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Latin America in the Rear View Mirror*

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1. Introduction

Latin America is a long-run development failure. We say this because Latin America's GDP per adult has been slipping further behind the U.S. over the last 50 years, while many other countries with broadly similar institutions and market structures have been gaining significant ground on the U.S. Figure 1 illustrates Latin America's development failure.[1] The figure shows real GDP per adult for a set of market economies in three countries in three continents : Europe, Asia, and Latin America.[2] Real GDP is the population-weighted average GDP for each region, and is measured as a percentage of U.S. real GDP per capita. (source: Maddison (2003)) Europe and Asia have gained significant ground on the United States over the last 50 years. Our Europe countries have increased from 40% of U.S. per capita income in 1950 to 67% of U.S. per capita income in 2001, while our Asian countries has increased from 16% to 57%. In sharp contrast, Latin America *lost* ground to the U.S. over the last 50 years. Real GDP in the average Latin country was 28 percent of the U.S. in 1950, but was just 22 percent in 2001.

We begin our analysis by taking a closer look at the relative failure of Latin America. Section 2 makes a detailed comparison between real GDP in each individual Latin America country and in the other countries in the other three regions. This individual country comparison reveals an even more striking disparity between Latin America and the other market economies. Not a *single* Latin American country has gained significant ground on the United States over the last 50 years. In other words, *every* Latin American country has been a long-run development failure.

Why is Latin America falling behind the U.S., when so many other reasonably similar countries have been catching up? To gain a better understanding of this puzzle, we next

decompose GDP per adult 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 development failure is largely the consequence of a labor productivity failure; Latin America's employment rate is about the same as in the U.S., but Latin 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 is largely the consequence of labor productivity successes; Labor productivity in all of these other countries is catching up to U.S. labor productivity. Thus, understanding Latin America's relative stagnation requires understanding their relative productivity stagnation. The remainder of our paper focuses on this issue.

Section 3 investigates the source of low Latin labor productivity by evaluating whether productivity is low because capital per worker is low, or because production efficiency is low. Our main finding is that low efficiency, rather than low physical capital investment, is the dominant factor. Section 4 discusses different theories of low efficiency per worker. We begin by assessing whether differences in human capital, as proxied by educational attainment, is the main determinant of low efficiency. We find that education is not the primary reason why Latin worker efficiency is low. In contrast to their labor productivity dynamics, educational attainment in Latin America is indeed catching up to U.S. levels, and moreover, educational attainment in a number of Latin countries exceeds that in a number of the development success countries.

These facts lead us to suspect that Latin America's low efficiency is more likely the consequence of factors that have reduced total factor productivity (TFP), either through the use of less efficient technologies or less efficient organizational design than those used in the

U.S. and in other market economies. Lack of competition is one factor that may lead to low TFP. Section 5 presents some evidence that government policies that either directly or indirectly limit competition have significantly reduced efficiency in a number of industries and in a number of Latin American countries.

2. Latin America's Development Failure

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

$$\max E_0 \sum \beta^t \{\log(C_{it}) - v(L_{it})\},$$

where C_{it} is consumption in country i in period t, v is a convex function that governs the household's disutility of working, and L_{it} is the fraction of the population that works. The population is denoted as N_{it}, and is normalized to be 1 at date zero. 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 process A_{it} is the product of two components, as in Parente and Prescott ():

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

where A_t is the world technology frontier, and η_{it} is the relative efficiency of country i in using that technology. For our subsequent analysis, we will assume that U.S. TFP is a reasonable proxy for the world technology frontier, which implies that $\eta_{US} = 1$. We will later specify the stochastic process governing the evolution of η_{it} for the other countries. For our purposes, the process generating A_t is unimportant, and at certain points we will find it convenient to assume that it grows at constant rate γ.

The law of motion for capital is given by:

$$K_{it+1} = X_{it} + (1 - \delta)K_{it}$$

A. Widespread and Persistent Latin Stagnation

We define economic development as the process of catching up to the world income frontier. Countries that get closer to the frontier are development successes, and those that do not get closer are development failures. We assume that U.S. per capita income is a

reasonable proxy for the world income frontier. We therefore measure each country's per capita output relative to that in the U.S.

This section presents relative output for each Latin country and for each country in the other regions. We then decompose these output data into a productivity component and an employment component to shed light on the source of Latin America's stagnation.

Figures 1-4 show output per adult as a fraction of the U.S. for each country in each specific region over the last 50 years. The most striking feature of these data is that *not a single Latin country* has gained significant ground on the U.S. in the last 50 years. Latin America's economic stagnation stands in sharp contrast to the performance of the other 18 countries that we consider. All of the countries from these other regions gained ground on the U.S., with 13 of the countries catching up by at least 25 percentage points over the last 50 years.

Latin America's relative stagnation is also clear at other dates, both within the last 50 years and before 1950. In fact, there is little evidence that Latin America was *ever* in the process of becoming a development success at any time during the last 100 years.

Table 1 shows relative output for the population-weighted Latin American average and for each Latin country at three points in time: 1950, 1980, and 2002. We chose 1980 as a comparison date because a popular view is that Latin America was performing well before the debt crises of the 1980s, (average Latin American real GDP growth per capita was 2.6% percent between 1950 and 1979) and then the debt crises of the 1980s derailed Latin development (average real GDP growth per adult was 0.0 percent between 1981 and 2002).

Our measure of relative development differs significantly from this GDP growth rate measure. We find no significant Latin American catch-up during the pre-debt crisis period -

output was 28 percent of the U.S. in 1950, and was 30 percent in 1980. There was, however, substantial catch-up in the other regions. The European countries rose from 40% of U.S. per capita income to 70% of U.S. per capita income, and the Asian countries rose from 16% of U.S. per capita income to 46% of U.S. per capita income over the 1950-1979 period. Thus, while Latin America did have higher growth before 1980, its growth rate was no better than that of the United States. While Latin America was treading water in the 1950s, 1960s, and 1970s, the rest of these countries were moving rapidly ahead.

This pre-debt crisis aggregate Latin stagnation also emerges in 11 of the 13 individual Latin countries, the exceptions being Mexico, which rose from 25 percent in 1950 to 34 percent in 1980, and Brazil, which rose from 17 percent to 28 percent. These data show that Latin America's relative stagnation over the last 50 years is not the consequence of adverse shocks occurring in just the last 20 years. The data thus indicates that Latin America largely stagnated through 1980, and then declined moderately after the debt crisis. This means that Latin America's pre-1980 stagnation is due to much more older factors that the 1980s debt crises.

How long have these stagnation factors been in place? Maddison's data suggest they may have persisted over the last century. Table 2 shows relative Latin income in 1900, in 1950, and in 2000. These data show that Latin America's stagnation has been the norm for the last 100 years. Latin American per capita income was 29% in 1900, almost exactly where it was in 1950, and slightly above where it was in 2001.[3] 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 U.S. during this period. Argentinian income fell from 67% of the U.S. level

in 1900 to 52% by 1950, and Chilean income fell from 48% of the U.S. level to 40% by 1950. Venezuela was the only country that gained ground, rising from 20% of the U.S. level in 1900 to 78% 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% of U.S. income by 2001.

What makes Latin America's development failure all the more perplexing is that there is a strong empirical presumption that they *should* have caught up over the last 50 years. This is because every non-communist country, with roughly the same 1950 income level as Latin America (outside of Africa and the Middle East), is in the process of catching up to the United States.[4] Since Latin America's institutions, educational attainment, infrastructure, and their frequency of war and civil conflict are far superior to those in Africa and the Middle East, we conclude that Latin America is perhaps the biggest collection of macroeconomic underachievers in the last 50 years.

B. The Uniform Development Process of Successful Countries

The data on successful development show that these countries, while not converging instantly to the world frontier, seem to be doing so under a process in which countries that are relatively far from the frontier gain the most ground in relative terms. To examine the extent of this uniformity, we consider a simple relationship for per capita income in country i relative to the U.S., which we denote by y_{it}. The process we consider is

$$(1 - y_{it}) = \gamma(1 - y_{it-1}) + \varepsilon_{it}.$$

where γ governs the average rate at which the gap between a country's relative income level and the frontier is shrinking. If this difference in productivity was the only difference between countries, then, with open capital markets, it is easy to see that the level of per capital output in country i relative to per capital output in the frontier country, y_{it}, is simply equal to η_{it} and hence

$$E\left\{\frac{(1-y_{it})}{(1-y_{it-1})}\right\}=\gamma.$$

In light of this, we examine the average shrinkage rates over a variety of time periods for our European, Asian and Latin American countries where we have computed the decadial shrinkage rate. These are presented in Table 3. What stands out from this table is the overall similarity in the convergence rate of our European and Asian countries. Both have on average closed 12% of the output gap in each decade, though the time pattern of this closure is a bit different. Europe did most of it's closing relative early in the half-century, while Asia did it somewhat later. Moreover, during the periods of rapid closure these closure rates ranged between 0.83 and 0.89.

3. Accounting for Latin American Stagnation

What factors are responsible for Latin America's long-run stagnation? We address this question 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).

We begin by evaluating Latin American employment levels. Table 4 shows the fraction of the adult population employed in Latin America, and also in the United States, Europe, and Asia. The data show that employment is not the most important factor accounting for Latin America's stagnation. Latin America's employment rate is only about 25 percent lower than in the United States, Europe, and Asia.

These similar employment rate data suggest that labor productivity is the major source of Latin America's stagnation, and also is an important source of the development successes of the other countries. Figure 5 establishes this by showing labor productivity for Latin America, Europe, and Asia between 1950 and 2000. These productivity data are measured relative to U.S. productivity level. These data show that the primary reason behind the output catch-up in Europe and Asia is because labor productivity in these countries are catching up to the U.S. The figure also shows that Latin America's stagnation is due to their productivity stagnation. In particular, Latin American productivity was 33 percent of the U.S. in 1950, and was 32 percent of the U.S. in 1998. In contrast, European productivity rose from 39% of the U.S. level to 79% of the U.S. level in 1998, and Asian productivity rose from 15% of the U.S. level to 54% of the U.S. level over the same time period.

4. Decomposing Stagnant Latin Productivity

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 productivity is not catching up. If TFP is the dominant factor, then we should be formulating explanations of why production efficiency is so much lower in Latin America than in the U.S.. Alternatively, if low capital per worker is the dominant factor, then we should be formulating explanations of why capital formation is so much lower in Latin America than in the U.S.

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

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

Labor America's relative labor productivity gap is determined by their TFP gap between and their capital-labor ratio gap:

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

A. The Direct and Indirect Impact of TFP on Productivity

Before proceeding, it is important to recognize that TFP has both a direct and indirect effect on labor productivity. The direct effect is seen in equation (1). There is also an indirect

effect because TFP affects the capital-labor ratio:

$$\frac{Y_t}{L_t} = \eta A_t \left(\frac{K_t}{L_t} (A_t, \cdot) \right)^{\theta}, \tag{2}$$

The efficiency condition that governs capital accumulation in the neoclassical growth model shows the indirect effect. The stationary version of this equation is:

$$(1+n)(1+\gamma)\frac{u_{ct}}{u_{ct+1}} = \beta[\theta\eta A_{t+1}(K_{t+1}/L_{t+1})^{\theta-1} + 1 - \delta], \tag{3}$$

where γ is the growth rate of TFP, n is the population growth rate, u_c is the marginal utility of de-trended consumption, β is the household's discount factor, A is TFP, and δ is the depreciation rate of capital. Re-writing this equation yields

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

This shows that the capital-labor ratio is affected by the level of TFP, (this the indirect effect of TFP on labor productivity described above), and also 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 indirect effect of TFP.

The two bounds on this decomposition are that TFP accounts for none of the labor productivity gap, and at the other extreme, that TFP accounts for all of the gap. If TFP

accounts for none of the gap, then we should find that Latin TFP is about the same as U.S. TFP, and that the Latin capital labor ratio is only about 1/27 the size of the U.S. capital labor ratio, with all of the Latin capital per worker shortfall accounted for by non-TFP factors. Our estimate that the capital-labor ratio under this case would be 1/27 of the U.S. follows from the fact that Latin labor productivity is 1/3 of the U.S. level and the common assumption that $\theta = 1/3$.

