 6. Investment-to-Output Ratios by Region
(Regional Averages for Selected Countries)

Year	Europe	Asia	Latin America	U.S.
1960s	0.32	0.33	0.21	0.19
1970s	0.26	0.34	0.24	0.20
1980s	0.22	0.30	0.21	.0.20
1990s	0.21	30	0.21	0.18

Table 7. Bils-Klenow Relative Human Capital Levels
(Regional Averages for Selected Countries, U.S. = 100)

	1960	1990
Latin America	46	55
Europe	65	73
Asia	66	73

*King and Levine (1994) also construct capital-to-output series for a wide variety of countries. The implications of their data for the relative value of the ratio for Latin America is quite similar to Nehru and Dhareshwar's (1993).

Table 8. Nominal Rates of Protection in 1960

Latin America and the EEC

Country	Nondurables	Durables	Semi-Mfg.	Raw Materials	Capital Goods	Average
Argentina	176%	266%	95%	55%	98%	138%
Brazil	260%	328%	80%	106%	84%	172%
Chile	328%	90%	98%	111%	45%	134%
Colombia	247%	108%	28%	57%	18%	92%
Mexico	114%	147%	28%	38%	14%	68%
Uruguay	23%	24%	23%	14%	27%	22%
EEC	17%	19%	7%	1%	13%	11%

Table 9. Business Start-up Costs

Fraction of per Capita GDP

Region	United States	Europe	Asia	Latin America
Total	1.7	36	24	80

Table 10. Government Ownership Share of the Top 10 Banks

Regions	United States	Europe	Asia	Latin America
1970	0	64%	26%	75%
1990	0	40%	21%	47%

Table 11. Mandated Severance Pay

(In Terms of Months of Wages)

Region	United States	Europe	Asia	Latin America
Indemnity Pay	0	1.1	1.5	2.7

Figure 1: GDP Per Capita Ranking
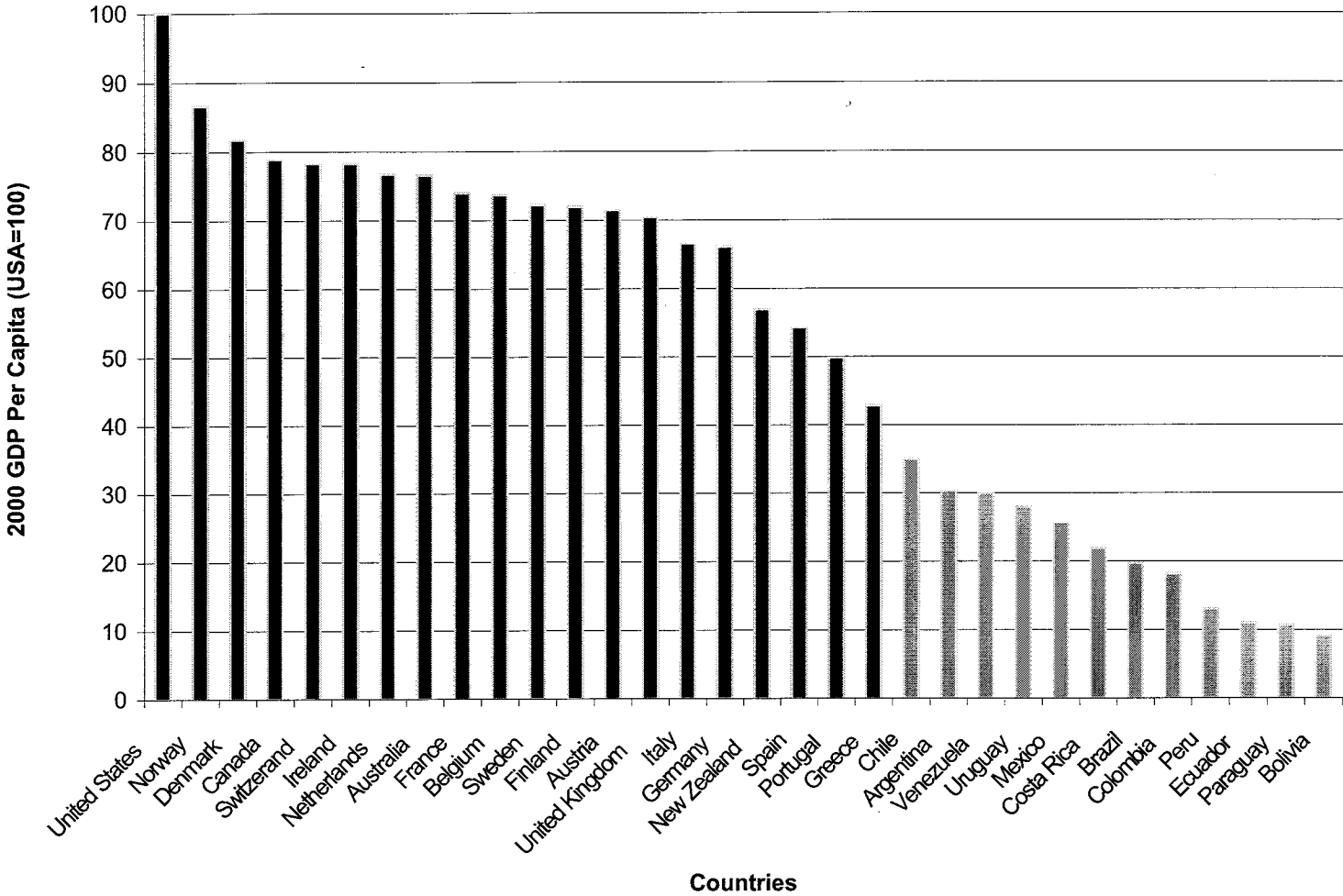
Figure 2: Regional GDP Per Capita Relative to US
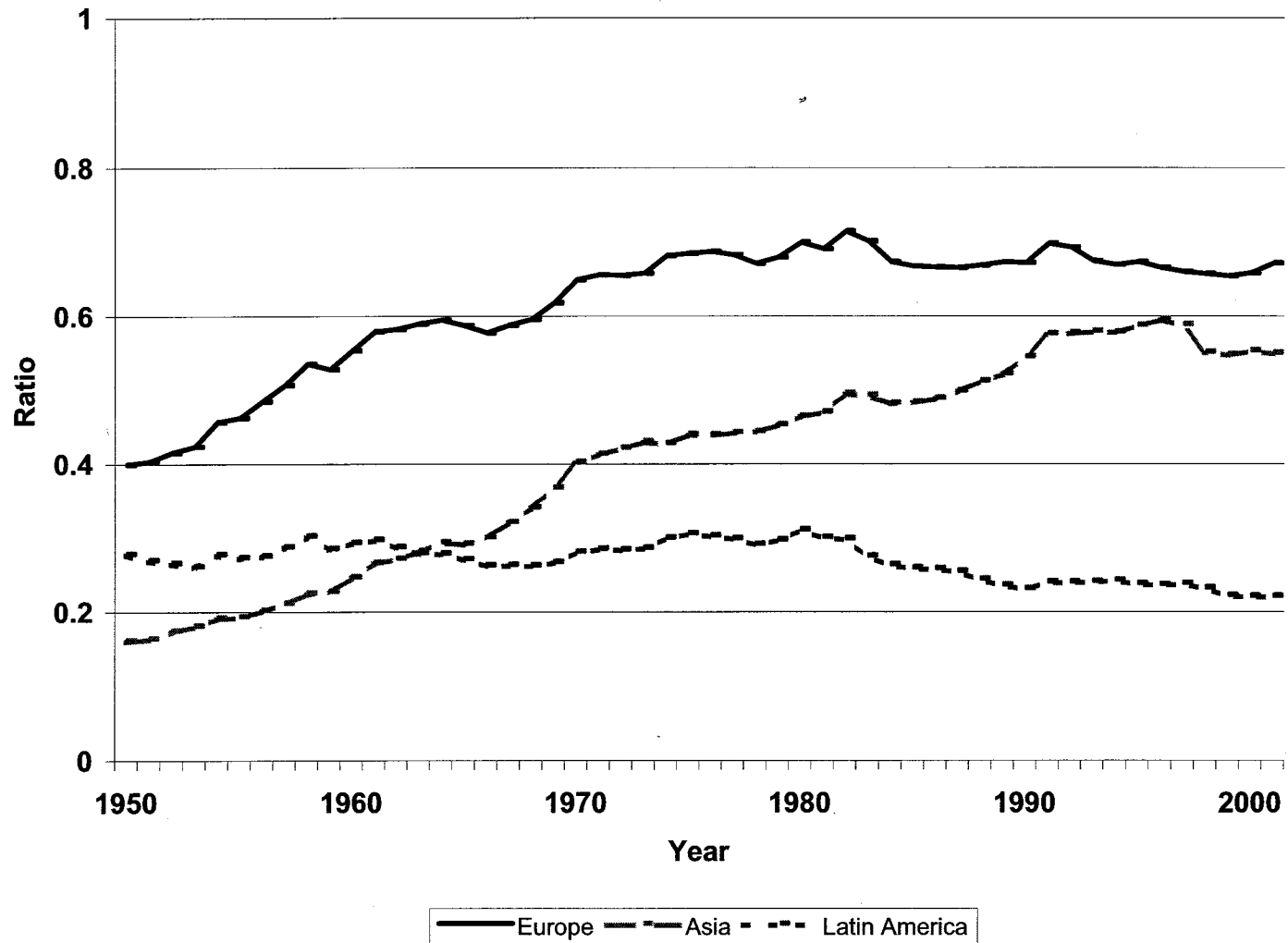
Figure 3: European GDP Per Capita Relative to US
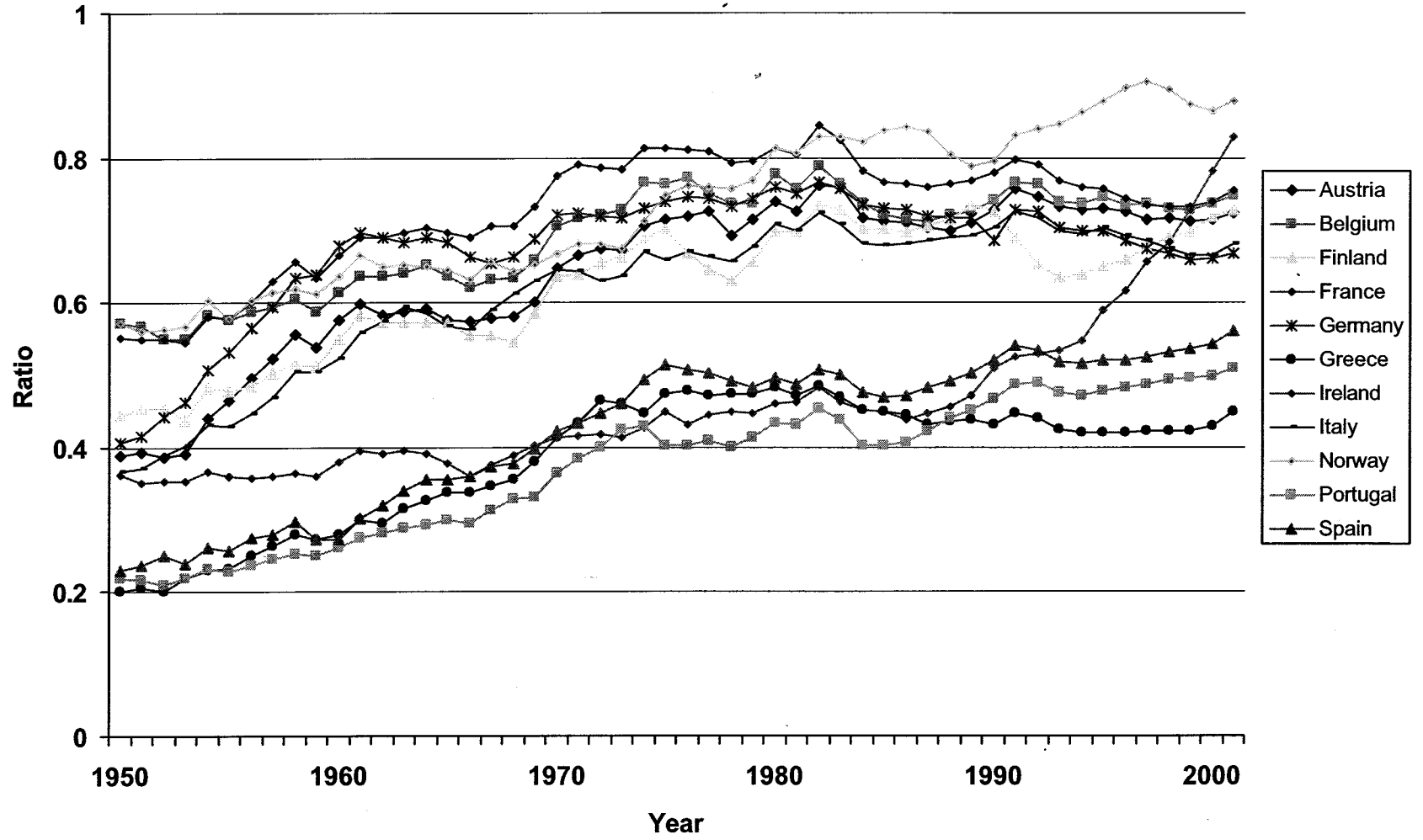
Figure 4: Asian GDP Per Capita Relative to US

