

Is It Possible to Measure Sectoral Productivity Levels? The Case of Manufacturing*

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Abstract

This paper studies conversion factors based on the expenditure approach and evaluates the appropriateness for international productivity comparisons in manufacturing. We apply a consistency check based on the insight that relative productivity levels should be invariant to the choice of base year. Consequently, convergence parameters and dispersion of productivity across countries should also be unaffected. The results are disappointing: (i) relative measures of productivity depend heavily of the choice of base year and (ii) productivity in manufacturing sectors does not show evidence of convergence across OECD countries for early base years, whereas it does for later base years. Consequently, we cannot measure relative productivity levels in manufacturing across countries using these conversion factors.

Keywords: conversion factors, expenditure approach, convergence, manufacturing

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1 Introduction

The main message of this paper is depressing. It states that we cannot use expenditure-based conversion factors to make productivity comparisons across countries at the sectoral level. The central problem is measurement of relative output levels that requires conversion of a country's output in national prices into prices of the base country. Appropriate conversion requires the existence of conversion factors that reflect relative manufacturing prices between countries. Such conversion factors do not exist when the expenditure approach is used; one of two approaches developed for computing conversion factors. It still has to be proven that conversion factors based on the other approach, the industry approach, is insensitive to the consistency check applied in this paper.

The broader consequence of the main message is also depressing. Since we are unable to measure productivity levels in manufacturing, analyses of international comparisons that build on the measure potentially lead to flawed results. This may be the case for productivity ranking, catch-up and convergence analysis, analysis of technological progress, analysis of structural change, and measurement of unit labor costs and thus analysis of competitiveness.

Sørensen (2001) suggests an easy-to-implement consistency check for the appropriateness of conversion factors. The main insight is that relative productivity levels should be invariant to the base year chosen for making the conversions.¹ This implies that convergence parameters and dispersion of productivity across countries should also be unaffected by the choice of base year. A requirement in this context is the existence of conversion factors for an adequate number of base years. The original purpose of the research presented in this paper was to identify conversion factors applied in cross-country productivity studies for manufacturing that could pass the consistency check. The candidate conversion factors under investigation are based on component factors of aggregate GDP PPPs, see for example Hooper and Larin (1989), Hooper (1996) and Harrigan (1999). We are unable to identify any appropriate conversion factors for manufacturing.

As mentioned above, two main approaches have developed to compute conversion factors. Under the expenditure approach component factors of aggregate GDP PPPs are used, which origin from the International Comparison Project (ICP), see for example Kravis, Heston and Summers (1982) and Heston, Summers and Aten (2002).

¹Base year refers to the year in which the fixed prices originate.

There is a number of conceptual problems with this approach because it is based on expenditure prices on domestic consumption rather than producer prices on domestic production. Expenditure prices include indirect taxes and subsidies, wholesale and retail markups and transportation costs that are not relevant for productivity measurement. Expenditure is also based on import and domestic production excluding exports. Finally, expenditure prices concern final expenditure only and do not cover prices for intermediate products that are especially important for manufacturing industries. Despite the mentioned problems, the expenditure approach is a popular approach in productivity measurement at the sectoral level because price data are easily available for a large number of countries.

Over the past two decades, a common practice using aggregate GDP PPPs in measurement of sectoral productivity levels has developed. See for example Dollar and Wolff (1988, 1993), Bernard and Jones (1996*a, b*), Caree et al. (2000), Gardia Pascual and Westermann (2002), and Malley, Muscatelli, and Woitek (2003) for manufacturing, and Gouyette and Perelman (1997) for services. This practice has developed, even though component factors of aggregate GDP PPPs have been readily available for many years. In addition to the critique of the expenditure approach presented above, the use of aggregate GDP PPPs in measuring sectoral productivity can be further criticized because prices related to specific sectors should be used not prices for the economy as a whole. Sørensen (2001) establishes that aggregate GDP PPPs are not suitable conversion factors for measuring productivity at the sectoral level.

The industry approach is the theoretically most appealing approach because it is based on prices of disaggregate industry outputs rather than prices of disaggregate final expenditures, see Timmer and van Ark (2001). This approach is often disregarded by researchers and it is argued that data are costly to compile and not readily available for most countries. Today, however, conversion factors exist for a relative large group of countries.²

There are also significant drawbacks to this method, see the discussion by Jorgenson and Lichtenberg in van Ark and Pilat (1993). The main problem is difficulties in matching measures of output quantity across countries when

²See Groningen Growth and Development Center, ICOP Industry Database, <http://www.eco.rug.nl/GGDC/icop.html>. Countries for which conversion factors for manufacturing exist are Australia, Belgium, Canada, Finland, France, Germany, West Germany, Japan, Netherlands, Portugal, Spain, Sweden, the United Kingdom, Brazil, Mexico, China, India, Indonesia, Korea, Taiwan, Czechoslovakia, Czech Republic, East, Hungary, Poland, and USSR.

information origins from censuses of manufactures. This is due to difficulties in product definitions and product qualities across countries.³ A consistency check of this approach would also be very interesting. However, the method applied in this paper cannot be used because it is based on the availability of conversion factors for an adequate number of base years and conversion factors under this approach is usually developed for one base year only, see Timmer and van Ark (2001).

We find that conversion factors based on selected sets of expenditure categories for measuring productivity in manufacturing perform as poorly as or worse than aggregate GDP PPPs that are themselves inappropriate for productivity measurement. Moreover, for sub-sectors of manufacturing, for example machinery and equipment, the variation in relative productivity over base years are even higher.⁴ It is also found that estimated convergence parameters and measured dispersion of productivity across countries depend heavily on the choice of base year. If an early base year is chosen, there is only little evidence of convergence, whereas convergence is found to apply for later base years.

Why do conversion factors based on expenditure prices fail to pass the consistency check in manufacturing? And why are measures of convergence so similar across conversion factors? The key to these questions is that changes in measured initial productivity levels only depend on changes in relative prices as base years advances. If a country experiences rapidly declining relative manufacturing prices and the applied conversion factor reflects aggregate prices, measured relative initial productivity falls when base years roll forward. We find this to be pronounced in countries with rapid labor productivity growth in manufacturing. Consequently, convergence is more pronounced for later base years than early base years. This reflect Balassa-Samuelson effects: high productivity growth and falling relative prices in manufacturing go hand in hand. Hence, Balassa-Samuelson effects unintentionally influence results for convergence leading to flawed conclusions. The measures of initial productivity in manufacturing turn out to suffer from this

³According to the discussion by Jorgenson in van Ark and Pilat (1993), the underlying data set provides prices for 11,000 US products, 6,000 German products, and 1,850 Japanese products. However, it was only possible to match 271 products for Germany and the United States and 190 products for Japan and the United States.

⁴This follows Roy (1982) who also found significant differences in productivity measures for sub-sectors of manufacturing over base years. Contrary to our study, Roy found that for the manufacturing sector as a whole, the results obtained using different base years were quite similar. We are not able to support the latter conclusion.

problem and therefore all the conversion factors based on the expenditure approach investigated in this paper are inappropriate.

2 Measuring Relative Output

Appropriate conversion factors are crucial when measuring relative initial output levels between country i relative to base country 1. Such conversion factors are given by the number of country i currency units required in country i to purchase a quantity of sectoral output costing one dollar in country 1.

The measured initial relative output level is independent of the choice of base year, when the theoretically correct conversion factor reflecting relative prices between countries exists. To see this let the base year price of output in country i be denoted by $q_{i,t}$ for base year t and let initial output be denoted by $V_{i,0}$. Furthermore, let $c_{i,t} = q_{i,t}/q_{1,t}$ measure the theoretically correct conversion factor between country i and country 1. The initial output level of country i is measured in base year prices, $q_{i,t}V_{i,0}$. Therefore, measured initial output of country i expressed in country 1 prices, $q_{i,t}V_{i,0}/c_{i,t}$, relative to measured output in country 1, $q_{1,t}V_{1,0}$, simply equals the initial relative output level

$$\hat{V}_{i,0} = \frac{q_{i,t}V_{i,0}}{c_{i,t}} \frac{1}{q_{1,t}V_{1,0}} = \frac{q_{1,t}V_{i,0}}{q_{1,t}V_{1,0}} = \frac{V_{i,0}}{V_{1,0}}, \quad (1)$$

$\hat{V}_{i,0}$ denotes the true initial relative output level.

For practical purposes, theoretically correct conversion factors do not exist. Consequently, imperfect measures of the ratio of output prices are used to measure relative output levels. The imperfect conversion factor between country i and country 1 is denoted by $\tilde{c}_{i,t} = \tilde{q}_{i,t}/\tilde{q}_{1,t}$ and measured initial relative output by $\tilde{V}_{i,t,0}$. The latter measure equals:

$$\tilde{V}_{i,t,0} = \frac{q_{i,t}V_{i,0}}{\tilde{c}_{i,t}} \frac{1}{q_{1,t}V_{1,0}} = \frac{\tilde{q}_{1,t}}{q_{1,t}} \frac{q_{i,t}}{\tilde{q}_{i,t}} \hat{V}_{i,0} \quad (2)$$

It is important to note that $\tilde{V}_{i,t,0}$ depends on the base year unless $\tilde{q}_{1,t}/\tilde{q}_{i,t} = q_{i,t}/q_{1,t}$. This is opposite to true relative output, $\hat{V}_{i,0}$, that is independent of the choice of base year. This simple insight is used below to evaluate the suitability of conversion factors.

3 Productivity and Convergence

In the following, we focus on relative labor productivity levels instead of reporting relative output levels. Doing this it becomes possible to apply a consistency check for productivity measurement related to convergence and catch-up.

The measured initial relative productivity level, $\tilde{P}_{i,t,0}$, equals the measured initial relative output level, $\tilde{V}_{i,t,0}$, divided by $\hat{L}_{i,0}$. The latter measure denotes initial employment in country i in relation to country 1 employment:

$$\tilde{P}_{i,t,0} = \tilde{V}_{i,t,0} / \hat{L}_{i,0}. \quad (3)$$

We assume that measurement problems is related solely to relative initial output.⁵

The basic model for productivity convergence can be expressed as follows:

$$\bar{p}_i = \alpha_t + \beta_t \ln \tilde{P}_{i,t,0} + \tilde{\varepsilon}_{i,t}, \quad (4)$$

where $\bar{p}_i$ denotes the average growth rate in country i relative to country 1 between time 0 and time T , $\tilde{\varepsilon}_{i,t}$ indicates an average relative productivity shock between the two countries, and β_t is the convergence parameter that is estimated to test for β -convergence. β -convergence is said to exist if β_t is significantly below zero; σ -convergence holds if the standard deviation of $\ln \tilde{P}_{i,t,\tau}$ across countries decreases over time τ .

It is important to understand what is not affected by the choice of base year and what is affected. Growth rates are not affected by the choice of base year since these are independent of base year prices.⁶ On the other hand, measured initial relative productivity levels depend on the choice of base year, which originates from the discrepancy between the relative price

⁵It can be argued that $\hat{L}_{i,0}$ also involves measurement problems when employment in persons are used to construct this measure, as is the case in this paper. In order to rank productivity levels across countries, measure of labor input should include adjustments for education, sex, hours worked etc. This critique is however not relevant in the present study since we focus on the appropriateness of conversion factors. If conversion factors turn out to be suitable for productivity measurement, measurement issues related to labor input can be taken into account.

⁶In country i , fixed price value-added equals $q_{i,t}V_{i,\tau}$, where t indicates the base year and τ indicates time. Growth rates are determined as log differences over time. Hence, the one year growth rate at time τ for country i equals $g_{i,\tau} = \ln(q_{i,t}V_{i,\tau}/q_{i,t}V_{i,\tau-1}) = \ln(V_{i,\tau}) - \ln(V_{i,\tau-1})$.

in manufacturing and the conversion factor. Since $\tilde{P}_{i,t,0}$ depends on the choice of base year, the measures for β -convergence and σ -convergence are also affected by the choice.

The more appropriate a convergence factor is, the less affected are measures of convergence by the choice of base year. When the measured convergence factor approaches the theoretically correct convergence factor, the relative productivity measure is unaffected by the choice of base year. Consequently, the estimated β parameter and the measured standard deviation of (log) productivity are also unaffected by the choice of base year.

Accordingly, one way of evaluating how suitable candidate conversion factors are for productivity measurement, is to investigate the sensitivity of convergence results over base years. In the remainder of this paper, we present three indicators that are used to evaluate appropriateness of the different conversion factors in manufacturing, machinery and equipment, and food, beverages and tobacco. The insight behind these measures is that measured relative productivity levels and thereby the results for convergence are unaffected by the choice of base year when proper conversion factors are used.

4 Conversion Factors

A number of conversion factors will be applied in this paper. For total manufacturing two conversion factors are applied. The first is simply aggregate GDP PPP that is often used in empirical work on international comparisons as mentioned in the Introduction.

The second conversion factor follows Hooper and Larin (1989) that is a geometric average of component factors of aggregate GDP PPPs with weights based on expenditure share for commodity categories in country i and country 1. More precisely, the conversion factor equals

$$PPP_i^{HL} = \prod_{j=1}^J PPP_{i,j}^{w_{i,j}} \quad (5)$$

where i is a country index and j is an index for expenditure category. $w_{i,j}$ is a weight that measures expenditure category j 's share of total expenditure in manufacturing in country i . This weight is determined by

$$w_{i,j} = \frac{(E_{i,j}E_{1,j})^{0.5}}{\sum_{j=1}^J (E_{i,j}E_{1,j})^{0.5}}. \quad (6)$$

E denotes expenditure of category j . We refer to this conversion factor as PPP^{HL} .

Besides conversion factors for total manufacturing, conversion factors for machinery and equipment and food, beverages and tobacco are developed. It might be argued that relative output should be measured for a more narrow set of manufacturing industries. We determine the conversion factor used by Harrigan (1999) that builds on Hooper and Larin (1989) for the former sector and a similar conversion factor for the latter sector. We refer to these convergence factors as PPP_i^{HME} and PPP_i^{HFBT} . In the case that output measures for these sub-sectors are insensitive to the choice of base year and measures for total manufacturing are sensitive, the relative output levels for manufacturing should be measured as a sum of relative output levels over sub-sectors.

5 Data

The productivity measure that we apply in this paper is labor productivity. We do not construct measures of multifactor productivity because data on capital stocks only exist for a few base years. Furthermore, for some countries, capital data change significantly for different versions of the applied database. We only develop measures for labor productivity, in order to focus on the source for measurement problems from convergence factors as clean-cut as possible.

5.1 Real Output

Nominal and real value added for manufacturing sectors are taken directly from the International Sectoral Data Base (ISDB); see OECD (1999) for 14 OECD countries over the period 1970–1993. The 14 OECD countries selected are Australia, Belgium, Canada, Denmark, Finland, France, Italy, Japan, the Netherlands, Norway, Sweden, the United Kingdom, the United States, and West Germany. The 1993 German PPP figure refers to unified Germany. The United States is used as the country of reference.⁷

The measured initial productivity level of country i is calculated using backward extrapolation of growth rates, see Baumol (1986). That is, mea-

⁷The reason that this study does not investigate years after 1993 is that the industrial classification changes between OECD (1999) and newer versions of the database, OECD (2003).

sured productivity of country i at base year t is determined by using value-added current prices. In order to derive a measure of initial productivity, the value at base year t is discounted by productivity growth rates:

$$q_{i,t}P_{i,0} = e^{-g_{it}t} (q_{i,t}P_{i,t}) \quad (7)$$

where $g_{i,t}$ is the average productivity growth rate in country i between time zero and time t and $P_{i,t} = V_{i,t}/L_{i,t}$.⁸

To investigate the robustness of the established results, we develop an alternative productivity measure based on gross output instead of value added. Data on gross output stem from the STAN database, see OECD (2003).

5.2 Labor

Employment data also origin from ISDB; see OECD (1999). Employment data are missing for Norway and the United Kingdom for 1991–1993 and 1990–1993, respectively. The development in sectoral employment for these years was determined by using employment data from OECD (1997*b*). Data for the total population stem from OECD (1998).

5.3 Conversion Factors

Aggregate GDP PPPs are taken from OECD (1997*a*) for the period 1970–1993, whereas the ICP data used to construct conversion factors based on component factors of aggregate GDP PPPs are available for base years 1970, 1975, 1980, 1985, 1990, and 1993. For base years 1970, 1975, 1980, and 1985 the ICP data origin from Summers, Heston, and Atan (2002); for base year 1990 from OECD (1993) and for base year 1993 from OECD (1996). For base year 1970, the ICP data contain 8 of the countries covered by ISDB, 9 countries in 1975, 12 countries in 1980, and all 14 countries in 1985, 1990, and 1993. These groups of countries are referred to as Group 1, 2, 3 and 4, respectively. Data availability is presented in Table 1.

⁸ Average growth rates were calculated by using value added 1990 prices. This gives rise to a potential problem because the weights used to calculate growth rates were also based on 1990 prices. To evaluate whether changing weights affect the results, the analysis was performed with growth rates based on 1980 and 1985 prices from earlier versions of OECD (1999). The results presented are strongly confirmed when this data are used.

<Table 1 about here>

For 1970-1985 the data contain price indices for about 125 final expenditure categories. The existence of this high number of expenditure categories implies that we develop two versions of PPP^{HL} . In the first version, we use all final expenditure categories in one step to determine the conversion factors. Furthermore, we determine a conversion factor in two steps. In the first step, we determine PPPs for seven sub-sectors.

$$PPP_{i,k} = \prod_{j=1}^J PPP_{i,j}^{w_{i,j,k}} \quad (8)$$

where k is an index for sub-sectors. The applied weights follows (6) and (10). The seven sub-sectors are (i) Food beverages and tobacco, (ii) Clothing and footwear, (iii) Fuel and Power, (iv) Household operations, (v) Transport Equipment, (vi) Equipment for Recreation, and (vii) Producer durables (machinery and equipment). In the second step, we use (5). Data for 1990 and 1993 are less detailed implying that step 1 is unnecessary.⁹

6 Results

In the following, we present the three measures that are used to evaluate conversion factors. The first is measured relative productivity in 1970 determined for the six base years. This was constructed by substituting the measured initial productivity of country i and country 1 given by equation (7) into the expression for initial relative productivity given by equation (3), applying the different conversion factors. The second measure is β_t parameters estimated on productivity data for each base year. The third measure is the cross-country dispersion over the period 1970–1993 for the six base years.