At the other extreme is the case in which TFP accounts for all of the gap. In this case, we should find that Latin TFP should be about 1/2 of U.S. TFP and that the Latin capital-labor ratio should be around 1/3 of the U.S. level. This presumes that $\theta = 1/3$, that all other parameter values between the two countries are the same, and that the Latin economy is on its steady state growth path. We now are in a position to conduct the decomposition

B. TFP's Contribution is Big

The first step is to obtain capital stock measures. Unfortunately, we do not have capital stock data for all the countries. However, we do have investment data for all countries, and we use this data to infer the capital stock. Table 6 shows the ratio of investment to GDP for the U.S., 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 suggests that both economies have been near their respective steady state growth paths. This steady state assumption implies the following relationship between investment and the capital stock for both Latin America and the U.S.:

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

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

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

Given values for these parameters, we can infer Latin America's relative capital-output ratio, which in turn will be used to infer their relative capital-labor ratios.

It is likely that sum of these parameters are quite similar between Latin America and the U.S. To see this, recall that Latin output has been a nearly constant fraction of U.S. output for the last century. This suggests that Latin America has been on a lower steady state growth path than the U.S., but with the same long-run growth rate factor γ. Regarding the other two parameters $(\delta+n)$, Latin America has a higher population growth rate than the United States (1.7 percent per year compared to 1 percent per year in the United States),[5] but Latin America likely has a lower depreciation rate, as it is plausible that a relatively greater fraction of the U.S. capital stock is comprised of more rapidly depreciating equipment, such as information processing equipment. We will therefore assume that the sum of these three parameters are the same in Latin America and the U.S. This suggests the steady state capital-output ratios are also about the same:

$$\left(\frac{K}{Y}\right)^{Latin} \approx \left(\frac{K}{Y}\right)^{US}$$

This observation about the capital-output ratios, together with the fact that Latin output is about 1/4 of U.S. output and that Latin employment is about 3/4 of U.S. employment, implies that the Latin American capital-labor ratio is 1/3 of the U.S. level. Recall from our discussion above that this is also the value of the Latin capital-labor ratio when TFP accounts for *all* of the labor productivity gap. This finding suggests that TFP is the dominant factor driving Latin America's labor productivity gap.

The household's Euler equation provides independent evidence that TFP is the major factor that accounts for Latin America's labor productivity gap. To see this consider the steady state version of equation (3):

$$\frac{\left(\frac{K}{L}\right)^{Latin}}{\left(\frac{K}{L}\right)^{US}} = \frac{\left[\left(\frac{(1+\gamma)(1+n)+(1-\delta)\beta}{\theta\eta A\beta}\right)^{1/(\theta-1)}\right]^{Latin}}{\left[\left(\frac{(1+\gamma)(1+n)+(1-\delta)\beta}{\theta A\beta}\right)^{1/(\theta-1)}\right]^{US}} \tag{4}$$

This expression shows that any steady state difference in the relative Latin capital stock is determined by differences in the parameters $\gamma, n, \delta, \theta, \beta$, or A (TFP). Recall from above that differences in the parameters γ, n or δ are not sufficiently large to account for a significant fraction of the capital-labor ratio gap. Regarding θ, Gollin (2001) shows that income shares are quite similar across countries once uniform accounting procedures are used

to allocate entrepreneurial income. This suggests that differences in θ are probably small.

This leaves only differences in TFP (A) or differences in the household's rate of impatience (β) as the possible remaining factors. There are two reasons why differences in β are not the key factor. The first is that we are unaware of any estimates that this parameter differs substantially across these continents. The second is that large differences in β across these continents would imply that the rate of return to investment in Latin America would have been much higher than that in the United State over the last 50 years. We are unaware of any convincing evidence that this has been the case. We therefore conclude that the bulk of Latin America's labor productivity gap is accounted for by a large TFP gap. This conclusion is consistent with Hall and Jones' finding that at a single point in time, the Solow residual accounts for much of the difference between incomes across many countries throughout the world. We now analyze why Latin TFP has failed to catch up over the last 50 years.

5. Why is Latin American TFP Stagnant?

TFP is the efficiency which an economy uses their capital and labor services. This section evaluates some possible factors that might account for Latin America's TFP gap, including human capital, poverty traps, and barriers to competition.

A. Human Capital is not the Main Factor

Our analysis so far has measured labor services as employment, without any adjustment for differences in human capital between regions. This suggests the possibility that differences in measured TFP across countries may in part be due to differences in human capital. This view has been explored in other studies of cross-country productivity differences, such as Hall and Jones (2000), and Parente and Prescott().

If differences in human capital are the main factor behind the Latin America TFP gap, then we should observe Latin America's relative human capital stagnating, and human capital in other countries rapidly catching up to the U.S.

Table 7 shows this is not the case. The table shows changes in human capital for Latin America and the other regions using Bils and Klenow's (1998) human capital measures. The patterns in this table don't account for the very different patterns in output per worker across between Latin America and the other regions, because human capital in *all* the regions is catching up to the U.S. 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 for these three regions.

The Bils-Klenow data suggest that human capital is not the factor that distinguishes the development successes in the other regions from the development failures of Latin America. The fact that Latin America's relative output continues to decline, despite this large increase in human capital, indicates that some other factor is retarding Latin TFP and output.

This conclusion about human capital is robust to the use of alternative measures of human capital, such as 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. 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 were development successes, and why Latin America is a development failure.

Country-level schooling attainment data also supports this view, as some Latin 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. This compares favorably to 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 higher years of schooling, income in these Latin countries is much lower than income in these other countries. Output per adult (relative to the U.S.) in Argentinian, Chile and Uruguay was 29%, 36% and 27%, respectively, in 2001, while relative per capita income in Portugal, Spain and Singapore was 51%, 56% and 75% respectively.

These data suggest that human capital is not the dominant factor driving Latin America's productivity failure. Our view that there is an alternative factor retarding Latin American development is similar to broader conclusions about the role of human capital in the development process reached by a number of other authors, including Easterly, Parente and Prescott, Hall and Jones, Hendricks, and Klenow and Rodrigues-Clare. We consider this other factor to be inefficient production.

B. A Poverty Trap is not the Main Factor

One potential explanation of inefficient production in Latin America is that a poverty trap precludes them from adopting the newest technologies or from making efficiency enhancing investments. This is unlikely, because many of the development successes in both Europe

and Asia started at around the same relative income levels as Latin America. Specifically, many of the Latin American countries had output around 20 percent of the U.S. level in 1950. In Europe, Spain, Portugal, and Greece also had income levels between 20 and 22 percent of the U.S. in 1950, but increased to around 50 percent of the U.S. by 2001. In Asia, Hong Kong, Japan and Singapore all started out at around 20% of the U.S. level in 1950, and all increased to around 75 percent of the U.S. level by 2001. The fact that all these other countries were equally poor as Latin America in 1950, but whom all have had growth miracles in the last 50 years, casts doubt on simple poverty trap explanations for Latin America's development failure. We therefore conclude that some other factor is retarding Latin American efficiency.

C. Barriers to Competition: A Potentially Important Factor

We will argue that barriers to competition are at least part of the reason why Latin American producers are systematically and persistently less efficient than North American, European and Asian producers. By competition, we mean low entry costs and no collusion (price taking behavior), so that competition drives the price of output down to the marginal cost of the most efficient producer. Since competition is the central factor driving organizations to produce efficiently, Latin America's failure to achieve the same efficiency level as these other countries suggests that there are more competitive barriers in Latin America than in these other countries.

We now examine the link between competition and productivity, with a focus on government policies that restrict competition. We focus on the government 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 divide these barriers up into these types for two reasons. First, because international barriers are key in that, if international barriers are low, then the impact of the domestic barriers is likely to be greatly reduced. (See Holmes and Schmitz (.).) The reason is because without international barriers, the domestic producers, with the exception of nontraded goods, are simply part of the competitive international marketplace. Second, the barriers to international competition tend to come in relatively straightforward monolithic policies, such as tariffs and quotas which directly limit the extent of this form of competition. In contrast, the domestic barrier to competition is typically built upon a variety of interacting policies. These typically include regulation that impacts on start-up costs, poorly functioning and highly politicized financial markets, and labor regulations that make it hard for low cost producers to gain the benefits of their cost advantages.

We will present evidence that shows that Latin America has constructed many international and domestic barriers that have closed off Latin America from competition, both internally and externally. We will then present evidence on the size of international trade and output that shows Latin America has been much less open than any of the development success countries. We next present data from Latin America that shows there is a systematic relationship between the level of competition and the level of productivity. Specifically, we will present microeconomc data in which policies that reduce competition in major Latin industries are associated with large productivity and output declines, and that policies that increase competition in major industries are associated with large productivity and output

increases.

Latin America's Protectionist Roots

Latin America has a long history of putting in place international competitive barriers to protect domestic industries. These international barriers date back to at least the late 1800s (see Haber (), and Clemens and Williamson ()). Latin America has long used quotas, multiple exchange rate systems, and in particular, high tariffs, to protect their domestic producer.

We now present historical data on these distortions that create competitive barriers. Before we proceed, it is important to recognize that measuring the effective level of competitive barriers is difficult. One reason is because barrier measures are typically based on a single distortion, whereas the competitive impact of a barrier may be the result of the interaction of a variety of barriers.[6] A second reason is because the barrier measures that we have are not ideal.[7]

Clemens and Williamson show that Latin 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 1870-1913, 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 1950-80 European output per person gained 30 percentage points on the U.S., while

Latin America gained only two percentage points. Table 8, reproduced from Alan Taylor (), shows that Latin American tariffs were systematically and substantially higher than 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 nondurables, semi-manufactured 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 5 of the 6 Latin countries ranges from 68 percent to 172 percent. Protection rates are particularly high on consumer goods, including rates of 176% in Argentina, 260% in Brazil, 328% in Chile, 247% in Colombia, and 114% 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.

Latin American countries also has made significant use of quotas during the period in which they stagnated, but during which Europe and Asia gained 30 percentage points on the U.S. Haber (p.50) reports that the number of imported goods subject to quotas rose from 28% in 1956 to 74% by 1974.

Standard neoclassical theory predicts that Latin America's high protection levels should have closed off Latin America to competition and international trade. We will next

show that this is indeed the case, and we will also show that our development success countries in Europe and Asia tended to be much more open than Latin America.

Latin America is Not as Open as the Successful Countries

We now compare openness in Latin America to Europe and Asia. We follow standard practice and define openness as the trade share, which is the sum of imports and exports divided by GDP. Following Eaton and Kortum, and Lucas, 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 6 -9 shows 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 development

failures.

We use the relationship between openness and development further by assessing whether there is a statistical relationship between the regression residual from the GDP-trade share regression and how fast countries are closing their gap relative to the U.S. That is, we will test whether there is any systematic relationship between countries that are more open relative to the regression line (those with positive ε_{it}) and how fast countries are closing their gap relative to the U.S.

To do this, we first calculate the mean catch-up rate for the successful countries in our group, which are the European and Asian countries. We find that both set of countries are catching up at about the same rate. That is, the income gap between the average success country and the United States is falling at 13 percent per decade, where the gap is given by:

$$g_{it} = \frac{y_{US,t} - y_{it}}{y_{US,t}}.$$

This implies that the evolution of the income gap in any individual success country is given by the average 13 percent closure rate and a country specific component, which we denote as u_{it} :

$$g_{it} = .87 * g_{it-10} + u_{it}$$

We next calculate the correlation between u_{it} and the ε_{it}. Table 9 shows the correlations for each decade from the 1960s through the 1990s. The correlations are negative for each

decade, which means that the most successful countries - those with negative u_{it} - also have relatively high trade shares - those with positive ε_{it}.

Latin America's Domestic Competitive Barriers

As we noted earlier, there are a variety of aspects to domestic barriers to competition. In what follows, we will show that Latin American is systematically more discouraging of competition with respect to all of these different types of barriers. Moreover, since as we noted with respect to domestic and international barriers, the different barriers to competition are probably complementary in terms of their overall effect on competition, this leads us to conclude that the overall level of domestic barriers to competition is probably quite high in Latin America.

Entry costs can be an important competitive barrier, as high entry costs, ceteris parabus, 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 cost by summing the individual costs of all the requirements for establishing a "representative" business in the formal sector, including the opportunity cost of time and the direct pecuniary cost. The authors keep track of the number of working days required to complete the procedures and the out-of-pocket costs to complete the procedures (e.g., the costs of filing fees, of notaries, etc.).