Legend:
- Hong Kong
- Japan
- Korea
- Malaysia
- Singapore
- Taiwan
- Thailand

Y-axis: Ratio

X-axis: Year
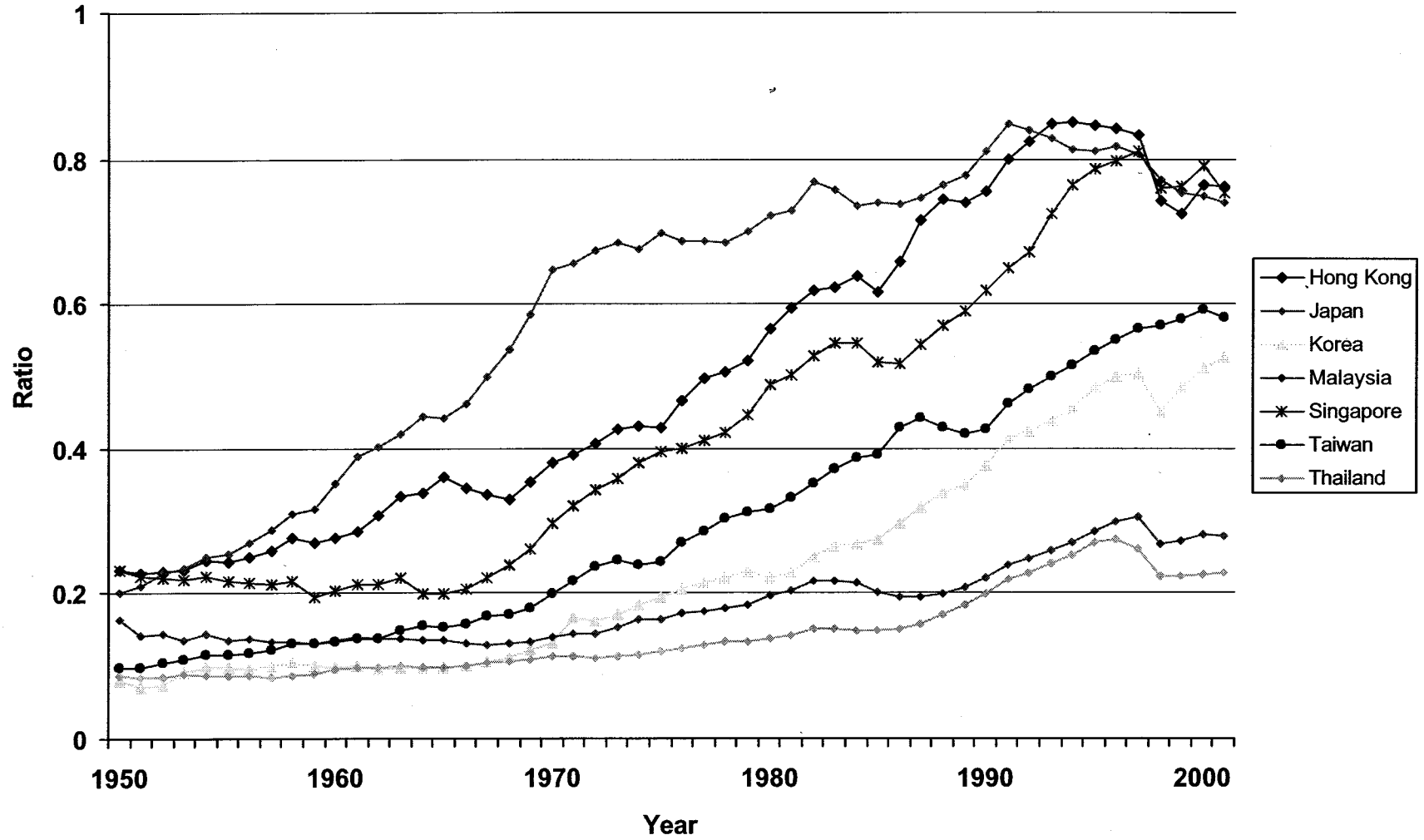
Figure 5: Latin American GDP Per Capita Relative to US