Figure 1 shows measured relative productivity levels for 1970 for each base year t across sectors for the OECD countries. The measure is presented as the (log) deviation from the average value of initial relative productivity levels over base years, i.e.

$$\ln \tilde{P}_{i,t,0} - \ln \bar{\tilde{P}}_{i,t,0} = \ln \left(\frac{\tilde{q}_{1,t} q_{i,t}}{q_{1,t} \tilde{q}_{i,t}} \right) - \ln \left(\frac{\bar{\tilde{q}}_1 \bar{q}_i}{\bar{q}_1 \bar{\tilde{q}}_i} \right). \quad (9)$$

⁹We plan to collect more detailed data for 1990 and 1993 to determine conversion factors.

This equation follows from equation (2) and (6). A bar indicates the average value of a variable over base years. The measure depends solely on relative sectoral prices and conversion factors. If the percentage change in relative sectoral prices, $q_{i,t}/q_{1,t}$, differs from the percentage change in conversion factor $\tilde{q}_{i,t}/\tilde{q}_{1,t}$ the measured relative productivity level changes over base year. The larger the difference between relative inflation rates, the larger the effect on relative productivity and the more inappropriate are the conversion factors.¹⁰ Given a suitable conversion factor, this normalized productivity measure should be expressed as a horizontal line going through 0.

<Figure 1 about here>

Figure 1 presents results for four sectors. These are the total economy with aggregate GDP PPP as conversion factor, manufacturing with aggregate GDP PPP and two versions of Hooper and Larin as conversion factors, and machinery and equipment with aggregate GDP PPP and Harrigan as conversion factors, and finally food, beverages and tobacco with aggregate GDP PPP and the sector specific conversion factor. We include productivity measures for the total economy using aggregate GDP PPP as a measure of reference.

It is seen that the measured relative initial productivity levels for the total economy are relatively insensitive to the choice of base year, whereas productivity measures for the other sectors are very sensitive to the choice of base year. Surprisingly, none of the conversion factors constructed using component factors of aggregate GDP PPPs seem to perform better than aggregate GDP PPPs themselves, neither for total manufacturing nor sub-sectors. Consequently, the conversion factors applied for manufacturing, machinery and equipment, and food, beverages and tobacco all seem to be inappropriate for productivity measurement for these sectors.

Table 2 presents the standard deviation of measured relative productivity across base years for the four country groups and four sectors. The standard

¹⁰It cannot be concluded that the conversion factors are appropriate when measured relative productivity levels are invariant to the choice of base year. It can only be concluded that the conversion factors *may* be appropriate. Therefore, the measured relative productivity level may be insensitive to the base year and the conversion factors may still be inappropriate. This would be the case when developments in relative sectoral prices and the conversion factor exactly offset each other so as to keep the product $(\tilde{q}_{1,t}/\tilde{q}_{i,t})(q_{i,t}/q_{1,t})$ unchanged while at the same time $\tilde{q}_{i,t}/\tilde{q}_{1,t} \neq q_{i,t}/q_{1,t}$.

deviation equals zero if measured relative productivity is invariant to the choice of base year.

<Table 2 about here>

The impression from Figure 1 is summarized in Table 2. It is seen that the average standard deviation across countries is relatively low for the total economy, whereas the measure attains values much higher in manufacturing, machinery and equipment, and food, beverages and tobacco. The standard deviation is four to five times larger in manufacturing than total economy when aggregate GDP PPPs are applied in manufacturing, whereas the standard deviation of the other productivity measures are six to seven times higher than total economy. The same impression is evident for machinery and equipment and food, beverages and tobacco: again the standard deviations for the productivity measures using aggregate GDP PPPs are relatively low. The only deviation for this pattern is for country group 3 in machinery and equipment. For a single country, the tendency is similar to the country average. Hence, conversion factors based on selected sets of expenditure categories for measuring productivity in manufacturing and sub-sectors of manufacturing perform worse than aggregate GDP PPPs, which are themselves inappropriate for productivity measurement in these sectors as shown by Sørensen (2001).

6.1 Convergence

The next two measures that we present are the β_t parameters and the cross-country dispersion over the period 1970–1993 for the six base years. These two measures can be interpreted as consistency checks of the measures presented above in Figure 1 and Table 2. The idea is to evaluate whether the variation in measured relative productivity caused by changing base years affects the results for productivity convergence across countries.

In Figure 2, the estimated coefficients for β_t are presented for different base years for the four sectors of the economy (Total economy, manufacturing, machinery and equipment, and food, beverages and tobacco). Furthermore, 95-percent confidence intervals are displayed. Given suitable conversion factors, the estimated β_t coefficients should be invariant to the choice of base year.

<Figure 2 about here>

It is evident that the estimated β_t coefficients for total economy are very insensitive to the choice of base year. This is the case for all four country groups.

For manufacturing, however, it is clear that the β_t coefficients depend heavily on the choice of base year. The overall impression for the four country groups is that the estimated β_t coefficient is not significantly below zero, if a base year is chosen at the beginning of the period covered by the data set. The consequence of this choice of base year is a conclusion that manufacturing shows little evidence of productivity convergence. On the other hand, the estimated β_t coefficient is negative and significantly different from zero if a base year at the end of the period is chosen. In this case, it is concluded that manufacturing shows strong evidence of productivity convergence. This result holds for all conversion factors. Consequently, none of the conversion factors are appropriate for productivity measurement in manufacturing.

For machinery and equipment a similar pattern is observed as for manufacturing. This is the case for both conversion factors (aggregate GDP PPPs and Harrigan). Hence, the estimated β_t coefficient is not significantly below zero for early base years, whereas it is for later base years. Therefore, none of the conversion factors are appropriate for productivity measurement. For food, beverages, and tobacco the β_t coefficients fall over base years, however, the conclusion that productivity does not converge in the sector is not sensitive to the choice of base year.

Figure 3 shows cross-country dispersion measured by the standard deviation of (log) income per capita and (log) labor productivity for selected base years. The presented measure is normalized by the standard deviation in 1970. Given appropriate conversion factors, the standard deviation for each year should be invariant to the choice of base year, implying that the curves for different base years should coincide.

<Figure 3 about here>

It is seen that the standard deviations approximately coincide for total economy. For manufacturing, however, it is clear that the conclusion of σ -convergence depends on the choice of base year: the conclusion that dispersion grows over time prevails if the base year is 1970, 1975, or 1980. On the

other hand, σ -convergence is concluded if later base years are used. As for the previously presented measures, the third measure suggests that applied conversion factors cannot be used as conversion factors in manufacturing. For machinery and equipment and for food, beverages and tobacco similar results as for manufacturing are established: neither of the applied conversion factors are suitable for productivity measurement in these sectors.

The main insight of the three measures presented above is that none of the applied conversion factors are appropriate for productivity measurement in manufacturing or in the two sub-sectors of manufacturing. Consequently, the productivity levels of countries and convergence across countries in the sectors depend heavily on the choice of base year. Thus, the exact productivity level of the single country in manufacturing and whether or not productivity converges in the sector across OECD countries remains an open question.¹¹

6.2 Potential Explanation

It is striking how similar the results for productivity measurement presented for manufacturing sectors are across conversion factors. It seems quite unimportant whether conversion factors based on component factors of aggregate GDP PPPs or aggregate GDP PPPs themselves are chosen for productivity measurement in these sectors. If anything, aggregate GDP PPPs seem to perform a little better than the versions of Hooper and Larin or Harrigan.¹²

Why do conversion factors based on component factors perform so poorly? And why are measures of convergence so similar for manufacturing across conversion factors? We address these questions in this sub-section. As a point of departure we focus on productivity measurement using aggregate GDP PPPs. Subsequently, we discuss the results obtained using conversion factors based on component factors.

¹¹At least when the expenditure approach is applied. This paper does not settle if productivity measurement based on the industry approach leads to reliable results.

¹²This finding is in line with findings in Scarpetta and Tressel (2002) and Nicoletti and Scarpetta (2003) that include a measure of technology gap in a regression explaining multifactor productivity growth. This variable is based on relative levels of multifactor productivity. The former analysis uses aggregate GDP PPPs as conversion factors, whereas conversion factors are based on component factors of aggregate GDP PPPs in the latter. According to Nicoletti and Scarpetta (2003), there are no significant differences in key results between the two analyses. This finding of robustness does not support the credibility of the results in the analysis using component factors of aggregate PPPs. Instead it could indicate that results may be misleading.

From the β -convergence results in Figure 2, we know that the β_t coefficients become more negative as base years move forward. There can be two explanations for this: the covariance of growth rates and initial productivity levels becomes more negative or the variance of initial levels across countries falls.

<Figure 4 about here>

It appears from Figure 4 panel *a* and *b* that the covariance of growth rates and initial levels falls over base years, whereas the variance of initial levels is quite stable or slightly increasing. Hence, the reason for the falling β -coefficient is due to falling covariance. Panel *a* is based on 14 OECD countries, whereas panel *b* is based on the 8 countries of country Group 1.

The covariance between growth rates and initial productivity levels becomes more negative when base years move forward. This would be the outcome if the measured initial productivity levels of countries with the highest growth rates are decreasing as the base year roles forward. Such a pattern is also consistent with the observed increase in the variance of initial levels. When base years moves forward, measured productivity changes according to:

$$\begin{aligned} \ln \left(\frac{\tilde{P}_{i,t_2,0}}{\tilde{P}_{i,t_1,0}} \right) &= \ln \left(\frac{\tilde{q}_{1,t_2} q_{i,t_2}}{q_{1,t_2} \tilde{q}_{i,t_2}} \right) - \ln \left(\frac{\tilde{q}_{1,t_1} q_{i,t_1}}{q_{1,t_1} \tilde{q}_{i,t_1}} \right) \\ &= \left(\ln \left(\frac{q_{i,t_2}}{q_{i,t_1}} \right) - \ln \left(\frac{\tilde{q}_{i,t_2}}{\tilde{q}_{i,t_1}} \right) \right) - \left(\ln \left(\frac{q_{1,t_2}}{q_{1,t_1}} \right) - \ln \left(\frac{\tilde{q}_{1,t_2}}{\tilde{q}_{1,t_1}} \right) \right), \end{aligned}$$

which follows (2) and (3). Changes in measured productivity levels are determined by changing prices of manufacturing, $\ln(q_{i,t_2}/q_{i,t_1})$ and $\ln(q_{1,t_2}/q_{1,t_1})$, and changing aggregate consumer prices, $\ln(\tilde{q}_{i,t_2}/\tilde{q}_{i,t_1})$ and $\ln(\tilde{q}_{1,t_2}/\tilde{q}_{1,t_1})$. If country i experience a rapidly declining relative price of manufacturing, the measured initial relative productivity is falling.

If countries with relatively rapid labor productivity growth rates in manufacturing also have rapidly declining relative prices, this explains the increased correlation between growth rates and initial levels. Following the reasoning above, the difference between (log) productivity measured with 1993 as the base year and with 1970 as the base year as a measure of the percentage change in the relative price of manufacturing. A high negative value of this difference indicates that the relative price of manufacturing falls rapidly in country i compared to the base country.

<Figure 5 about here>

Figure 5 plot average growth rates in productivity and the difference in (log) relative productivity levels between base year 1993 and 1970. Panel *a* and *b* illustrates the relation for aggregate GDP PPP; panel *a* using 14 OECD countries, panel *b* the 8 Group 1 countries. It is seen that high growth countries experience larger falls in relative price of manufacturing than low growth countries.¹³

The relationship illustrated in Figure 5 is consistent with the Balassa-Samuelson effect: rapidly declining relative prices of manufacturing and rapid labor productivity growth in manufacturing are two sides of the same coin.¹⁴ The hypothesis that the systematic change in β -coefficients over base years reflects Balassa-Samuelson effects was suggested by Bernard and Jones (2001).

Since the results for β -convergence are similar across conversion factors, it seems plausible that changes in conversion factors based on component factors of aggregate GDP PPPs reflect changes in aggregate expenditure prices rather than reflecting inflation rates of producer prices. As in the case for aggregate GDP PPPs, we investigate the development in the covariance between growth rates and initial levels and the variance of initial levels as base years roll forward, see Figure 4 panel *c* and *d*. Again falling covariances drive the fall in β -coefficients and the variances increase. Furthermore, the fall in initial productivity is largest in high growth countries, which is seen in Figure 5 panels *c* and *d*. Again, this suggests that Balassa-Samuelson effects explain changing β -coefficients.

Finally, we investigate the covariance and variance for the two sub-sectors of manufacturing. It is evident from Figure 4 that the covariance fall over base years. The development in variances are less clear. Again we find high negative correlation between changes in relative prices of manufacturing and labor productivity growth, which is evident from Figure 5.

In conclusion, it seems that changes in initial productivity over base years are linked to growth rates when the expenditure approach is used to develop conversion factors. In countries with high growth rates in manufacturing sectors, relative prices of the sector drop quite much. Convergence

¹³The correlation coefficients equal -0.84 and -0.91 in panels *a* and *b*, respectively. Both coefficients are significant at the 1 percent level.

¹⁴In principle Figure 5 should be based on labor productivity growth rates in manufacturing relative to growth rates of the whole economy. Using relative growth rates lead to almost identical results.

factors do not capture this development and in effect relative initial labor productivity levels change as base years roll forward in a systematic way. Hence, Balassa-Samuelson effects unintentionally show up in productivity data. Even though conversion factors based on component factors are theoretically superior to aggregate GDP PPPs, they suffer from similar problems.

7 Adjustment of Expenditure PPPs

The version of the expenditure approach used above can be criticized because no adjustments for differences in distribution margins, taxes and subsidies, and international trade have been made. This is problematic because without such adjustments productivity measurement is based on expenditure prices of domestic consumption. By adjusting for distribution margins and for taxes and subsidies, productivity measurement is based on producer prices of domestic consumption. Finally, productivity measurement is based on producer prices of domestic output after prices are adjusted for international trade. The question addressed in this section is whether the lack of these adjustments is responsible for the high variability across base years in relative productivity measurement for manufacturing sectors, as documented in the above section. The adjustments are based on Hooper (1996) and Hooper and Vrankovich (1995).

7.1 Distribution Margins, Taxes and Subsidies

Hooper (1996) and Hooper and Vrankovich (1995) adjust for distribution margins the following way. PPPs adjusted for distribution margins equal

$$PPP_{i,t}^m = PPP_{i,t} \frac{(1 + \delta_{i,t})}{(1 + \delta_{1,t})} = PPP_{i,t} \phi_{i,t}$$

where $PPP_{i,t}$ denotes expenditure PPP between the country i and country, $PPP_{i,t}^m$ denotes the conversion factor of country i at time t adjusted for distribution margins, $\delta_{i,t}$ denotes the combined wholesale and retail distribution mark-up over producer prices of country i at time t , and $\phi_{i,t} = (1 + \delta_{1,t}) / (1 + \delta_{i,t})$. Furthermore, the adjustment for taxes and subsidies follow

$$PPP_{i,t}^{\theta,m} = PPP_{i,t}^m \frac{(1 + \theta_{1,t})}{(1 + \theta_{i,t})} = PPP_{i,t} \phi_{i,t} \psi_{i,t}$$

where $PPP_{i,t}^{\theta,m}$ denotes the conversion factor of country i at time t adjusted for distribution margins ($\delta_{i,t}$) and taxes and subsidies ($\theta_{i,t}$), $\theta_{i,t}$ denotes indirect taxes net of subsidies as a percentage of value-added in country i at time t , and $\psi_{i,t} = (1 + \theta_{1,t}) / (1 + \theta_{i,t})$.

In the case when $PPP_{i,t}^{\theta,m}$ is the applied conversion factor, measured productivity $\left(\tilde{P}'_{i,t,0} / \tilde{P}'_{i,0} \right)$ can be expressed as

$$\ln \left(\frac{\tilde{P}'_{i,t,0}}{\tilde{P}'_{i,0}} \right) = \ln \left(\frac{\tilde{P}_{i,t,0}}{\tilde{P}_{i,0}} \right) - \ln \left(\frac{\phi_{i,t}}{\bar{\phi}_i} \right) - \ln \left(\frac{\psi_{i,t}}{\bar{\psi}_i} \right).$$

If the lacking adjustment for distribution margins and taxes and subsidies should explain the variability in relative productivity over base years, this requires immense variability in relative distribution margins and taxes and subsidies over time. In Figure 1, the fluctuations in relative productivity were between -20% and 20% when the two versions of Hooper and Larin were applied. Furthermore, we observe large shifts between base years; not gradual changes in relative productivity.

Data for distribution margins are only available for more than one year for France, Germany, the United Kingdom, and the United States. This enables us to get an impression of such an adjustment in these countries. The data origin from Hooper (1996). Data on net indirect taxes exist for a sub-group of the countries under investigation (OECD (1999)).

<Table 3 about here>

Table 3 presents results after adjustments for distribution margins and taxes and subsidies. In the first part of the table, relative productivity levels are presented for France, Germany, and the United Kingdom for 1990 using the United States as the reference country. The relative productivity levels are presented as (log) differences from the average of 1985 and 1990. Furthermore, $\ln(\phi_{i,t}/\bar{\phi}_i)$ is determined for the three countries. It has only been possible to determine $\bar{\phi}_i$ over the years 1986 and 1987. Therefore, we do not carry out the exact adjustment. Instead data for relative productivity over the period 1985-90 are presented together with the values for $\ln(\phi_{i,t}/\bar{\phi}_i)$.