Table 10 shows these entry costs for Europe, Asia, and Latin America. The costs include the number of days required, the pecuniary costs of the procedures as a fraction of per capita income, and the total is the sum of the pecuniary cost and the time cost valued at per capital income. The estimates show that the U.S. has the lowest entry costs, and

Latin America has the highest entry costs. In particular, entering the average Latin industry requires 60 days, compared to just 4 days in the United States. The financial cost of entry in Latin America is also much higher in Latin America; it is equal to 56 percent of per capita GDP in Latin America, compared to .5 percent of per capita GDP in the United States, and 12-18 percent in Asia and Europe. Summing the financial entry cost and the opportunity cost of entrepreneurial time, 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 function capital markers which impeded the capital accumulation by 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. The extent of government ownership of banks has often been seen as an important negative indicator of the extent to which bank lending is being directed to the more productive enterprises. Table 11 which show that Latin America's government ownership share, while falling, is still substantially higher than that in our European countries, and much higher than that in our Asian countries or in the United States (where this share is zero).

Latin America has also put in significant impediments to firms acquiring the efficient level of composition of their workforce. In summarizing the results of a collection of studies on Latin American and Caribbean (LAC) labor markets, Heckman and Pages 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 rather than social security provisions. Heckman and Pages conclude that the higher level of LAC job

security costs "likely impair productivity and adaptation to new technology ..." (p. 38) In Table 12 we show one key aspect of the higher Latin American job security costs. That table documents that Latin American imposes much higher dismissal costs (measured in terms of months of the workers wage) than in Europe or Asia, or the U.S. 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 have documented the large extent of this worker reallocation in the United States. Hopenhayn and Rogerson have shown theoretically that making worker reallocation costly can have significant effects.

(To be completed)

6. The Impact of Latin Policy Changes on Productivity

We now present microeconomic evidence that shows how productivity and output change when there is a policy change that affects competition. Some of these cases will show what happens when these types of policies are adopted. We will see that the adoption of these anti-competitive policies are associated with large productivity and output decreases. The other cases will show what happens when anti-competitive policies are eliminated. We will see that the elimination of these policies are associated with large productivity and output increases.

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

We first present 2 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 6 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.

A. Eliminating Competition in the Venezuelan Oil Industry

Here we consider a case where nationalization eliminated foreign competition and reduced productivity substantially in a major sector. Our discussions draws on recent work by Restuccia and Schmitz (2004). Before World War II, Venezuela had substantial foreign investment in their 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 defacto 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 10 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 begin 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 a large productivity and output loss. Restuccia and Schmitz argue that the bulk of this productivity loss was due to the loss of international expertise.

B. Eliminating Competition in the Venezuelan Iron Industry

Venezuela followed a similar nationalization policy with their iron ore industry, and the results were very similar. Figure 11 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 rise 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 until 1974. Both output and productivity fall 50 percent between 1974, which is just before the nationalization, and 1976, which is the first year after nationalization. By 1983, output is 62 percent below its 1974 peak level, and productivity is 58 percent below its peak level. As in the case of oil, output and productivity recover modestly, but remain well below their pre-nationalization peak. 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. Reversing Nationalization 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 their 1971 nationalization of the industry, reduced both entry and incentive impediments.

Copper is a major industry in Chile, accounting for about 1/3 of total 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 (see Garcia, 2001). This policy largely continued for nearly 20 years, with Codelco continuing to account for about 75-85 percent of production. An important outcome of the nationalization is that there was very little foreign investment in the industry following the policy change, and that consequently Codelco faced very little foreign competition[8].

Following the transition from the Pinochet government to a civilian government, significant reforms were introduced that provided protection to foreign producers and investors, and this led to significant entry of foreign producers.

Figures 12 and 13 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 13 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 et al (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 14 shows that Chile's rapid post-reform productivity growth significantly reduced the labor productivity gap between Chile and the U.S. 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 is roughly unchanged for 5 years before the reforms, and for 5 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 either mining better deposits, (2) using better technology (that was available before 1990) and/or (3) had better expertise. The important point is that all of these 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 1990-97, productivity rose by 37, 70, 70 and 84 percent at these mines. (Tilton 2002. see figure 4, Garcia). 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 they 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 (), and Botelho et al ().

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[9]. 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 tubes, and other standard parts. The prices of these Brazilian components were 2 to 5 times higher than international prices. The policies also restricted entry into the component supply industries. (Luzio and Greenstein 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 1990-92, 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,[10] 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 1/3 of their productivity gap, however, between 1990-92. This is striking, given the very rapid productivity advancements occuring in the U.S.

The policy reform also is associated with a large increase in domestic production. From 1992-98, output increased by about 100 percent, compared to just a 33 percent increase from 1985-92[11]. (See Botelho, et al. 1999, Figure 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 competition, many of the Brazilian firms were able to succesfully 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

Here we discuss the privatization of the Brazilian iron ore industry. Our discussion draw on the work of Schmitz and Teixeira (2004). We will show that the privatization of this industry removed both entry and incentive impediments.

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 comprised 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, unions pushed for work rules that 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 two different channels. One channel is excessive employment; the restrictive work rules created higher employment than otherwise would be, with some workers remaining idle a significant fraction of the time. The second channel is through the inefficient allocation of tasks; they argue that total output

would have been higher with fewer workers and a re-allocation of tasks across workers.

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 change in the allocation of tasks. The privatization of CVRD was completed in 1997 when it was purchased by local entrepreneurs.

Figure 15, 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 16 decomposes overall industry productivity into the productivity at CVRD's Northern and Southern operations and the productivity of the private producers[12]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

at both the newly privatized firms, and at the firms that had to compete with the privatized firms.

F. Brazilian oil (illustrates B)

To be added

G. The Large Scale Privatization of Mexican SOEs

We now explore larger scale Latin privatizations. We begin with Mexico's privatization of most of their SOES, which began in 1983. Our discussion draws on work by Laporta et al (1999)/ We will present data that shows 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 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 et al (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 afterwards, 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 et al 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.

H. The Large Scale Privatization of Argentinian SOEs

Argentina also privatized many of their SOEs in the 1990s. Galiani, Gertler, Schargrodsky and Sturzenegger (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, they 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, Gertler, Schargrodsky and Sturzenegger 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 are not as large as in the more competitive Mexican cases, but are still significant. They find a median increase in labor productivity of 46 percent. They also found unit costs declined 10 percent, and production rose 25 percent.

I. Competition and Productivity: It Works in North America Too

In Brazil, we saw that privatization of the iron ore industry led to a significant change in work rules and a significant increase in employment and productivity. We now show a very similar pattern in the U.S. and Canadian iron ore industries. Our discussion draws on work by Galdon-Sanchez and Schmitz (), and Schmitz ().

High transportation costs of iron ore had provided protection to local iron ore suppliers in the midwestern United States and Canada. Most U.S. and Canadian iron-ore is produced

very close to one of the Great Lakes, and it is then shipped very short distances over water to the steel mills located near Chicago, Cleveland and other locations around the lower rim of the Great Lakes. These producers were the sole suppliers of iron-ore to this large steel market up through the 1970s. The only potential foreign threat was Brazil, but the high transportation cost of the ore raised the net price of Brazilian ore, which we will denote as $(1+\tau)p^B$, where τ is the per-unit transportation cost, above the local price, p^L.

However, the demand for Brazilian ore declined significantly in the 1980s, reflecting a large decline in steel production in Europe. This change led to a large fall in the price of Brazilian ore, and made it profitable for Brazil to ship ore to the steel producers around the Great Lakes. Note that this exogenous decline in the price of Brazilian ore is akin to an exogenous tariff reduction, and thus increased foreign competition in the Great Lakes region.

Figure 17 shows output and productivity in the U.S. iron ore industry between x and x. The figure shows a large decrease in production between 1979-82, reflecting a large drop in U.S. steel production and shipments of iron ore from Brazil to Chicago. To get some idea of the seriousness of the situation, when investors in Minnesota in the late 1980s were considering reopening a mine that had closed a few years earlier, they received a guarantee from the United Steelworkers of America that it would not unionize the mine. Most Minnesotans would have found it inconceivable in the late 1970s that there would be a non-union mine on the "Iron Range" a decade later.

The figure also shows that U.S. productivity surged during the 1980s after changing very little in the prior decade. This increase was not the result of any significant technological development that occurred in the 1980s; mine productivity in other major iron ore producing countries was roughly unchanged during this decade. Nor was higher productivity the result

of shutting down low productivity mines; Schmitz () shows that productivity in individual mines also rose substantially during the decade.

Schmitz shows that higher productivity was primarily the result of the type of work rule changes that also increased productivity in the Brazilian iron ore industry. As in Brazil, the U.S. union had pushed for narrow job classifications that restricted the number of tasks that a worker could perform. As Brazil began exporting steel to the Great Lakes area and the output of local ore decreased, it became clear to both firms and the union that the industry could not survive without cutting costs. The union agreed to removing the restrictions on work rules, just as the Brazilian union agreed to lift work rule restrictions during the privatization of CVRD. Following this work rule change, productivity roughly doubled.

Finally, note that while this episode was akin to a fall in tariffs, and helps us understand the consequences of falling tariffs, it was also not exactly a fall in tariffs. That is, the U.S. and Canadian iron-ore industries were in a "protected" position as a result of their location (and the location of much of the U.S. steel industry). This was a consequence of how history had developed, and not a consequence of government policy (as in all the Latin American episodes we present).

7. Conclusion

Almost all market economies that had income levels about the same as Latin America's in 1950 are catching up to the U.S. This includes the market economies in Europe and many of the market economies in Asia. The primary reason why Latin America has failed to catch up is because their TFP has failed to catch up. Our analysis suggests competitive barriers are a promising route for understanding Latin America's large and persistent productivity

gap. This is because Latin America systematically sets up more impediments to competition than the United States, Europe, or Asia, and these impediments are associated with low productivity. Specifically we found that Latin policy changes that eliminated competition are associated with large and permanent declines in productivity and output, and that Latin policy changes that increased competition are associated with large increases in productivity and output.

Table 1. GDP per Capital Relative to the U.S.

(Regional Averages for Selected Countries)[13]

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 2. Latin American

GDP per Capital Relative to the U.S.[14]

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
Ecuador	-	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
AVG.	0.29	0.28	0.31	0.22

Table 3. Decadial Per Capital Output Gap

Shrinkage Rates by Region and Time Period

Periods	Europe	Asia	Latin America
1959-50	0.87	0.98	0.98
1969-60	0.89	0.91	1.14
1979-70	0.89	0.87	1.04
1989-80	1.08	0.83	1.12
1999-90	0.97	0.93	1.00
2001-1950	0.88	0.88	1.04

Table 4. Participation 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. Labor Productivity Relative to the U.S. by Region

(Regional Averages for Selected Countries)

Year	Europe	Asia	Latin America
1950	0.39	0.15	0.33
1973	0.66	0.41	0.39
1998	0.79	0.54	0.32

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 - US = 100)

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

Table 8 . Nominal Rates of Protection in 1960

Latin America and the EEC

Country	Non-dur's	Dur's	Semi-Mfg	Raw Matls	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 . Correlation between openness

and catch-up for Asia and Europe

Decade	Correlation
1960s	-0.25
1970s	-0.38
1980s	-0.46
1990s	-0.48

Table 10. Business Start-up Costs: Time and Financial Costs

Financial and Total Costs are fraction of per-capita GDP

Regions	USA	Europe	Asia	Latin America
Time (days)	4	44	30	60
Financial	.5	18	12	56
Total	1.7	36	24	80

Table 11. Government Ownership Share of the Top 10 Banks

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

Table 12. Mandated Severance Pay

(in terms of months of wages)