Legend:
- Argentina
- Bolivia
- Brazil
- Chile
- Colombia
- Costa Rica
- Equador
- Mexico
- Paraguay
- Peru
- Uruguay
- Venezuela

X-axis: Year (1950–2000)
Y-axis: Ratio (0–1)
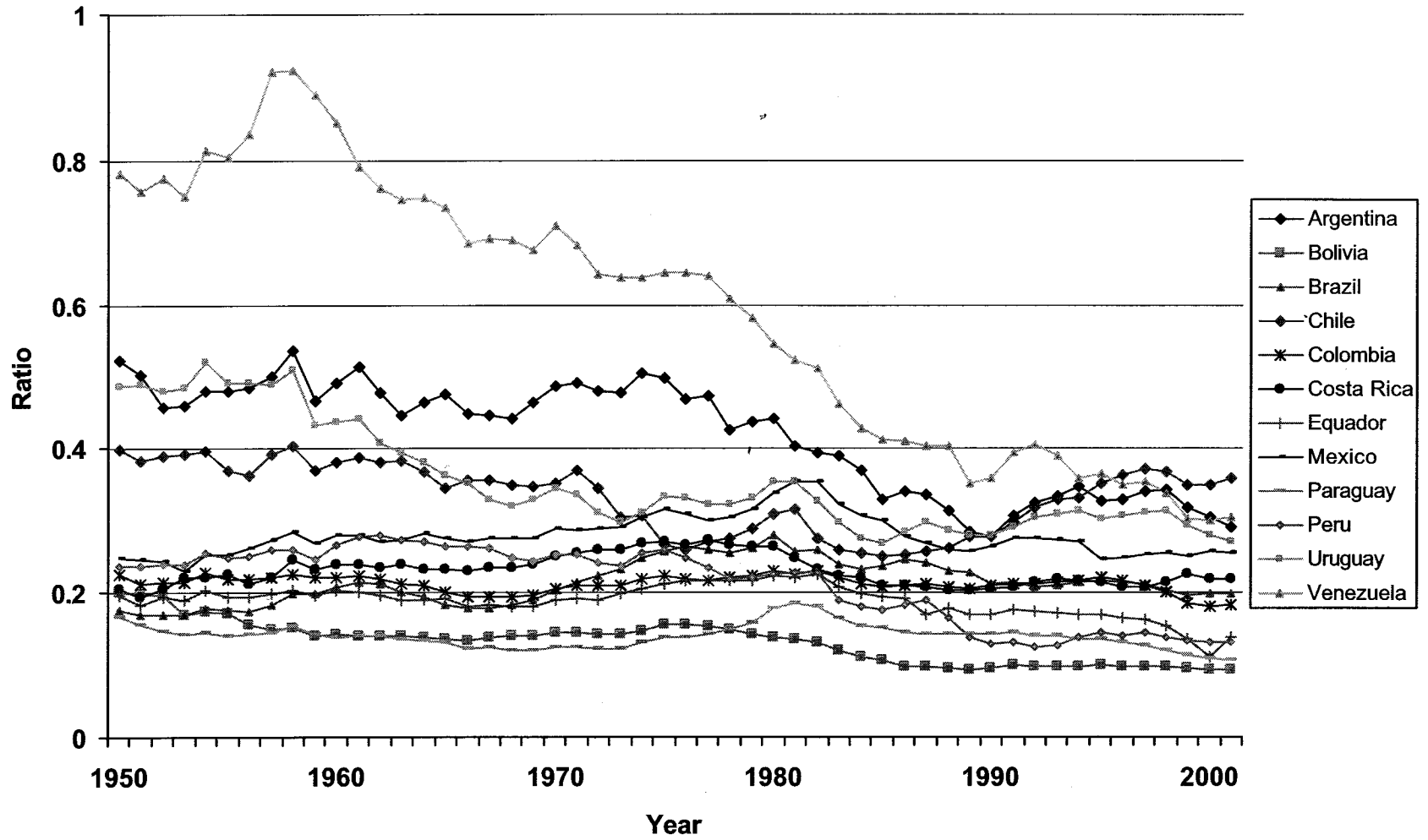
Figure 6: Labor Productivity Relative to US by Region
