Why Did Europe's Productivity Catch-up Sputter Out? A Tale of Tigers and Tortoises*

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ABSTRACT

This paper takes a different approach to examining the sharp turnaround in EU relative to U. S. labor productivity growth since 1995. The vast majority of the literature focuses on the American growth revival. But close to half of the turnaround was caused by a European retardation. What caused that retardation? Our paper shows that none of the consensus explanations of the American revival provide any help at all in explaining the European retardation. It is *sui generis* and therein lies a tale that has not previously been told.

Europe has faltered across the board. The deceleration of its productivity growth is not explained at all by ICT production and only to a small degree by retailing/wholesaling. Rather, the big European countries have failed in nearly every dimension. The retardation of Europe is illuminated by dividing up the EU-15 countries into Tigers, a Middle group, and Tortoises.

Our first surprise in examining the data is to find that the EU-US turnaround in labor productivity growth was not just a reflection of an equivalent turnaround in total factor productivity growth. Capital deepening also faltered in Europe, indicting all the macroeconomic determinants of economywide investment as part of Europe's problem.

The most striking aspect of our results is that the failing of the Tortoise countries is widespread, spanning industries as diverse as agriculture, wholesale trade, mining, chemicals, construction, fabricated metals, and clothing. Our explanation is that Europe's previous catch-up to the U. S. productivity level before 1995 was artificial – by making labor expensive, Europe raised its average product. But after 1995 as labor market reforms have helped to make labor cheaper, so the average product of labor has been pushed down and its growth rate has faltered. The falling behind of Europe is quite simple to explain; European regulations defied the laws of labor market equilibrium for decades, and a slight leak in the dam holding back market forces has already led to faster growth in European employment and slower growth in productivity.

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I. Introduction

The level of average labor productivity (ALP) in the fifteen pre-enlargement members of the EU steadily caught up to the level of the United States throughout the postwar era up until 1995, and at that point several EU members, e.g., France and Belgium, had surpassed the U. S. in the level of ALP. But then the process of catching up ground to a halt and reversed. The data used in this paper, which translate levels of ALP across countries using 1995 PPP exchange rates, show that the ratio of EU-15 to U. S. ALP was 77 percent in 1979, reached 94 percent in 1995, and by 2004 had slipped back to 85 percent. [1]

The sources of this turnaround in the relative productivity growth rates of the EU-15 versus the U. S. have been widely discussed, e.g. by Inklaar, O'Mahony, and Timmer (2005), Timmer and van Ark (2005), and van Ark and Inklaar (2005). Primary attention has been given to differences between the EU and U. S. in producing and exploiting information and communications technology (hereafter ICT). And differences between the EU and U. S. in TFP in the production of ICT equipment played an even smaller role than did capital deepening. Thus virtually all of the turnaround can be attributed to a sharp acceleration in the U. S. and deceleration in the EU in TFP in the production of non-ICT goods and services.

Early in this decade van Ark and his colleagues had identified the retail trade sector as by far the most important source of this TFP growth divergence, see van Ark, Inklaar, and

McGuckin (2003). At about the same time Foster, Haltiwanger, and Krizan (2002) had developed the amazing result from micro establishment panel data that *all* of the productivity acceleration in the U. S. retailing sector after 1990 was attributable to the appearance of new establishments and the disappearance of old establishments, and *none* to continuing establishments. This finding led to speculation that the real reason for the difference between European and U. S. retailing was not just a differential adoption of ICT capital but everything else that differentiates "new" from "old" in retailing, including scale and the greater ability in the U. S. to construct "big boxes" at freeway intersections without regard for the need to preserve and protect small shopkeepers and pedestrian precincts in central cities (Gordon, 2004; McGuckin, Spiegelman, and van Ark, 2005). Indeed, Baily and Kirkegaard (2004) placed at the top of their list of needed European regulatory reforms the freeing up of land-use restrictions that impeded the development of big boxes in Europe.

This Glass is Half-Empty, Let's Start Filling It

This paper argues that the previous literature on the EU-U. S. productivity growth turnaround has spent all its time looking at half of the puzzle. One paper after another has identified ICT-using industries, especially retail/wholesale, as the source of the U. S. advantage. But we find that this analytical glass is half empty. By every measure, the turnaround in ALP growth, TFP growth, or in the extent of capital-deepening, *the retardation of EU productivity*

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1. All data in this paper extending to 2004 come from http://www.ggdc.net/dseries/growth-accounting.shtml. Productivity levels for the EU-15 and individual European countries are converted at 1995 PPP "EKS" exchange rates from http://www.oecd.org/dataoecd/61/56/1876133.xls.

growth is almost as large a contributor to the EU-U. S. turnaround as the U. S. acceleration. What caused the EU retardation? We show that it had nothing to do with ICT production and little to do with retail/wholesale. Europe's retardation represents a fundamental, across-the-the board economic failure that encompasses industries in almost every sector.

Our basic hypothesis represents an inversion on a theme that one of us has explored previously (Gordon, 1997). Back then in 1997, before the U. S. productivity growth revival was visible or identified, it seemed reasonable to focus on a simple analysis based on elementary labor supply and demand curves. [2] European labor market institutions like high minimum wages and hire-fire laws made labor expensive, and pushed economies northwest along the labor demand curve to an equilibrium of high average and marginal labor productivity and high unemployment. The absence of such regulations made U. S. labor markets flexible and encouraged the creation of millions of low-skilled jobs including grocery-baggers, bus boys, parking lot attendants, and an urban industry in what Americans call "valet parking." Free American labor markets also allowed immigrants to create their own jobs and their own firms, quite different from the plight of the French minority dwellers of suburban high-rise ghettos. Thus the U. S. had fast employment growth and low productivity growth, and Europe had the reverse.

Our explanation of the European productivity growth retardation rests on the preceding

2. The paper (Gordon, 1997) was presented in its final form in a magnificent European location, the Parador of Bayona in Galicia, in September 1994, a few hundred meters from the memorial to the beach

idea that Europe made itself productive by making labor expensive. Thus Europe did not *really* catch up to the U. S. level of productivity as conventional measures appear to demonstrate. Europe's achievement as of 1995 was completely artificial, and it was doomed to collapse as it promptly did. All the themes in this paper, that Europe's productivity growth faltered along every dimension (labor productivity, TFP, capital deepening) in almost every industry, are consistent with the view that Europe had built up a regime by 1995 of overpriced labor, and labor market regulatory reforms would poke a hole in the dam (dyke?) previously holding back the equalizing flow of equilibrating labor market forces that previously had been prevented from creating more jobs and lower labor productivity.

The Empirical Achievement of this Paper

Thanks to the efforts of the OECD and especially the Groningen Growth and Development Centre, we are able to look inside the aggregate EU-U. S. differences in multiple dimensions that have not heretofore been adequately explored. Data are available for real value-added, hours, and nominal value-added shares of income, for 57 individual industries in the 15 countries of the EU, the EU-15 aggregate, and for the U. S.[3]

The primary goal of this paper is to aggregate across this multi-dimensional data base (56*17 = 952) to develop new research results that help us to understand what is going on inside

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where Christopher Columbus' "Niña" brought to Europe in 1493 the first news that a new continent had been discovered.

3. Unfortunately capital data are not available in this data base, but that is a blessing as it simplifies our task of extracting new results for labor productivity. The Groningen 57-industry data base includes a total of 29 countries, virtually the entire OECD, not just the 17 country units that we analyze here.

Europe. The EU-15 is not a homogeneous entity, but includes countries like Ireland and Finland where both ALP and TFP have continued to grow faster than the U. S., as well as countries like Spain and Italy where ALP has scarcely grown for the past decade and TFP growth has been negative. To avoid drowning in 969 dimensions, we create sub-aggregates that are designed to shed light on important differences within Europe and between Europe and the U. S. To highlight differences across countries in ALP growth, we create sub-aggregates of the four fastest growing EU countries during 1995-2002 (the "Tigers"), the five slowest growing (the "Tortoises"), and the remaining six (the "Middle"). To focus on differences among countries and between Europe and the U. S., we distill the 56 available industries into two different sets of sub-aggregates, one consisting of nine industries and another along a different dimension consisting of six.

It is important for readers of tables in this paper to recognize that the Tigers, Middle group, and Tortoises are not remotely of the same size, and the Tigers are very odd and special. In 1995 at PPP exchange rates of that year, the Tigers accounted for only 6.4 percent of EU-15 value added, the Middle group for 60.4 percent, and the Tortoises for 33.2 percent. Thus the real story of this paper is about what went wrong in the Middle and Tortoise group, and in the empirical analysis we will provide some insight into the productivity growth retardation of these laggard nations.

The analysis answers numerous questions that are not addressed by the previous literature. What differentiates the Tigers from Tortoises? Do they have a higher share of ICT

production, have they out-performed in particular sectors where the Tortoises have fallen behind, or have they simply continued to converge to the U. S. level of ALP because they started out so far behind. Surprisingly, one of our Tigers is Greece, hardly a paragon of either ICT production or retailing efficiency.

This paper presents a fascinating and not fully explained portrayal of most of Europe as falling behind for reasons that are largely beyond the control of individual policymakers. Europe postponed the reckoning with the U. S. by making its labor force expensive. The beginning of the reforms after 1995 exposed the termites in the previous woodwork. Making labor cheaper and more flexibly hired inevitably led to lower productivity across the board, and of course a lower *level* of productivity implies a lower *growth rate* of productivity in the national data.

II. Data and Measurement Issues

This paper is based on an analysis of two different Groningen data bases. The first is the "growth-accounting data base" which refers to the total economy (including government), covers 1980 through 2004, and disaggregates only along the dimensions of output, hours, labor productivity, TFP, and growth in capital investment and capital stock into three types of ICT investment and capital (IT, communications, and software) and three types of non-ICT investment and capital (non-ICT equipment, transport equipment, and nonresidential structures). Previous papers, e.g., van Ark and Inklaar (2005), have used these data to contrast

the EU-15 with the U. S. We go further by examining the decomposition among labor productivity, TFP, and capital deepening, further subdivided among ICT and non-ICT, for the 15 individual EU countries. We also begin our pre-1995 comparison period in 1979 rather than 1987 or 1990, as in most of the other papers in this literature. In this part of the paper our main measurement achievement is to create the Tiger and Tortoise sub-aggregates, which is a complex computational task involving Tornqvist index number aggregation across countries for the sub-components of capital investment and capital services, in addition to the basic numbers on real value added.

The second and longer part of the paper is based on the Groningen so-called "60-industry" data base, which actually contains data on 56 industries. Here there are no data on capital, and thus we cannot calculate TFP growth or the capital deepening effect. Our focus is thus entirely on differences in ALP growth across industries and countries. We confine ourselves to 51 of these industries in the private business sector, deleting government and nonprofit institutions. Because we focus only on the private business sector, the growth rates of ALP for individual countries are uniformly faster than in the ALP data for the total economy examined in the first part of the paper, and we show that the difference made by removing the government and institutions sectors differs across countries. This annual data base also begins in 1979 rather than 1980 but extends only to 2002, unfortunately just missing the years of unusually high productivity growth in the U. S. in 2003-04.

Aggregation Issues

Here our main achievement is to aggregate across both countries and industries to reduce the 950 dimensions of the data base into a smaller number of country sub-aggregates and industry sub-aggregates. Despite this aggregation, we are still able to explore many issues in the performance of European ALP and TFP at the level of groups of countries and industries that have been overlooked in the previous literature that focuses on EU-wide ICT use and retailing ALP performance. It is this aspect of aggregation that allows us to develop the main theme of the paper, that the deceleration in Europe is not related at all to the previous emphasis in the literature on ICT industries and on the retail/wholesale sector.

We begin with data on 17 countries (the 15 members of the EU, the EU-15 aggregate, and the U. S.) for 51 industries for 23 years, that is, 19,941 observations. The first step is to convert all data into U. S. dollars, using OECD-provided 1995 PPP exchange rates. We then aggregate using the standard Tornqvist index number formula, in which the growth rate of real value added for a particular industry or country between year *t-1* and year *t* is weighted by the geometric mean of its share in nominal value added in years *t-1* and year *t.* Even though much of our analysis focuses on the difference between growth rates for a particular country or industry between 1979-95 and 1995-2002, the aggregation must be carried out separately for all 22 year-pairs (1979-80 through 2001-02).