Regions	USA	Europe	Asia	Latin America
Indemnity Pay	0	1.1	1.5	2.7

Figure 1: Regional GDP Per Capita Relative to US

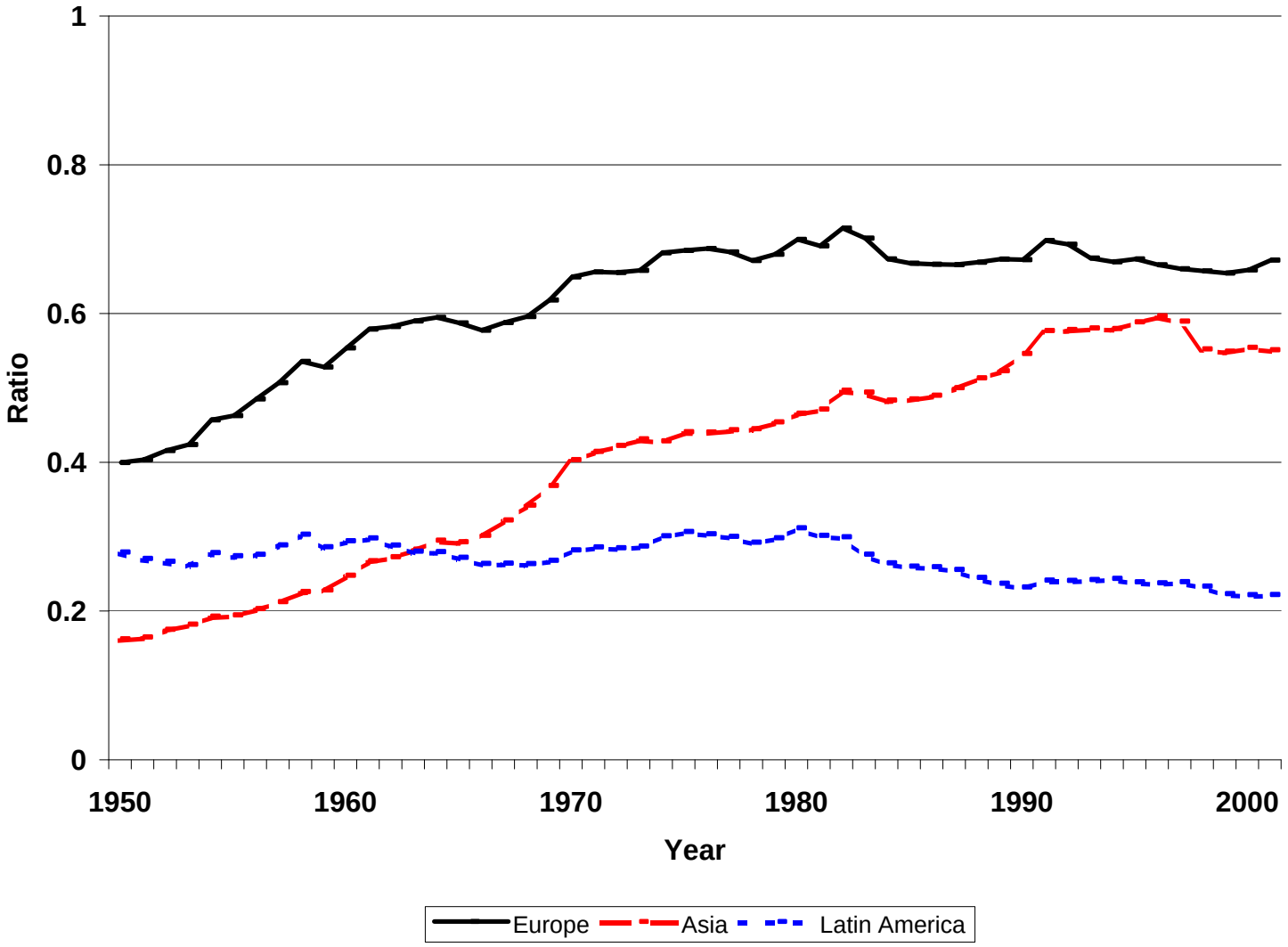

Figure 2: European GDP Per Capita Relative to US

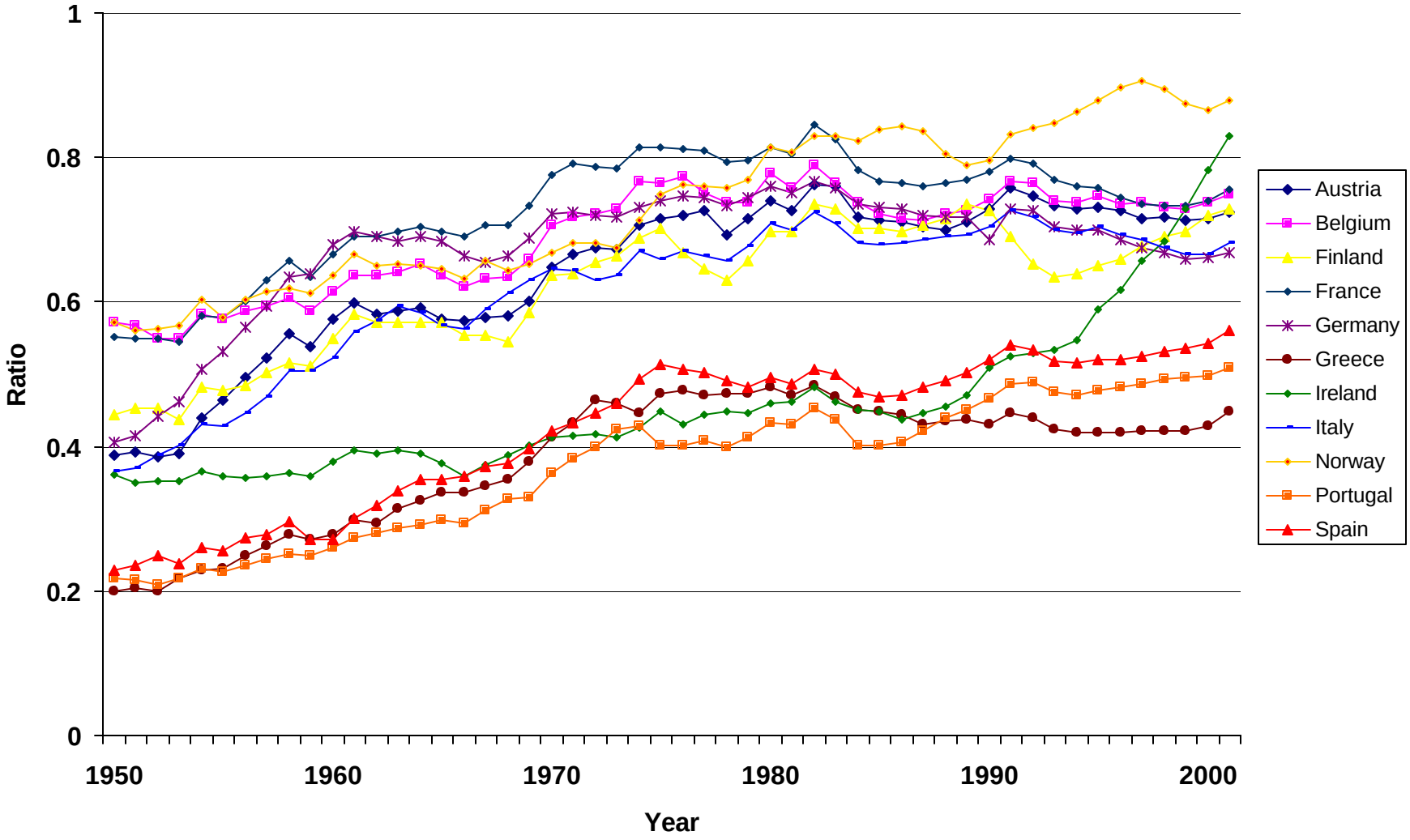

Figure 3: Asian GDP Per Capita Relative to US

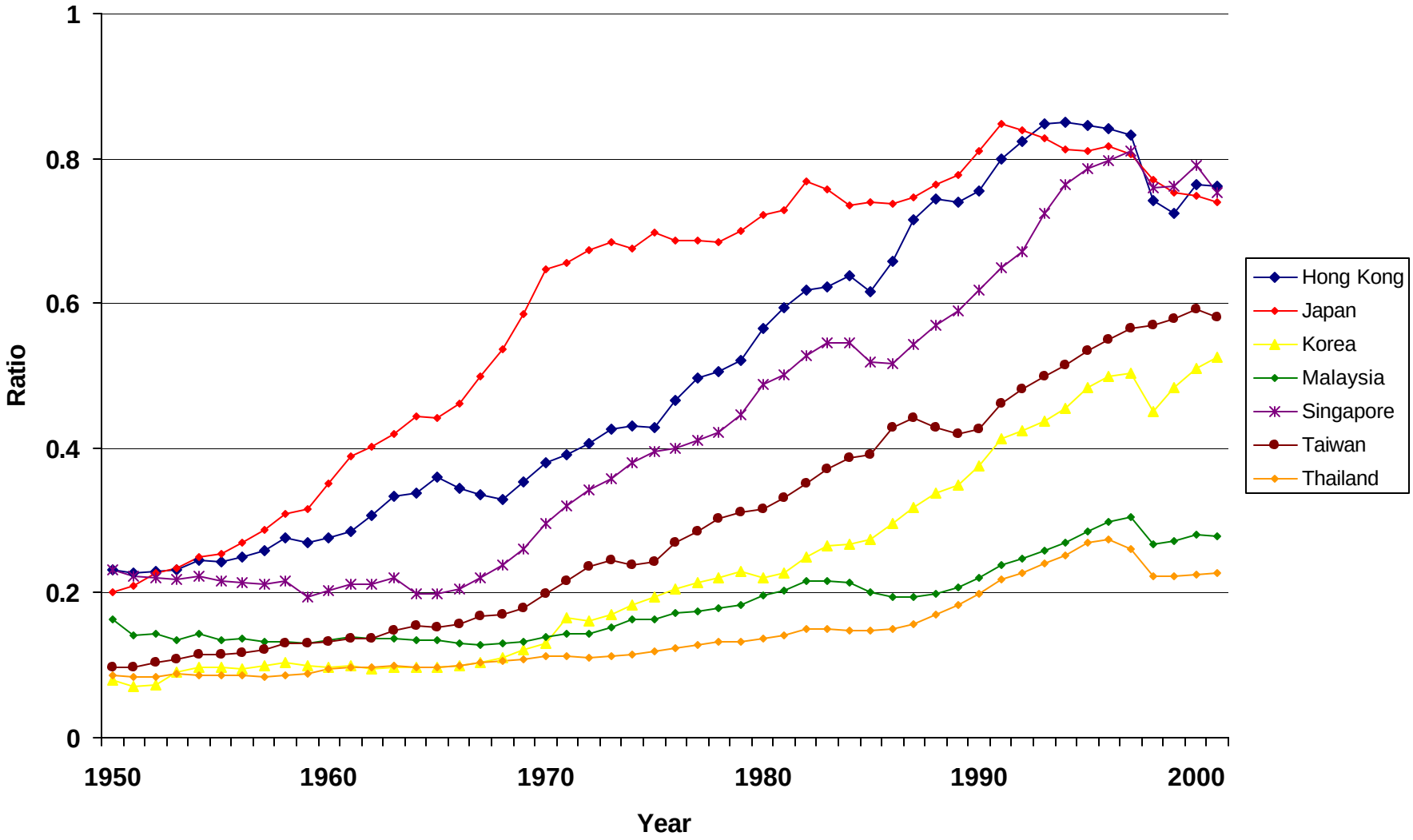

Figure 4: Latin American GDP Per Capita Relative to US