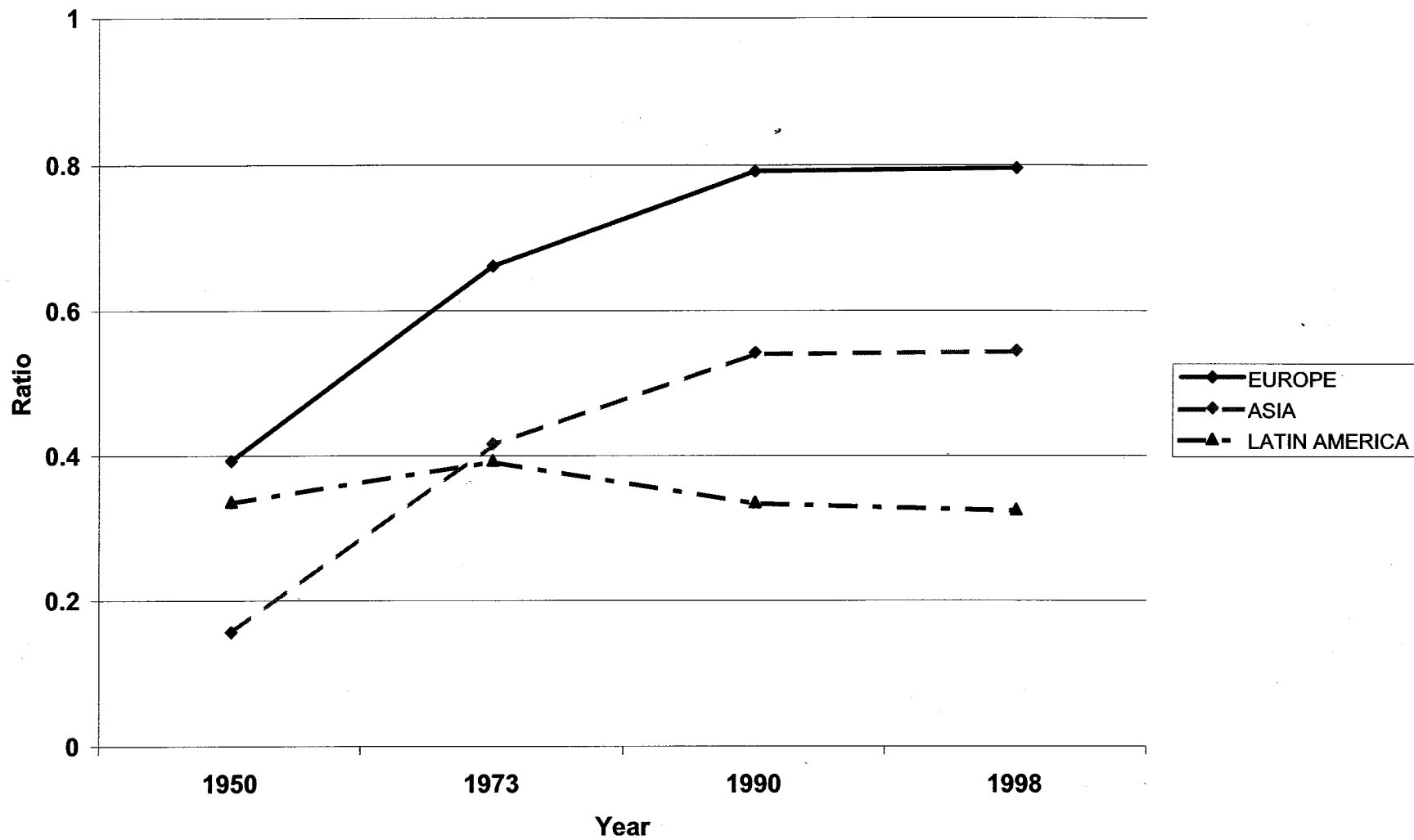
Figure 7. Trade Share and GDP (60s Average)
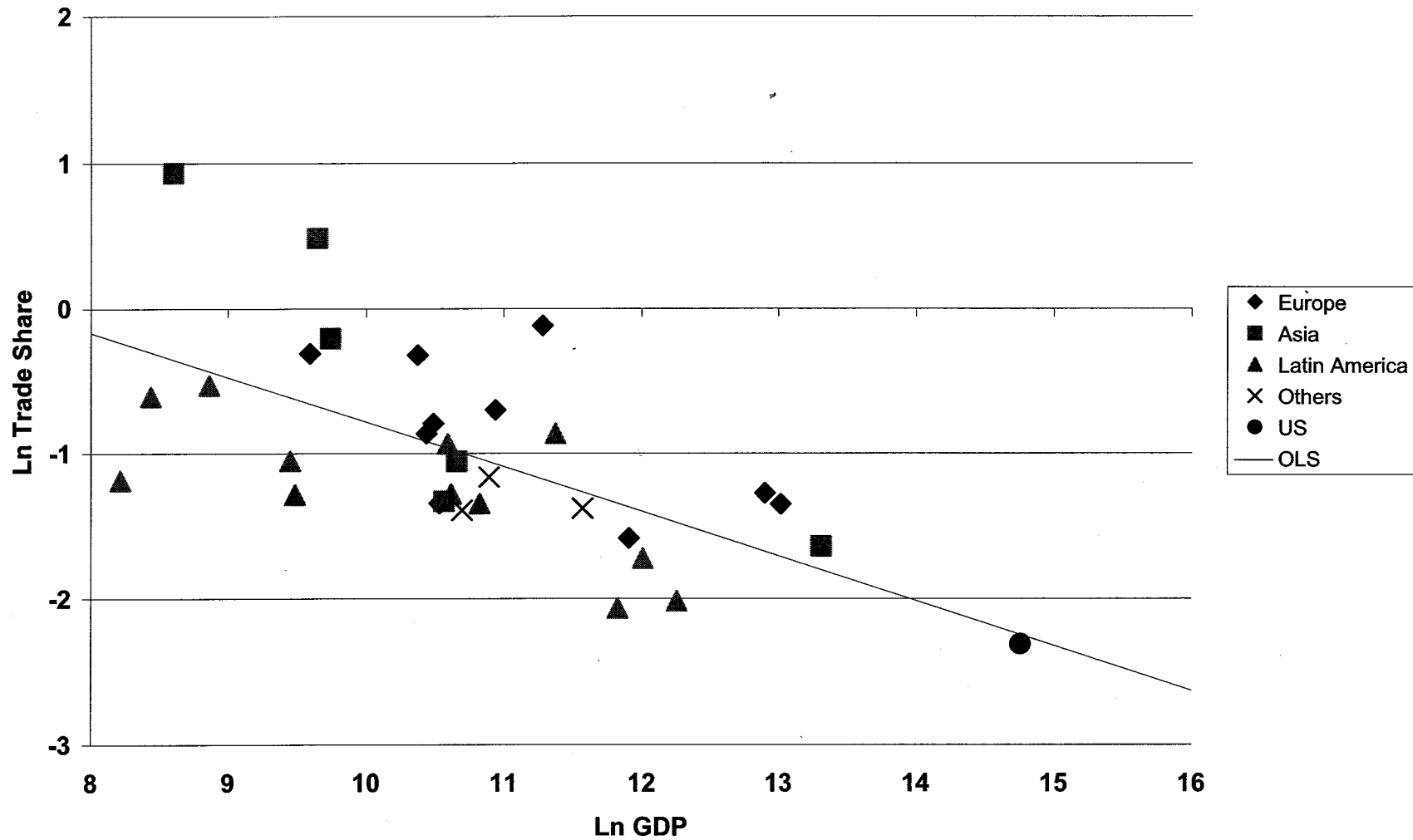
Figure 8. Trade Share and GDP (70s Average)
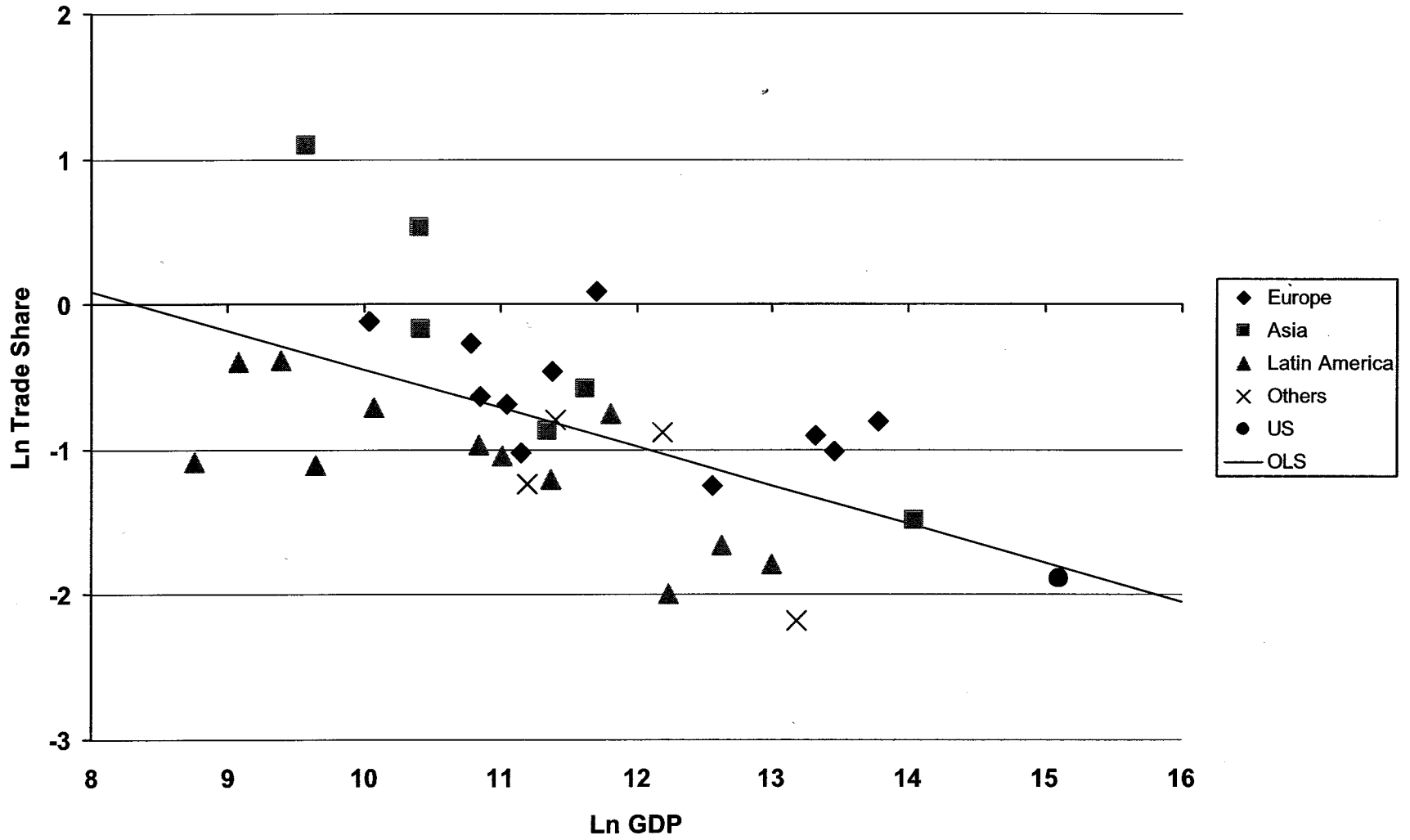