The effect of this adjustment on productivity measures can be seen by comparing the signs of $\ln(\tilde{P}'_{i,t,0}/\tilde{P}'_{i,0})$ and $\ln(\phi_{i,t}/\bar{\phi}_i)$. If the two measures

have the same sign, this adjustment seems to improve the productivity measurement. Of course, the numerical value of $\ln(\phi_{i,t}/\bar{\phi}_i)$ may be so high, that measures of relative productivity are over-adjusted and become worsened even if the signs of the two measures are similar. Based on the presented information, Table 3 suggests that adjustment for distribution margins improves measured relative productivity. This is, however, only an indication and the result does not lead to any firm conclusions of reduced standard deviations of relative productivity levels.

In the second part of Table 3, relative productivity levels are adjusted for $\ln(\psi_{i,t}/\bar{\psi}_i)$. Since data cover a relative large number of countries and base years the adjustment for differences in net-taxes can be made. Data on standard deviations over base years are presented for the adjusted relative productivity measures. These can be compared to standard deviations for the unadjusted relative productivity levels presented in Table 2. It is evident that this adjustment does not improve productivity measures. Actually, the standard deviation is only reduced for about half the countries when the Hooper and Larin conversion factor is used. Furthermore, it is seen that reductions in standard deviations is minor. The same result appears for machinery and equipment and food, beverages, and tobacco.

7.2 Export and Import

The adjustment for international trade is performed by expressing the price of total domestic output as a weighted sum of the price of exported goods, the price of imported goods and the price of domestic expenditure. We assume that both imports and exports are priced according to the average world price. This enables us to determine the world price as the output-weighted average of each country's expenditure price level in dollars. The adjustment follows Hooper (1996) and Hooper and Vrankovich (1995).

The adjustment for international trade is quite crude and is based on several strict assumptions.¹⁵ One assumption states that each country is a price-taker in the world market. Another states that tariff and non-tariff barriers are absent. A third states that the average price level for the included countries can be used as a proxy for the world price.

Table 4 presents data on standard deviations over base years for the adjusted relative productivity measure.

¹⁵Hooper (1996) discusses the limitations.

<Table 4 about here>

As for the tax adjustment, standard deviations over base years may increase or fall after the adjustment for international trade. The main impression is that the adjustment for international trade do not improve productivity measures noticeable.

In this section, expenditure PPPs are adjusted for differences in distribution margins, indirect taxes and subsidies, and international trade. The outcome of these adjustments are disappointing: conversion factors based on expenditure categories perform as poorly as aggregate GDP PPPs in measuring productivity in manufacturing sectors even after theoretical appealing adjustments have been made. The adjustment for distribution margins might improve productivity measures, however, it is not possible to make firm conclusions due to lacking data availability.

8 Additional Considerations

Even after adjustments for distribution margins, indirect taxes and subsidies, and international trade are considered, expenditure conversion factors do not perform better than aggregate GDP PPPs in measuring productivity in manufacturing sectors. There are a number of potential explanations for this disappointing result. When researchers develop industry-specific expenditure PPPs, the first task is to map expenditure categories into the industrial classification. This creates a risk of assigning expenditure prices to inappropriate industries. More critically, prices on industry products may not even exist in the consumption basket expenditure PPPs are based on. For example, there might be a big difference in the output from the chemical industry and household expenditure of chemical products. If this is the underlying reason for problems with the conversion factors, it is hard to see how the expenditure approach to productivity measurement in manufacturing can survive in future research.

Second, it is not clear that the used conversion factors are appropriate. The conversion factor suggested by Hooper and Larin (1989) can be criticized by being constructed for bilateral comparisons concerning solely price and quantity ratios for two countries. Since we focus on convergence and catch-up issues, conversion factors developed using multilateral methods should be used. Therefore, we develop a conversion factor following Kravis, Heston and

Summers (1982). This factor is determined as a geometric average similar to (5), but with weights that are invariant across countries:

$$w_j = \frac{1}{n} \sum_{i=1}^n \left(\frac{E_{ij}}{\sum_{j=1}^J E_{ij}} \right). \quad (10)$$

We refer to this conversion factor as PPP^{KHS} . It is clear that the conversion factors are sensitive to the group of countries that enter in the data set.¹⁶

Table 5 presents the standard deviation of measured relative productivity across base years for the four country groups and four sectors.

<Table 5 about here>

The main impression of the table is that the conversion factors developed for multilateral comparisons perform worse than aggregate GDP PPP. Hence, this does not seem to be a way out of the measurement problem.

Furthermore, the conversion factor following Hooper and Larin (1989) inappropriately use expenditure based weights instead of output based weights. Different from this, Hooper (1996) uses output based weights to determine conversion factors for total manufacturing. Theoretically, it is preferred to use output based weights.

<Table 6 about here>

Table 6 presents conversion factors for G-7 countries for base year 1990 calculated by output based and expenditure based weights. The conversion factors are relatively insensitive to the choice of weights. The conversion factor for Japan is the only one that seems to be somewhat sensitive to the choice of weights. This conversion factor is about 7% higher when expenditure weights are used compared to output weights. Because conversion factors are relatively insensitive to the choice of weights, we do not pursue this issue further.

¹⁶Other methods for multilateral productivity comparison exists, however these are all based on binary comparisons. One such example is the EKS method, see Kravis, Heston and Summers (1982).

A final conceptual problem with the applied method of productivity measurement is that the developed conversion factors relate to gross output, not value-added. Since we apply value-added as our measure of output there is no direct correspondence between measure of output and prices. Researchers tend to use value-added rather than gross output due to easy data availability. It is possible to find data on gross output both in current prices and volumes for five of the countries investigated in this paper, see OECD (2003). In Table 7, initial relative productivity levels based on gross output are presented for each base year t .

<Table 7 about here>

The procedure pioneered by Jorgenson (see for example Jorgenson (1990)) is the most theoretically appealing for productivity measurement.

[TBA]

9 Concluding Remarks

The purpose of this paper is to investigate the expenditure approach for construction of conversion factors in manufacturing. The expenditure approach is used when price data origin from ICP, see Kravis, Heston and Summers (1982). The present analysis is important because the widespread method of using expenditure PPPs for total GDP at the sectoral level recently was found to lead to flawed conclusions, see Sørensen (2001). If conclusions based on this method cannot be trusted, it is of great interest to understand if conversion factors based on disaggregate expenditure categories perform better.

We investigate different conversion factors that are based on component factors of aggregate PPPs. Surprisingly, we find that conversion factors based on expenditure categories do not perform any better than aggregate GDP PPPs. This highlights the importance of appropriate conversion factors for sectoral productivity comparison. The development of such factors is needed to determine the placement of countries in the ranking of productivity levels in manufacturing and the role of sectors in the international convergence of aggregate productivity.

Furthermore, we analyze whether the main conclusion is robust to the adjustment of three conceptual problems when using expenditure prices. The problem is that consumer prices on domestic consumption are used instead of producer prices on domestic production. This leads to adjustments for differences in distribution margins and in taxes and subsidies across countries, and for international trade. By performing these adjustments suggested by Hooper (1996) and Hooper and Vrankovich (1995), we conclude that neither adjustments for indirect taxes and subsidies nor international trade seem to improve measures of productivity. The established results seem to be more promising when adjustments are performed for differences in distribution margins. However, it is not possible to make firm conclusions due to lacking data availability.

Other points of critique to the version of the expenditure approach applied in this paper are also discussed. First, the conversion factors are constructed for bilateral productivity comparison. Therefore, we develop conversion factors for multilateral productivity comparison. Moreover, conversion factors are based on expenditure weights. Therefore, the industrial structure of a country is not taken into account, even though the aim is to measure productivity in manufacturing sectors. We find that conversion factors are insensitive to both point of critique.

Second, the conversion factors relate to gross output, not value-added. The standard method in productivity measurement erroneously apply value-added because it is much easier to procure data. To evaluate whether this approach leads to grave measurement problems, productivity measures based on gross output are constructed for a subset of countries. We find that [TBA].

The final and probably most severe critique is that expenditure prices for final consumption may not be useful for productivity measurement at the sectoral level after all. Expenditure prices may not be suitable for productivity measurement simply because products that enter into final consumption and products that are produced in manufacturing are too different. One indication is that Balassa-Samuelson effects unintentionally influence results for convergence suggesting that output is not transformed into base country prices.

Future work on sectoral productivity comparison and convergence should abandon the use of conversion factors that cannot pass the consistency check presented in this paper. The reason is that the validity of the results is questionable when estimates depend heavily on the choice of base year. That

conversion of sectoral variables to a common currency should be interpreted with caution is widely accepted. However, the results presented in the present paper suggest that such conversion should not take place at all.

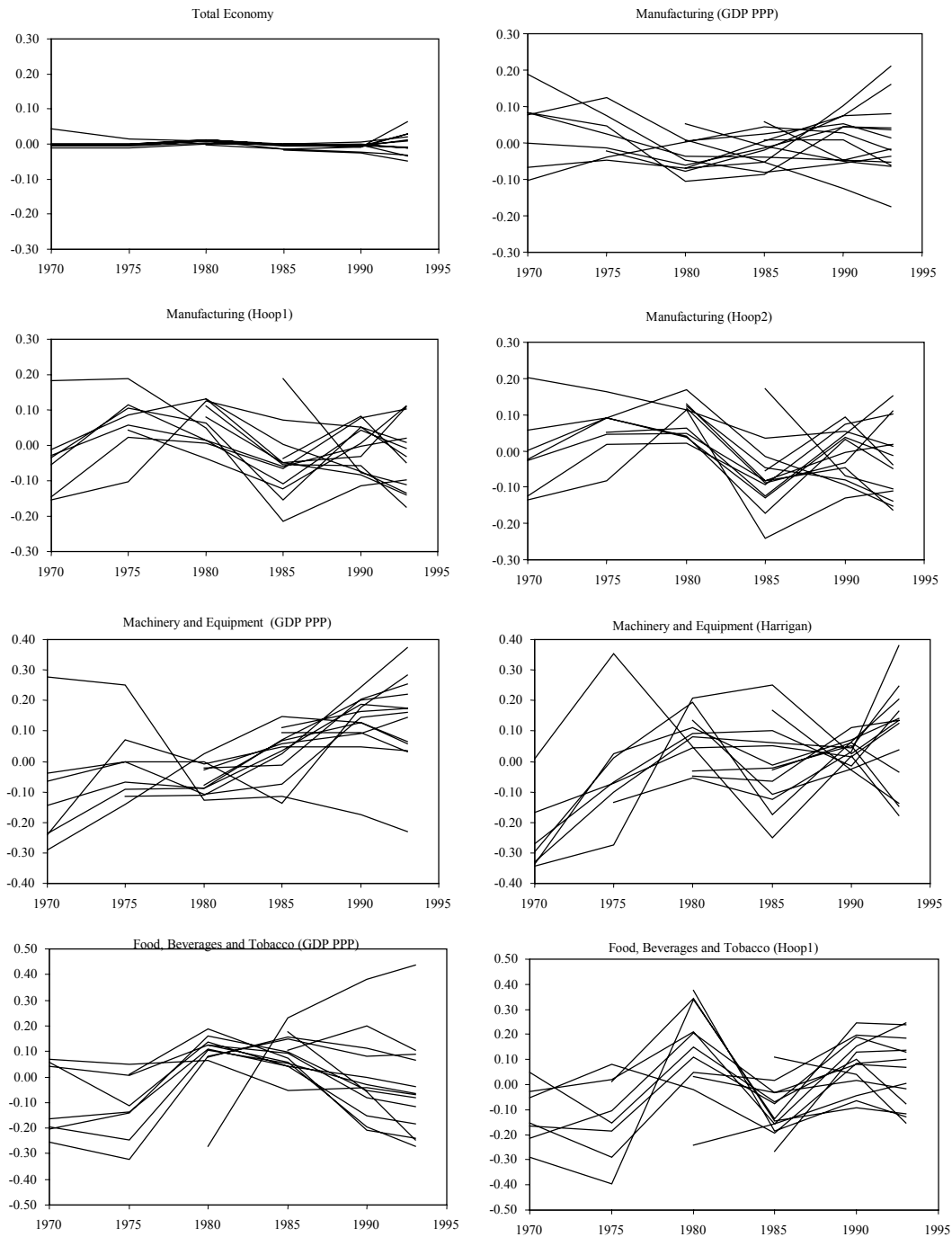
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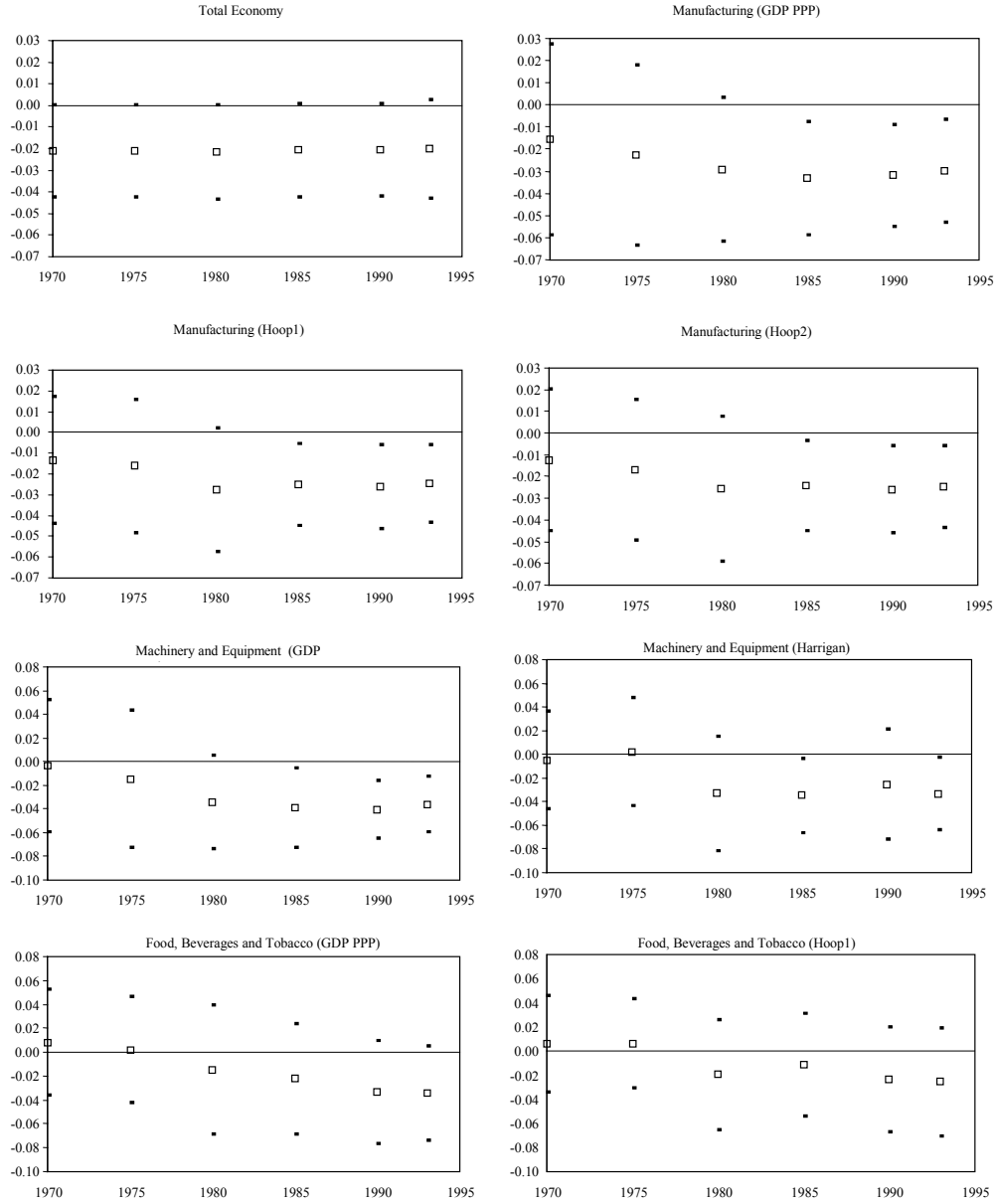
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Figure 1: Measured Productivity Levels for 13 OECD Countries in Relation to Measured Productivity in the United States for 1970, Base Years 1970, 1975, 1980, 1985, 1990, and 1993 (Deviation from Average Value, Natural Logs)



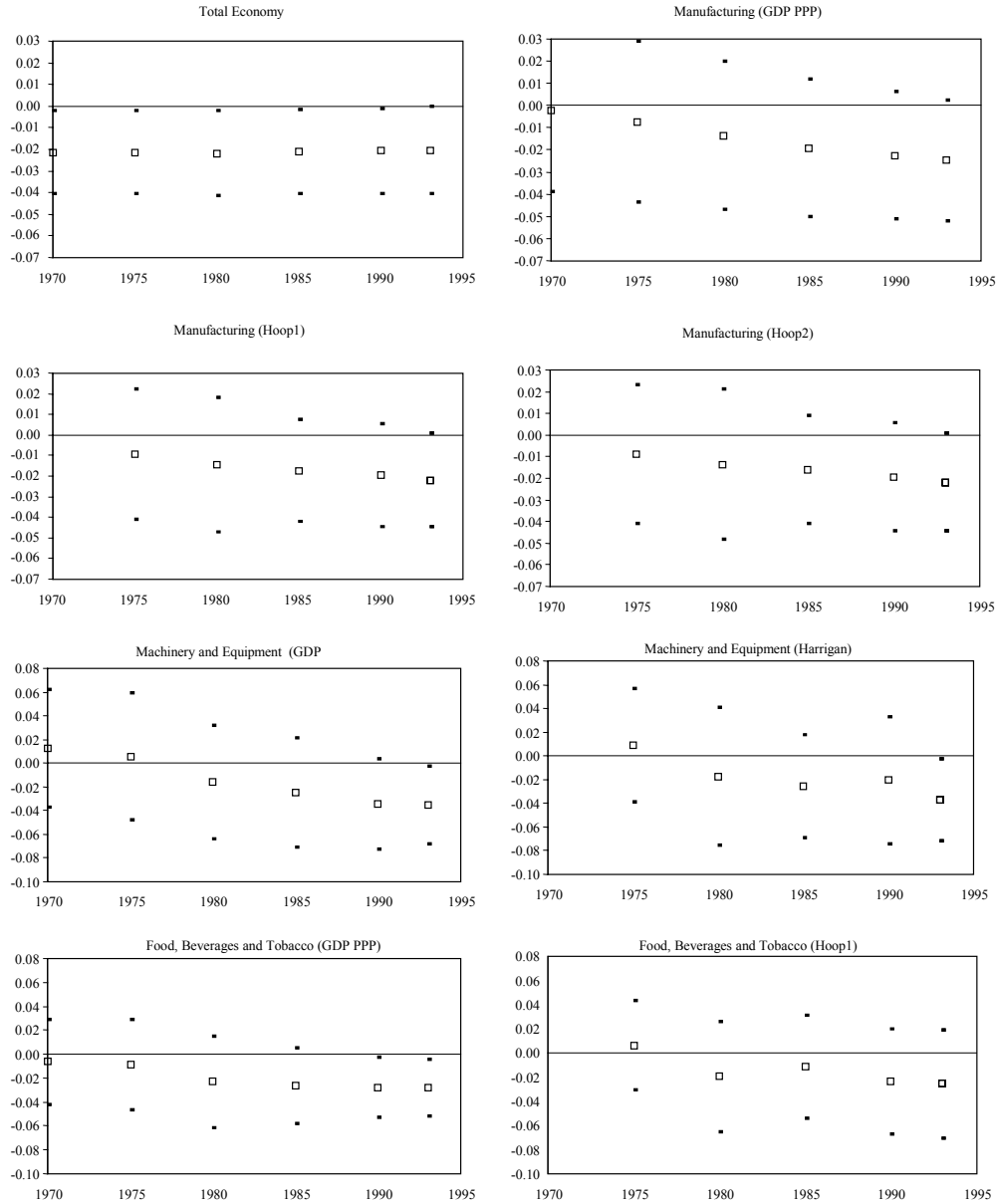
Notes: For each country, the initial relative productivity level for a given base year was normalized by the average of initial relative productivity levels across base years.