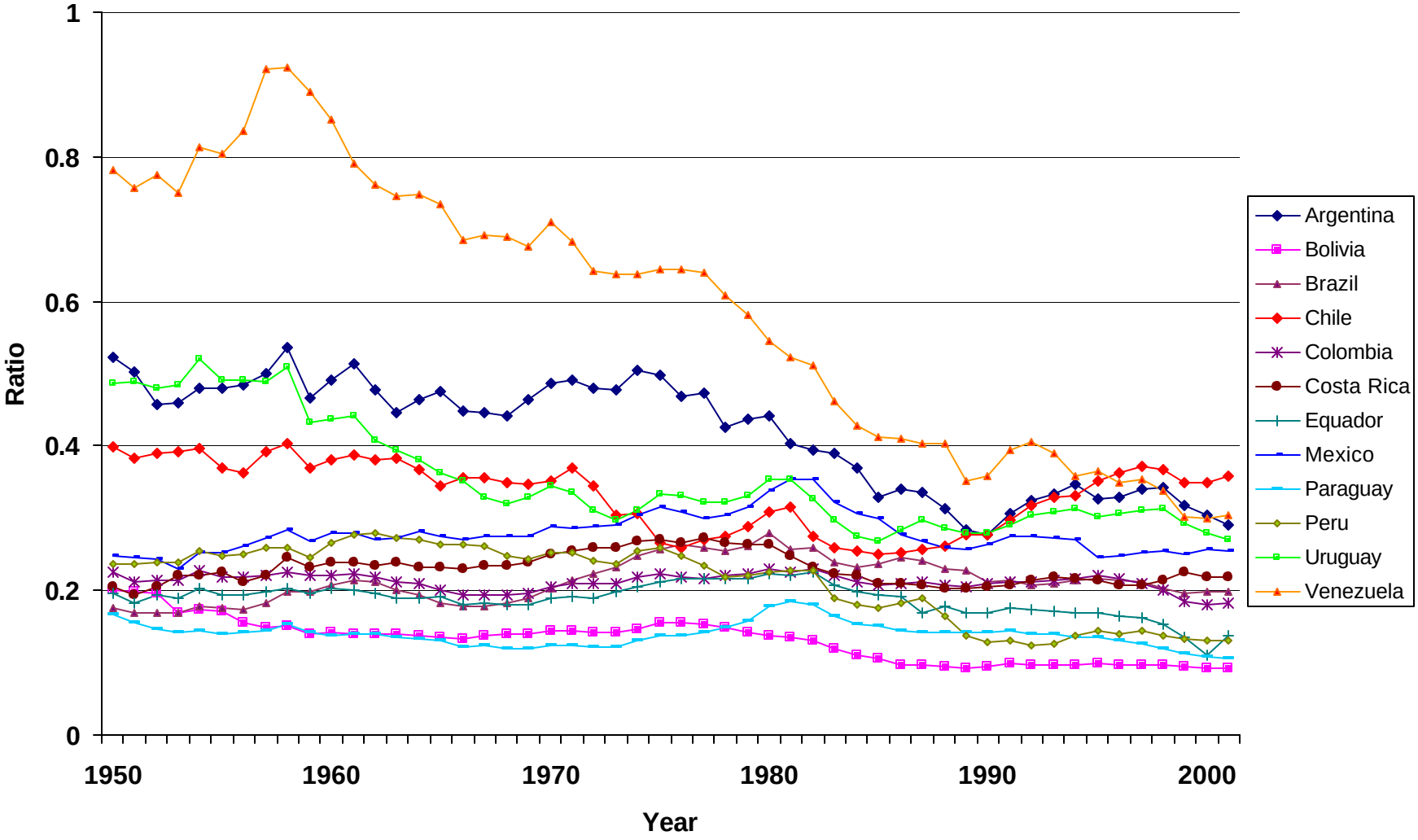

Figure 5: Labor Productivity Relative to US by Region

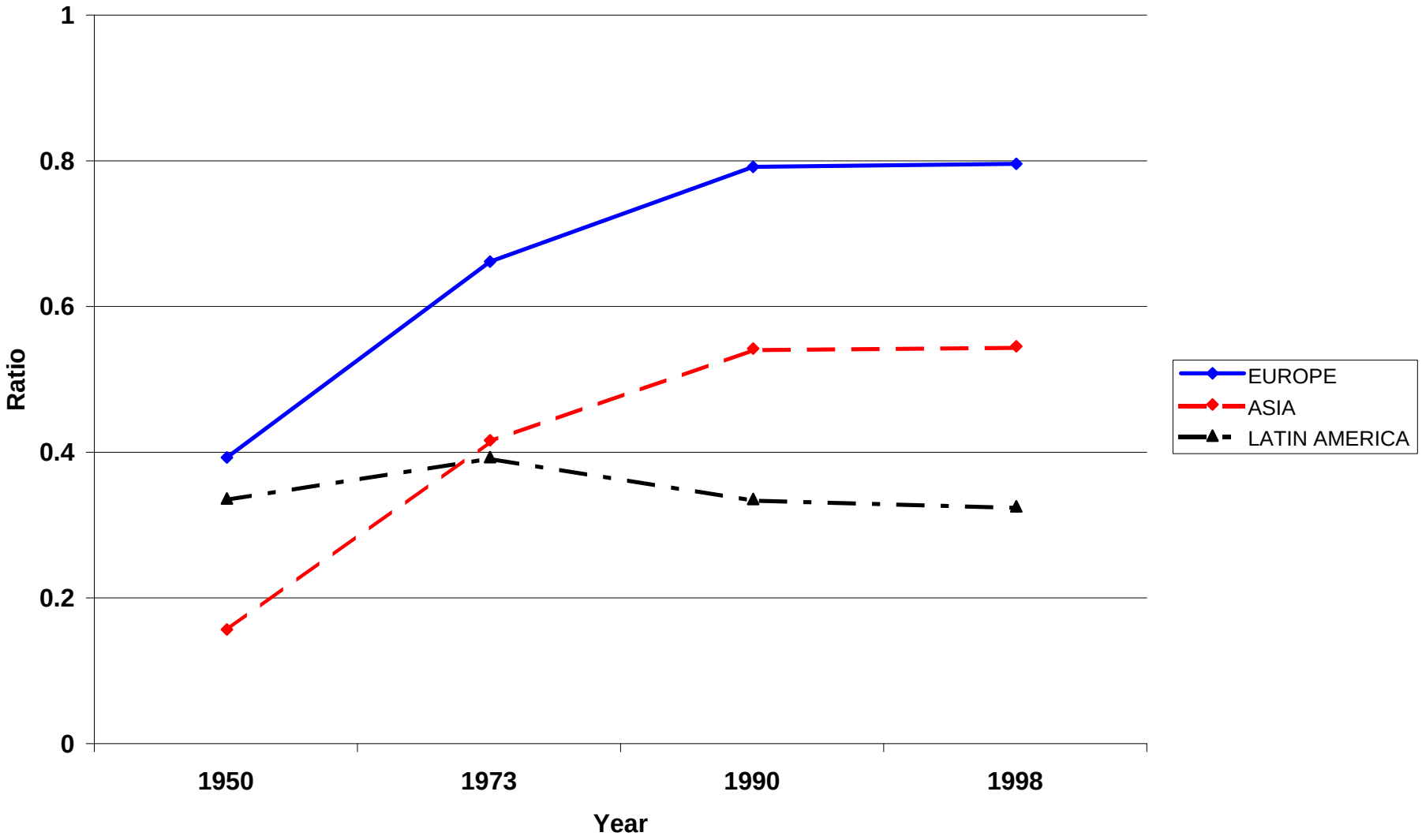

Figure 6. Trade Share and GDP (60s Average)

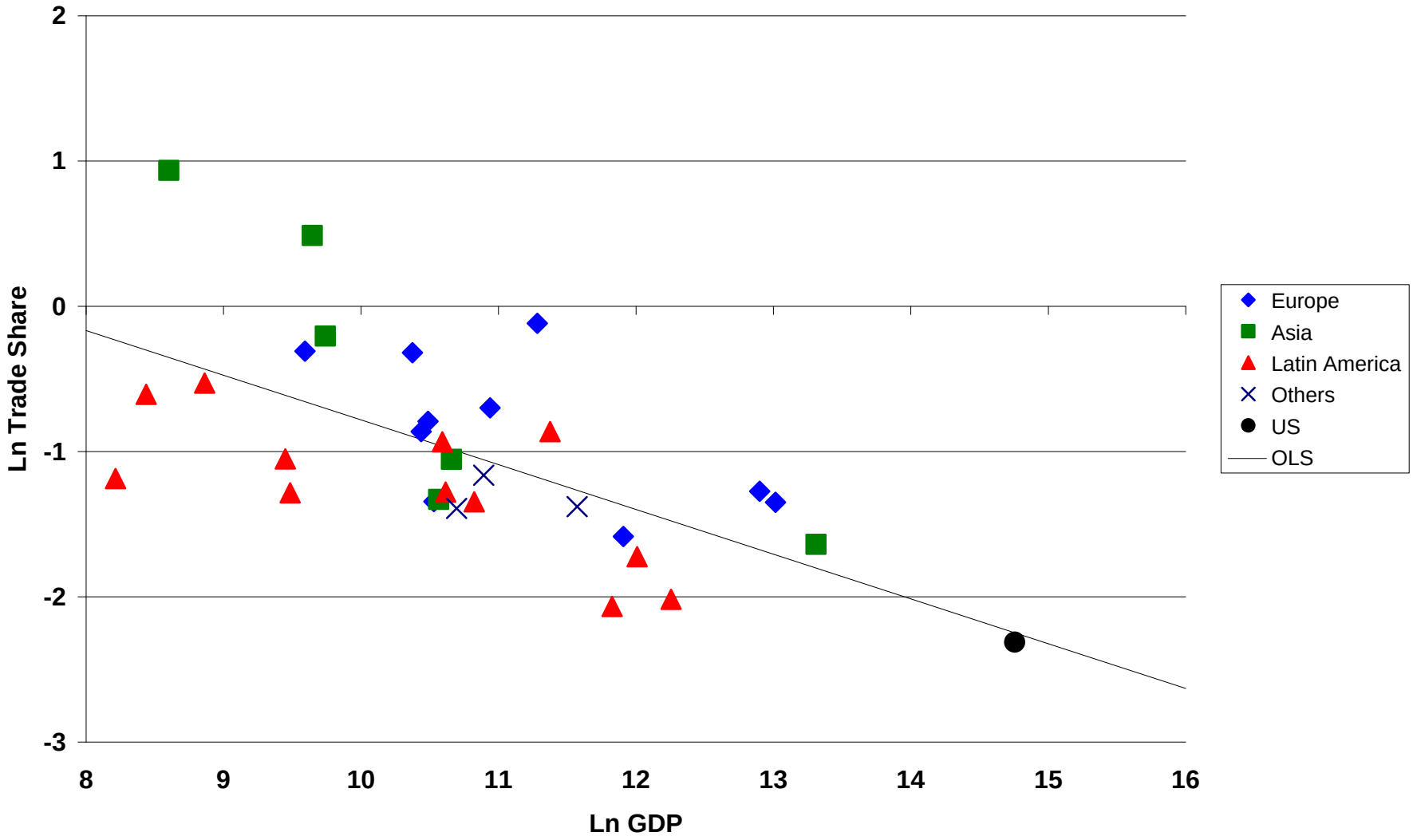

Figure 7. Trade Share and GDP (70s Average)

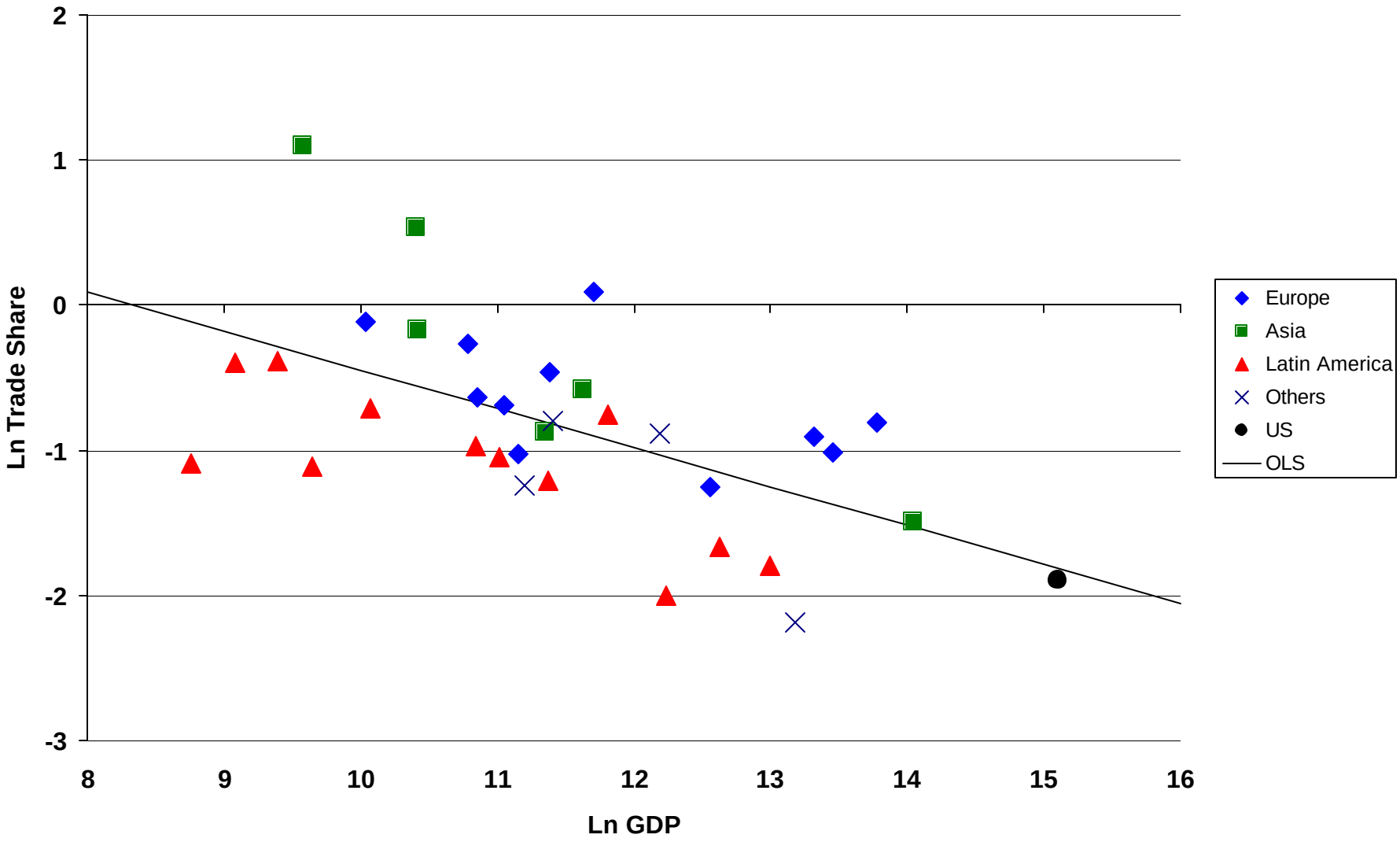

Figure 8. Trade Share and GDP (80s Average)