Figure 9. Trade Share and GDP (80s Average)
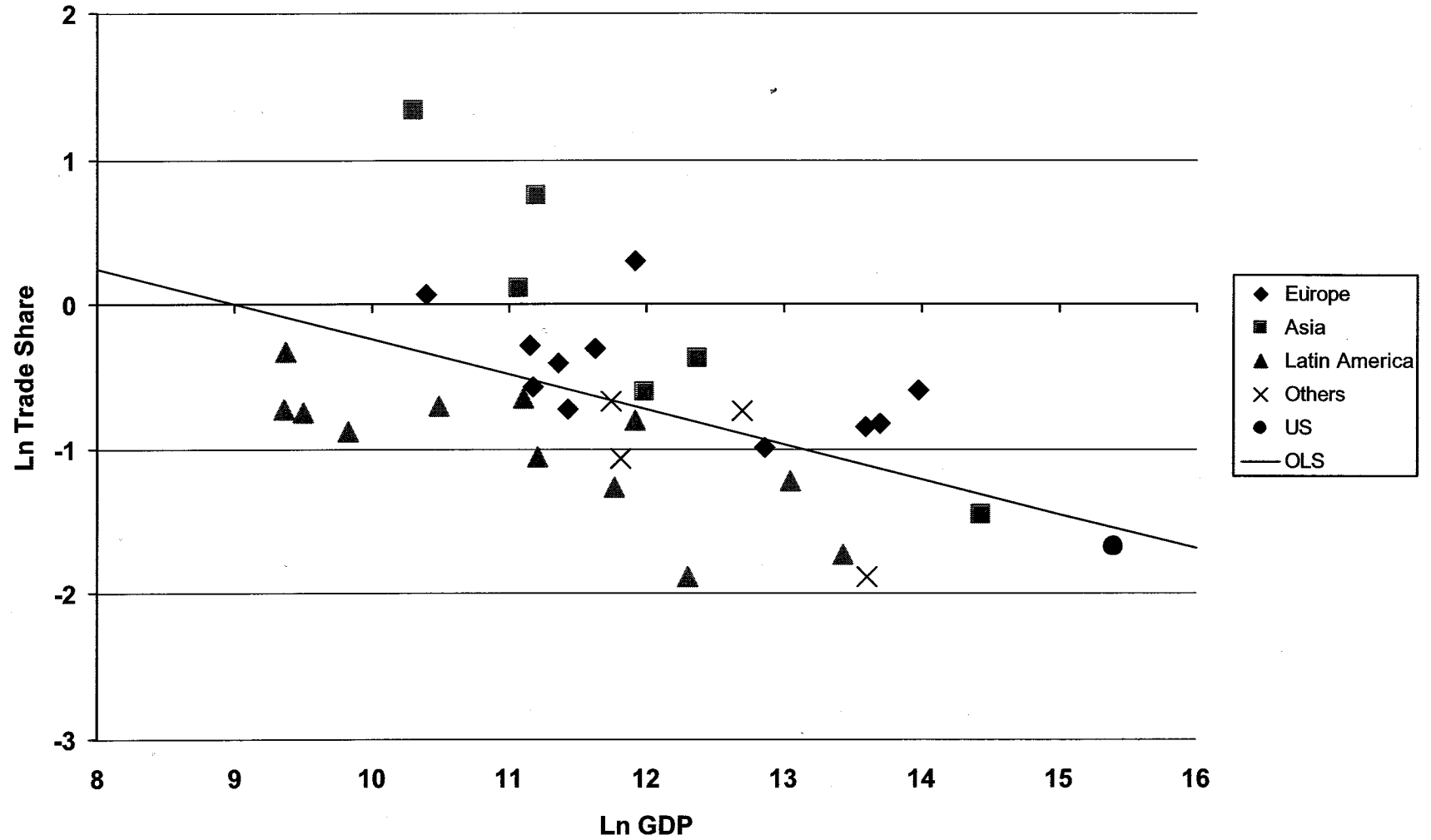
Figure 10. Trade Share and GDP (90s Average)
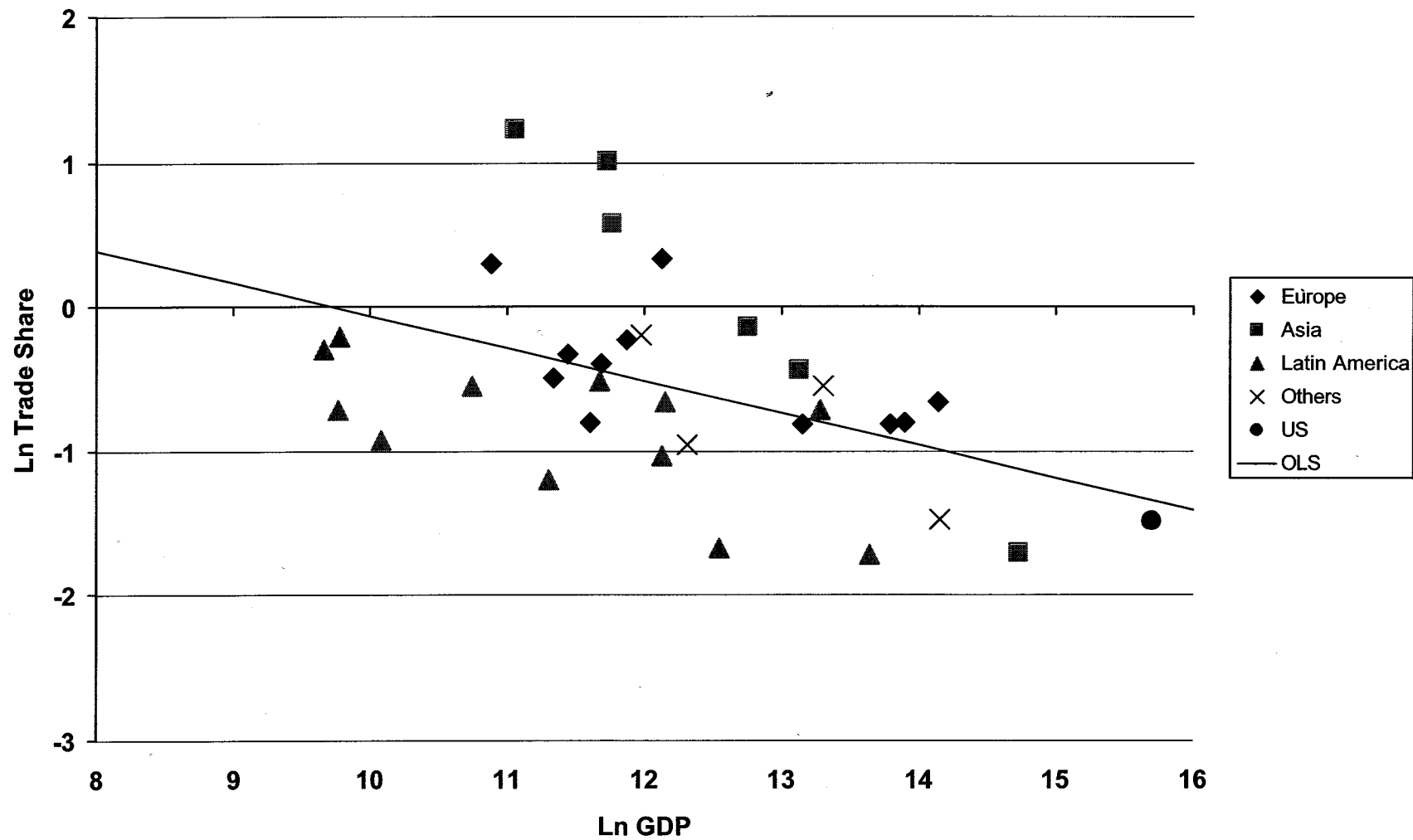
Figure 11. Output and Labor Productivity of the Petroleum Industry in Venezuela (1950-1997)