For much of this paper we follow Stiroh's (2002) method of decomposing aggregate productivity growth into share-weighted values and a reallocation effect:

$$\Delta \ln y = \sum_i \overline{w}_i \Delta \ln y_i + \left(\sum_i \overline{w}_i \Delta \ln H_i - \Delta \ln \sum_i H_i \right) = \sum_i \overline{w}_i \Delta \ln y_i + R$$

Where w is the share in nominal GDP of a particular industry, and a bar indicates the geometric mean of an industry's share in the given and previous year. R, the reallocation effect, is essentially a correction for the concavity of the natural log, but it also has the convenient feature that it is correlated with a shift of production from low to high productivity industries.[4]

Van Ark and Inklaar (2005) extend Stiroh's decomposition to analyze productivity differences between countries:

$$\Delta \ln y^a - \Delta \ln y^b = \sum_i productivity\_effect + \sum_i share\_effect + R^a - R^b$$

Here the "a" and "b" subscripts represent two different countries. The productivity effect is the weighted gap between productivity growth rates, and the share effect is the weighted gap between nominal shares.

$$productivity\_effect = \frac{1}{2}\left(\overline{w}_i^a + \overline{w}_i^b\right)\left(\Delta \ln y_i^a - \Delta \ln y_i^b\right)$$

$$share\_effect = \frac{1}{2}\left(\Delta \ln y_i^a + \Delta \ln y_i^b\right)\left(\overline{w}_i^a - \overline{w}_i^b\right)$$

The share effect is larger in a given industry if productivity in that industry is higher. At the end the reallocation terms are added, but since they tend to be small, looking at productivity and share effects by industry gives a good picture of their influence on overall productivity gaps. Moreover, the productivity and share effects can be summed in any given year to create industry aggregates, and they can be averaged over time to look at gaps between average productivity growth rates.

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3. See van Ark and Inklaar, 2005

Here we go beyond van Ark and Inklaar's analysis in two ways. First, we not only decompose the difference between EU and US growth, we also look at the three groups of European countries, namely the Tigers, Middle countries, and Tortoises. Second, we use this decomposition to examine productivity growth changes over time. We simply choose, for example, two seven-year periods in one country, and then treat each period as a different country. This allows a detailed understanding of industry and sectoral effects on aggregate productivity growth changes over time.

III. TFP Growth and ICT's Contribution through 2004

The dramatic turnaround in EU vs. U. S. ALP and TFP growth is summarized in Figures 1 and 2, each of which displays annual growth rates as four-year moving averages. These graphs use the Groningen growth-accounting data base that extends through 2004.

The Contribution of TFP and Capital-Deepening to the EU ALP Turnaround

The top frame of Figure 1 plots the four-year MA of ALP growth in the EU-15 and in the U. S., and the EU-U. S. difference in growth rates. The EU-U. S. difference is at or close to 1.0 percent during 1984-96 and then starts to decline in two stages, 1996-99 and again in 2002-04, reaching -1.73 percent in 2004. This graph displays what the introduction of this paper calls the "turnaround," the enormous 2.7 percent decline in the EU-U. S. ALP growth rate difference over the relatively short period of 1996 to 2004.

The middle and bottom frames in Figure 1 display the turnaround for TFP growth and

for the capital-deepening effect, which together are defined to sum to the growth rate of ALP. The middle frame shows that the timing of the TFP growth turnaround is identical but its magnitude is smaller, a decline from 1997 to 2004 of -1.85 percentage points rather than -2.7 points for ALP. By definition the difference is accounted for by a decline in the capital deepening effect in the EU, and this is shown separately in Figure 3. The capital-deepening effect for the EU displays no clear trend, as it was the same in 2002 as in 1988. The main event seems to be a big bulge in 1991-95 that (allowing for the four-year MA smoothing) could be reflecting German reunification and its stimulus to investment in Germany's trading partners. The U. S. shows a clear increase in the capital-deepening effect in 1996-2002 and a decrease in 2002-04 that is surprisingly small in light of the collapse of ICT investment in the early years of this decade. The EU-U. S. difference in the capital-deepening effect peaks at 0.72 in 1994 and declines to a range of -0.38 to -0.47 between 2001 and 2004.

Since by definition TFP growth difference and the capital-deepening effect difference sum to the ALP growth difference between the EU and U. S., we show this additive decomposition in Figure 2. The areas with the small grid lines show the contribution of the TFP growth differential and the areas with the large grid lines show the contribution of the differential in the capital-deepening effect. Remarkably, the crossover point for both capital deepening and TFP occurs simultaneously in 1998. In all years before 1998 both the TFP difference and capital-deepening difference were positive, favoring the EU, and in all years after 1998 both differences were negative. The relative importance of the two components changed

through time, however. In 1984-90 most of the EU advantage is attributed to TFP growth with a minor role for capital deepening. During 1992-96 most of the EU advantage is attributed to capital deepening. After 1998 a relatively constant -0.3 of the EU deficit is attributed to the capital-deepening effect, while an ever-growing contribution was provided by the TFP growth difference.

Overall, we find the summary decomposition in Figure 4 to be a bit surprising in the context of the previous literature. We had previously absorbed the impression that all the action in explaining the EU vs. U. S. ALP growth turnaround was in TFP growth, primarily outside of ICT production (particularly in retailing and other ICT-using industries). But Figure 4 shows that about one-third of the overall ALP turnaround can be attributed to the capital-deepening effect, both a reduction of the investment-GDP share in Europe and an increase in that share in the U. S. This leaves open the question as to whether the turnaround in the capital-deepening effect was mainly in ICT capital, non-ICT capital, or both. The next section addresses this among numerous other issues.

The main theme of this paper is that the EU-U. S. turnaround is a story not just of the American acceleration but also about the European retardation. The data displayed in Figures 1 and 2 allow us to show just how much of the European retardation is responsible for the overall EU-U. S. turnaround during 1995-2004.

	EU Retardation	*U. S. Acceleration*	*Total Turnaround*
ALP Growth	1.29	1.52	2.82

TFP Growth	0.86	0.91	1.76
Capital-deepening	0.44	0.62	1.05

Thus the story of the EU-U. S. turnaround is close to half a matter of the EU retardation that is the focus of this paper. In the area of the EU-U. S. TFP growth turnaround that has been the central focus of the previous literature, almost exactly half is due to the EU retardation. The role of the EU retardation in capital deepening has also received relatively minor emphasis in past research.

TFP and Capital Deepening in the 15 Individual EU Countries

We now switch from the display of four-year MA growth rates across the full time series as in Figures 1 and 2, to summary growth rates for 1979-95 and 1995-2004, as displayed in Table 1. This is our first look at the performance of the 15 EU countries separately. Table 1 also uses the growth-accounting database to subdivide TFP growth into the contribution of the ICT and non-ICT sectors,[5] and also to subdivide the capital-deepening effect into the contribution of ICT and non-ICT capital deepening. The 17 rows of the table display growth rates for the U. S., the EU-15 aggregate, and the 15 member countries of the EU-15. The countries are ordered by the same criterion used in the next section of this paper to define the Tigers, Middle, and Tortoise

5. The data available on the Groningen growth-accounting web site allow us to calculate the ICT and non-ICT capital deepening effect and total TFP growth accurately. However, the division of TFP growth between the ICT and non-ICT sectors is only an approximation. Since the web site has no data on hours or capital use within the ICT-producing sector, we have approximated TFP growth in the ICT-producing sector by multiplying the growth rate of real ICT investment (IT, communications, software) by the share of nominal ICT investment in nominal GDP. This results in a good match to van Ark-Inklaar (2005, Table 2), but it is inaccurate both by failing to subtract out hours of work and capital input in ICT production,

groups, namely the growth rate of ALP in the private business sector during 1995-2002 (see Table 2 below).

The first six columns of Table 1 refer to average annual growth rates over 1980-95 and the next six columns refer to 1995-2002. Distinguished for each period are ALP growth, TFP growth, TFP growth subdivided between the contributions of the ICT and non-ICT sectors, and finally the capital-deepening effect divided between ICT capital and non-ICT capital.

The top two lines display average annual growth rates for the U. S. and the EU-15. Here we see in the "ALP" and "TFP" columns the same message as in Figures 1 and 2, that everything true in 1979-95 was reversed during 1995-2004. The turnaround in EU minus U. S. productivity growth rates was 2.00 percent, of which 1.33 points was accounted for by TFP growth and the remainder of 0.67 points by the capital-deepening effect, exactly the 2/3 vs. 1/3 share in the explanation that we discussed above in the context of Figure 2.

What was the role of ICT in this turnaround? Of the 1.33 point turnaround in TFP growth, only 0.18 points was attributable to ICT production and the rest to non-ICT production, which is consistent with the received wisdom from the literature about the role of the trade and financial sectors.[6] What role did ICT capital deepening play in the turnaround? This was trivial, only 0.09 points, leaving the rest of the 0.67 point capital-deepening effect to operate

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but also by omitting ICT production other than that for domestic investment, i.e., that destined to domestic consumption, government spending, and net exports.

5.. Any calculation of the "turnaround" takes the U. S. difference for 1995-2004 minus 1979-1995 and subtracts the European difference over the same time intervals. Thus for TFP growth the calculation is 1.40-0.59-0.64+1.16 = 1.33.

outside of ICT capital. Of this .67 point shift, 1/3 was due to a rise in US investment, and 2/3 to a fall in EU investment. To the extent that non-ICT capital deepening reflected the European-specific chronology of German reunification, it makes sense that most of the capital-deepening turnaround had nothing to do with ICT.

Turning to the 15 individual country members of the EU-15, the vertical ordering in Table 1 reflects the growth rate of ALP in the private business sector in 1995-2002. Because Table 1 extends to 2004 and includes the non-private sector, the countries are not ordered exactly in the ALP column for 1995-2004. Nevertheless, the Tigers had much higher ALP and TFP growth rates than the Middle group, which in turn had much higher growth rates than the Tortoises for 1995-2004. What insights are provided by the columns in Table 1 on TFP growth and the capital-deepening effect?

The first fact that jumps out from Table 1 has not previously been discussed in the literature. Relatively rapid EU-15 ALP growth before 1995 was relatively uniform across countries, but this uniformity fizzled after 1995 into much more heterogeneity. The standard deviation of ALP growth rates across the 15 countries increased from 0.80 in 1979-95 to 1.23 in 1995-2004, for a ratio across the two periods (late/early) of 1.53. Looking across the other columns, most of this increase in cross-country variance is accounted for by TFP (standard deviation increases from 0.70 to 1.04, for a ratio of 1.48) and in particular non-ICT TFP (standard deviation increases from 0.71 to 1.03, for a ratio of 1.45). The standard deviation *decreases* both for TFP in ICT producing industries and for ICT capital deepening. There is a small additional

contribution from non-ICT capital deepening, where the standard deviation increases from 0.21 to 0.39.[7]

Notice that none of these standard deviations make any reference to the U. S. But the conclusions are of great importance to understanding what has been going on within Europe. The consensus conclusion of the existing literature is that the EU-U. S. turnaround is driven by differential TFP growth in the non-ICT producing sector (e.g., retailing). We also find that the big distinction across the successful and unsuccessful European countries after 1995 is in TFP growth in the non-ICT-producing sectors. TFP in ICT production and capital deepening in ICT equipment play no role at all. Thus a leading question for this paper is where has this differential in non-ICT TFP growth come from? Is it all retailing, or is something else going on?

Much of the heterogeneity within Europe after 1995 occurs in the growth of non-ICT TFP. Is there any connection between this source of growth and capital accumulation? Van Ark and Inklaar (2005, Figure 3) display a scatter plot implying that those nations having faster rates of non-ICT TFP growth also have faster rates of ICT capital deepening, implying a spillover effect that is not captured by the conventional methodology of calculating TFP. However, we do not find the same connection. We have estimated regression equations in which there are 16 observations for the 16 countries in Table 1, the dependent variable is the growth rate of non-ICT capital deepening, and the two explanatory variables are ICT and non-ICT capital

7. The Groningen data base eliminates measurement differences across countries by imposing the U. S. ICT deflators on all the countries. This helps to explain why the standard deviation of ICT TFP growth

deepening. For the 1995-2004 period the adjusted R^2 is zero, and while the coefficients on both types of capital deepening are positive, they are insignificant with p values of 0.9 in contrast to the standard $p<0.05$ significance criterion. For 1979-1995 the results are equally bad, with a coefficient on ICT capital deepening of exactly zero.