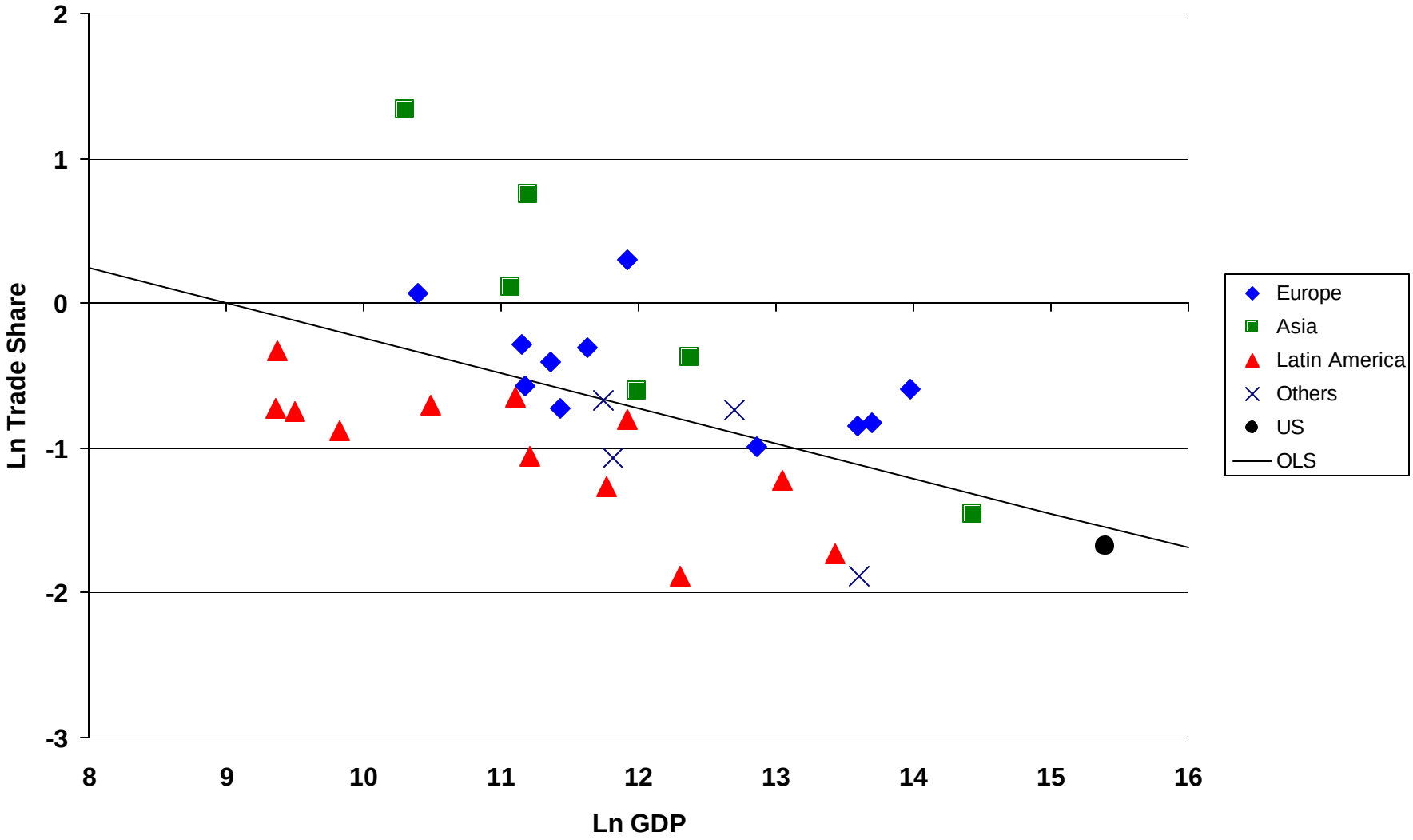

Figure 9. Trade Share and GDP (90s Average)

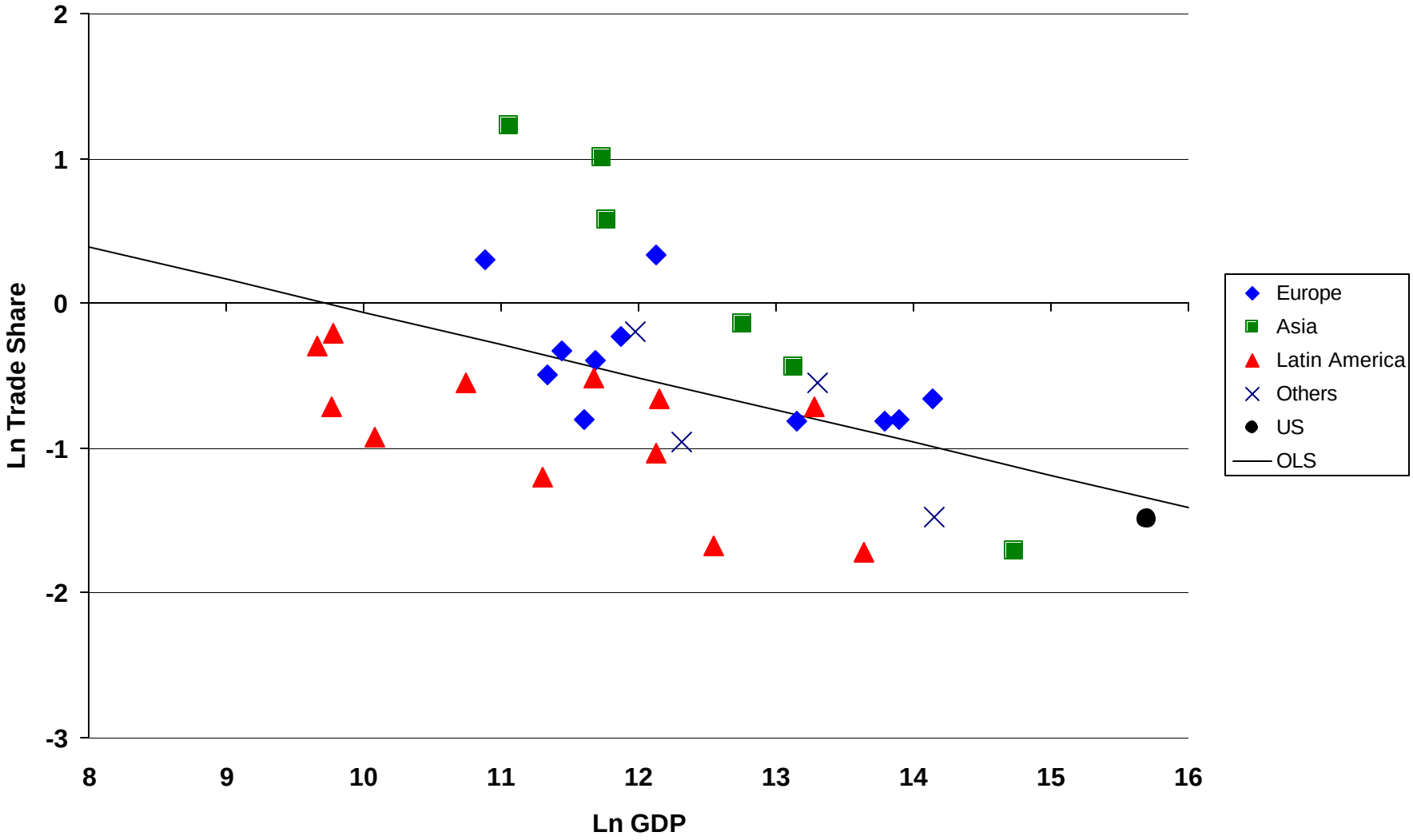

Figure 10. Output and Labor Productivity of the Petroleum Industry in Venezuela (1950-1997)

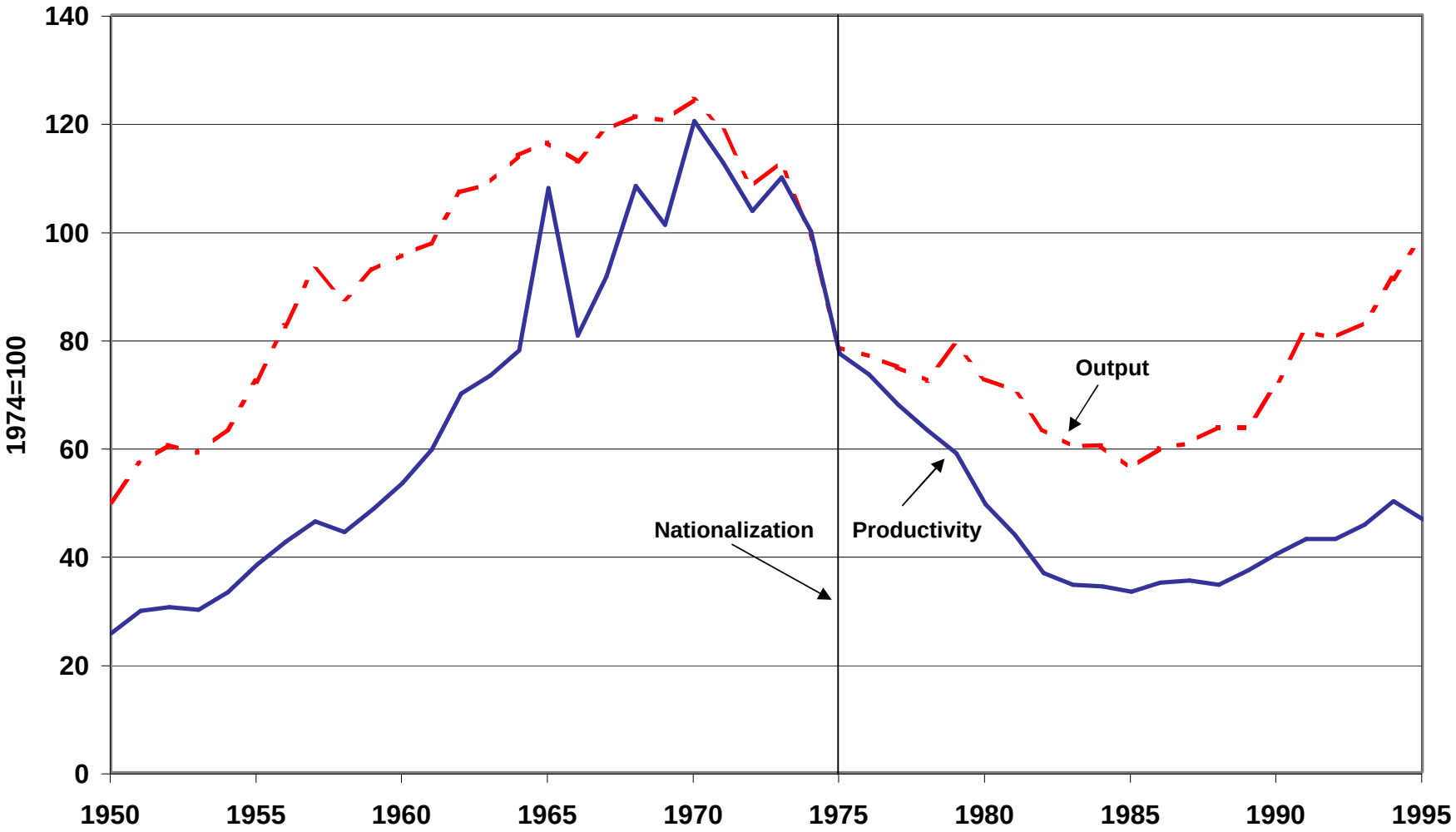

Figure 11. Output and Labor Productivity of the Iron-Ore Industry in Venezuela (1953-1996)