Figure 2 - Group 1: Estimated Convergence Coefficients (β) for Base Years 1970, 1975, 1980, 1985, 1990, and 1993



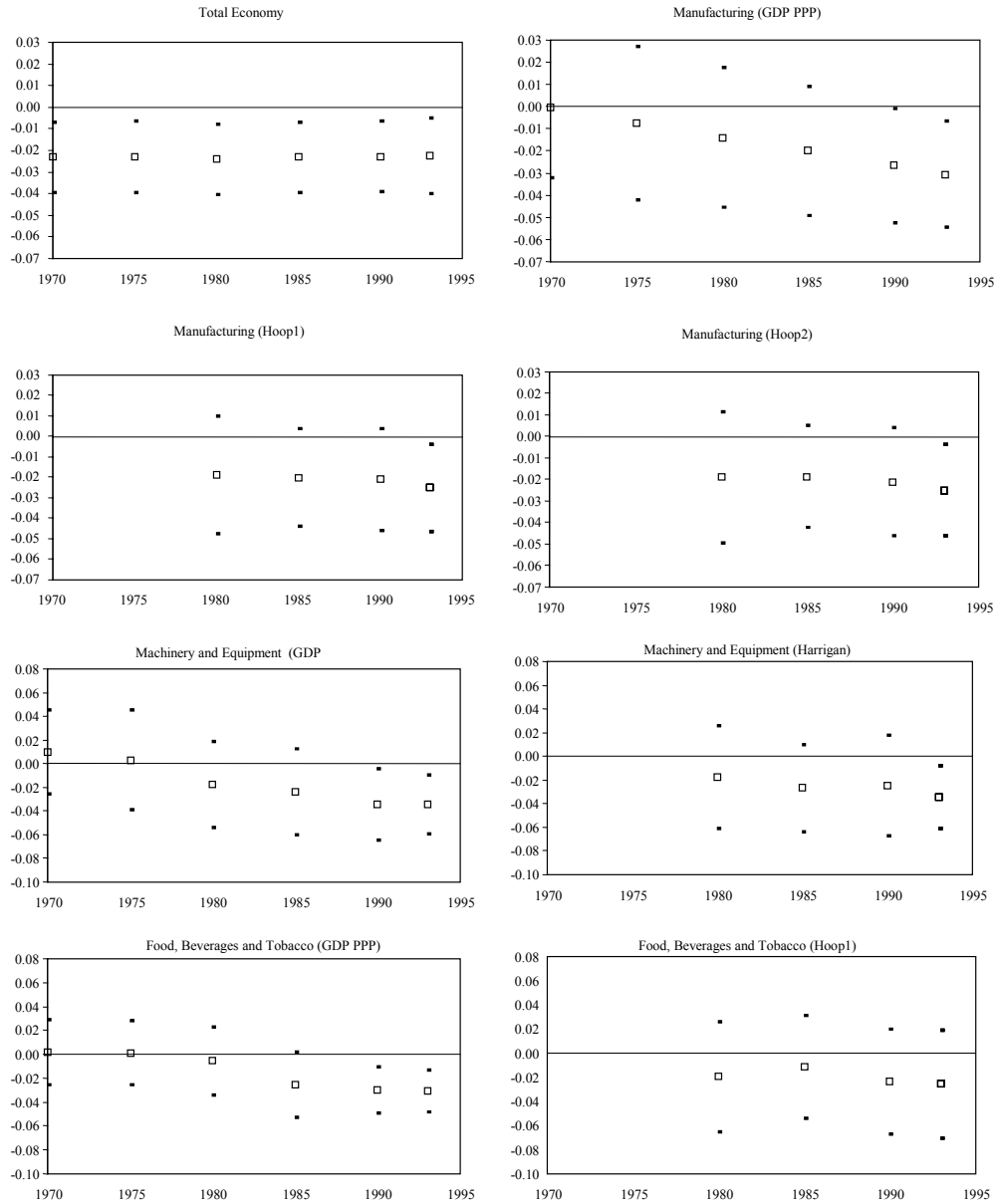
Note: Coefficients are estimated from the following equation: $\Delta \ln(P_i) = \alpha + \beta \ln(P_{i,1970}) + \varepsilon_i$. Growth rates are computed as the coefficient on a time trend in the regression of $\log(\text{productivity})$ on a constant and the trend. The broken lines give the 95 percent confidence interval for β .

Figure 2 - Group 2: Estimated Convergence Coefficients (β) for Base Years 1975, 1980, 1985, 1990, and 1993



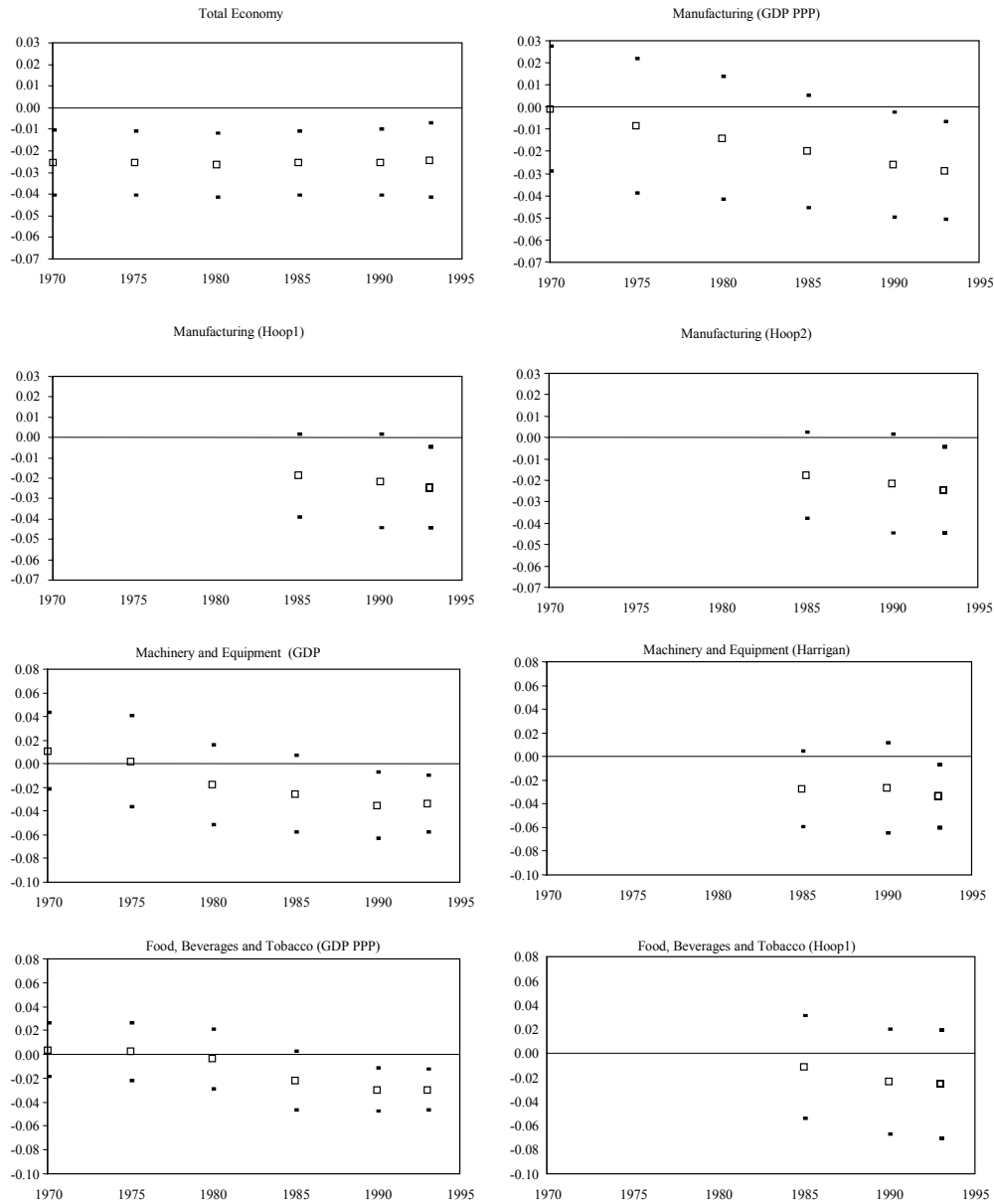
Note: Coefficients are estimated from the following equation: $\Delta \ln(P_t) = \alpha + \beta \ln(P_{t,1970}) + \varepsilon_t$. Growth rates are computed as the coefficient on a time trend in the regression of $\log(\text{productivity})$ on a constant and the trend. The broken lines give the 95 percent confidence interval for β .

Figure 2 - Group 3: Estimated Convergence Coefficients (β) for Base Years 1980, 1985, 1990, and 1993



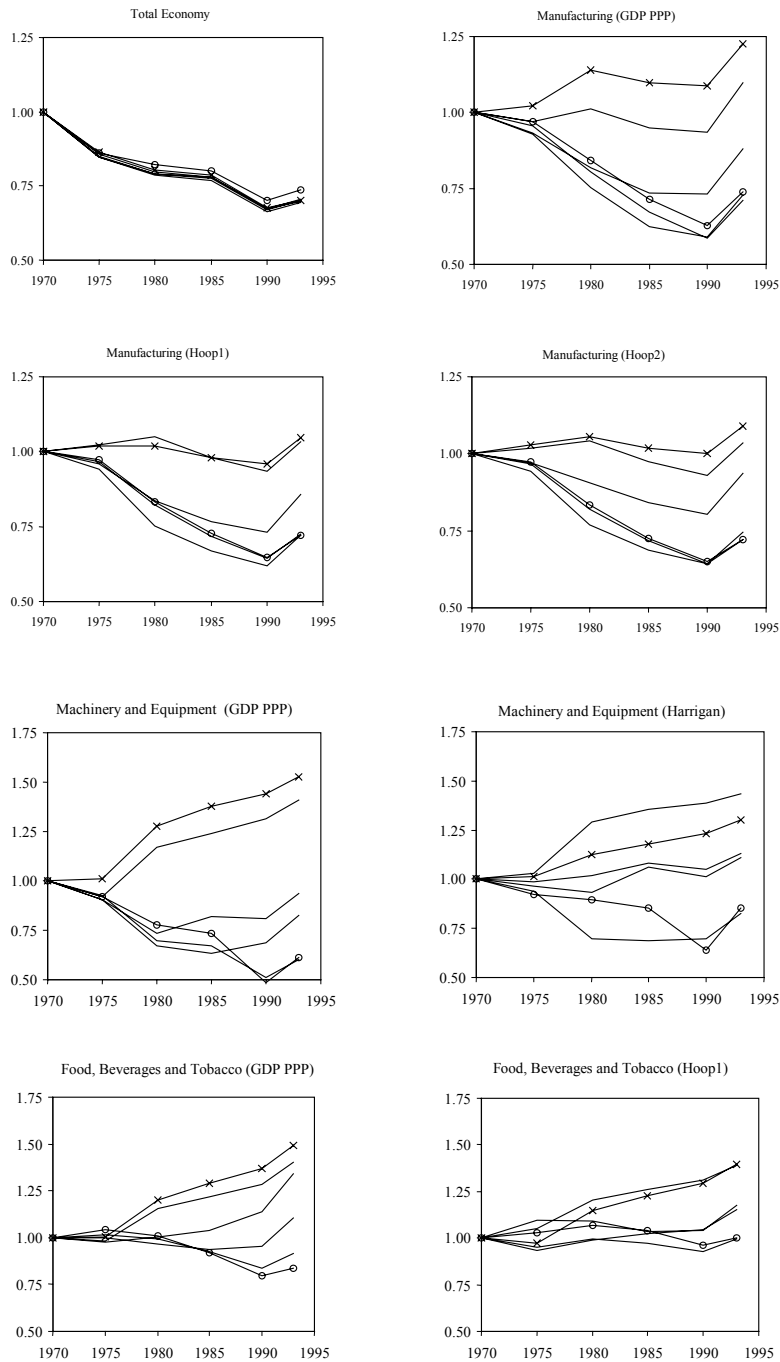
Note: Coefficients are estimated from the following equation: $\Delta \ln(P_i) = \alpha + \beta \ln(P_{i,1970}) + \varepsilon_i$. Growth rates are computed as the coefficient on a time trend in the regression of $\log(\text{productivity})$ on a constant and the trend. The broken lines give the 95 percent confidence interval for β .

Figure 2 - Group 4: Estimated Convergence Coefficients (β) for Base Years 1985, 1990, and 1993



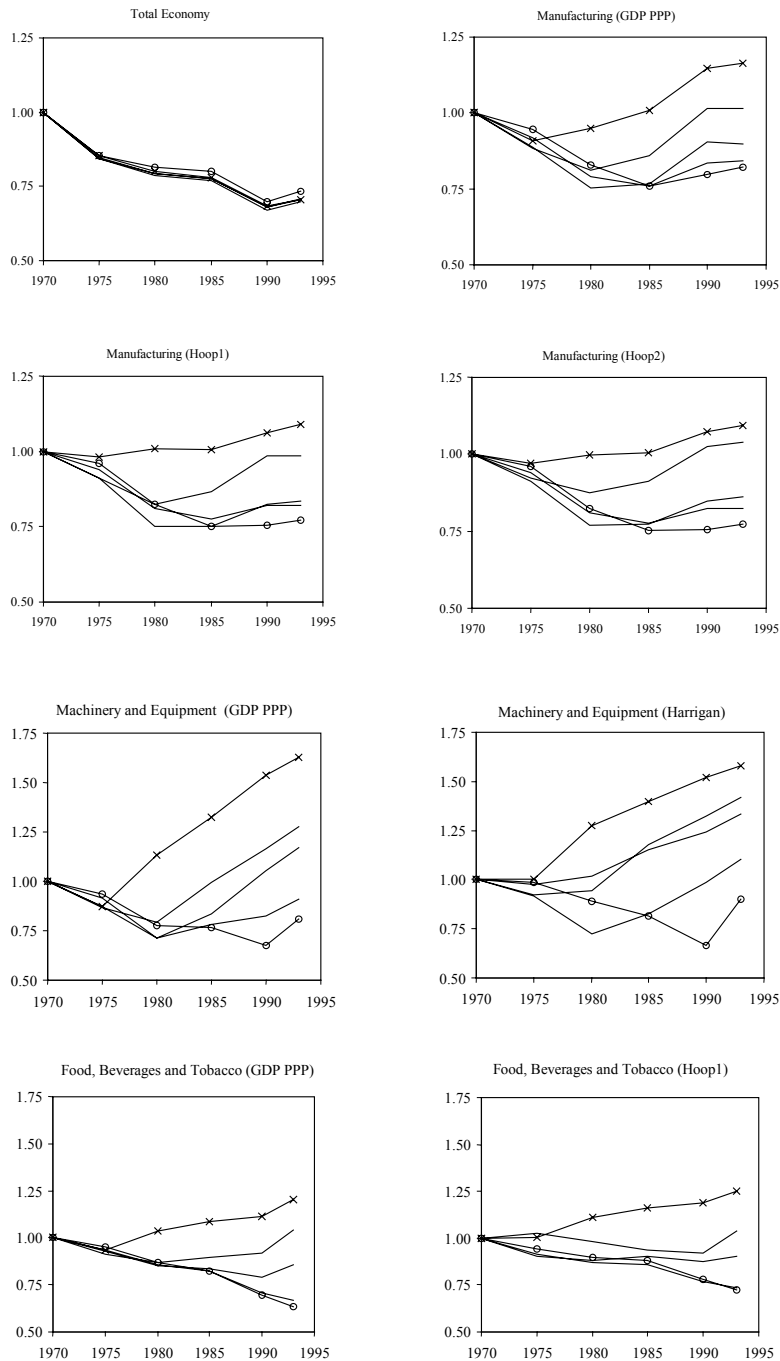
Note: Coefficients are estimated from the following equation: $\Delta \ln(P_i) = \alpha + \beta \ln(P_{i,1970}) + \varepsilon_i$. Growth rates are computed as the coefficient on a time trend in the regression of $\log(\text{productivity})$ on a constant and the trend. The broken lines give the 95 percent confidence interval for β .