While these equations lack any explanatory power, their residuals identify countries that had growth rates of non-ICT TFP that were higher than predicted, and the changes of residuals between 1979-95 and 1995-2004 can be described by country group. Ireland is unique in having a large positive residual in both periods. There were big positive jumps in the residuals for the other Tigers, from big negative to big positive for Greece, from zero to very big positive for Finland, and for Austria a decline from a medium negative residual to zero. Residuals in the Middle group were relatively small and in fact were nearly zero for the U. K. in both periods. The only positive movements in the residual were for France and Sweden. The other Middle-group countries had declines in residuals, from positive to negative for Portugal, for Germany a reduction in a positive residual to a lower value, and for Denmark a shift to a much bigger negative residual. In the Tortoise group, changes in residuals were very small for the Netherlands and Belgium but were very large in a negative direction for Italy and Spain.

IV. Productivity Growth within Europe

We now switch to the 56-industry Groningen data base and begin our analysis of

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and ICT capital deepening is so low, but we agree with the Groningen treatment that this is a feature of

differences across industries within Europe. Table 2 displays the U. S., the EU-15, and the fifteen individual European countries in the same order as in Table 1. The columns show growth rates of ALP for 1979-95, 1995-2002, and the difference between the two time periods. Within each of the sets of columns for a given time period, three columns are shown, first the total economy (GDP divided by aggregate hours), the private economy excluding government and institutions, and the difference between the private and total ALP growth rates.

Differential Growth Between the Total Economy and the Private Sector

The top two lines show that the difference between the private and total definitions increased the U. S. ALP growth rate in 1979-95 by 0.53 and for the EU-15 by 0.46, a very similar difference. But for 1995-2002, the U. S. difference jumped to 1.02 points while the EU-15 difference fell to 0.28 points. This makes sense because productivity growth everywhere in government and institutions is slow and stable, and thus when ALP growth speeds up in the private sector, the difference between the private sector and the total economy increases. The correlation between the ALP growth difference and the growth rate of ALP in the private sector across the U. S. and the 15 individual EU countries is 0.69.[8] At one extreme ALP growth in the private sector for the U. S. is fully one percentage point faster than in the total economy, almost matched by Ireland and Sweden, whereas in Italy and Spain there is no difference at all.

Table 2 also shows that the distinction between the Tigers, Middle, and Tortoises was

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the real world, in which computer technology has been equally adapted across all countries.

8. A regression of the difference on the private-sector ALP growth yields a constant of 0.13 and a slope coefficient of 0.14 that is significant with a P-value of 0.003.

not relevant before 1995. The respective ALP growth rates in the private economy of the three groups for 1979-95 were, respectively, 3.16, 2.85, and 2.63 percentage points, as contrasted to 4.21, 2.39, and 0.78 percentage points for 1995-2002. Why did European countries become so much more different after 1995? Of the 15 EU countries, only three (Ireland, Greece, and Sweden) achieved a post-1995 acceleration of ALP growth in the private economy, whereas the remaining 12 countries exhibited a deceleration ranging from -0.19 for the U. K. to -2.66 percent for Luxembourg. Three of the Tortoises (Belgium, Luxembourg, and Spain) experienced a deceleration of more than -2.0 percent, and two other countries (France and Italy) experienced decelerations greater than -1.0 percent.

Two Industry Decompositions of the EU-US Growth Turnaround

This paper performs two types of aggregation across the 952 dimensions of the Groningen industry data base. We have already aggregated across the EU countries in Table 2 to form the aggregates of the Tigers, Middle, and Tortoises. Now we turn to aggregation across the 51 private-sector industries in order to determine which industry groups have been most responsible for the EU-U. S. ALP growth turnaround. The columns in Table 3 display ALP growth rates for the EU, U. S., and the difference, for 1979-95, 1995-2002, and the difference between the second period and the first. The top part of Table 3 aggregates the 51 "two-digit" industry groups into 10 "one-digit" industry groups, following standard conventions of the one-digit groups. The bottom part of Table 3 provides a complementary division of the 51 industries into ICT-producing, ICT-using, and non-ICT intensive industries, following the

definitions proposed by Groningen researchers. [9]

The "Difference" column for 1995-2002 identifies the industry groups where the U. S. has its main advantage, namely durables, retail/wholesale, finance, and real estate. The greatest U. S. ALP growth disadvantage is in construction/utilities, non-durables, and communications. Some insight on the sources of the U. S.-EU turnaround is provided in the three right set of columns that displays differences in ALP growth rates when 1995-2002 is subtracted from 1979-95.

Figure 3 shows the contributions of each industry to the total EU-U. S. gap. Each bar has a productivity effect and a share effect corresponding to the equations introduced above. Clearly, the vast majority of the gap between EU and U. S. productivity between 1995 and 2002 was due to retail/wholesale, finance, and durables.

The bottom half of Table 3 provides a complementary decomposition of industries based on ICT production and use. The most important finding in comparing the top to the bottom of Table 3 is that the U. S. speed-up in durables after 1995 was *not* due to ICT production. The U. S. retained a uniform ALP growth advantage in ICT production after 1995 but had a big increase in its advantage in durables, presumably other than ICT-producing. The U. S. turnaround in durables of 3.15 percentage points (right column, third line) is even larger than the 2.27 point turnaround in ICT-using manufacturing in the bottom section of Table 3. Comparing the top and bottom sections, the huge retail/wholesale turnaround for the U. S. is

8. The division into the ICT-producing, ICT-using, and other industry groups is based on van Ark,

almost the same, and the big U. S. turnaround in finance is exactly the same. Even the ICT-using "others" help the U. S., as its negative ALP growth in these industries turned around to positive while there was a slight slowdown in Europe. Finally, the U. S. turnaround even occurred in non-ICT-intensive industries, and this was entirely because of a slowdown in the EU rather than any speed-up in the U. S.

There is an apparent paradox though, that the U. S. turnaround in total durables was 3.15 percentage points while the turnaround in the ICT-producing industries was a negligible 0.07 percentage points. Which industries in durable goods manufacturing account for this difference? In order, the non-ICT durable goods industries with the greatest EU-U. S. turnaround were these, where a EU shortfall is represented by a negative number. The list with percentage point EU shortfalls consists of Basic metals (-5.35), Aircraft and spacecraft (-4.53), Motor vehicles (-4.08), Railroad equipment (-3.86), Other electrical machinery (-2.41), other instruments (-1.55), mechanical engineering (-1.34), and ship building and repairing (-0.60). The corresponding EU advantage is only in non-metallic mineral products (+0.95) as well as in several industries within the ICT-producing sector.

Many dimensions of the post-1995 change in ALP growth across country groups and industry groups are brought together in the bar graph of Figure 4. In the left section we see how uniform was the 1979-95 growth of the Tigers-Middle-Tortoises and the EU-15 aggregate across the three main industry groups of ICT-producing, ICT-using, and "other" industries. In

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Inklaar, and McGuckin (2003).

this earlier period the U. S. had faster growth in ICT-producing but slower growth in ICT-using and *much* slower growth in ALP growth in other industries.

Figure 4 shows in quite dramatic fashion how all of this uniformity fell apart after 1995. In the profound splitting apart of the Tigers from the Middle and Tortoise EU-15 groups, the graph shows that ICT-production played virtually no role in the story. While the big difference between the U. S. and EU-15 aggregate was in ICT-using industries, including the retail sector that is the prime focus of the previous literature, we learn something else from Figure 4. This is that ALP growth in the "other" sectors (i.e., not ICT-producing or ICT-using) was much faster in the Tigers than the EU average, similar to the EU average in the Middle group of countries, and virtually zero in the Tortoises. An interesting finding is that growth in these "other" industries in 1995-2002 was slower in the U. S. than in the EU-15 average and also than in either the European Tigers or European Middle group countries.

Important questions are raised by Figure 4. Why did the Tortoise ALP performance decline so sharply in every industry group, both compared with the Tortoise performance in 1979-95 and as compared to the Tigers after 1995? Perhaps the differences between countries within the EU are just as interesting as the fact that much of the overall EU-U. S. gap was driven by the retail/wholesale sector. Clearly, the bottom line involves far more than Wal-Mart and big boxes in the U. S.

Levels and Shares

Part of the explanation of the EU-U. S. turnaround may be that rapid EU productivity

growth prior to 1995 was part of a "catching-up" process that began after World War II. As Europe approached the U. S. level of productivity, naturally, catching up petered out as the room for adopting U. S. technology narrowed. Thus we may be interested in whether the industries in which EU productivity growth slowed down the most were those in which the 1995 EU/U. S. productivity ratio was the highest.

Table 4 displays the ratios for EU15 to U. S. of labor productivity *levels* in 1979, 1995, and 2002 for the same industry groups as in Table 3. The bottom line of Table 4 shows that the EU15 achieved 79.8 percent of the U. S. level of ALP in the private market sector in 1979, caught up to 93.5 percent in 1995, and since then has fallen back to 84.8 percent. The EU – U. S. ratios for 1995 in the top part of Table 4 range from 67.5 percent for agriculture to 123.1 percent for services. However, there seems to be no tendency for the EU-U. S. turnaround to be most marked in the industries in which the EU had achieved the highest ratio in 1995. The three biggest turnarounds, as shown in the right-hand column of Table 4 for durables, retail/wholesale, and finance, all occurred in industries where the EU/U. S. ratio in 1995 was still below 100 percent. The same observation applies to the industry decomposition in the bottom part of Table 4.

We have seen in Tables 3 and 4 that the EU15 vs. U. S. productivity growth differences, as well as ratios of ALP of the EU15 to the U. S., are quite different across the ten industry groups displayed in the top section of these tables and the six industry groups displayed in the bottom section. How important are these groups in terms of the shares of hours worked? How

important are changes in shares toward or away from high-productivity industries as a source of productivity growth on both sides of the Atlantic?

Table 5 displays shares of each industry in total hours. The first and sharpest contrast is on the top line, where the EU hours share in farms and mining started out in 1979 as 7.6 percentage points higher than in the U. S., then declined to 3.4 percentage points higher in 1995 and finally 2.1 points in 2002. This is a classic convergence effect, where the reallocation of labor input out of low-productivity agriculture helps explain the overall ALP growth convergence of the EU to the U. S. Since the shrinkage in the share of agriculture continued during 1995-2002, this factor alone should have continued the EU catch-up, and the failure after 1995 suggests that the diminishing hours share within agriculture was swamped by what was going on in other sectors.

While the EU-to-U. S. ALP ratio was lowest in agriculture, from Table 4 we learn that this ratio was highest in transportation, services, and real estate. Differences in the hours shares in transportation and real estate are minor, but are very large in services. The U. S. has a much higher share of hours in services and, according to Table 4, a substantially lower level of productivity. This is consistent with a theme that one of us (Gordon, 1997) has pursued, that more flexible labor markets and lower minimum wages in the U. S. have encouraged a growth of low-skill jobs in the service sector, thus both raising the hours share in services and reducing the relative level of U. S. service productivity. The archetypal jobs in the U. S. service sector that do not exist in most of the EU-15 countries include grocery baggers, bus boys, parking lot

attendants, and valet parkers. This systematic theme in reducing U. S. productivity (and productivity growth) in the services, which may have been important in explaining the pre-1995 U. S. productivity growth "slowdown," continued after 1995 but was overwhelmed by the revival of U. S. productivity growth outside the pure services, especially in durable manufacturing, retail/wholesale, and finance.

The bottom section of Table 5 displays hours shares in the EU15 and U. S. in the alternative industry sub-aggregates that emphasize ICT production and ICT use. Any head-start that the U. S. gained in ICT production does not show up in the hours share of that industry, which is minor and does not change appreciably from 1979 to 2002. Instead, the big differences in hours shares are the much higher share of hours in ICT-using industries in the U.S. (both in retail/wholesale and in finance) and the complementary lower U. S. shares of hours in the non-ICT intensive industries. In these EU-U. S. differences, there was some convergence in hours shares between 1979 and 1995, although little convergence after 1995.

Searching for Convergence with Regressions

A more systematic way of looking for convergence of EU industries to US levels of productivity growth is to regress industry growth rates on the ratio of productivity levels. Table 6 displays the results of these regressions. The dependent variable is the 1995-2002 ALP growth rates in all the private-sector industries for all 15 EU countries, a total of 765 observations. The independent variables are the 1979-1995 ALP growth rate in the same industries, the overall ratio of the country's ALP to US ALP in 1995, the ratio of each industry's

ALP to ALP in that industry in the US in 1995, and the 1979-1995 and 1995-2002 growth rates of ALP in that industry in the US.