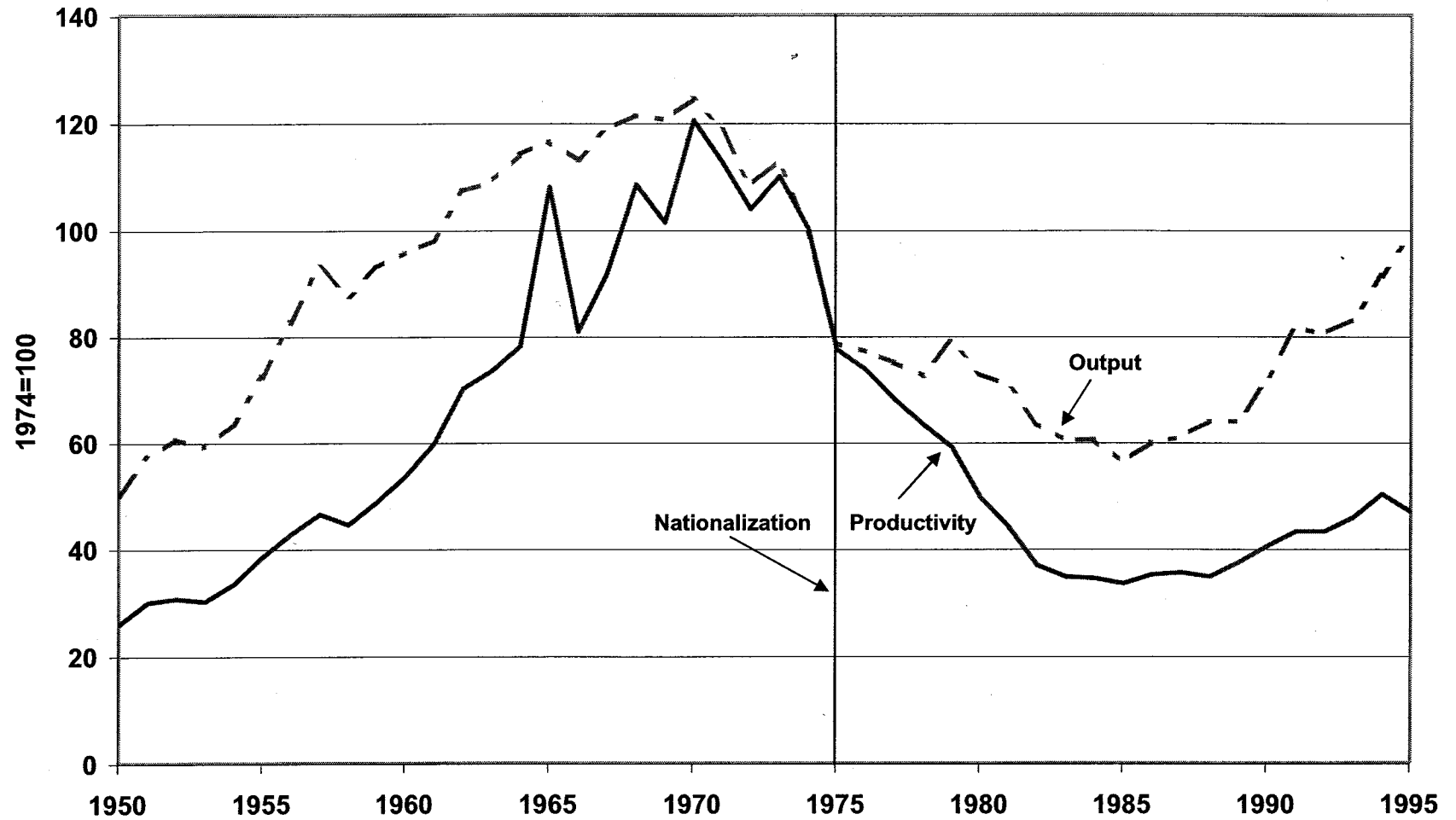
Figure 12. Output and Labor Productivity of the Iron-Ore Industry in Venezuela (1953-1996)
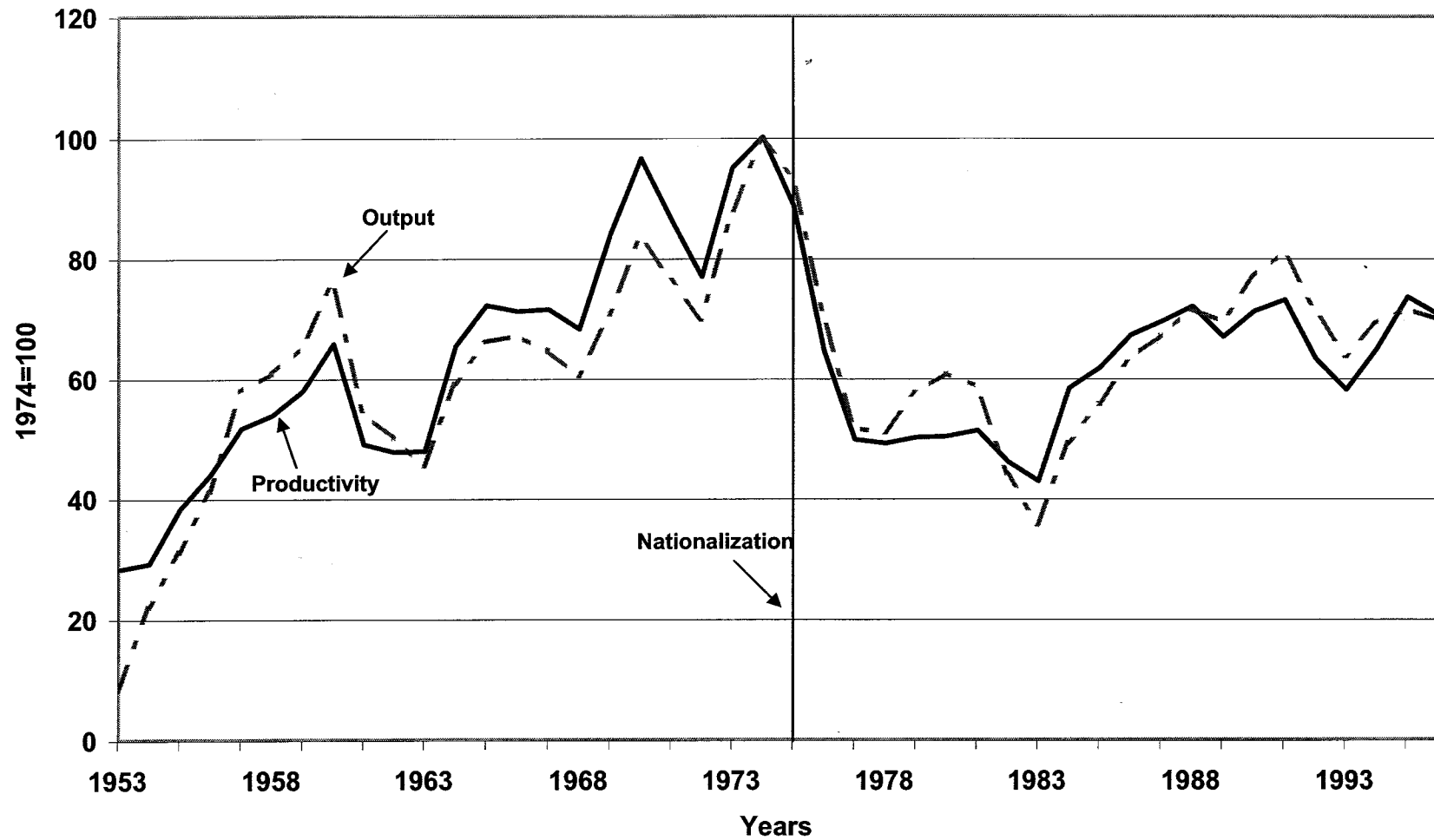
Figure 13. Copper Production in Chile and Codelco's (State-Firm) Share of Production