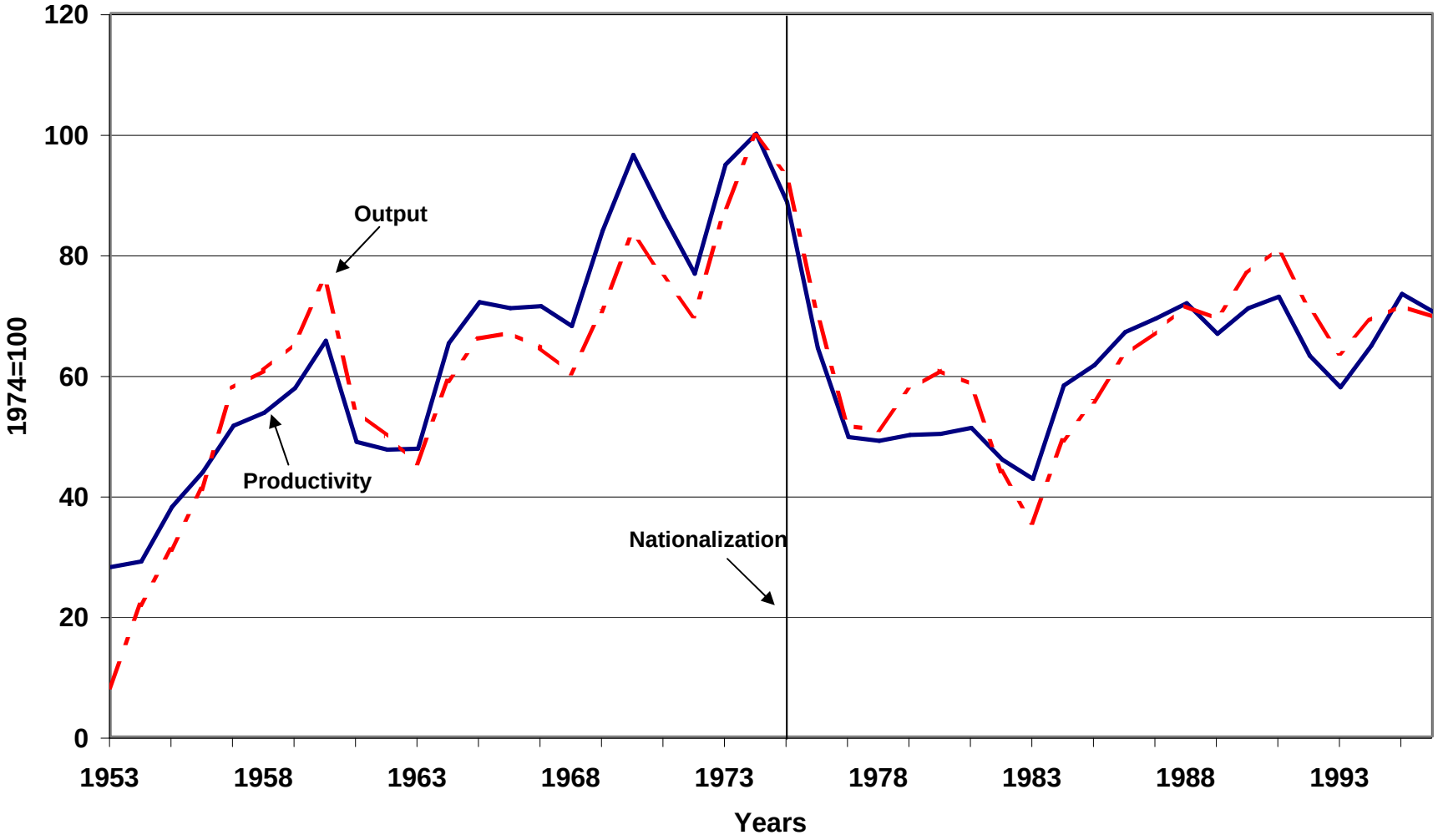

Figure 12. Copper Production in Chile and Codelco's (State-Firm) Share of Production

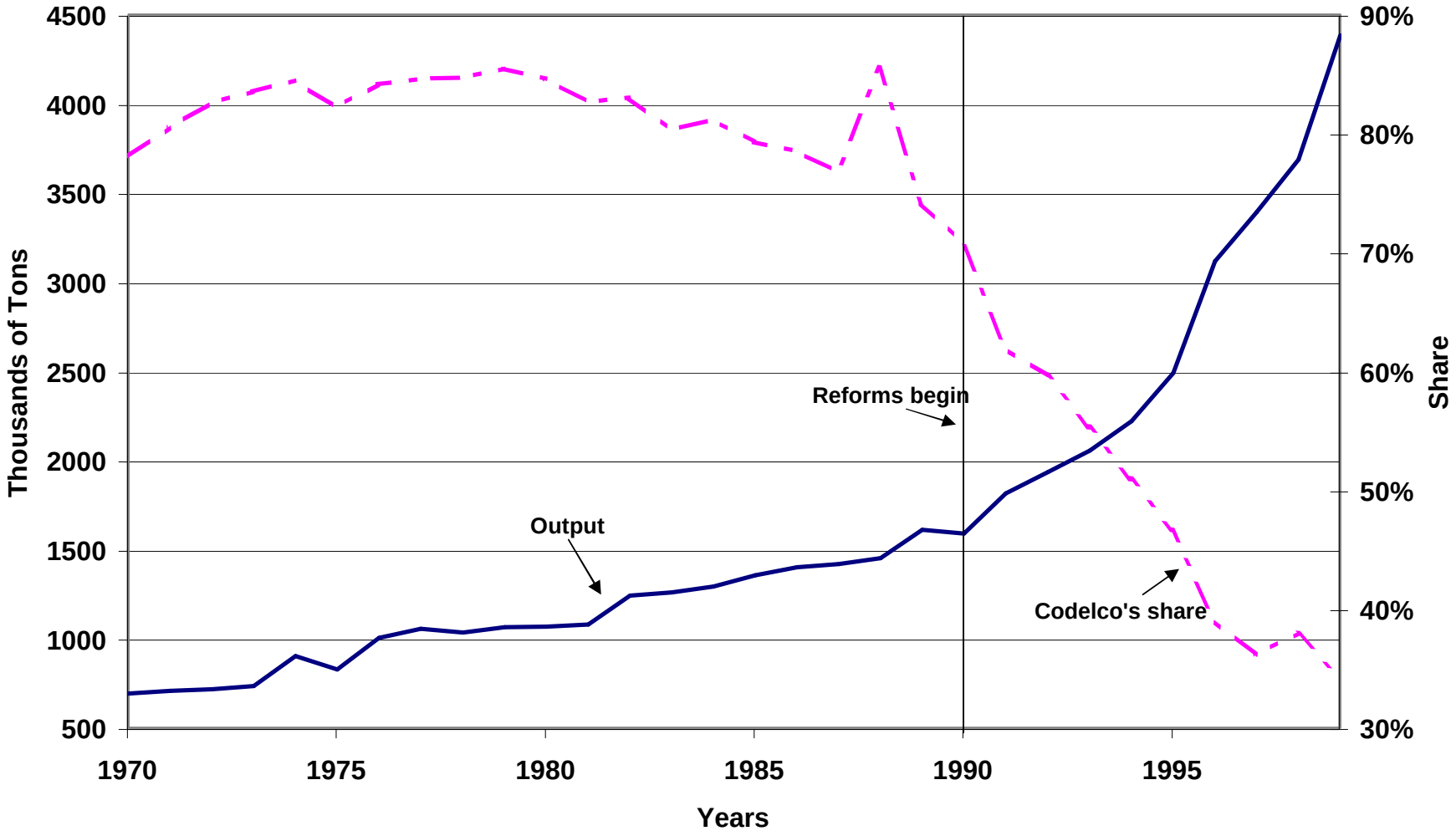

Figure 13. Labor Productivity and Output in the Chilean Copper Industry, 1970-2001