Figure 3 – Group 1: Standard Deviation of Relative Labor Productivity for Base Years 1970, 1975, 1980, 1985, 1990, and 1993 (Natural logs)



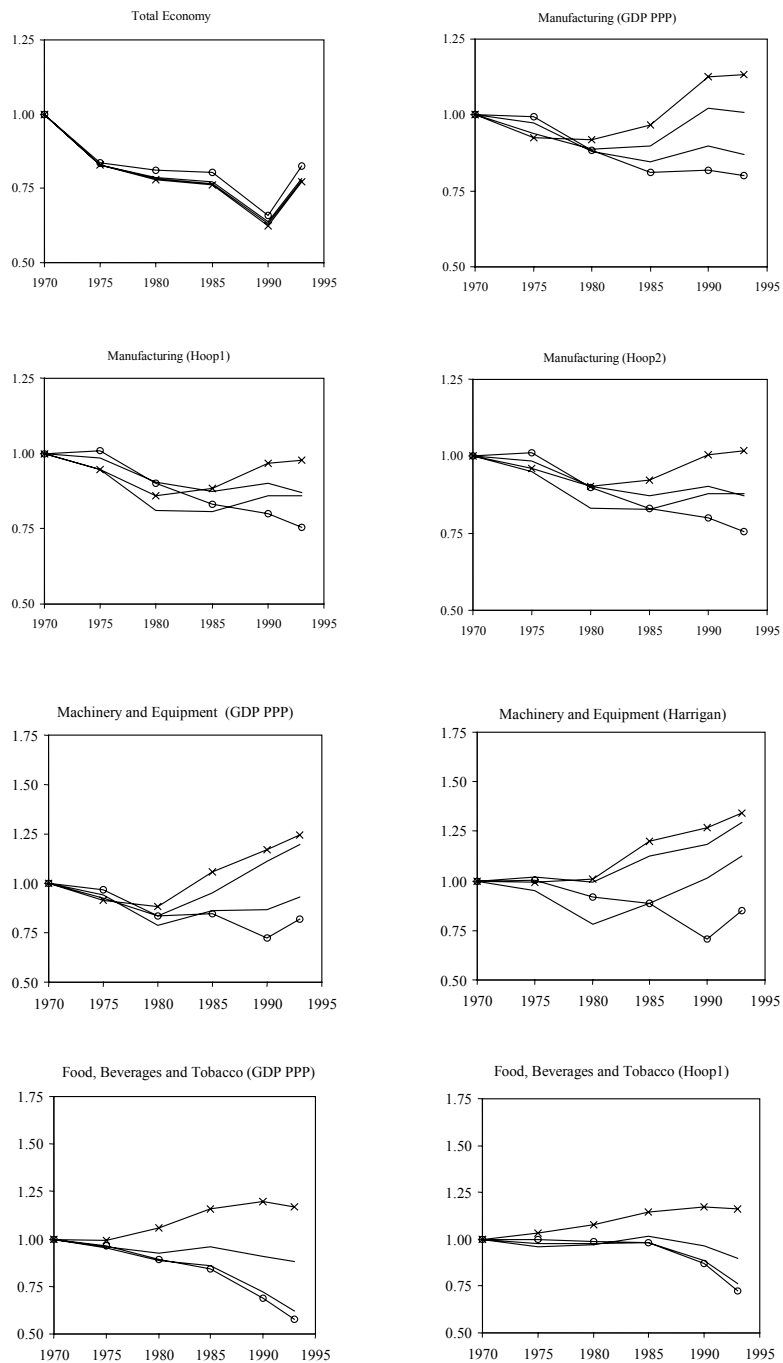
Note: Open circles denote base year 1993 and 'plus' denote base year 1970. The standard deviation is normalized in 1970.

Figure 3 – Group 2: Standard Deviation of Relative Labor Productivity for Base Years 1975, 1980, 1985, 1990, and 1993 (Natural logs)



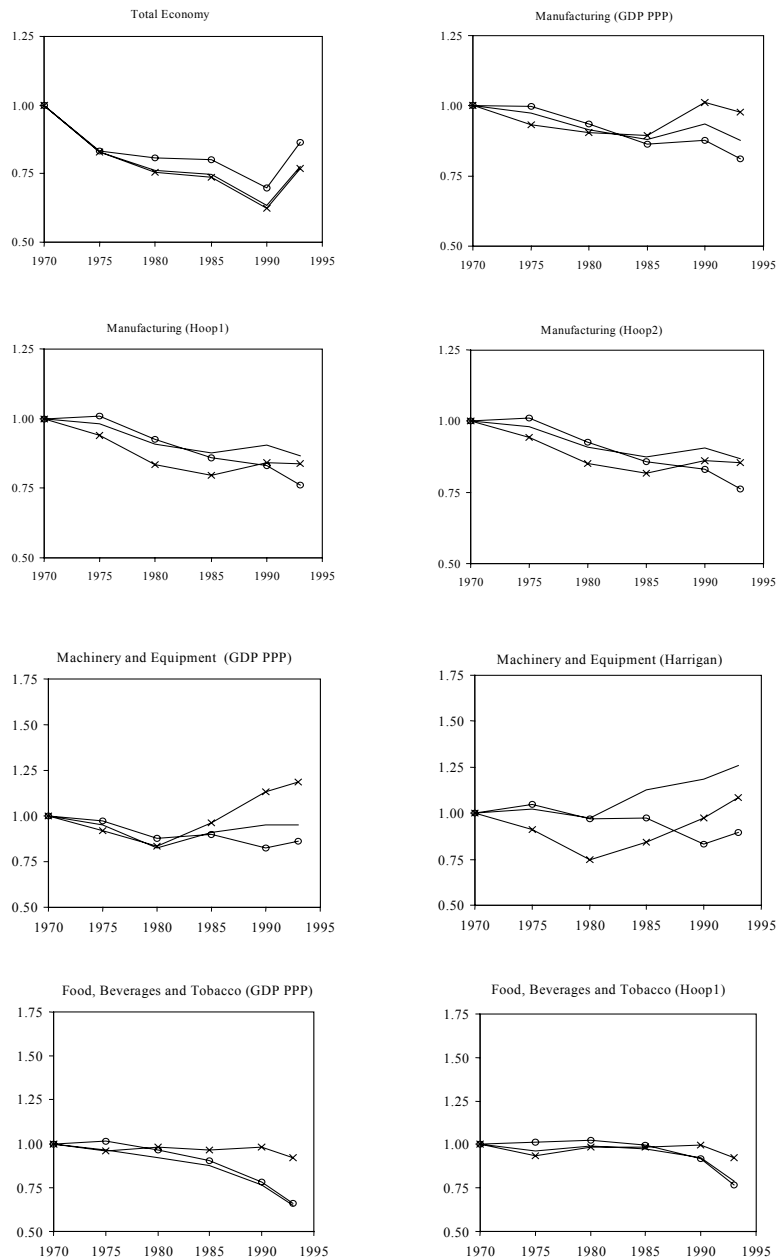
Note: Open circles denote base year 1993 and 'plus' denote base year 1975. The standard deviation is normalized in 1970.

Figure 3 – Group 3: Standard Deviation of Relative Labor Productivity for Base Years 1980, 1985, 1990, and 1993 (Natural logs)



Note: Open circles denote base year 1993 and 'plus' denote base year 1975. The standard deviation is normalized in 1970.

Figure 3 – Group 4: Standard Deviation of Relative Labor Productivity for Base Years 1985, 1990, and 1993 (Natural logs)



Note: Open circles denote base year 1993 and 'plus' denote base year 1985. The standard deviation is normalized in 1970.

Figure 4 – Group 1: Covariance and Variance for Base Years 1970, 1975, 1980, 1985, 1990, and 1993

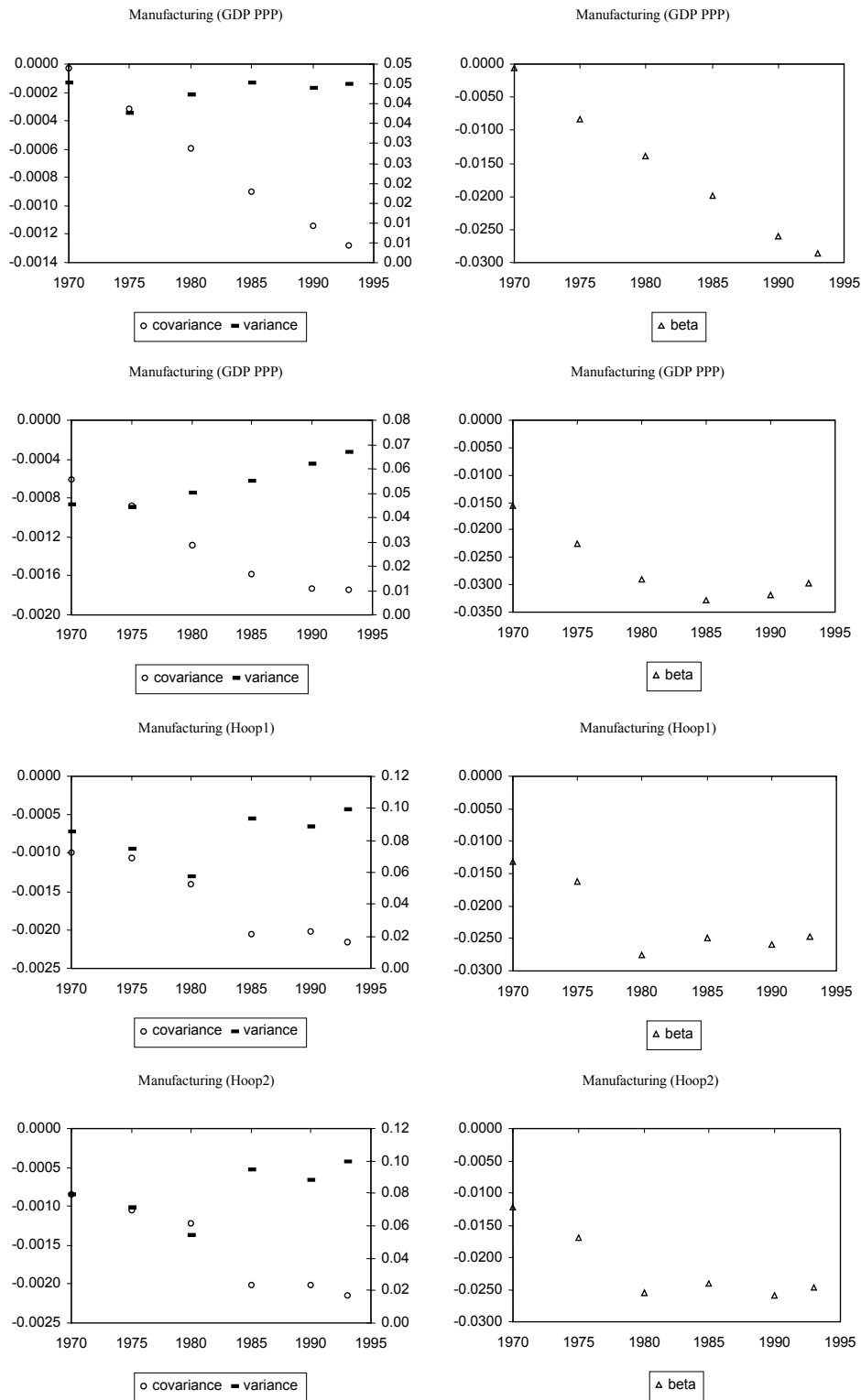
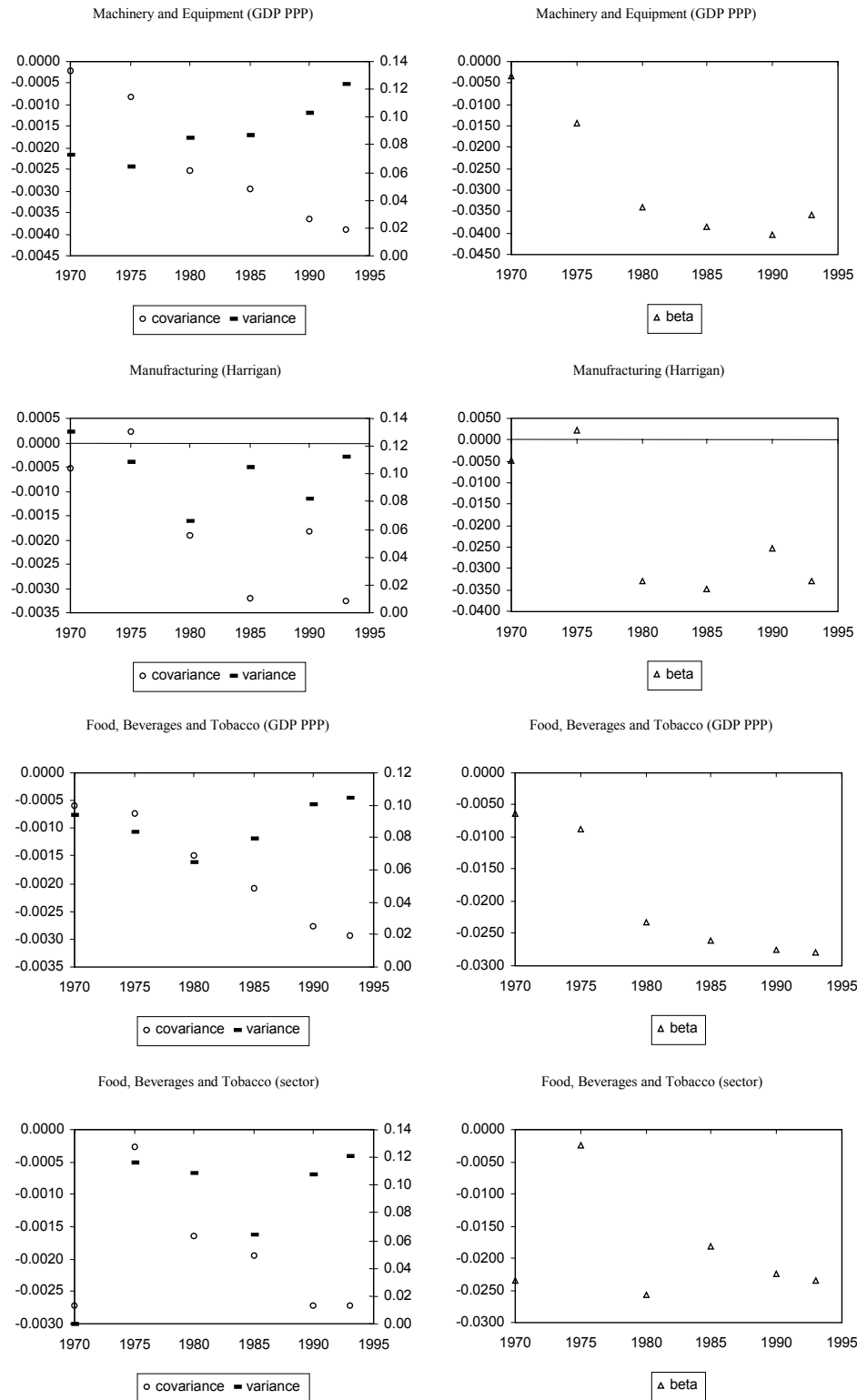


Figure 4 – Group 1: Covariance and Variance for Base Years 1970, 1975, 1980, 1985, 1990, and 1993 – continued



Note:

Figure 5 – Group 1: growth rates and changing prices

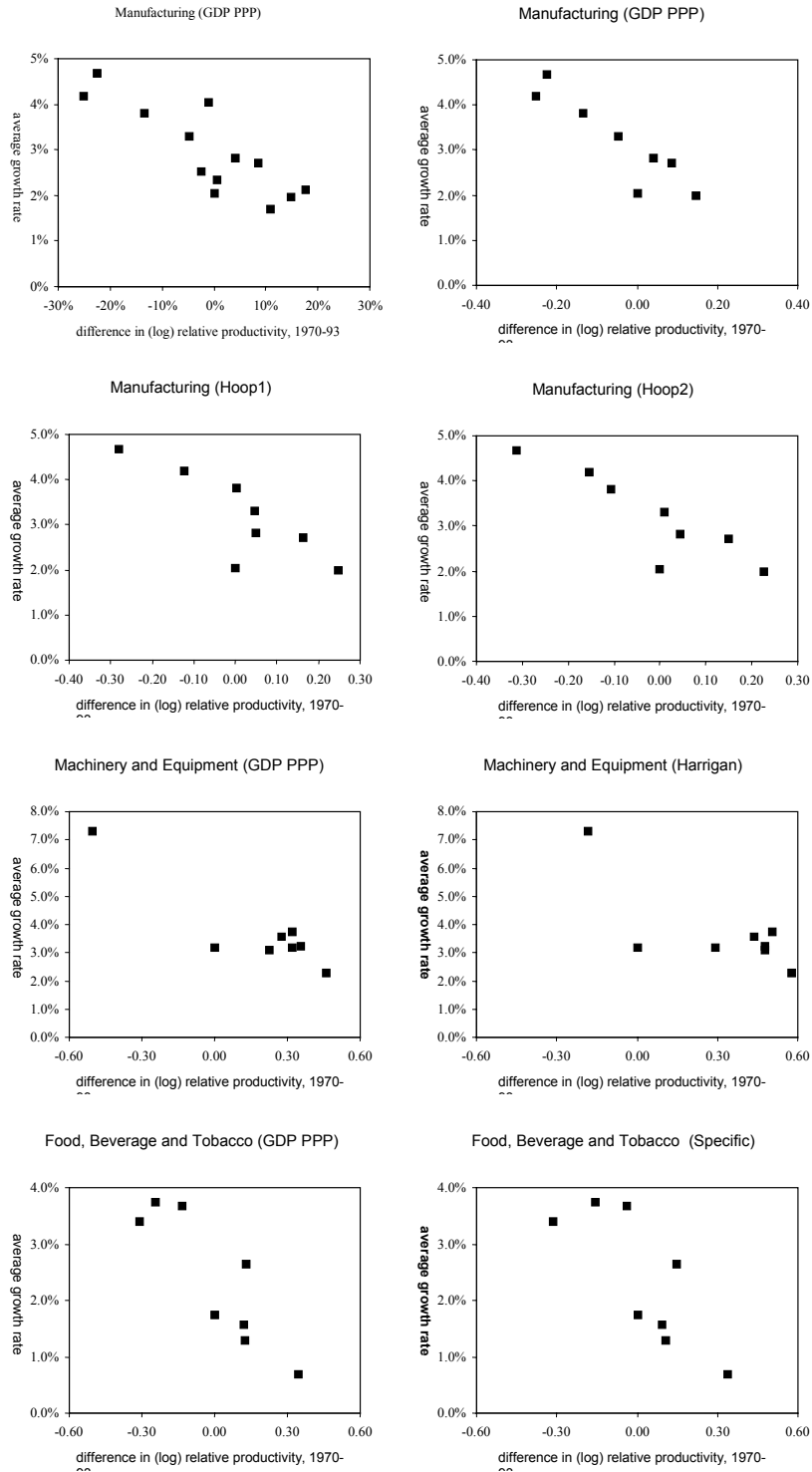


Table 1: Availability of PPPs across countries and base years.