Civilian government replaces Pinochet

Output

Codelco's share
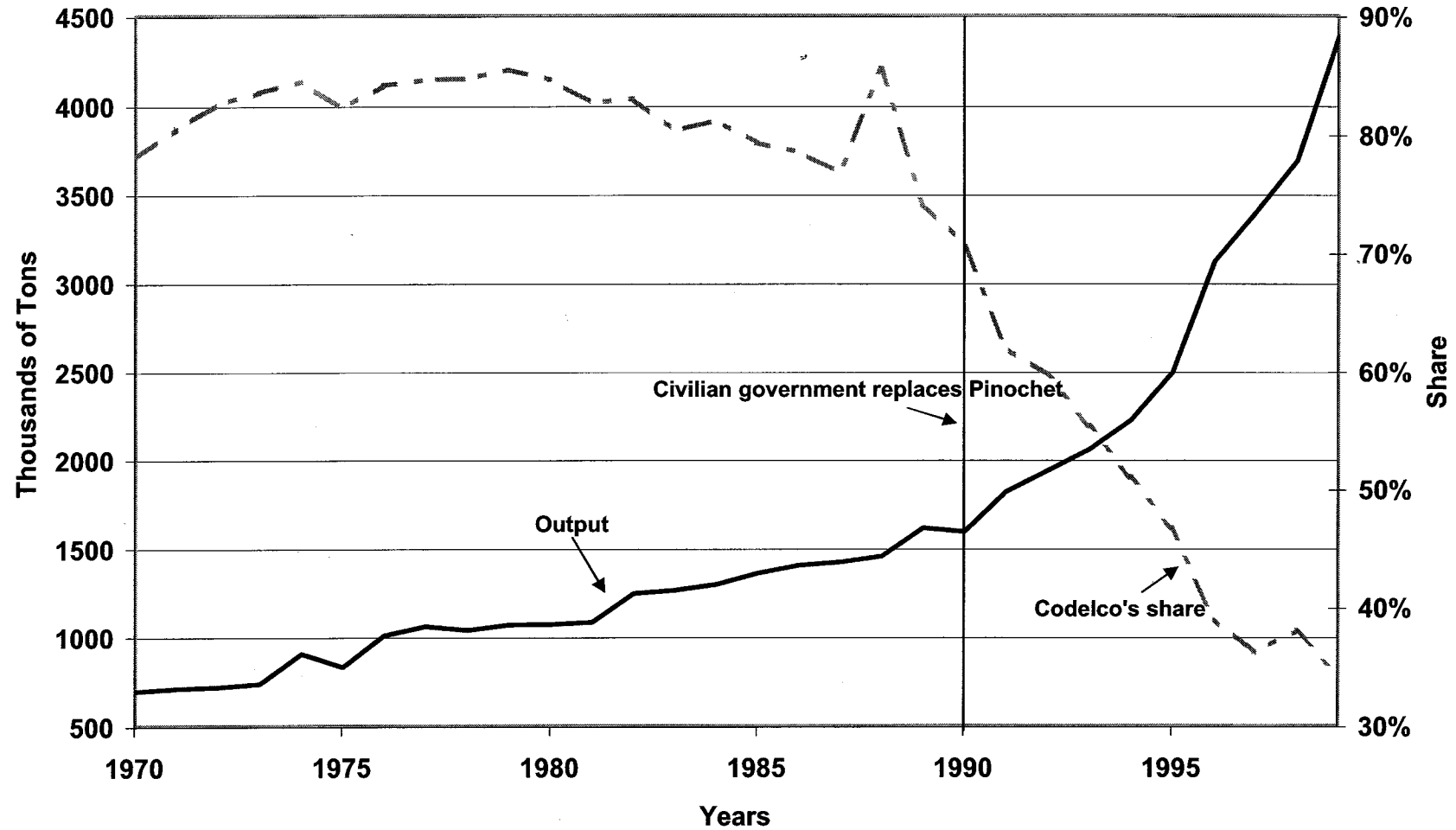
Figure 14. Labor Productivity and Output in the Chilean Copper Industry, 1970-2001