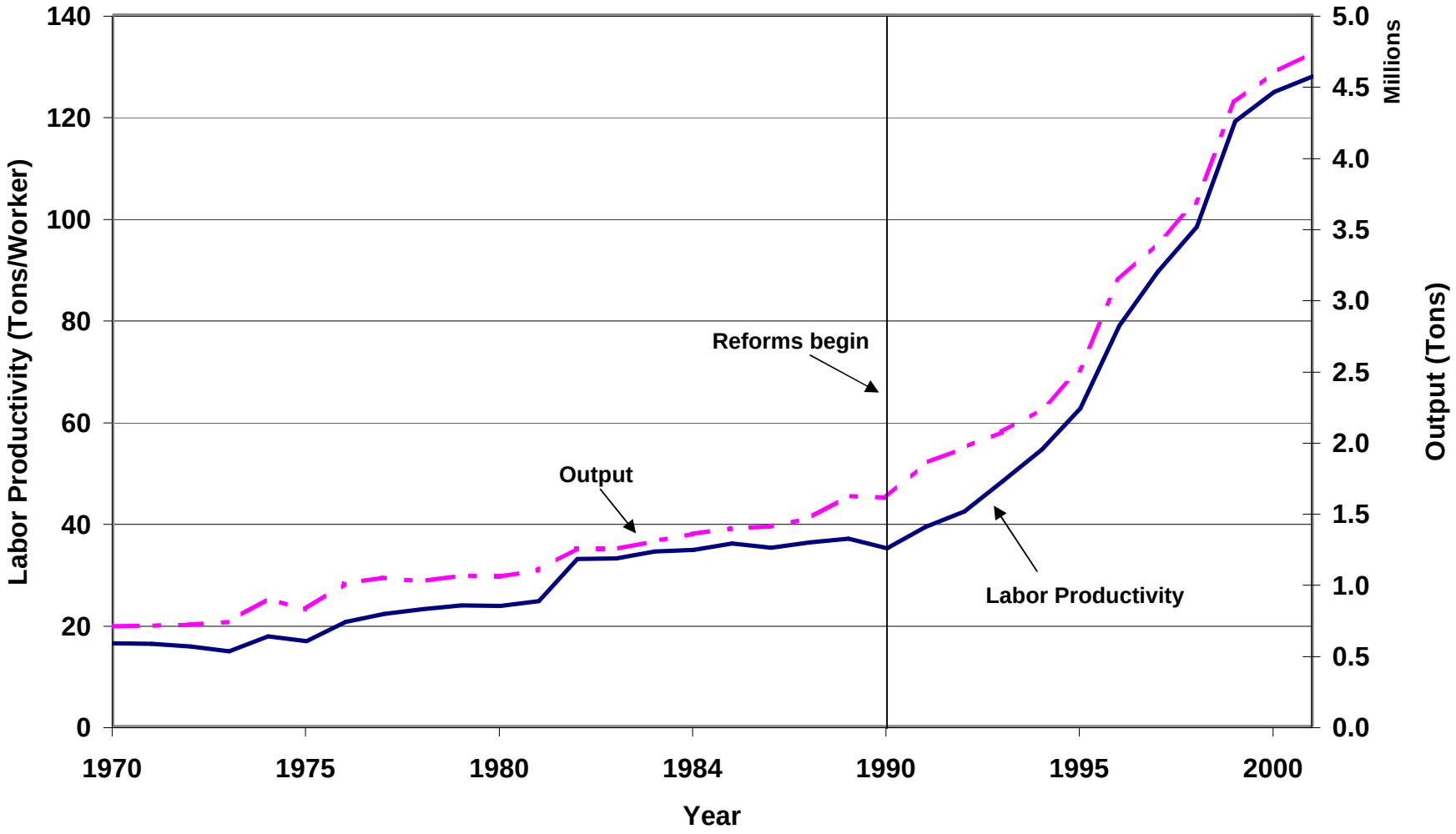

Figure 14. Labor Productivity in the U.S. and Chilean Copper Industry, 1975-2001

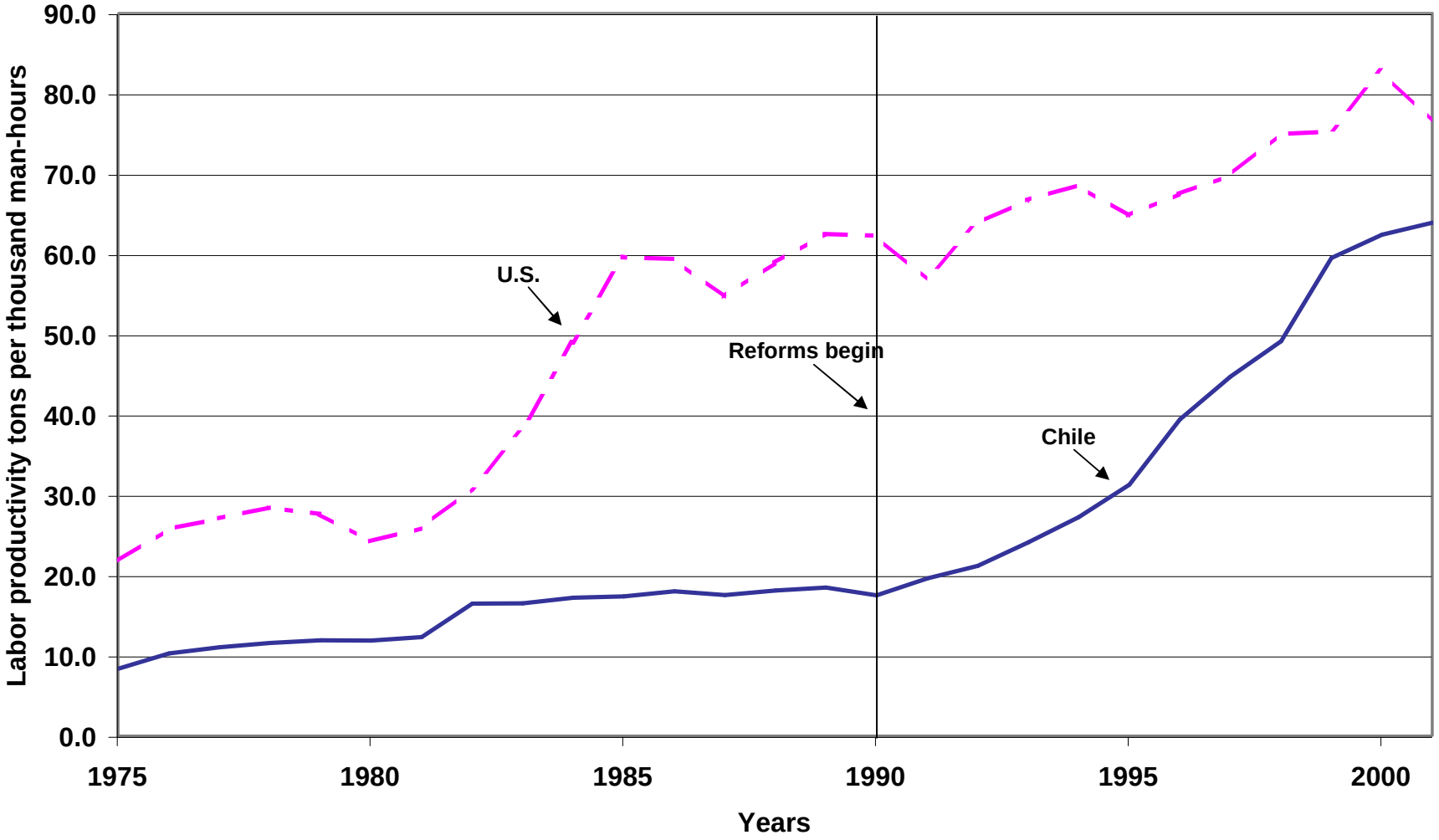

Figure 15. Production and Productivity Brazilian Iron-Ore Industry, 1971-97

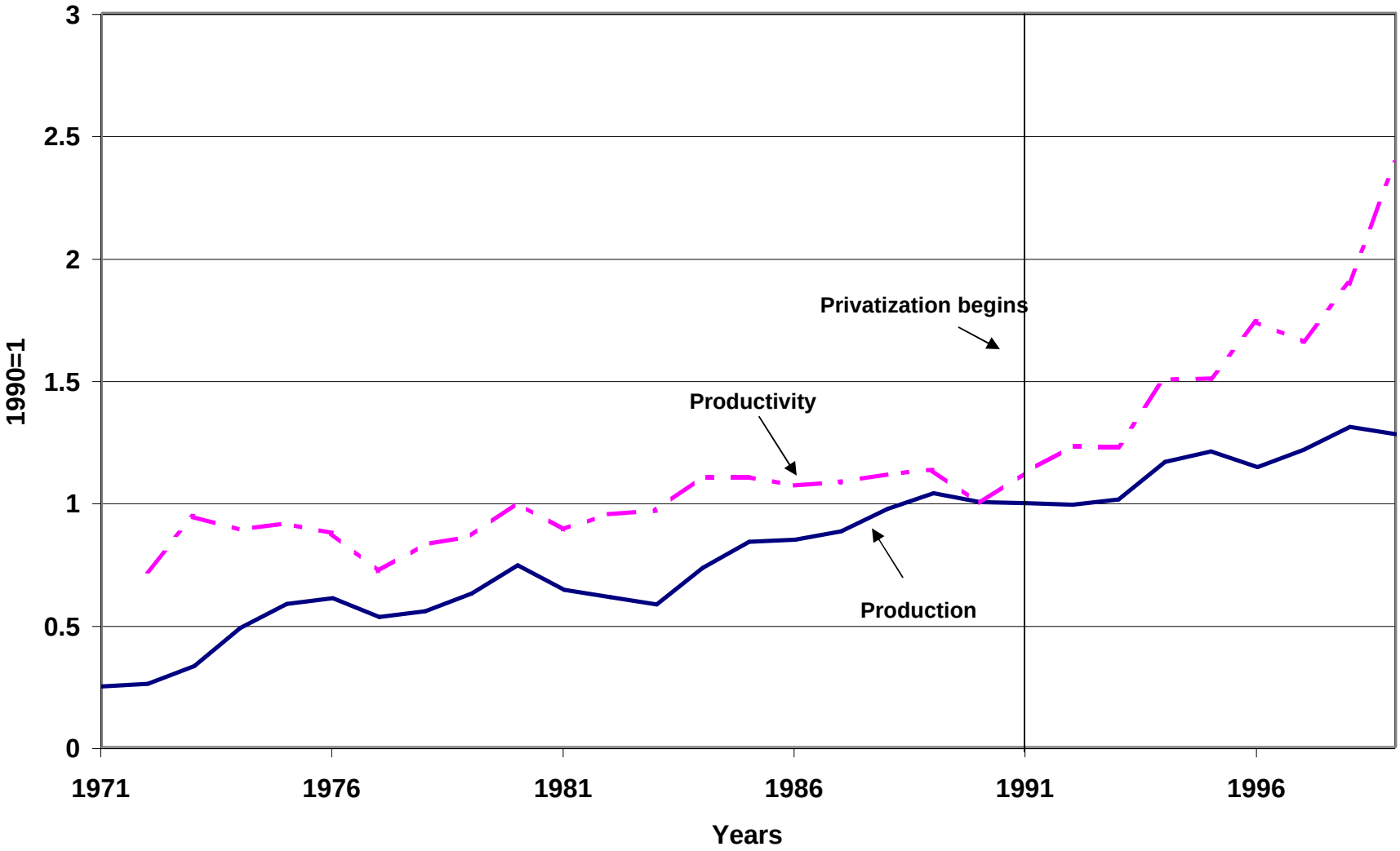

Figure 16. Labor Productivity in Brazilian Iron-Ore
CVRD/NORTH, CVRD/SOUTH, AND PRIVATE

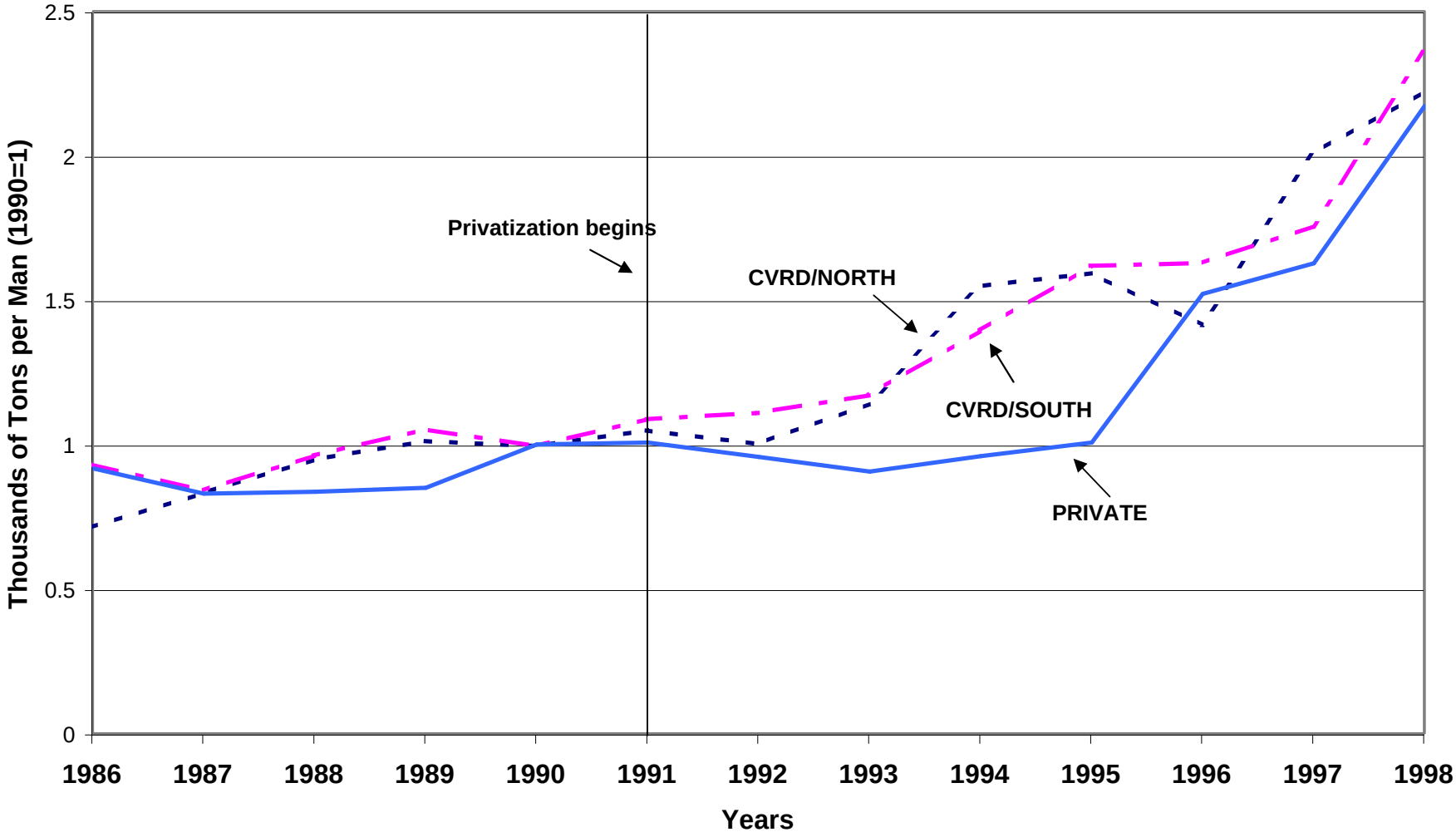

Figure 17: Production and Labor Productivity
in U.S. Iron-Ore Industry