	1970	1975	1980	1985	1990	1993
Australia	0	0	0	+	+	+
Belgium	+	+	+	+	+	+
Canada	0	0	+	+	+	+
Denmark	0	+	+	+	+	+
Finland	0	0	+	+	+	+
France	+	+	+	+	+	+
Germany	+	+	+	+	+	+
Italy	+	+	+	+	+	+
Japan	+	+	+	+	+	+
Netherlands	+	+	+	+	+	+
Norway	0	0	+	+	+	+
Sweden	0	0	0	+	+	+
United Kingdom	+	+	+	+	+	+
United States	+	+	+	+	+	+
Number of countries	8	9	12	14	14	14

Table 2: Standard Deviation Induced by Conversion Factors, Base Years 1970-1993
1970 Measured Productivity Relative to U.S.

	Total	Manufacturing			Machinery and Equipment		Food, Beverages and Tobacco	
	GDP PPP	GDP PPP	Hoop1	Hoop2	GDP PPP	Harrigan	GDP PPP	Specific
Group 1								
Belgium	0.028	0.104	0.167	0.183	0.155	0.202	0.131	0.120
France	0.027	0.039	0.041	0.050	0.141	0.103	0.139	0.149
Germany	0.012	0.069	0.092	0.090	0.182	0.197	0.106	0.163
Italy	0.006	0.115	0.098	0.117	0.117	0.158	0.156	0.118
Japan	0.007	0.054	0.093	0.095	0.223	0.211	0.203	0.313
Netherlands	0.007	0.079	0.078	0.076	0.116	0.174	0.064	0.114
United Kingdom	0.007	0.054	0.108	0.092	0.172	0.252	0.137	0.192
<i>Average</i>	0.014	0.073	0.097	0.100	0.158	0.185	0.134	0.167
<i>Number of obs</i>	7	7	7	7	7	7	7	7
Group 2								
Belgium	0.031	0.061	0.158	0.172	0.166	0.155	0.137	0.134
Denmark	0.015	0.094	0.088	0.100	0.218	0.212	0.184	0.200
France	0.019	0.044	0.043	0.054	0.131	0.071	0.126	0.118
Germany	0.012	0.069	0.065	0.075	0.151	0.124	0.092	0.158
Italy	0.007	0.117	0.110	0.131	0.029	0.094	0.169	0.129
Japan	0.008	0.031	0.103	0.102	0.190	0.235	0.191	0.312
Netherlands	0.008	0.076	0.081	0.084	0.124	0.062	0.061	0.124
United Kingdom	0.008	0.035	0.086	0.071	0.115	0.211	0.134	0.198
<i>Average</i>	0.014	0.066	0.092	0.098	0.140	0.146	0.137	0.167
<i>Number of obs</i>	8	8	8	8	8	8	8	8
Group 3								
Belgium	0.034	0.020	0.109	0.148	0.187	0.176	0.154	0.154
Canada	0.010	0.020	0.118	0.112	0.072	0.102	0.041	0.030
Denmark	0.016	0.104	0.097	0.115	0.217	0.224	0.211	0.231
Finland	0.007	0.052	0.117	0.124	0.086	0.082	0.121	0.255
France	0.016	0.050	0.037	0.057	0.130	0.047	0.116	0.097
Germany	0.009	0.071	0.075	0.086	0.143	0.093	0.064	0.115
Italy	0.008	0.080	0.115	0.139	0.026	0.075	0.191	0.115
Japan	0.009	0.007	0.100	0.098	0.052	0.146	0.033	0.210
Netherlands	0.009	0.079	0.066	0.079	0.142	0.066	0.060	0.136
Norway	0.019	0.134	0.079	0.103	0.143	0.104	0.322	0.237
United Kingdom	0.009	0.029	0.049	0.042	0.056	0.099	0.076	0.093
<i>Average</i>	0.013	0.059	0.087	0.100	0.114	0.110	0.126	0.131
<i>Number of obs</i>	11	11	11	11	11	11	11	11
Group 4								
Australia	0.017	0.055	0.165	0.151	0.034	0.155	0.211	0.136
Belgium	0.041	0.023	0.063	0.071	0.220	0.191	0.122	0.084
Canada	0.005	0.020	0.046	0.047	0.043	0.073	0.046	0.025
Denmark	0.020	0.090	0.117	0.139	0.177	0.258	0.173	0.027
Finland	0.007	0.028	0.069	0.060	0.037	0.100	0.112	0.061
France	0.008	0.033	0.042	0.053	0.084	0.056	0.096	0.061
Germany	0.010	0.042	0.090	0.106	0.081	0.112	0.040	0.140
Italy	0.003	0.061	0.069	0.069	0.007	0.092	0.172	0.099
Japan	0.009	0.006	0.103	0.102	0.058	0.139	0.038	0.218
Netherlands	0.005	0.073	0.077	0.085	0.132	0.076	0.013	0.166
Norway	0.023	0.133	0.087	0.102	0.141	0.110	0.108	0.212
Sweden	0.019	0.040	0.073	0.081	0.036	0.055	0.054	0.231
United Kingdom	0.005	0.034	0.033	0.021	0.043	0.113	0.060	0.101
<i>Average</i>	0.013	0.049	0.079	0.084	0.084	0.118	0.096	0.120
<i>Number of obs</i>	13	13	13	13	13	13	13	13

Note: For each country, the initial relative productivity level for a given base year is normalized by the average of initial relative productivity levels across base years.

Table 3A: Adjustments for Distribution Margins, France, Germany and the United Kingdom, 1990

	France	Germany	United Kingdom
$Log\left(\tilde{P}_{i,t,0} / \tilde{P}_{i,0}\right)$ Hoop1	0.03	0.07	-0.01
$Log\left(\tilde{P}_{i,t,0} / \tilde{P}_{i,0}\right)$ Hoop2	0.04	0.08	0.01
$Log(\phi_{i,t,0} / \bar{\phi}_{i,0})$ Minimum	0.006	0.021	-0.01
Maximum	0.021	0.025	0.07

Note: Initial relative productivity levels are presented for 1990 as the log difference from the average of 1985 and 1990. Relative distribution margins are presented for 1987 as the log difference from the average of 1986 and 1987. $\phi_{i,t,0}$ is based on data for the United States (1986, 1987), France (1985, 1987), Germany (1985, 1987), and United Kingdom (1984, 1988). We estimate values for distribution margins in 1986 and 1987 for the countries based on minimum, average and maximum growth rates, which results in minimum and maximum values for relative distribution margins.

Table 3B: Standard Deviation Induced by Conversion Factors, Base Years 1970-1993, Adjusted for Indirect Taxes and Subsidies
1970 Measured Productivity Relative to U.S.

	Manufacturing		Machinery and Equipment	Food, Beverages and Tobacco
	Hoop1	Hoop2	Harrigan	Specific
Group 1				
Belgium	0.173	0.190	0.198	0.183
France				
Germany	0.097	0.095	0.199	0.143
Italy	0.091	0.110	0.167	0.166
Japan	0.089	0.084	0.207	0.248
Netherlands				
United Kingdom				
<i>Average</i>	0.095	0.106	0.143	0.172
<i>Number of obs</i>	4	4	4	4
Group 2				
Belgium	0.157	0.172	0.160	0.194
Denmark				
France				
Germany	0.067	0.077	0.120	0.102
Italy	0.101	0.123	0.098	0.186
Japan	0.094	0.092	0.231	0.184
Netherlands				
United Kingdom				
<i>Average</i>	0.089	0.104	0.115	0.160
<i>Number of obs</i>	4	4	4	4
Group 3				
Belgium	0.111	0.150	0.181	0.220
Canada				
Denmark				
Finland	0.113	0.120	0.087	0.172
France	0.041	0.070	0.019	0.171
Germany	0.077	0.089	0.089	0.105
Italy	0.106	0.131	0.075	0.213
Japan	0.095	0.093	0.144	0.065
Netherlands	0.077	0.088	0.065	0.122
Norway	0.050	0.086	0.076	0.255
United Kingdom				
<i>Average</i>	0.084	0.103	0.092	0.165
<i>Number of obs</i>	8	8	8	8
Group 4				
Australia	0.143	0.129		0.305
Belgium	0.063	0.071	0.197	0.082
Canada				
Denmark				
Finland	0.067	0.059	0.106	0.134
France	0.039	0.054	0.024	0.108
Germany	0.093	0.109	0.107	0.013
Italy	0.058	0.059	0.091	0.169
Japan	0.095	0.094	0.136	0.064
Netherlands	0.094	0.102	0.074	0.022
Norway	0.060	0.087	0.104	0.056
Sweden	0.078	0.084	0.063	0.111
United Kingdom				
<i>Average</i>	0.079	0.085	0.100	0.106
<i>Number of obs</i>	10	10	9	10

Note: For each country, the initial relative productivity level for a given base year is normalized by the average of initial relative productivity levels across base years.

Table 4: Standard Deviation Induced by Conversion Factors, Base Years 1970-1993, Adjusted for International Trade
1970 Measured Productivity Relative to U.S.

	Manufacturing		Machinery and Equipment	Food, Beverages and Tobacco
	Hoop1	Hoop2	Harrigan	Specific
Group 1				
Belgium	0.183	0.198	0.201	0.194
France	0.049	0.058	0.100	0.169
Germany	0.094	0.094	0.200	0.147
Italy	0.113	0.131	0.149	0.182
Japan	0.073	0.070	0.147	0.242
Netherlands	0.103	0.104	0.191	0.148
United Kingdom	0.113	0.094	0.256	0.205
<i>Average</i>	0.104	0.107	0.178	0.184
<i>Number of obs</i>	7	7	7	7
Group 2				
Belgium	0.179	0.193	0.131	0.211
Denmark	0.083	0.096	0.202	0.218
France	0.053	0.064	0.055	0.157
Germany	0.069	0.080	0.107	0.115
Italy	0.127	0.146	0.059	0.204
Japan	0.076	0.077	0.165	0.179
Netherlands	0.112	0.116	0.063	0.162
United Kingdom	0.092	0.073	0.203	0.202
<i>Average</i>	0.099	0.106	0.123	0.181
<i>Number of obs</i>	8	8	8	8
Group 3				
Belgium	0.129	0.165	0.144	0.236
Canada	0.124	0.119	0.207	0.135
Denmark	0.095	0.111	0.209	0.239
Finland	0.131	0.137	0.061	0.192
France	0.037	0.060	0.052	0.179
Germany	0.079	0.091	0.110	0.129
Italy	0.129	0.152	0.052	0.235
Japan	0.073	0.073	0.068	0.042
Netherlands	0.092	0.107	0.064	0.164
Norway	0.122	0.143	0.152	0.235
United Kingdom	0.067	0.053	0.131	0.135
<i>Average</i>	0.098	0.110	0.114	0.175
<i>Number of obs</i>	11	11	11	11
Group 4				
Australia	0.195	0.175	0.395	0.340
Belgium	0.068	0.077	0.154	0.080
Canada	0.049	0.050	0.136	0.090
Denmark	0.112	0.135	0.243	0.150
Finland	0.080	0.071	0.075	0.151
France	0.028	0.039	0.060	0.104
Germany	0.095	0.108	0.132	0.025
Italy	0.076	0.075	0.057	0.183
Japan	0.067	0.068	0.068	0.035
Netherlands	0.093	0.100	0.077	0.033
Norway	0.148	0.164	0.151	0.117
Sweden	0.072	0.076	0.073	0.103
United Kingdom	0.058	0.031	0.140	0.090
<i>Average</i>	0.088	0.090	0.136	0.116
<i>Number of obs</i>	13	13	13	13

Note: For each country, the initial relative productivity level for a given base year is normalized by the average of initial relative productivity levels across base years.

Table 5: Standard Deviation Induced by Conversion Factors, Base Years 1970-1993, Multilateral Weights
1970 Measured Productivity Relative to U.S.

	Total	Manufacturing			Machinery and Equipment		Food, Beverages and Tobacco	
	GDP PPP	GDP PPP	Hoop1	Hoop2	GDP PPP	Harrigan	GDP PPP	Specific
Group 1								
Belgium	0.028	0.104	0.168	0.148	0.155	0.195	0.131	0.099
France	0.027	0.039	0.046	0.033	0.141	0.099	0.139	0.143
Germany	0.012	0.069	0.090	0.085	0.182	0.194	0.106	0.212
Italy	0.006	0.115	0.122	0.102	0.117	0.163	0.156	0.141
Japan	0.007	0.054	0.087	0.081	0.223	0.193	0.203	0.336
Netherlands	0.007	0.079	0.074	0.072	0.116	0.176	0.064	0.125
United Kingdom	0.007	0.054	0.096	0.107	0.172	0.245	0.137	0.220
<i>Average</i>	0.014	0.073	0.097	0.090	0.158	0.181	0.134	0.182
<i>Number of obs</i>	7	7	7	7	7	7	7	7
Group 2								
Belgium	0.031	0.061	0.160	0.145	0.166	0.154	0.137	0.111
Denmark	0.015	0.094	0.086	0.073	0.218	0.214	0.184	0.075
France	0.019	0.044	0.050	0.036	0.131	0.080	0.126	0.088
Germany	0.012	0.069	0.073	0.054	0.151	0.121	0.092	0.152
Italy	0.007	0.117	0.136	0.115	0.029	0.093	0.169	0.122
Japan	0.008	0.031	0.095	0.090	0.190	0.213	0.191	0.317
Netherlands	0.008	0.076	0.080	0.072	0.124	0.052	0.061	0.117
United Kingdom	0.008	0.035	0.072	0.085	0.115	0.213	0.134	0.209
<i>Average</i>	0.014	0.066	0.094	0.084	0.140	0.143	0.137	0.149
<i>Number of obs</i>	8	8	8	8	8	8	8	8
Group 3								
Belgium	0.034	0.020	0.128	0.099	0.187	0.176	0.154	0.126
Canada	0.010	0.020	0.096	0.098	0.072	0.078	0.041	0.039
Denmark	0.016	0.104	0.097	0.085	0.217	0.210	0.211	0.077
Finland	0.007	0.052	0.238	0.225	0.086	0.420	0.121	0.102
France	0.016	0.050	0.050	0.030	0.130	0.045	0.116	0.052
Germany	0.009	0.071	0.084	0.064	0.143	0.090	0.064	0.119
Italy	0.008	0.080	0.138	0.119	0.026	0.045	0.191	0.101
Japan	0.009	0.007	0.105	0.103	0.052	0.103	0.033	0.208
Netherlands	0.009	0.079	0.070	0.053	0.142	0.054	0.060	0.130
Norway	0.019	0.134	0.087	0.060	0.143	0.063	0.322	0.302
United Kingdom	0.009	0.029	0.044	0.047	0.056	0.095	0.076	0.081
<i>Average</i>	0.013	0.059	0.103	0.089	0.114	0.125	0.126	0.122
<i>Number of obs</i>	11	11	11	11	11	11	11	11
Group 4								
Australia	0.017	0.055	0.159	0.176	0.034	0.151	0.211	0.143
Belgium	0.041	0.023	0.022	0.011	0.220	0.192	0.122	0.064
Canada	0.005	0.020	0.054	0.049	0.043	0.060	0.046	0.023
Denmark	0.020	0.090	0.116	0.100	0.177	0.241	0.173	0.022
Finland	0.007	0.028	0.059	0.069	0.037	0.114	0.112	0.061
France	0.008	0.033	0.043	0.030	0.084	0.048	0.096	0.037
Germany	0.010	0.042	0.102	0.078	0.081	0.107	0.040	0.139
Italy	0.003	0.061	0.065	0.070	0.007	0.049	0.172	0.099
Japan	0.009	0.006	0.110	0.111	0.058	0.047	0.038	0.235
Netherlands	0.005	0.073	0.074	0.063	0.132	0.068	0.013	0.153
Norway	0.023	0.133	0.092	0.073	0.141	0.032	0.108	0.219
Sweden	0.019	0.040	0.085	0.070	0.036	0.089	0.054	0.226
United Kingdom	0.005	0.034	0.022	0.036	0.043	0.106	0.060	0.093
<i>Average</i>	0.013	0.049	0.077	0.072	0.084	0.100	0.096	0.116
<i>Number of obs</i>	13	13	13	13	13	13	13	13

Note: For each country, the initial relative productivity level for a given base year is normalized by the average of initial relative productivity levels across base years.