The first column shows results for a regression on all 765 country-industry observations. Overall convergence is strongly supported. For every percentage point that a country/industry observation was below the U. S. in 1995, its growth rate was 0.03 points higher, and this effect rises to .04 when it applies both to the ratio for industry ALP and for the full economy. That is, a ten percent productivity deficit yields a 0.4 percent out-performance by that industry and country after 1995. Above all else, Table 6 explains what Greece is doing allocated to the "Tigers." Greece simply started so far behind that it was swept upwards by a standard convergence effect. Doubtless its acceleration after 1995 was greatly aided by transfers from the EU central budget, as was also the case for Ireland.

ALP growth between 1996 and 2002 is also heavily dependent on the industry's past ALP growth from 1979 to 1995, and on U. S. ALP growth in that industry both from 1979-1995 and from 1995-2002. The coefficient on US growth in the second half is the largest of these coefficients, and at 0.53 indicates that individual industry growth rates in EU countries are highly correlated with growth rates in the same industries in the U. S., even after controlling for a number of other factors. Looking at the underlying data, it is clear that the influence of U. S. industry growth rates on EU industries is mainly occuring in the ICT production industries. If we want to understand why a given ICT industry is growing at 18 or 20 percent per year, and we have no other information available, the regression picks up the fact that ALP growth in that

same industry in the U. S. is equally as high. The strength of this effect is greatly augmented by the fact that the Groningen data base uses U. S. computer price deflators for all countries.

Table 6 also reports regression results where the dependent variable is restricted to the three ICT-related sectors, namely ICT-producing, ICT-using, and non-ICT. It is notable that there is evidence for convergence in all three sectors. The 1995 industry productivity ratio always has a significant coefficient. However, the most interesting results occur within the ICT-producing industries. Of the three sectors, we can predict with the best accuracy the growth rates of ICT producing industries. This prediction is largely based on two factors. First is the ALP ratio with respect to the U. S. Every percentage point lower that ratio is, productivity grows .07 points faster. Secondly, the U. S. growth rate in ICT producing industries is strongly correlated with ALP growth in EU countries. In ICT using and non-ICT industries, EU growth is almost completely uncorrelated with U. S. growth, and the only real predictor we have of growth is convergence.

Tigers vs. Tortoises Across Industries

So far we have learned from Table 3 and Figure 4 that the Tigers seem to do everything right, and the Tortoises do everything wrong. But exactly where in the industry structure is this occurring? Is the margin of ALP growth of the Tigers over the Tortoises uniform across industries? Figure 5 is a revealing bar graph that ranks the one-digit industries by the margin between the ALP growth rate in the Tigers relative to the Tortoises, multiplied by their shares in GDP. Like Figures 3 and4, Figure 5 applies weights of current dollar value added to identify

the contributions of each industrial sector to the overall behavior of ALP growth in these industrial groups.

While the gap between the EU and the U. S. in Figures 3 and 4 is largely explained by ICT-using industries, especially retail, wholesale, and finance, the variance within the EU is mainly explained by more mundane industries like manufacturing and construction. Of the nearly three percent growth gap during 1995-2002 between the Tigers and Tortoises shown in Figure 4, fully 60 percent is accounted for by the manufacturing and construction sectors as shown in Figure 5. The size of the share effect in durable manufacturing is particularly notable. In ICT producing industries the share in value-added in the Tigers rose from 3.8 to 5.0 percent between 1979-95 and 1995-2002, while the share in the Tortoises increased only one third as much, from 4.1 to 4.5 percent.

Except for manufacturing durables, where the Tigers benefited by greatly increasing their share, in the rest of the industries the story is simply that ALP growth in the Tigers is faster than in the Tortoises. Figure 5 shows that the industries ranked highest in the productivity effect were construction/utilities, durables, and retail/wholesale.

We have two findings here about the gap between ALP growth in the Tiger countries compared to the Tortoise countries. As we would have expected, the Tigers shifted a larger share of production into ICT-producing industries and hence reaped large gains. The unexpected result is that nearly two-thirds of the difference between the Tigers and Tortoises is explained by "old" industries including both non-ICT manufacturing and construction. Thus in

a larger sense heterogeneity within Europe has grown because of differential performance across industries that play no role in the explanation of the EU-U. S. turnaround.

These differences among the Tigers-Middle-Tortoises are further illuminated in Tables 7 and 8. In Table 7 the rows represent the same industry decomposition as in Tables 3, 4, and 5. The columns display the growth rates for the three EU country groups in 1979-95, 1995-2002, and the change between those two periods. First, notice that in 1979-95 the Tigers already achieved faster ALP growth rates than the Tortoises in eight of the ten industry groups in the top part of the table. During 1995-2002 they continued to excel in eight groups. The Tigers fell short of the Tortoises in farms/mining in both periods, in services in the first period and in real estate in the second period. If we look for the biggest changes after 1995 in the Tigers vs. the Tortoises, as shown in the right-hand three columns, we notice an acceleration in the Tigers and deceleration in the Tortoises in the six sectors listed at the top of Table 7. In the next two sectors, finance and services, both groups had an acceleration but that in the Tigers was larger. Only in communications and real estate did the tigers go in the opposite direction. In almost every industry sector in the top half of table 7, the "Middle" group is in between the Tigers and Tortoises, distinguishing themselves only by an outstanding performance in communications.

The bottom section of Table 7 exhibits the alternative industry definition based on ICT production, ICT use, and non-ICT intensive industries. Here the story is simpler, albeit unhelpful for developing hypotheses. The Tigers simply outperformed the Tortoises in every category, with the Middle group in the middle.

Hours Shares in the Tigers, Middle, and Tortoises

We have already examined in Table 5 above the differential share of hours in the EU15 versus the U. S. Now in Table 8 we display the corresponding figures within Europe for the Tigers, Middle group, and Tortoises in 1979, 1995, and 2002. The most important fact about the Tigers is that they started out far behind and had in 1979 and still have in 2002 a much higher share of hours in agriculture than the rest of Europe. Thus much of the Tiger story is simply catching up in traditional growth theory fashion. Clearly Ireland has gone beyond just moving beyond a primitive agricultural society, but the story of Greece as an unlikely member of the Tigers may mainly involve this kind of traditional convergence.

Also unexpected is that the Tigers have much lower shares in durable goods manufacturing than the Middle and Tortoise groups, although this gap narrows between 1979 and 2002. Shares in non-durable goods manufacturing are quite uniform across country groups over the entire 1979-2002 period. The Tigers, starting out as primitive economies, also display notably lower shares of hours in services in all three years and there appears to be no narrowing.

Whether looking at the top or bottom sections of Table 8, the story seems to be one of convergence rather than anything exceptional. In the bottom section the convergence of the Tigers in ICT-producing industries must explain a lot of their overall rapid ALP growth rates. To a lesser extent, their partial convergence in ICT-using industries may have helped them to catch up in productivity levels and to achieve above-average productivity growth rates. Most

of the other shifts in hours shares evident in Table 8 can be interpreted more broadly as a story of convergence of previously primitive economies, at least as concerns Ireland, Finland, and Greece. (The membership of Austria within the Tigers seems somewhat anomalous.)

Changes Over Time

A simple way to examine productivity changes over time is to treat early and late periods as two different countries, and then use the same productivity and share decomposition as we have used so far. Figure 6 compares growth from 1988-1995 to 1995-2002, and the separate frames display results for the Tigers in the top frame, the Middle group in the middle frame, and the Tortoises in the bottom frame.

The most interesting results are shown in the bottom frame, which shows contributions to changes in productivity growth in the Tortoises. Transportation, non-durables, real estate, and agriculture and mining all contributed approximately the same amount to the Tortoise deceleration. The middle countries had very different determinants of their slowdown. Non-durables and agriculture still caused a good portion of the slowdown, but in these countries, real estate actually contributed positively to productivity growth.

Figure 7 further decomposes the deceleration in the Tortoises and middle countries by two-digit industry. As would be expected from figure 6, real estate and agriculture contribute the biggest shares of the decline. The other problematic industries for the Tortoises were inland transportation, wholesale trade, mining, and chemicals. The middle countries had some different industries that caused the bulk of their decline. Wholesale trade and mining took a

much larger share than in the Tortoises, and food and drink production also took a large share..

Figures 6 and 7 largely confirm what we already learned from figure 5. What differentiates countries within the EU has nothing to do with the "new economy" or indeed with the retail/wholesale sector that provides the main explanation of the post-1995 U. S. ALP acceleration. The explanation is amazingly conventional. The Tigers managed to find ways of raising productivity growth in durable and non-durable goods production, construction, and transportation. This tells us that the slow-moving countries on the continent have not fallen back because they were too slow to pick up some new trends in ICT. They simply didn't manage to sustain their productivity growth in any industry or sector. Their falling back is systemic, reflecting a basic flaw in economic organization in these economies. So rather than illustrating the story that one often hears about European economies not being dynamic enough to incorporate the "new economy", what we find is that the Tortoises have just failed at raising productivity anywhere, and most importantly, in those old-fashioned core industries, manufacturing and construction.

It is not surprising that the U. S. and EU would excel in productivity growth in different areas. After 1995 the U. S. excelled in retail/wholesale and finance. The Tigers achieve overall ALP growth rates higher than in the U. S. because they excel in manufacturing, and because they are still catching up in agriculture and services. This is a classic case of comparative advantage and specialization. If the world economy is efficient then we should see countries specializing where their native talents lie. The sad story of the Tortoises is that they do not have

any comparative advantage; they fail in everything. Therefore they have fallen behind, while the U. S. and the Tigers have pulled away.

V. Conclusion

The innumerable papers in the literature on the U. S. post-1995 productivity revival have focused primarily on the production and use of ICT equipment, and on the role of the retail/wholesale industrial sector in creating the U. S. growth acceleration. This paper is on a different topic, the "turnaround" in the EU/U. S. productivity growth differential. As shown above in Part II, almost half of the "turnaround" is caused not by the U. S. productivity growth revival but the European productivity growth retardation. This paper is primarily about that retardation, which turns out to have nothing to do either with ICT or retailing/wholesaling.

Europe has faltered across the board. The deceleration of its productivity growth is not explained at all by ICT production and only to a small degree by retailing/wholesaling. Rather, the big European countries in the middle (UK, France, Germany), and the big countries within the Tortoises (Italy, Spain), have failed in nearly every dimension. They are like a football team that loses every game (the San Francisco 49ers of the OECD, if you will).

The emphasis on the EU-U.S.difference in non-ICT TFP growth, with retailing as the dominant sector explaining the difference., is only half of the picture. Fully one-third of the turnaround in EU vs. U. S. productivity growth is explained by a turnaround in capital deepening, not TFP growth. The investment share in GDP surged in the U. S. in 1995-2000 and

was still at historically high levels in 2004, while in Europe that share had slumped.

At the industry level, the poor performance of the Tortoises in Europe reveals failings across the board. The top industry contributing to the slipping behind of overall Tortoise productivity growth is the agricultural and mining sector, perhaps suggesting that this traditional source of convergence is no longer relevant. But the most striking aspect of Figure 7 in this paper is that the failing of the Tortoise countries is widespread, spanning industries as diverse as agriculture, wholesale trade, mining, chemicals, construction, fabricated metals, and clothing.

The retardation of European labor productivity is not just a matter of land-use planning that prevents Wal-Marts and Home Depots from sprouting at every freeway interchange. The European failing is more fundamental. The analyst is first tempted to compare the U. S. productivity growth slowdown of 1965-80 with that in Europe of 1995-2005. While no convincing explanation of the 1965-80 U. S. slowdown was ever delivered, to one of us (Gordon, 2000) it seemed as if the U. S. economy had run out of ways of exploiting the "Great Inventions" of the late nineteenth century. Is it so implausible that the EU-15 had finally run up against a barrier in catching up to the U. S. level of productivity by 1995?

But there is more involved than just running out of ideas. As one of us argued before (Gordon, 1997), Europe's productivity catch-up in the years before 1995 was largely artificial, not fundamental. By making labor expensive, a country can thus create both high labor productivity and high unemployment. What changed after 1995? After three decades of

virtually no growth in hours in the private sector, Europe's labor input began to grow. Restrictions that had made labor expensive began to crumble, and where they did not crumble, they certainly did not grow stronger. Productivity growth began to fall across the board, as the European system was brought into closer equality with the American.