Civilian government replaces Pinochet

Output

Labor Productivity
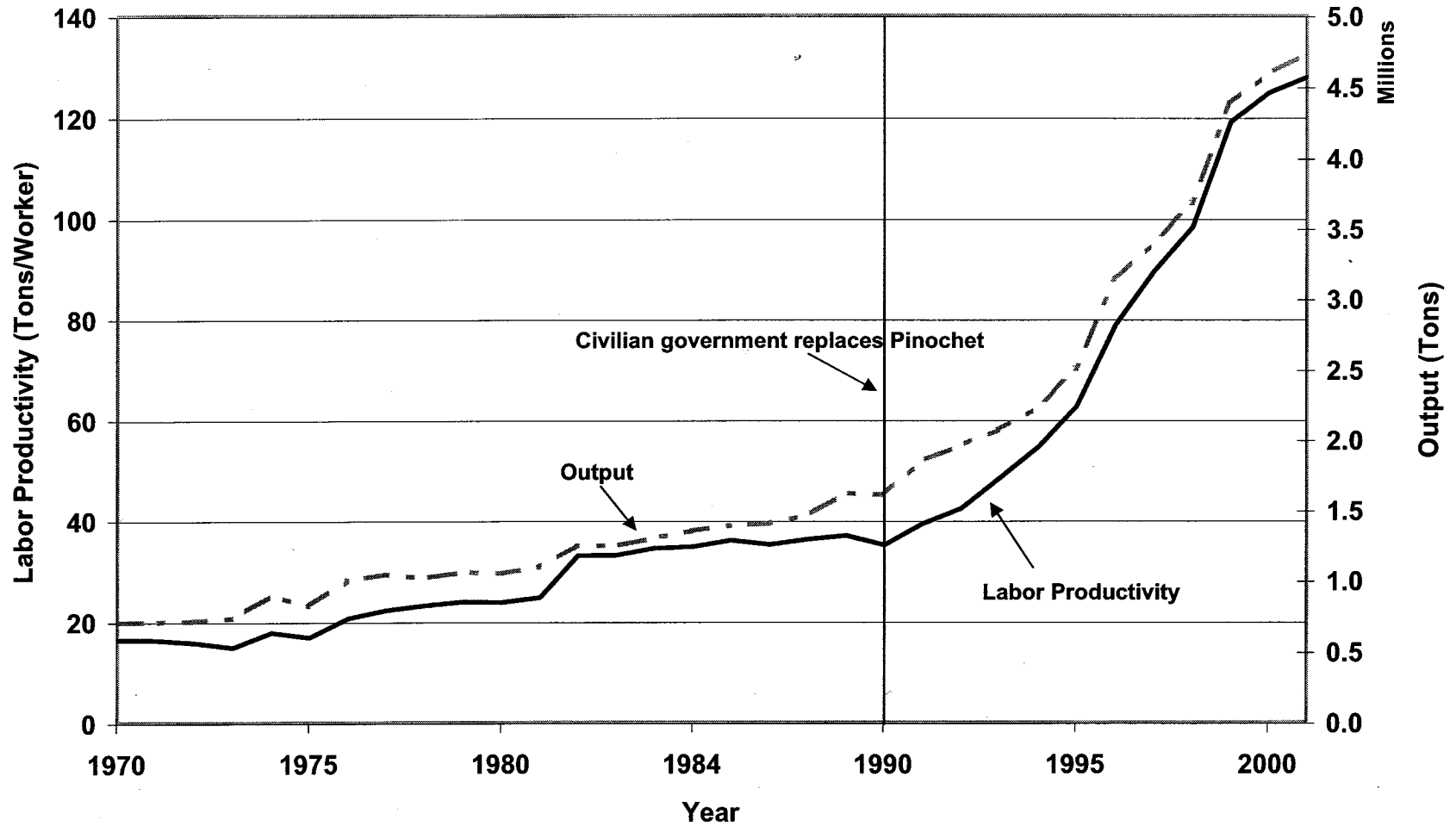
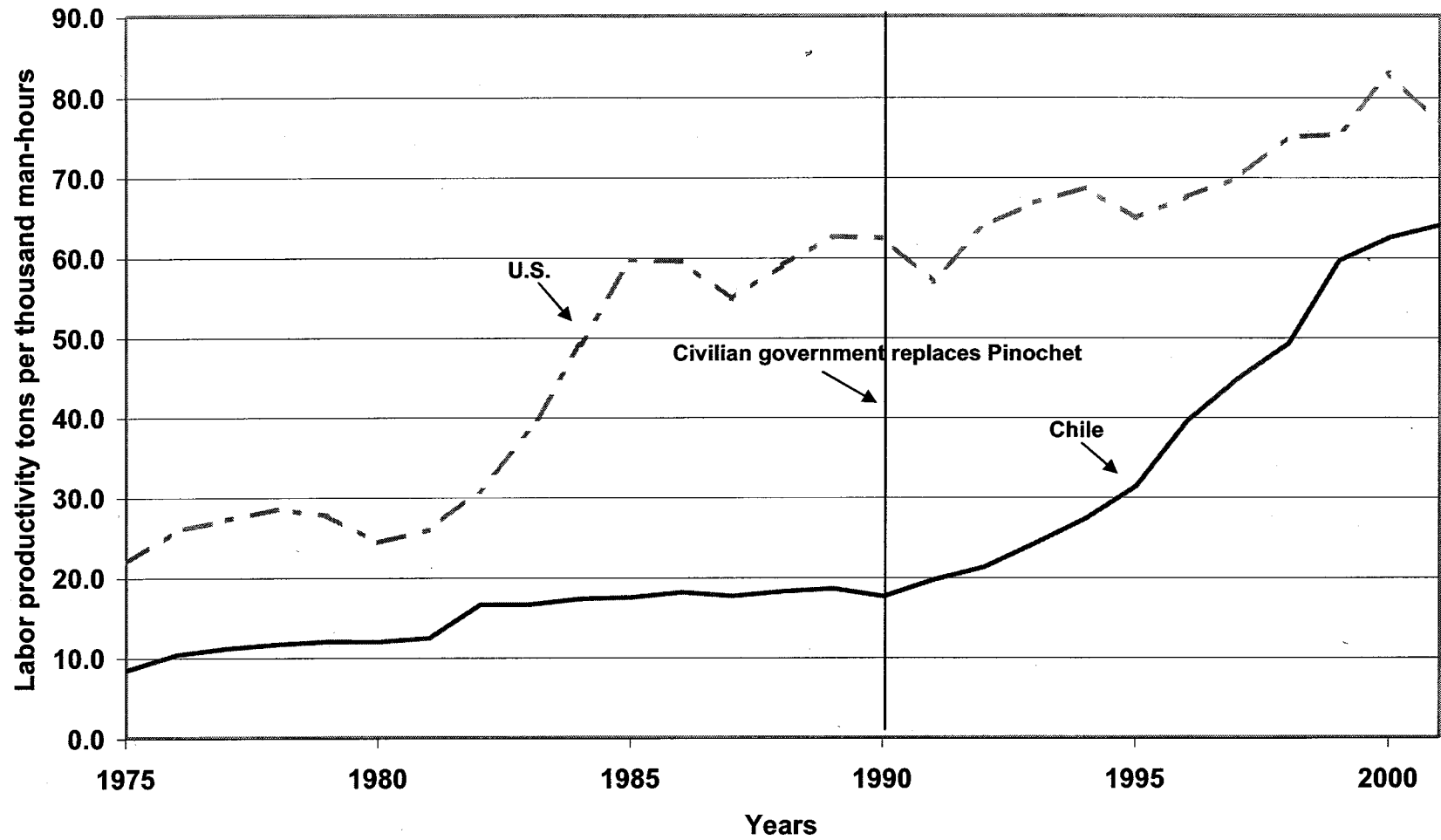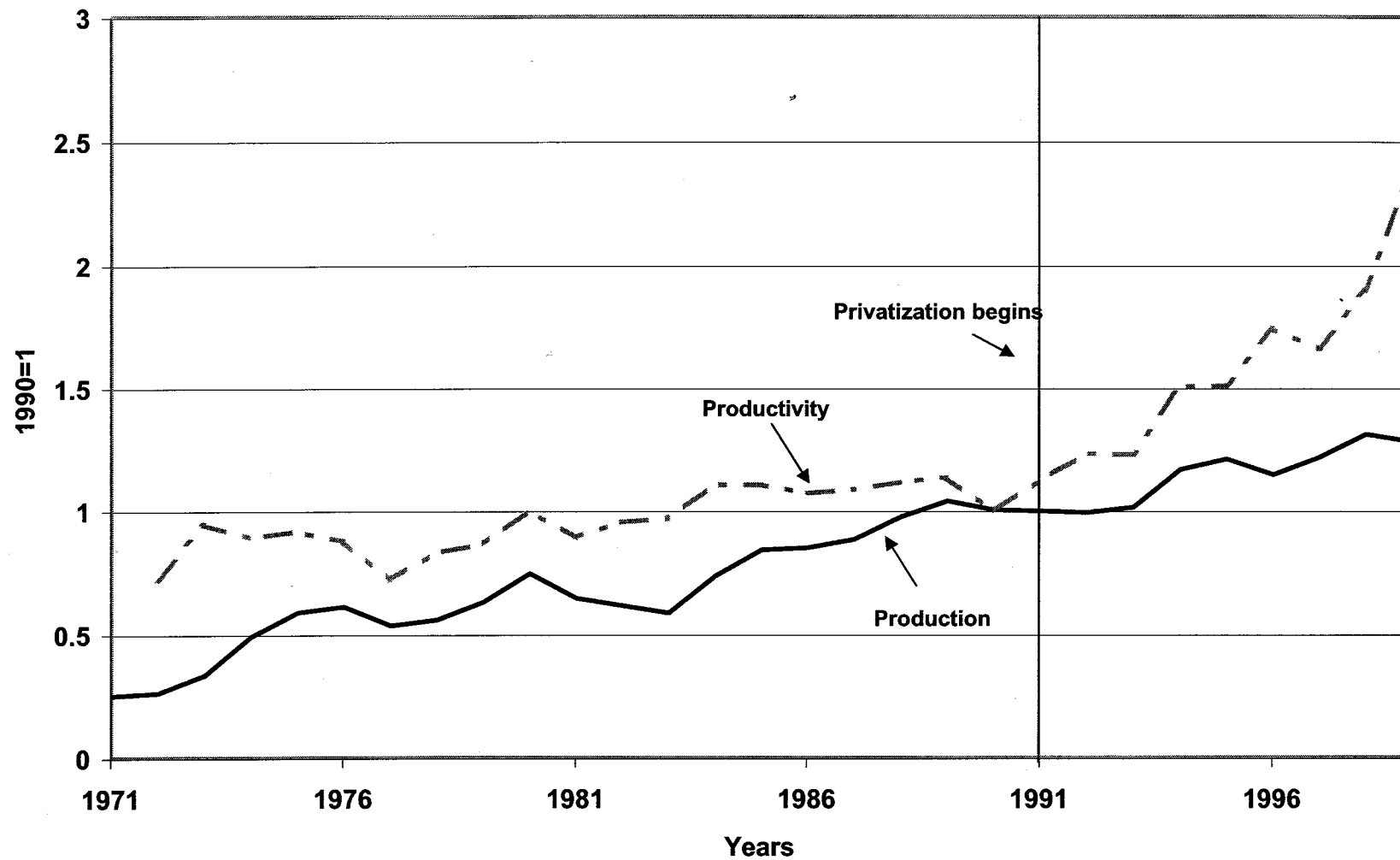# Figure 15. Labor Productivity in the U.S. and Chilean Copper Industry, 1975-2001

Figure 16. Production and Productivity Brazilian Iron-Ore Industry, 1971-97

Figure 17. Labor Productivity in Brazilian Iron-Ore
CVRD/NORTH, CVRD/SOUTH, AND PRIVATE