Table 6: Conversion Factors Based on Expenditure and Output Weights

	Weights		Conversion Factors					
	Expenditure	Output	Italy	Germany	France	Japan	UK	Canada
Food, beverages, and tobacco	25%	11%	1666	2.07	6.97	280.7	0.67	1.54
Textiles, apparel and leather products	12%	4%	2131	2.73	10.73	217.4	0.69	1.51
Chemical, petrol. Rubber & plastic prods.	20%	15%	1751	2.38	7.26	203.5	0.73	1.34
Machinery, equip. and fabric. Metal prods.	34%	48%	1756	2.21	7.92	169.4	0.75	1.33
Other manufactured products	10%	21%	1870	2.3	7.91	225.5	0.64	1.59
Total manufacturing	Expenditure weights		1787	2.28	7.88	214.9	0.71	1.43
	Output weights		1786	2.26	7.84	200.6	0.71	1.42
	Expenditure/output		1.00	1.01	1.01	1.07	0.99	1.01

Table 7: Standard Deviation Induced by Conversion Factors, Base Years 1980-1993, Production Value
1970 Measured Productivity Relative to U.S

[TBA]

Sector	Country	PPP	1970	1975	1980	1985	1990	1993
Total	Australia	GDP PPP	0.75	0.93	1.04	1.19	1.39	1.35
Manufacturing	Australia	Hoop1				1.12	1.53	1.60
Manufacturing	Australia	Hoop1 - adjust IT Group 4				1.00	1.50	1.44
Manufacturing	Australia	Hoop1 - adjust TAX				1.06	1.40	1.46
Manufacturing	Australia	Hoop1 - Multi. weights Group 4				1.14	1.55	1.62
Manufacturing	Australia	Hoop2				1.15	1.53	1.60
Manufacturing	Australia	Hoop2 - adjust IT Group 4				1.03	1.50	1.44
Manufacturing	Australia	Hoop2 - adjust TAX				1.09	1.40	1.46
Manufacturing	Australia	Hoop2 - Multi. weights Group 4				1.11	1.55	1.62
Machinery_and_Equipment	Australia	Harrigan				1.11	1.67	1.84
Machinery_and_equipment	Australia	Harrigan - adjust IT - Group 4				0.76	1.82	1.89
Machinery_and_Equipment	Australia	Harrigan - Multi. weights Group 4				1.12	1.63	1.84
Food_Bev_Tobacco	Australia	Specific				1.04	1.03	1.01
Food_Bev_Tobacco	Australia	Specific - adjust TAX				0.96	0.92	0.92
Food_Bev_Tobacco	Australia	Specific - adjust IT - Group 4				1.23	1.41	1.58
Food_bev_tobacco	Australia	Specific - Multi. weights Group 4				1.02	1.03	1.01
Total	Belgium	GDP PPP	40.9	44.0	39.6	40.2	39.5	37.3
Manufacturing	Belgium	Hoop1	46.4	44.3	40.6	51.7	47.2	44.7
Manufacturing	Belgium	Hoop1 - adjust IT Group 1	46.8	43.2	39.7	53.0	47.1	46.1
Manufacturing	Belgium	Hoop1 - adjust IT Group 2		43.3	39.7	53.0	47.1	46.1
Manufacturing	Belgium	Hoop1 - adjust IT Group 3			39.7	53.1	47.1	46.0
Manufacturing	Belgium	Hoop1 - adjust IT Group 4				53.0	47.2	46.0
Manufacturing	Belgium	Hoop1 - adjust TAX	45.9	45.3	41.1	52.6	48.4	45.3
Manufacturing	Belgium	Hoop1 - Multi. weights Group 1	45.5	44.3	37.0	48.7	47.5	44.9
Manufacturing	Belgium	Hoop1 - Multi. weights Group 2		44.3	37.0	48.5	47.5	44.9
Manufacturing	Belgium	Hoop1 - Multi. weights Group 3			37.4	48.2	47.5	44.9
Manufacturing	Belgium	Hoop1 - Multi. weights Group 4				48.2	47.5	44.9
Manufacturing	Belgium	Hoop2	44.9	44.8	37.6	52.5	47.2	44.7
Manufacturing	Belgium	Hoop2 - adjust IT Group 1	45.3	43.6	37.0	53.8	47.1	46.1
Manufacturing	Belgium	Hoop2 - adjust IT Group 2		43.7	37.0	53.8	47.1	46.1
Manufacturing	Belgium	Hoop2 - adjust IT Group 3			37.0	53.8	47.1	46.0
Manufacturing	Belgium	Hoop2 - adjust IT Group 4				53.8	47.2	46.0
Manufacturing	Belgium	Hoop2 - adjust TAX	44.4	45.8	38.1	53.4	48.4	45.3
Manufacturing	Belgium	Hoop2 - Multi. weights Group 1	47.5	44.1	39.1	47.3	47.5	44.9
Manufacturing	Belgium	Hoop2 - Multi. weights Group 2		44.0	39.0	47.0	47.5	44.9
Manufacturing	Belgium	Hoop2 - Multi. weights Group 3			39.2	46.8	47.5	44.9
Manufacturing	Belgium	Hoop2 - Multi. weights Group 4				46.7	47.5	44.9
Machinery_and_Equipment	Belgium	Harrigan	57.5	47.1	35.3	45.1	48.0	43.7
Machinery_and_equipment	Belgium	Harrigan - adjust IT - Group 1	60.6	48.8	36.0	43.0	48.8	44.8
Machinery_and_equipment	Belgium	Harrigan - adjust IT - Group 2		48.7	36.0	43.0	48.8	44.8
Machinery_and_equipment	Belgium	Harrigan - adjust IT - Group 3			36.0	43.0	48.9	44.7
Machinery_and_equipment	Belgium	Harrigan - adjust IT - Group 4				43.0	48.9	44.7
Machinery_and_equipment	Belgium	Harrigan - adjust TAX	57.6	48.7	36.1	46.4	49.4	44.3
Machinery_and_Equipment	Belgium	Harrigan - Multi. weights Group 1	55.8	46.4	34.7	44.7	47.2	43.9
Machinery_and_Equipment	Belgium	Harrigan - Multi. weights Group 2		46.3	34.9	44.9	47.2	43.9
Machinery_and_Equipment	Belgium	Harrigan - Multi. weights Group 3			35.1	45.0	47.2	43.9
Machinery_and_Equipment	Belgium	Harrigan - Multi. weights Group 4				45.2	47.2	43.9
Food_Bev_Tobacco	Belgium	Specific	45.0	38.9	37.2	49.7	35.9	31.2
Food_Bev_Tobacco	Belgium	Specific - adjust TAX	44.5	43.8	44.2	50.8	38.6	32.3
Food_Bev_Tobacco	Belgium	Specific - adjust IT - Group 1	44.7	39.1	39.9	51.9	42.8	39.1
Food_Bev_Tobacco	Belgium	Specific - adjust IT - Group 2		39.1	39.9	51.9	42.8	39.1
Food_Bev_Tobacco	Belgium	Specific - adjust IT - Group 3			39.9	52.0	42.9	39.1
Food_Bev_Tobacco	Belgium	Specific - adjust IT - Group 4				51.9	42.9	39.1
Food_bev_tobacco	Belgium	Specific - Multi. weights Group 1	42.9	38.3	38.6	48.1	35.9	31.2

Food_bev_tobacco	Belgium	Specific - Multi. weights Group 2		38.4	38.5	48.0	35.9	31.2
Food_bev_tobacco	Belgium	Specific - Multi. weights Group 3			38.6	48.0	35.9	31.2
Food_bev_tobacco	Belgium	Specific - Multi. weights Group 4				47.9	35.9	31.2
Total	Canada	GDP PPP	1.15	1.22	1.25	1.28	1.30	1.26
Manufacturing	Canada	Hoop1			1.07	1.34	1.44	1.43
Manufacturing	Canada	Hoop1 - adjust IT Group 3			1.06	1.34	1.46	1.43
Manufacturing	Canada	Hoop1 - adjust IT Group 4				1.34	1.46	1.43
Manufacturing	Canada	Hoop1 - Multi. weights Group 3			1.12	1.32	1.45	1.43
Manufacturing	Canada	Hoop1 - Multi. weights Group 4				1.32	1.45	1.43
Manufacturing	Canada	Hoop2			1.08	1.34	1.44	1.43
Manufacturing	Canada	Hoop2 - adjust IT Group 3			1.07	1.34	1.46	1.43
Manufacturing	Canada	Hoop2 - adjust IT Group 4				1.33	1.46	1.43
Manufacturing	Canada	Hoop2 - Multi. weights Group 3			1.12	1.33	1.45	1.43
Manufacturing	Canada	Hoop2 - Multi. weights Group 4				1.33	1.45	1.43
Machinery_and_Equipment	Canada	Harrigan			1.05	1.50	1.45	1.39
Machinery_and_equipment	Canada	Harrigan - adjust IT - Group 3			0.88	1.59	1.49	1.30
Machinery_and_equipment	Canada	Harrigan - adjust IT - Group 4				1.59	1.49	1.30
Machinery_and_Equipment	Canada	Harrigan - Multi. weights Group 3			1.09	1.47	1.43	1.40
Machinery_and_Equipment	Canada	Harrigan - Multi. weights Group 4				1.47	1.43	1.40
Food_Bev_Tobacco	Canada	Specific			1.16	1.38	1.28	1.22
Food_Bev_Tobacco	Canada	Specific - adjust IT - Group 3			1.12	1.38	1.55	1.46
Food_Bev_Tobacco	Canada	Specific - adjust IT - Group 4				1.38	1.55	1.46
Food_bev_tobacco	Canada	Specific - Multi. weights Group 3			1.13	1.38	1.28	1.22
Food_bev_tobacco	Canada	Specific - Multi. weights Group 4				1.38	1.28	1.22
Total	Denmark	GDP PPP	6.78	7.94	8.34	9.25	9.39	8.79
Manufacturing	Denmark	Hoop1		7.93	8.54	10.94	10.75	9.84
Manufacturing	Denmark	Hoop1 - adjust IT Group 2		8.16	8.72	10.95	10.72	9.97
Manufacturing	Denmark	Hoop1 - adjust IT Group 3			8.72	10.95	10.73	9.96
Manufacturing	Denmark	Hoop1 - adjust IT Group 4				10.9	10.7	10.0
Manufacturing	Denmark	Hoop1 - Multi. weights Group 2		8.16	7.99	11.08	10.89	9.94
Manufacturing	Denmark	Hoop1 - Multi. weights Group 3			8.10	11.07	10.90	9.95
Manufacturing	Denmark	Hoop1 - Multi. weights Group 4				11.05	10.90	9.95
Manufacturing	Denmark	Hoop2		8.2	8.0	11.4	10.7	9.8
Manufacturing	Denmark	Hoop2 - adjust IT Group 2		8.5	8.2	11.4	10.7	10.0
Manufacturing	Denmark	Hoop2 - adjust IT Group 3			8.2	11.4	10.7	10.0
Manufacturing	Denmark	Hoop2 - adjust IT Group 4				11.4	10.7	10.0
Manufacturing	Denmark	Hoop2 - Multi. weights Group 2		8.11	8.59	10.66	10.89	9.94
Manufacturing	Denmark	Hoop2 - Multi. weights Group 3			8.61	10.70	10.90	9.95
Manufacturing	Denmark	Hoop2 - Multi. weights Group 4				10.71	10.90	9.95
Machinery_and_Equipment	Denmark	Harrigan		7.54	7.3	10.0	10.8	8.1
Machinery_and_equipment	Denmark	Harrigan - adjust IT - Group 2		7.68	7.26	9.88	11.05	8.33
Machinery_and_equipment	Denmark	Harrigan - adjust IT - Group 3			7.3	9.9	11.1	8.3
Machinery_and_equipment	Denmark	Harrigan - adjust IT - Group 4				9.88	11.06	8.32
Machinery_and_Equipment	Denmark	Harrigan - Multi. weights Group 2		7.95	7.25	9.71	10.44	8.21
Machinery_and_Equipment	Denmark	Harrigan - Multi. weights Group 3			7.3	9.7	10.4	8.2
Machinery_and_Equipment	Denmark	Harrigan - Multi. weights Group 4				9.8	10.4	8.2
Food_Bev_Tobacco	Denmark	Specific		8.2	7.4	12.0	8.7	8.1
Food_Bev_Tobacco	Denmark	Specific - adjust IT - Group 2		5.67	6.21	10.13	6.85	7.93
Food_Bev_Tobacco	Denmark	Specific - adjust IT - Group 3			6.15	10.19	6.94	7.92
Food_Bev_Tobacco	Denmark	Specific - adjust IT - Group 4				10.10	6.94	7.86
Food_bev_tobacco	Denmark	Specific - Multi. weights Group 2		8.5	10.1	11.9	8.7	8.1
Food_bev_tobacco	Denmark	Specific - Multi. weights Group 3			10.1	11.9	8.7	8.1
Food_bev_tobacco	Denmark	Specific - Multi. weights Group 4				11.9	8.7	8.1

Total	Finland	GDP PPP	3.44	4.50	5.00	5.79	6.38	6.09
Manufacturing	Finland	Hoop1			5.54	7.12	7.53	7.99
Manufacturing	Finland	Hoop1 - adjust IT Group 3			5.26	6.83	7.32	7.87
Manufacturing	Finland	Hoop1 - adjust IT Group 4				6.82	7.32	7.86
Manufacturing	Finland	Hoop1 - adjust TAX			5.75	7.37	7.75	8.21
Manufacturing	Finland	Hoop1 - Multi. weights Group 3			4.36	7.50	7.60	8.03
Manufacturing	Finland	Hoop1 - Multi. weights Group 4				7.48	7.59	8.03
Manufacturing	Finland	Hoop2			5.49	7.41	7.53	7.99
Manufacturing	Finland	Hoop2 - adjust IT Group 3			5.22	7.06	7.32	7.87
Manufacturing	Finland	Hoop2 - adjust IT Group 4				7.05	7.32	7.86
Manufacturing	Finland	Hoop2 - adjust TAX			5.70	7.67	7.75	8.21
Manufacturing	Finland	Hoop2 - Multi. weights Group 3			4.42	7.13	7.60	8.03
Manufacturing	Finland	Hoop2 - Multi. weights Group 4				7.13	7.59	8.03
Machinery_and_Equipment	Finland	Harrigan			4.68	6.20	6.75	7.31
Machinery_and_equipment	Finland	Harrigan - adjust IT - Group 3			5.00	6.23	7.57	7.48
Machinery_and_equipment	Finland	Harrigan - adjust IT - Group 4				6.23	7.57	7.48
Machinery_and_equipment	Finland	Harrigan - adjust TAX			4.79	6.31	6.96	7.60
Machinery_and_Equipment	Finland	Harrigan - Multi. weights Group 3			2.09	6.15	6.72	7.47
Machinery_and_Equipment	Finland	Harrigan - Multi. weights Group 4				6.19	6.72	7.47
Food_Bev_Tobacco	Finland	Specific			4.37	8.58	7.05	6.91
Food_Bev_Tobacco	Finland	Specific - adjust TAX			6.53	9.03	8.07	8.34
Food_Bev_Tobacco	Finland	Specific - adjust IT - Group 3			6.19	8.70	8.83	8.31
Food_Bev_Tobacco	Finland	Specific - adjust IT - Group 4				8.70	8.83	8.32
Food_bev_tobacco	Finland	Specific - Multi. weights Group 3			6.04	8.59	7.05	6.91
Food_bev_tobacco	Finland	Specific - Multi. weights Group 4				8.59	7.05	6.91
Total	France	GDP PPP	4.37	4.86	5.50	6.62	6.61	6.57
Manufacturing	France	Hoop1	5.31	5.33	6.02	8.17	8.17	7.91
Manufacturing	France	Hoop1 - adjust IT Group 1	5.31	5.24	5.95	8.17	8.42	8.13
Manufacturing	France	Hoop1 - adjust IT Group 2		5.24	5.95	8.17	8.43	8.13
Manufacturing	France	Hoop1 - adjust IT Group 3			5.95	8.18	8.43	8.13
Manufacturing	France	Hoop1 - adjust IT Group 4				8.17	8.43	8.12
Manufacturing	France	Hoop1 - adjust TAX			5.72	7.81	7.83	
Manufacturing	France	Hoop1 - Multi. weights Group 1	5.25	5.40	5.76	8.23	8.25	7.97
Manufacturing	France	Hoop1 - Multi. weights Group 2		5.40	5.75	8.22	8.25	7.97
Manufacturing	France	Hoop1 - Multi. weights Group 3			5.81	8.25	8.25	7.97
Manufacturing	France	Hoop1 - Multi. weights Group 4				8.25	8.25	7.97
Manufacturing	France	Hoop2	5.27	5.39	5.79	8.34	8.17	7.91
Manufacturing	France	Hoop2 - adjust IT Group 1	5.27	5.29	5.74	8.35	8.42	8.13
Manufacturing	France	Hoop2 - adjust IT Group 2		5.29	5.74	8.35	8.43	8.13
Manufacturing	France	Hoop2 - adjust IT Group 3			5.74	8.35	8.43	8.13
Manufacturing	France	Hoop2 - adjust IT Group 4				8.35	8.43	8.12
Manufacturing	France	Hoop2 - adjust TAX			5.50	7.98	7.83	
Manufacturing	France	Hoop2 - Multi. weights Group 1	5.25	5.36	5.96	8.00	8.25	7.97
Manufacturing	France	Hoop2 - Multi. weights Group 2		5.35	5.95	8.00	8.25	7.97
Manufacturing	France	Hoop2 - Multi. weights Group 3			5.98	8.05	8.25	7.97
Manufacturing	France	Hoop2 - Multi. weights Group 4				8.05	8.25	7.97
Machinery_and_Equipment	France	Harrigan	5.14	5.59	5.53	7.48	9.04	7.94
Machinery_and_equipment	France	Harrigan - adjust IT - Group 1	5.17	5.30	5.34	7.58	9.27	8.08
Machinery_and_equipment	France	Harrigan - adjust IT - Group 2		5.30	5.34	7.58	9.27	8.08
Machinery_and_equipment	France	Harrigan - adjust IT - Group 3			5.34	7.59	9.27	8.07
Machinery_and_equipment	France	Harrigan - adjust IT - Group 4				7.59	9.28	8.07
Machinery_and_equipment	France	Harrigan - adjust TAX			5.52	7.49	9.02	
Machinery_and_Equipment	France	Harrigan - Multi. weights Group 1	4.96	5.73	5.62	7.45	8.77	7.91
Machinery_and_Equipment	France	Harrigan - Multi. weights Group 2		5.71	5.62	7.47	8.77	7.91
Machinery_and_Equipment	France	Harrigan - Multi. weights Group 3			5.62	7.50	8.77	7.91