A core measure of the European turnaround in labor-market flexibility is the ratio of employees per capita in the EU-15. The decline in this ratio over the postwar era is well known, it is the major explanation of why the EU/U. S. ratio of labor productivity grew from 1970 to 1995 while the ratio of output per capita stagnated. Yet there was a distinct turnaround from an average annual growth rate of the employment-population ratio for the EU-15 of -0.87 percent over 1960-95 to a very different +0.76 percent for 1995-2004.

Oddly enough, totally different dynamics were driving the American and EU productivity performance data. America had been held back through 1995 by the flexibility of its unskilled labor market and the explosion of unskilled jobs (busboys, grocery baggers, etc) that held down the level and growth of productivity. Europe had continued to charge ahead by adopting American technology and by achieving a higher capital-deepening coefficient (see Figures 1 and 2 above).

What caused the turnaround after 1995? In America, a unique set of institutions created a big-box retail culture that has brought low prices to every nook and cranny of the American marketplace. But something else was going on within Europe. Labor market regulations were loosening, and this meant that Europe was becoming more like America, with fewer barriers to

jobs, more employment opportunities for the unskilled, and this increase in the number of unskilled jobs pulled down the growth rates of average labor productivity across the board, in virtually all industries as shown in the bottom frame of Figure 6.

The major conclusion of this paper is that the Middle and Tortoise countries in Europe are doing everything badly. This is not just a matter of land-use planning that prevents Wal-Mart from sprouting up at every freeway interchange. It is a matter of pervasive restrictions that make it difficult to create new businesses, and an insider-outsider culture that provides lavish welfare benefits to employed and usually unionized insiders while leaving the unemployed outsiders to riot and burn in the Paris suburbs. This research will hopefully divert future researchers from thinking that retailing is the only industry worth studying in Europe – *every industry is worth studying*, for almost every industry is faltering. A broader diagnosis is needed that does not contain "retail land use planning" in its first paragraph.

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Figure 1a. Average Labor Productivity Growth

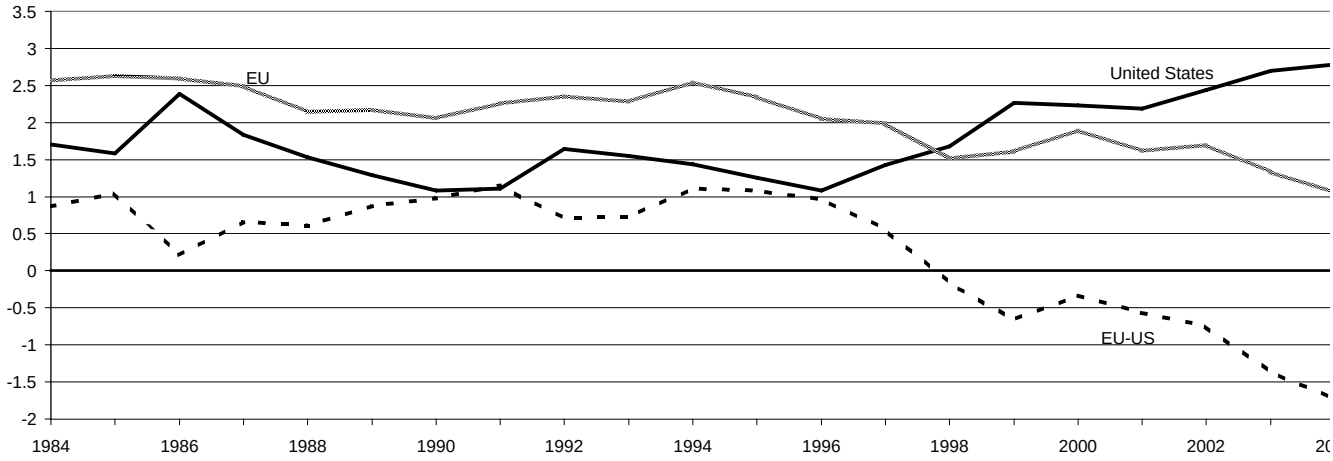

Figure 1b. Total Factor Productivity Growth

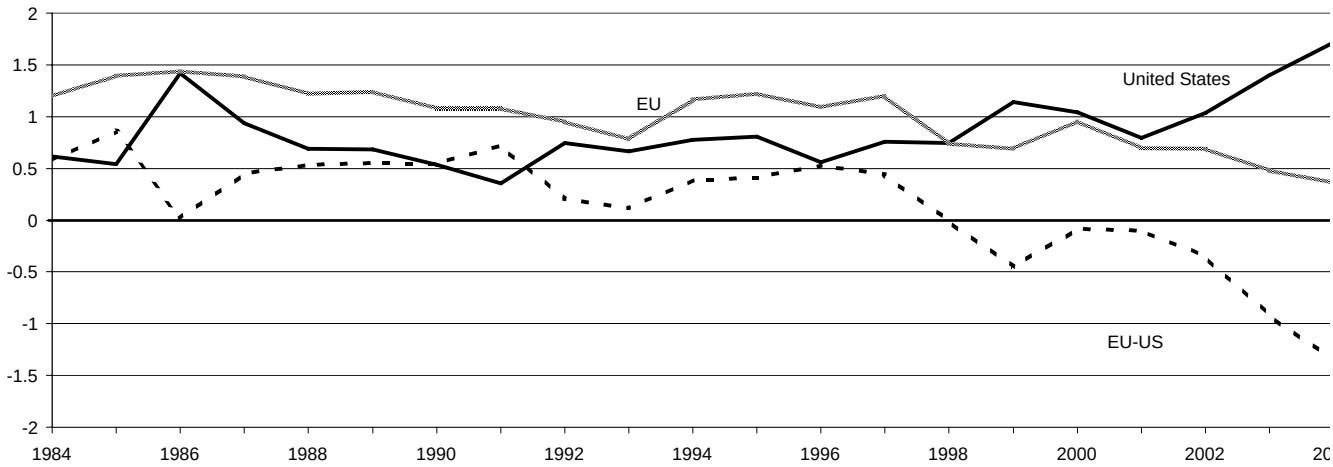

Figure 1c. Capital Deepening

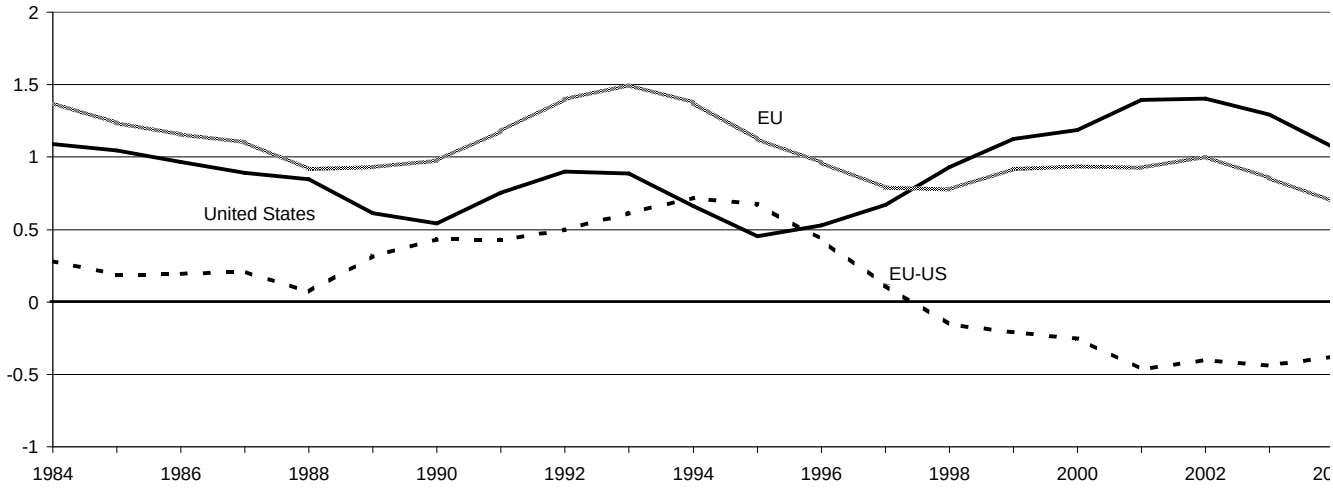

Figure 2. Components of Labor Productivity Gap

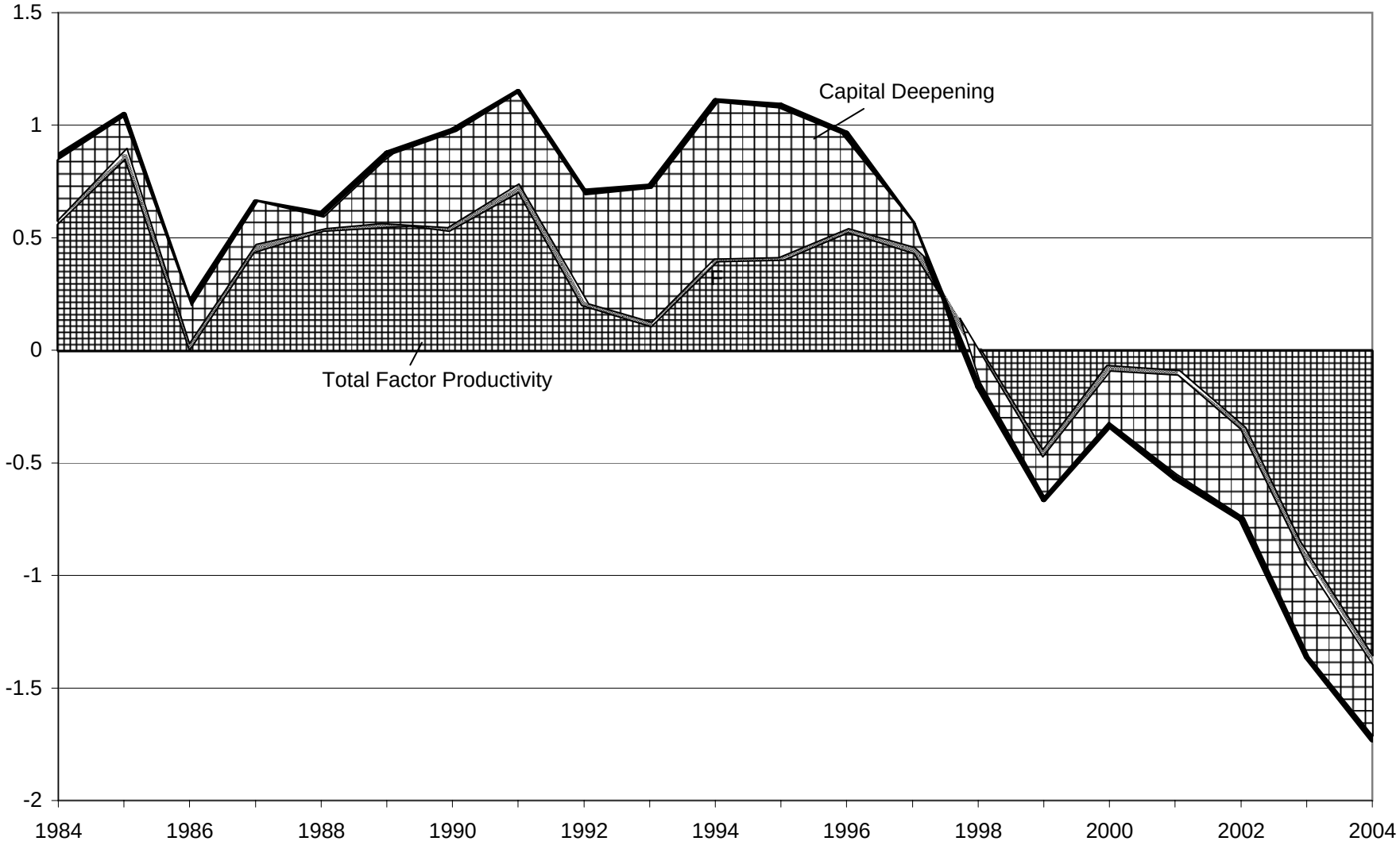

Figure 3. Components of EU-US ALP Growth Gap, 1995-2002

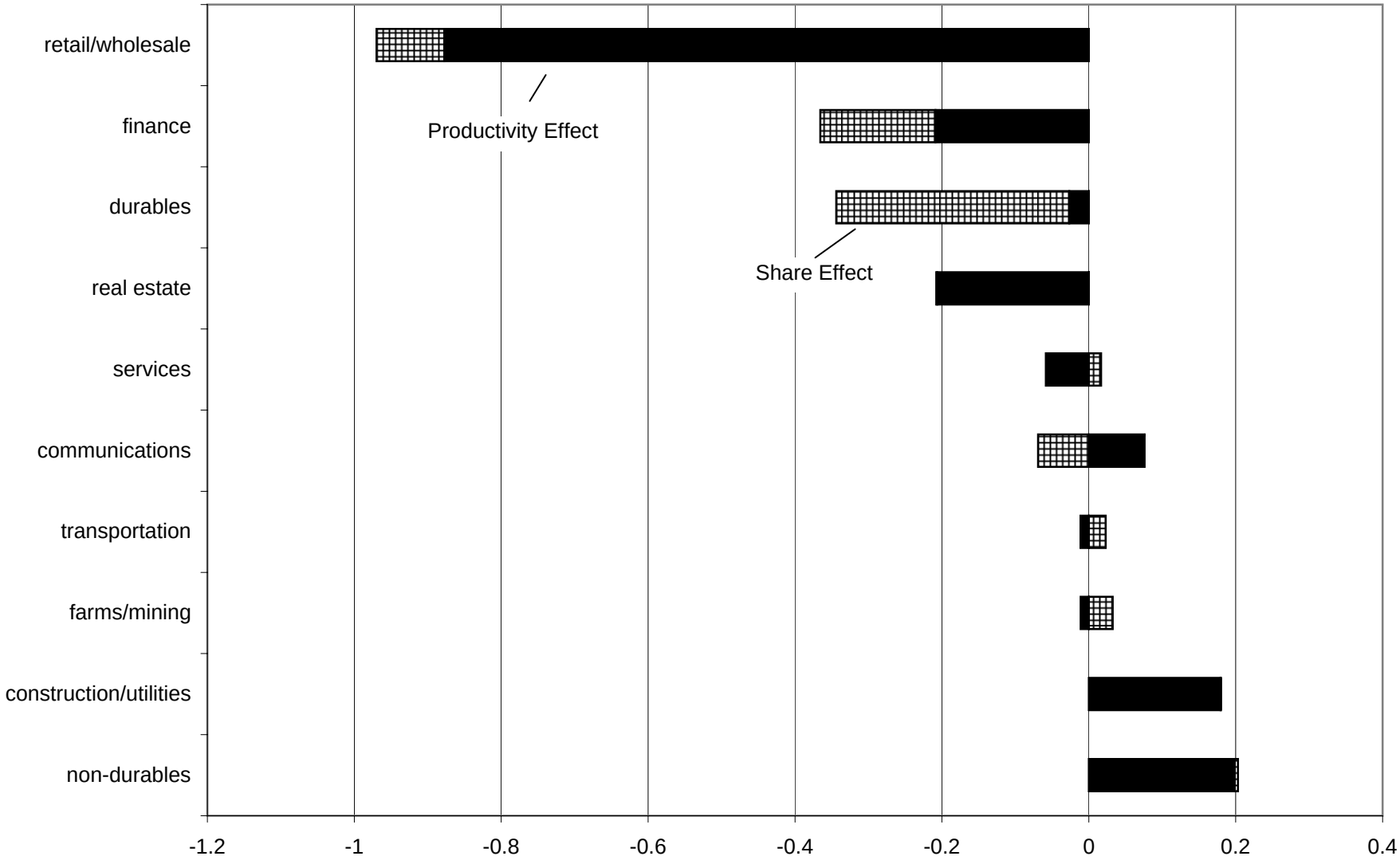

Figure 4. Sectoral Contributions to Labor Productivity Growth

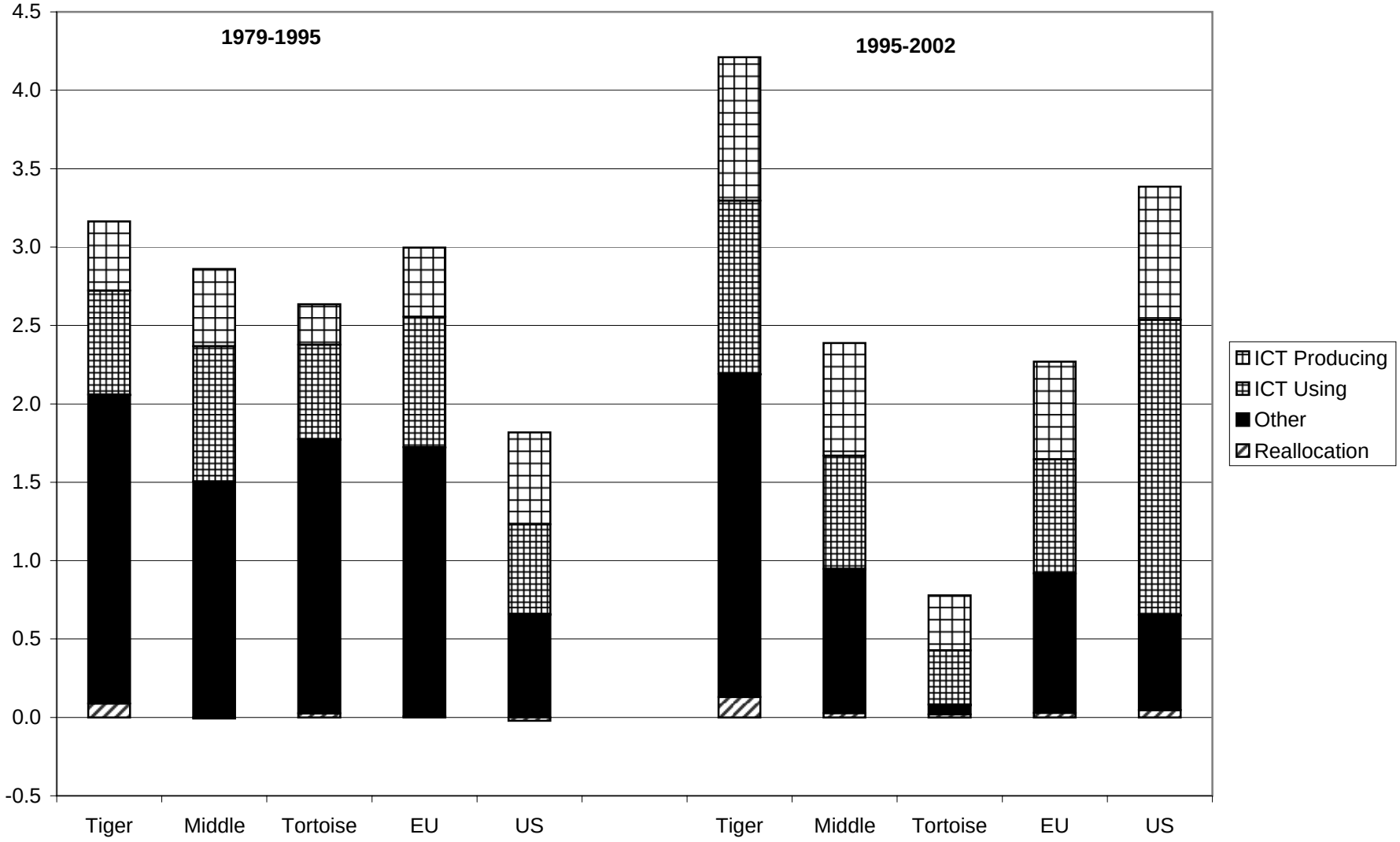

Figure 5. Industry Contributions to Gap Between Tigers and Tortoises

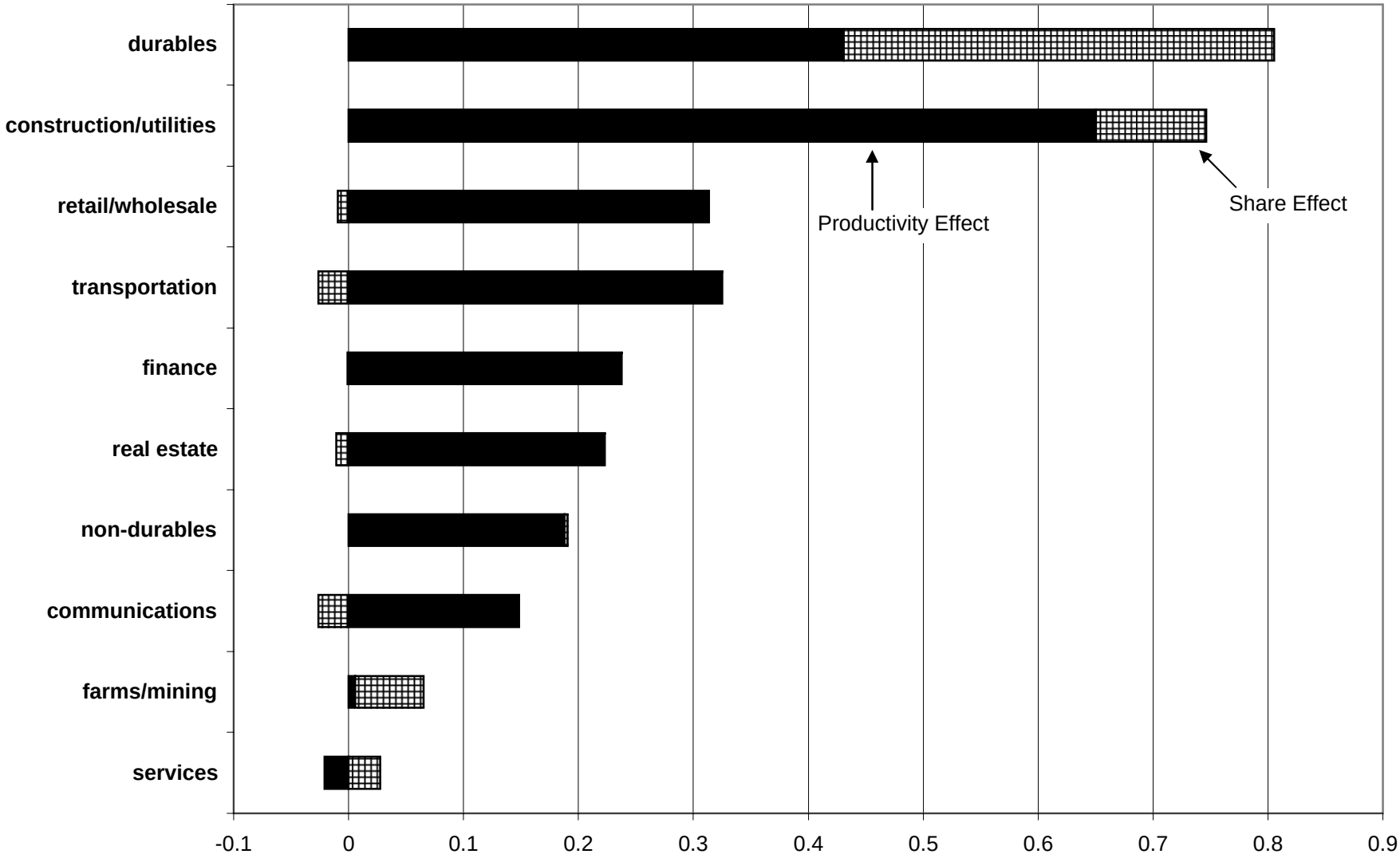

Figure 6a. Contributions to change after 1995 in Tigers

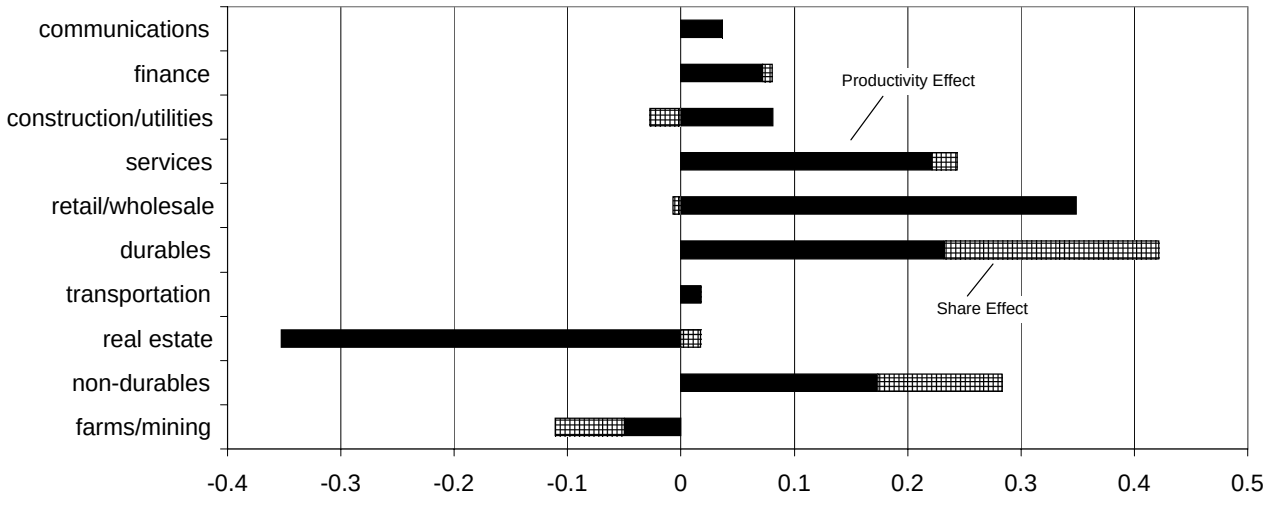

Figure 6b. Contributions to change after 1995 in Middle Countries

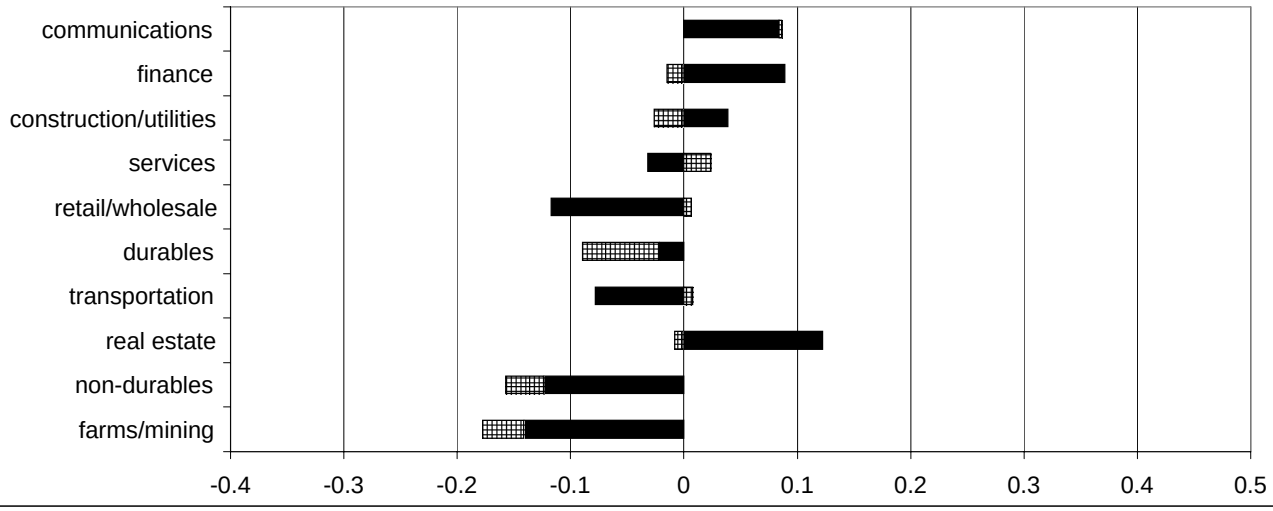

Figure 6c. Contributions to change after 1995 in Tortoises

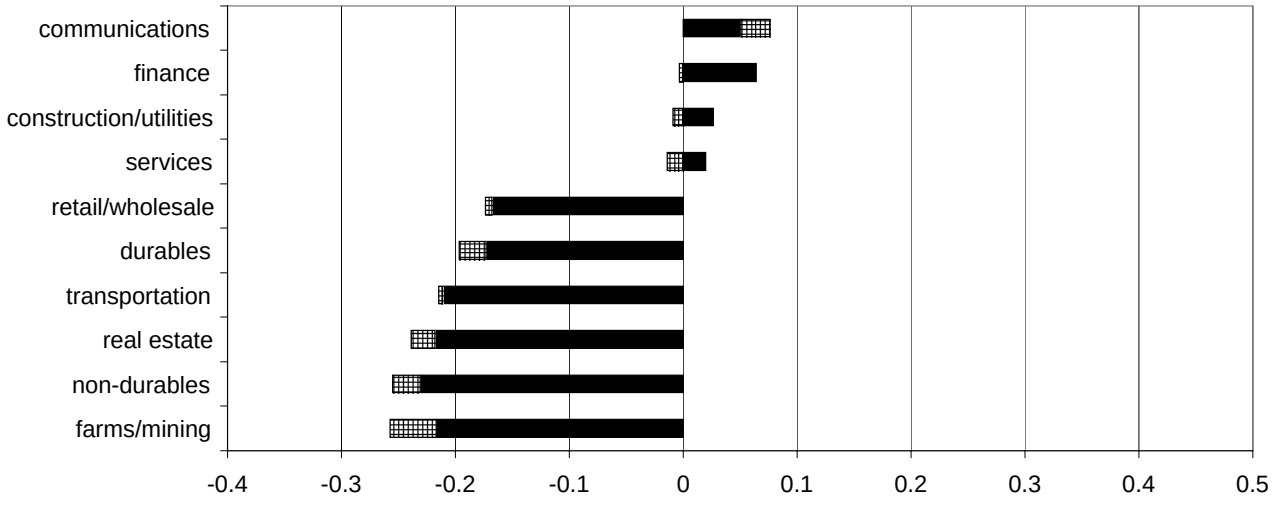

Figure 7. Components of Change in Productivity Growth Rate

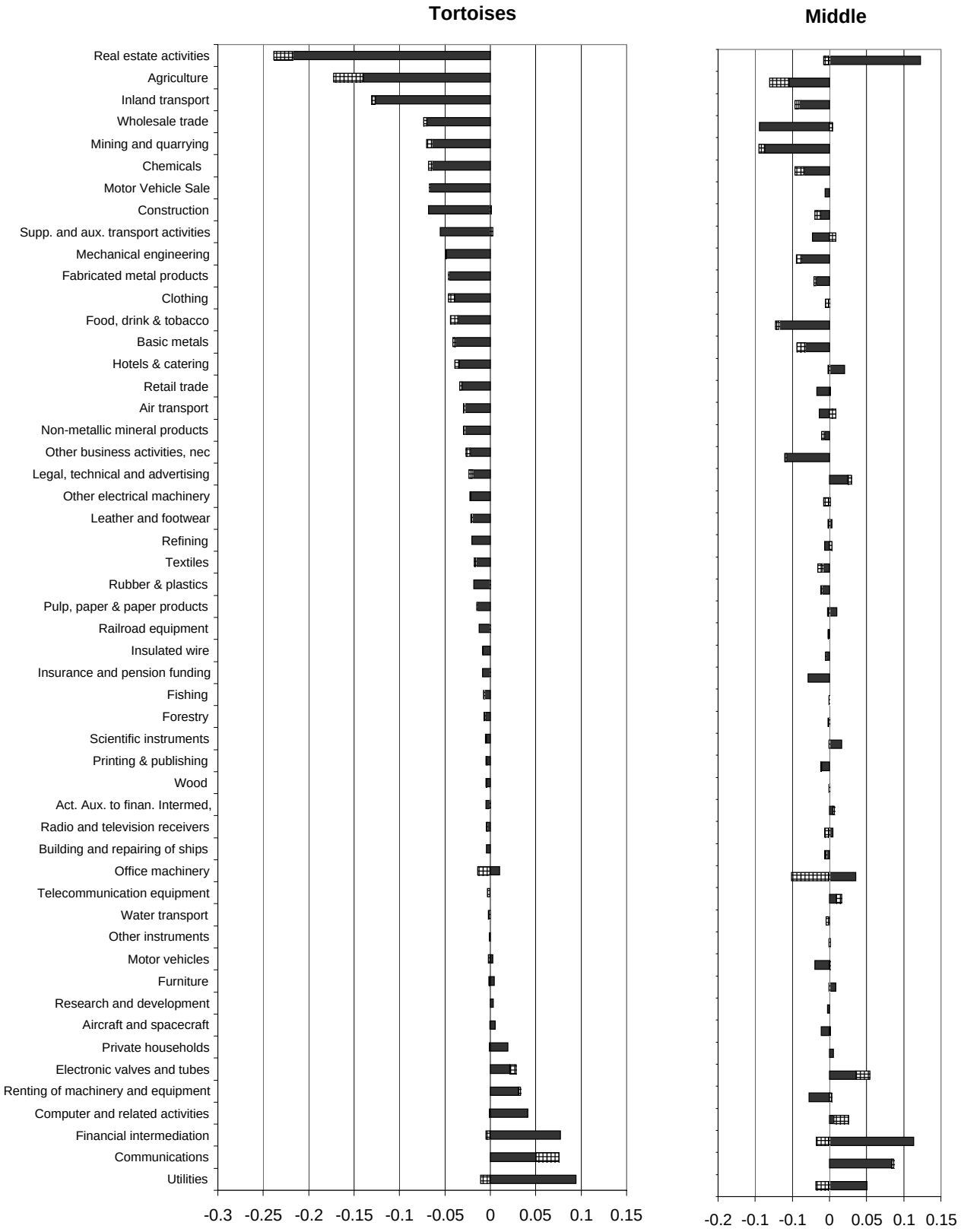

Table 1

Annual Growth Rates of Labor Productivity, Total Factor Productivity, and Contributions of ICT , and of Capital Deepening, Country Units and Groups, 1980-2004

	1980-95						1995-2004					
	LP	TFP	ICT TFP	Non-ICT TFP	ICT Capital Deepen	non-ICT Capital Deepen	LP	TFP	ICT TFP	Non-ICT TFP	ICT Capital Deepen	non-ICT Capital Deepen
United States	1.41	0.59	0.31	0.28	0.66	0.16	2.53	1.40	0.55	0.84	0.79	0.34
EU-15	2.34	1.16	0.20	0.96	0.42	0.76	1.46	0.64	0.26	0.38	0.46	0.36
Tigers												
Ireland	3.60	2.81	0.09	2.72	0.17	0.66	5.20	3.35	0.28	3.07	0.55	1.31
Greece	0.10	-0.33	0.10	-0.43	0.10	0.32	2.90	1.86	0.40	1.46	0.38	0.67
Finland	2.35	1.27	0.31	0.96	0.47	0.75	3.10	2.73	0.38	2.35	0.56	-0.18
Austria	1.64	0.55	0.14	0.40	0.40	0.69	2.30	1.04	0.29	0.74	0.47	0.79
Middle												
Sweden	1.59	0.58	0.31	0.27	0.49	0.51	2.60	1.60	0.39	1.21	0.75	0.25
Portugal	2.37	1.58	0.16	1.42	0.24	0.55	1.60	0.40	0.29	0.11	0.47	0.75
UK	2.46	1.31	0.32	0.99	0.45	0.70	2.10	1.26	0.29	0.97	0.62	0.27
Germany	2.70	1.64	0.16	1.48	0.47	0.62	1.80	0.99	0.21	0.78	0.40	0.39
Denmark	2.35	1.11	0.34	0.77	0.64	0.59	1.80	0.31	0.41	-0.10	0.74	0.82
France	2.39	0.92	0.12	0.79	0.29	1.18	2.10	1.01	0.20	0.80	0.32	0.75
Tortoises												
Netherlands	1.72	0.93	0.18	0.75	0.44	0.35	0.80	0.40	0.38	0.02	0.39	-0.04
Belgium	2.09	0.94	0.30	0.64	0.69	0.46	1.90	1.06	0.44	0.62	0.70	0.09
Luxembourg	3.13	1.74	0.28	1.47	0.76	0.63	1.40	0.49	0.33	0.16	0.42	0.51
Italy	1.99	0.91	0.21	0.70	0.35	0.73	0.50	-0.39	0.25	-0.64	0.41	0.50
Spain	2.78	1.61	0.20	1.41	0.32	0.85	0.00	-0.43	0.26	-0.69	0.27	0.14

Table 2
Labor Productivity Growth by Country

	1979-1995			1995-2002			Change		
	Total	**Private**	**Difference**	**Total**	**Private**	**Difference**	**Total**	**Private**	**Difference**
US	**1.27**	**1.80**	**0.53**	**2.37**	**3.39**	**1.02**	**1.10**	**1.59**	**0.49**
EU-15	**2.33**	**2.79**	**0.46**	**1.70**	**1.98**	**0.28**	**-0.63**	**-0.81**	**-0.18**
Tigers	2.58	3.16	0.58	3.42	4.21	0.79	0.84	1.05	0.21
Ireland	4.28	4.66	0.38	7.04	8.01	0.97	2.77	3.35	0.58
Greece	0.89	1.34	0.45	2.97	3.38	0.41	2.08	2.04	-0.04
Finland	3.09	3.97	0.89	2.60	3.35	0.75	-0.49	-0.62	-0.13
Austria	3.12	3.72	0.61	2.33	3.22	0.89	-0.79	-0.50	0.29
Middle	**2.42**	**2.85**	**0.43**	**1.87**	**2.39**	**0.52**	**-0.55**	**-0.47**	**0.08**
Sweden	1.70	2.62	0.92	1.92	2.89	0.97	0.22	0.27	0.05
Portugal	2.94	3.51	0.57	2.56	2.78	0.23	-0.39	-0.72	-0.34
UK	2.43	2.88	0.45	2.20	2.70	0.50	-0.23	-0.19	0.04
Germany	2.25	2.63	0.37	1.98	2.42	0.45	-0.28	-0.20	0.07
Denmark	2.23	2.76	0.53	1.37	2.08	0.70	-0.86	-0.68	0.18
France	2.56	3.11	0.54	1.95	2.01	0.06	-0.61	-1.10	-0.49
Tortoises	**2.22**	**2.63**	**0.41**	**0.72**	**0.78**	**0.06**	**-1.50**	**-1.86**	**-0.35**
Netherlands	2.06	2.36	0.30	1.27	1.57	0.31	-0.79	-0.78	0.01
Belgium	2.84	3.38	0.54	0.90	1.30	0.40	-1.93	-2.08	-0.14
Luxembourg	3.32	3.46	0.14	0.62	0.81	0.19	-2.70	-2.66	0.04
Italy	2.13	2.55	0.42	0.71	0.72	0.01	-1.42	-1.83	-0.41
Spain	2.33	2.67	0.34	0.64	0.63	-0.02	-1.68	-2.04	-0.36

Table 3
EU and US Labor Productivity Growth Rates by Industry

	1979-1995			1995-2002			Change		
	EU	US	Difference	EU	US	Difference	EU	US	Difference
Farms/Mining	4.95	3.13	1.82	2.95	2.69	0.26	-2.00	-0.44	-1.56
Construction/Utilities	1.88	0.11	1.77	1.26	-0.73	1.99	-0.63	-0.84	0.21
Durables	4.11	4.15	-0.04	3.79	6.97	-3.19	-0.32	2.83	-3.15
Non-Durables	3.03	2.23	0.80	2.52	1.29	1.23	-0.52	-0.94	0.43
Retail/Wholesale	1.99	2.76	-0.76	1.56	6.98	-5.43	-0.44	4.23	-4.66
Transportation	3.10	1.34	1.76	1.79	1.81	-0.02	-1.31	0.47	-1.78
Finance	1.88	1.46	0.42	2.36	5.05	-2.69	0.49	3.59	-3.10
Services	0.17	-0.10	0.28	0.45	1.16	-0.71	0.28	1.27	-0.99
Communications	5.40	2.80	2.59	8.56	6.39	2.17	3.16	3.59	-0.43
Real Estate	-0.43	0.90	-1.33	-0.68	0.91	-1.60	-0.26	0.01	-0.27
ICT Producing Industries	7.04	7.23	-0.19	9.04	9.30	-0.27	2.00	2.07	-0.07
ICT Using Industries	2.27	1.62	0.65	1.83	4.94	-3.11	-0.44	3.32	-3.76
of which:									
Manufacturing	2.70	0.85	1.85	2.14	2.57	-0.43	-0.55	1.72	-2.27
Retail/Wholesale	2.06	2.95	-0.89	1.65	7.55	-5.90	-0.41	4.60	-5.01
Finance	1.88	1.46	0.42	2.36	5.05	-2.69	0.49	3.59	-3.10
Others	0.77	-0.86	1.62	0.60	0.64	-0.04	-0.17	1.49	-1.66
Non-ICT Intensive	2.66	1.17	1.50	1.21	1.16	0.05	-1.46	-0.01	-1.45
Total	2.79	1.80	1.00	1.98	3.39	-1.41	-0.82	1.59	-2.41

Table 4
EU-US Productivity Ratios by Industry

				Growth Rates	
	1979	**1995**	**2002**	**1979-1995**	**1995-2002**
Farms/Mining	50.4	67.5	68.7	1.82	0.26
Construction/Utilities	66.8	88.8	102.0	1.77	1.99
Durables	84.1	83.6	66.9	-0.04	-3.19
Non-Durables	76.6	87.0	94.8	0.80	1.23
Retail/Wholesale	108.3	95.9	65.6	-0.76	-5.43
Transportation	81.5	108.0	107.9	1.76	-0.02
Finance	90.6	96.9	80.3	0.42	-2.69
Services	117.8	123.1	117.1	0.28	-0.71
Communications	50.7	76.9	89.4	2.59	2.17
Real Estate	149.1	120.6	107.8	-1.33	-1.60
ICT Producing Industries	79.8	77.4	75.9	-0.19	-0.27
ICT Using Industries	88.7	98.3	79.1	0.65	-3.11
of which:					
Manufacturing	72.6	97.6	94.7	1.85	-0.43
Retail/Wholesale	108.2	93.9	62.1	-0.89	-5.90
Finance	90.6	96.9	80.3	0.42	-2.69
Others	99.9	129.6	129.2	1.62	-0.04
Non-ICT Intensive	73.1	92.9	93.2	1.50	0.05
Total	79.8	93.5	84.8	1.00	-1.41

Table 5

EU and US Hour Shares by Industry

	1979			1995			2002		
	EU	US	Difference	EU	US	Difference	EU	US	Difference
Farms/Mining	14.36	6.76	7.60	8.27	4.83	3.44	6.58	4.44	2.14
Construction/Utilities	11.78	9.44	2.34	11.48	9.29	2.19	11.06	10.48	0.59
Durables	19.06	18.19	0.87	15.39	13.20	2.19	14.30	11.04	3.26
Non-Durables	14.25	11.69	2.56	11.79	9.49	2.30	10.23	7.53	2.70
Retail/Wholesale	17.86	23.50	-5.65	20.27	23.44	-3.17	20.48	23.01	-2.53
Transportation	5.71	4.53	1.18	5.83	5.05	0.78	5.95	5.05	0.90
Finance	3.41	5.49	-2.08	4.45	6.15	-1.71	4.31	6.44	-2.13
Services	10.78	16.08	-5.30	19.14	24.42	-5.28	23.62	27.75	-4.12
Communications	2.13	2.79	-0.66	2.18	2.42	-0.24	2.12	2.42	-0.29
Real Estate	0.66	1.51	-0.85	1.21	1.71	-0.50	1.34	1.85	-0.51
ICT Producing Industries	4.45	5.76	-1.31	4.86	5.83	-0.97	5.45	6.36	-0.91
ICT Using Industries	32.37	40.05	-7.68	36.02	40.54	-4.52	35.98	39.71	-3.73
of which:									
Manufacturing	10.97	11.00	-0.03	9.09	8.23	0.86	8.06	6.41	1.64
Retail/Wholesale	15.17	19.21	-4.04	17.31	19.23	-1.92	17.44	18.78	-1.33
Finance	3.41	5.49	-2.08	4.45	6.15	-1.71	4.31	6.44	-2.13
Others	2.82	4.34	-1.52	5.17	6.92	-1.75	6.17	8.08	-1.91
Non-ICT Intensive	63.18	54.19	8.99	59.12	53.63	5.49	58.57	53.92	4.64

Table 6.
Regressions of 1995-2002 Productivity Growth by Industry

	Total Economy	ICT Producing	ICT Using	Non-ICT
Constant	-0.34	-1.49	1.84 **	1.24 **
1995 Overall ratio	-0.01	0.03 **	-0.03 *	0
1995 Industry ratio	-0.03 **	-0.07 **	-0.02 **	-0.02 **
79-95 growth rate	0.25 **	0.64 **	0.09	0.14 **
US 79-95 rate	0.32 **	-0.37	0.13	0.17
US 95-02 rate	0.53 **	0.79 **	0	0.17 *
R-squared	0.73	0.86	0.12	0.13

Table 7

Productivity Growth Rates by Industry for Tigers, Middle, and Tortoises

	1979-1995			1995-2002			Change		
	Tigers	**Middle**	**Tortoises**	**Tigers**	**Middle**	**Tortoises**	**Tigers**	**Middle**	**Tortoises**
Farms/Mining	2.91	5.11	5.65	3.12	3.34	2.43	0.21	-1.77	-3.22
Construction/Utilities	2.13	1.87	1.77	2.35	1.71	0.10	0.21	-0.16	-1.66
Durables	5.19	4.14	3.93	8.69	4.29	1.86	3.50	0.15	-2.06
Non-Durables	4.45	2.60	3.77	6.93	2.67	1.17	2.48	0.07	-2.60
Retail/Wholesale	0.98	2.48	1.39	2.75	1.90	0.76	1.77	-0.57	-0.63
Transportation	3.18	3.13	3.06	4.18	2.29	0.41	0.99	-0.83	-2.64
Finance	1.97	2.09	1.36	3.48	2.68	1.59	1.51	0.59	0.22
Services	0.30	0.68	-0.76	1.96	0.59	-0.08	1.66	-0.10	0.68
Communications	4.93	5.62	4.85	6.42	9.50	7.14	1.49	3.87	2.29
Real Estate	2.54	-0.70	-0.33	-0.53	0.00	-2.59	-3.06	0.70	-2.26
ICT Producing Industries	7.71	7.64	5.23	12.18	9.90	6.07	4.47	2.26	0.85
ICT Using Industries	2.12	2.52	1.79	3.51	2.08	1.01	1.39	-0.45	-0.78
of which:									
Manufacturing	3.30	2.56	3.06	5.75	2.30	1.25	2.45	-0.26	-1.81
Retail/Wholesale	1.17	2.61	1.33	2.77	2.01	0.85	1.59	-0.59	-0.48
Finance	1.97	2.09	1.36	3.48	2.68	1.59	1.51	0.59	0.22
Others	0.33	1.49	-0.97	1.64	0.92	-0.29	1.31	-0.57	0.68
Non-ICT Intensive	3.13	2.54	2.84	3.38	1.59	0.11	0.24	-0.95	-2.74
Total	3.16	2.85	2.63	4.21	2.39	0.78	1.05	-0.47	-1.86

Table 8
Hour Shares by Industry for Tigers, Middle, and Tortoises

	1979			1995			2002		
	Tigers	**Middle**	**Tortoises**	**Tigers**	**Middle**	**Tortoises**	**Tigers**	**Middle**	**Tortoises**
Farms/Mining	27.32	11.42	16.79	20.05	6.63	8.29	15.98	5.28	6.44
Construction/Utilities	11.49	11.89	11.59	10.77	12.07	10.65	11.66	10.82	11.32
Durables	12.99	20.48	17.86	12.03	16.18	14.78	11.90	14.72	14.20
Non-Durables	13.89	14.29	14.25	11.62	11.63	12.12	10.09	9.99	10.66
Retail/Wholesale	14.50	18.28	17.96	18.48	20.28	20.66	19.15	20.82	20.11
Transportation	6.59	5.66	5.56	6.83	5.82	5.59	6.72	6.03	5.64
Finance	2.18	3.71	3.14	3.33	4.80	4.06	3.39	4.78	3.75
Services	8.47	11.10	10.76	14.27	18.68	21.26	18.19	23.49	25.32
Communications	1.99	2.40	1.64	1.87	2.44	1.75	2.10	2.42	1.63
Real Estate	0.58	0.77	0.45	0.74	1.47	0.84	0.82	1.66	0.93
ICT Producing Industries	1.00	5.06	3.57	3.76	5.40	4.13	4.99	6.08	4.50
ICT Using Industries	25.72	34.26	30.44	30.91	37.13	35.18	31.70	37.25	34.82
of which:									
Manufacturing	9.41	11.54	10.23	8.24	9.36	8.81	7.36	8.12	8.13
Retail/Wholesale	12.26	15.70	14.95	15.55	17.49	17.38	16.13	17.93	16.82
Finance	2.18	3.71	3.14	3.33	4.80	4.06	3.39	4.78	3.75
Others	1.87	3.31	2.11	3.80	5.48	4.93	4.82	6.43	6.11
Non-ICT Intensive	71.09	60.68	65.99	65.33	57.47	60.69	63.31	56.66	60.68