Machinery_and_Equipment	France	Harrigan - Multi. weights Group 4				7.53	8.77	7.91
Food_Bev_Tobacco	France	Specific	4.48	4.76	5.32	7.62	5.86	5.73
Food_Bev_Tobacco	France	Specific - adjust TAX			6.16	7.55	5.92	
Food_Bev_Tobacco	France	Specific - adjust IT - Group 1	4.87	4.77	5.77	7.75	7.02	6.87
Food_Bev_Tobacco	France	Specific - adjust IT - Group 2		4.77	5.77	7.75	7.03	6.87
Food_Bev_Tobacco	France	Specific - adjust IT - Group 3			5.77	7.75	7.03	6.87
Food_Bev_Tobacco	France	Specific - adjust IT - Group 4				7.75	7.03	6.87
Food_bev_tobacco	France	Specific - Multi. weights Group 1	4.65	4.68	5.68	7.32	5.86	5.73
Food_bev_tobacco	France	Specific - Multi. weights Group 2		4.69	5.67	7.31	5.86	5.73
Food_bev_tobacco	France	Specific - Multi. weights Group 3			5.70	7.31	5.86	5.73
Food_bev_tobacco	France	Specific - Multi. weights Group 4				7.30	5.86	5.73
Total	Germany	GDP PPP	3.09	2.99	2.51	2.23	2.09	2.10
Manufacturing	Germany	Hoop1	3.70	3.08	2.57	2.64	2.31	2.28
Manufacturing	Germany	Hoop1 - adjust IT Group 1	3.67	2.97	2.48	2.70	2.31	2.33
Manufacturing	Germany	Hoop1 - adjust IT Group 2		2.97	2.48	2.70	2.31	2.33
Manufacturing	Germany	Hoop1 - adjust IT Group 3			2.48	2.71	2.31	2.33
Manufacturing	Germany	Hoop1 - adjust IT Group 4				2.70	2.31	2.33
Manufacturing	Germany	Hoop1 - adjust TAX	3.58	2.94	2.44	2.54	2.23	2.16
Manufacturing	Germany	Hoop1 - Multi. weights Group 1	3.60	3.05	2.50	2.72	2.32	2.28
Manufacturing	Germany	Hoop1 - Multi. weights Group 2		3.05	2.49	2.71	2.32	2.28
Manufacturing	Germany	Hoop1 - Multi. weights Group 3			2.51	2.71	2.32	2.28
Manufacturing	Germany	Hoop1 - Multi. weights Group 4				2.71	2.32	2.28
Manufacturing	Germany	Hoop2	3.61	3.09	2.53	2.72	2.31	2.28
Manufacturing	Germany	Hoop2 - adjust IT Group 1	3.59	2.98	2.44	2.76	2.31	2.33
Manufacturing	Germany	Hoop2 - adjust IT Group 2		2.98	2.44	2.76	2.31	2.33
Manufacturing	Germany	Hoop2 - adjust IT Group 3			2.44	2.77	2.31	2.33
Manufacturing	Germany	Hoop2 - adjust IT Group 4				2.76	2.31	2.33
Manufacturing	Germany	Hoop2 - adjust TAX	3.50	2.95	2.41	2.61	2.23	2.16
Manufacturing	Germany	Hoop2 - Multi. weights Group 1	3.65	3.06	2.53	2.59	2.32	2.28
Manufacturing	Germany	Hoop2 - Multi. weights Group 2		3.06	2.52	2.59	2.32	2.28
Manufacturing	Germany	Hoop2 - Multi. weights Group 3			2.53	2.60	2.32	2.28
Manufacturing	Germany	Hoop2 - Multi. weights Group 4				2.60	2.32	2.28
Machinery_and_Equipment	Germany	Harrigan	3.69	3.28	2.30	2.44	2.66	2.23
Machinery_and_equipment	Germany	Harrigan - adjust IT - Group 1	3.64	2.90	2.12	2.64	2.40	2.23
Machinery_and_equipment	Germany	Harrigan - adjust IT - Group 2		2.90	2.12	2.64	2.40	2.23
Machinery_and_equipment	Germany	Harrigan - adjust IT - Group 3			2.12	2.64	2.41	2.22
Machinery_and_equipment	Germany	Harrigan - adjust IT - Group 4				2.64	2.41	2.22
Machinery_and_equipment	Germany	Harrigan - adjust TAX	3.74	3.27	2.30	2.44	2.67	2.25
Machinery_and_Equipment	Germany	Harrigan - Multi. weights Group 1	3.64	3.27	2.29	2.37	2.66	2.23
Machinery_and_Equipment	Germany	Harrigan - Multi. weights Group 2		3.26	2.29	2.38	2.66	2.23
Machinery_and_Equipment	Germany	Harrigan - Multi. weights Group 3			2.30	2.38	2.66	2.23
Machinery_and_Equipment	Germany	Harrigan - Multi. weights Group 4				2.39	2.66	2.23
Food_Bev_Tobacco	Germany	Specific	2.98	3.02	2.42	2.41	1.66	1.71
Food_Bev_Tobacco	Germany	Specific - adjust TAX	4.08	3.41	2.87	2.63	1.86	2.16
Food_Bev_Tobacco	Germany	Specific - adjust IT - Group 1	3.92	3.09	2.72	2.36	2.02	2.04
Food_Bev_Tobacco	Germany	Specific - adjust IT - Group 2		3.09	2.72	2.36	2.02	2.04
Food_Bev_Tobacco	Germany	Specific - adjust IT - Group 3			2.72	2.36	2.01	2.04
Food_Bev_Tobacco	Germany	Specific - adjust IT - Group 4				2.36	2.01	2.04
Food_bev_tobacco	Germany	Specific - Multi. weights Group 1	3.70	3.00	2.65	2.43	1.66	1.71
Food_bev_tobacco	Germany	Specific - Multi. weights Group 2		3.01	2.64	2.42	1.66	1.71
Food_bev_tobacco	Germany	Specific - Multi. weights Group 3			2.64	2.42	1.66	1.71
Food_bev_tobacco	Germany	Specific - Multi. weights Group 4				2.41	1.66	1.71
Total	Italy	GDP PPP	412	526	809	1213	1421	1534
Manufacturing	Italy	Hoop1	586	714	932	1496	1764	1921

Manufacturing	Italy	Hoop1 - adjust IT Group 1	587	709	933	1539	1785	2008
Manufacturing	Italy	Hoop1 - adjust IT Group 2		709	933	1539	1786	2009
Manufacturing	Italy	Hoop1 - adjust IT Group 3			933	1540	1787	2006
Manufacturing	Italy	Hoop1 - adjust IT Group 4				1539	1788	2005
Manufacturing	Italy	Hoop1 - adjust TAX	593	735	958	1539	1795	1935
Manufacturing	Italy	Hoop1 - Multi. weights Group 1	562	690	878	1502	1778	1921
Manufacturing	Italy	Hoop1 - Multi. weights Group 2		690	876	1499	1778	1920
Manufacturing	Italy	Hoop1 - Multi. weights Group 3			887	1508	1780	1920
Manufacturing	Italy	Hoop1 - Multi. weights Group 4				1508	1780	1920
Manufacturing	Italy	Hoop2	568	697	882	1495	1764	1921
Manufacturing	Italy	Hoop2 - adjust IT Group 1	569	695	887	1542	1785	2008
Manufacturing	Italy	Hoop2 - adjust IT Group 2		696	887	1542	1786	2009
Manufacturing	Italy	Hoop2 - adjust IT Group 3			887	1543	1787	2006
Manufacturing	Italy	Hoop2 - adjust IT Group 4				1542	1788	2005
Manufacturing	Italy	Hoop2 - adjust TAX	575	718	907	1538	1795	1935
Manufacturing	Italy	Hoop2 - Multi. weights Group 1	568	711	924	1492	1778	1921
Manufacturing	Italy	Hoop2 - Multi. weights Group 2		710	921	1487	1778	1920
Manufacturing	Italy	Hoop2 - Multi. weights Group 3			926	1493	1780	1920
Manufacturing	Italy	Hoop2 - Multi. weights Group 4				1493	1780	1920
Machinery_and_Equipment	Italy	Harrigan	568	809	981	1536	2023	1800
Machinery_and_equipment	Italy	Harrigan - adjust IT - Group 1	577	769	965	1577	1997	1910
Machinery_and_equipment	Italy	Harrigan - adjust IT - Group 2		769	965	1577	1998	1910
Machinery_and_equipment	Italy	Harrigan - adjust IT - Group 3			965	1579	1999	1907
Machinery_and_equipment	Italy	Harrigan - adjust IT - Group 4				1578	2000	1907
Machinery_and_equipment	Italy	Harrigan - adjust TAX	598	839	1009	1575	2075	1846
Machinery_and_Equipment	Italy	Harrigan - Multi. weights Group 1	569	826	993	1498	1871	1808
Machinery_and_Equipment	Italy	Harrigan - Multi. weights Group 2		822	995	1501	1871	1808
Machinery_and_Equipment	Italy	Harrigan - Multi. weights Group 3			998	1505	1871	1808
Machinery_and_Equipment	Italy	Harrigan - Multi. weights Group 4				1511	1871	1808
Food_Bev_Tobacco	Italy	Specific	456	689	881	1536	1182	1411
Food_Bev_Tobacco	Italy	Specific - adjust TAX	643	746	1037	1625	1288	1560
Food_Bev_Tobacco	Italy	Specific - adjust IT - Group 1	636	687	898	1385	1426	1620
Food_Bev_Tobacco	Italy	Specific - adjust IT - Group 2		687	897	1384	1424	1619
Food_Bev_Tobacco	Italy	Specific - adjust IT - Group 3			900	1381	1419	1620
Food_Bev_Tobacco	Italy	Specific - adjust IT - Group 4				1385	1419	1624
Food_bev_tobacco	Italy	Specific - Multi. weights Group 1	608	698	914	1535	1182	1411
Food_bev_tobacco	Italy	Specific - Multi. weights Group 2		701	914	1533	1182	1411
Food_bev_tobacco	Italy	Specific - Multi. weights Group 3			920	1536	1182	1411
Food_bev_tobacco	Italy	Specific - Multi. weights Group 4				1534.1	1182.0	1411.0
Total	Japan	GDP PPP	243	279	251	218	195	184
Manufacturing	Japan	Hoop1	309	291	257	276	200	204
Manufacturing	Japan	Hoop1 - adjust IT Group 1	314	296	257	263	205	201
Manufacturing	Japan	Hoop1 - adjust IT Group 2		296	257	263	205	201
Manufacturing	Japan	Hoop1 - adjust IT Group 3			257	263	205	201
Manufacturing	Japan	Hoop1 - adjust IT Group 4				263	206	201
Manufacturing	Japan	Hoop1 - adjust TAX	301	281	241	258	191	192
Manufacturing	Japan	Hoop1 - Multi. weights Group 1	288	312	257	279	199	205
Manufacturing	Japan	Hoop1 - Multi. weights Group 2		312	257	279	199	206
Manufacturing	Japan	Hoop1 - Multi. weights Group 3			258	279	200	206
Manufacturing	Japan	Hoop1 - Multi. weights Group 4				279	200	206
Manufacturing	Japan	Hoop2	277	290	258	275	200	204
Manufacturing	Japan	Hoop2 - adjust IT Group 1	285	296	257	263	205	201
Manufacturing	Japan	Hoop2 - adjust IT Group 2		296	257	263	205	201
Manufacturing	Japan	Hoop2 - adjust IT Group 3			257	264	205	201
Manufacturing	Japan	Hoop2 - adjust IT Group 4				263	206	201

Manufacturing	Japan	Hoop2 - adjust TAX	270	281	242	258	191	192
Manufacturing	Japan	Hoop2 - Multi. weights Group 1	313	318	260	278	199	205
Manufacturing	Japan	Hoop2 - Multi. weights Group 2		318	260	278	199	206
Manufacturing	Japan	Hoop2 - Multi. weights Group 3			260	279	200	206
Manufacturing	Japan	Hoop2 - Multi. weights Group 4				280	200	206
Machinery_and_Equipment	Japan	Harrigan	323	255	213	253	164	177
Machinery_and_equipment	Japan	Harrigan - adjust IT - Group 1	330	280	231	234	173	164
Machinery_and_equipment	Japan	Harrigan - adjust IT - Group 2		281	231	234	173	164
Machinery_and_equipment	Japan	Harrigan - adjust IT - Group 3			231	235	173	163
Machinery_and_equipment	Japan	Harrigan - adjust IT - Group 4				235	174	163
Machinery_and_equipment	Japan	Harrigan - adjust TAX	320	248	205	242	158	171
Machinery_and_Equipment	Japan	Harrigan - Multi. weights Group 1	318	273	222	248	193	182
Machinery_and_Equipment	Japan	Harrigan - Multi. weights Group 2		273	223	249	193	182
Machinery_and_Equipment	Japan	Harrigan - Multi. weights Group 3			224	249	193	182
Machinery_and_Equipment	Japan	Harrigan - Multi. weights Group 4				249	193	182
Food_Bev_Tobacco	Japan	Specific	295	352	227	340	194	186
Food_Bev_Tobacco	Japan	Specific - adjust TAX	344	364	364	326	187	170
Food_Bev_Tobacco	Japan	Specific - adjust IT - Group 1	359	360	357	356	249	239
Food_Bev_Tobacco	Japan	Specific - adjust IT - Group 2		360	357	356	249	239
Food_Bev_Tobacco	Japan	Specific - adjust IT - Group 3			357	356	249	239
Food_Bev_Tobacco	Japan	Specific - adjust IT - Group 4				356	249	240
Food_bev_tobacco	Japan	Specific - Multi. weights Group 1	360	399	338	349	194	186
Food_bev_tobacco	Japan	Specific - Multi. weights Group 2		398	338	349	194	186
Food_bev_tobacco	Japan	Specific - Multi. weights Group 3			336	350	194	186
Food_bev_tobacco	Japan	Specific - Multi. weights Group 4				349.3	194.0	186.0
Total	Netherlands	GDP PPP	2.72	2.99	2.76	2.48	2.17	2.13
Manufacturing	Netherlands	Hoop1	3.41	3.05	2.68	2.77	2.37	2.43
Manufacturing	Netherlands	Hoop1 - adjust IT Group 1	3.40	2.97	2.60	2.93	2.44	2.49
Manufacturing	Netherlands	Hoop1 - adjust IT Group 2		2.97	2.60	2.93	2.44	2.49
Manufacturing	Netherlands	Hoop1 - adjust IT Group 3			2.60	2.93	2.44	2.49
Manufacturing	Netherlands	Hoop1 - adjust IT Group 4				2.93	2.44	2.48
Manufacturing	Netherlands	Hoop1 - adjust TAX			2.67	2.78	2.35	2.30
Manufacturing	Netherlands	Hoop1 - Multi. weights Group 1	3.31	3.08	2.58	2.78	2.40	2.43
Manufacturing	Netherlands	Hoop1 - Multi. weights Group 2		3.08	2.58	2.77	2.39	2.43
Manufacturing	Netherlands	Hoop1 - Multi. weights Group 3			2.60	2.78	2.40	2.43
Manufacturing	Netherlands	Hoop1 - Multi. weights Group 4				2.78	2.40	2.43
Manufacturing	Netherlands	Hoop2	3.28	3.11	2.60	2.81	2.37	2.43
Manufacturing	Netherlands	Hoop2 - adjust IT Group 1	3.28	3.01	2.53	2.97	2.44	2.49
Manufacturing	Netherlands	Hoop2 - adjust IT Group 2		3.01	2.53	2.97	2.44	2.49
Manufacturing	Netherlands	Hoop2 - adjust IT Group 3			2.53	2.97	2.44	2.49
Manufacturing	Netherlands	Hoop2 - adjust IT Group 4				2.97	2.44	2.48
Manufacturing	Netherlands	Hoop2 - adjust TAX			2.59	2.82	2.35	2.30
Manufacturing	Netherlands	Hoop2 - Multi. weights Group 1	3.45	3.06	2.69	2.71	2.40	2.43
Manufacturing	Netherlands	Hoop2 - Multi. weights Group 2		3.06	2.69	2.71	2.39	2.43
Manufacturing	Netherlands	Hoop2 - Multi. weights Group 3			2.70	2.72	2.40	2.43
Manufacturing	Netherlands	Hoop2 - Multi. weights Group 4				2.72	2.40	2.43
Machinery_and_Equipment	Netherlands	Harrigan	4.14	3.37	2.57	2.69	2.70	2.52
Machinery_and_equipment	Netherlands	Harrigan - adjust IT - Group 1	4.43	3.49	2.68	2.45	3.02	2.62
Machinery_and_equipment	Netherlands	Harrigan - adjust IT - Group 2		3.49	2.68	2.45	3.02	2.62
Machinery_and_equipment	Netherlands	Harrigan - adjust IT - Group 3			2.68	2.44	3.02	2.62
Machinery_and_equipment	Netherlands	Harrigan - adjust IT - Group 4				2.44	3.01	2.62
Machinery_and_equipment	Netherlands	Harrigan - adjust TAX			2.62	2.74	2.77	2.58
Machinery_and_Equipment	Netherlands	Harrigan - Multi. weights Group 1	4.18	3.38	2.63	2.63	2.71	2.52
Machinery_and_Equipment	Netherlands	Harrigan - Multi. weights Group 2		3.37	2.63	2.63	2.71	2.52
Machinery_and_Equipment	Netherlands	Harrigan - Multi. weights Group 3			2.64	2.64	2.71	2.52

Machinery_and_Equipment	Netherlands	Harrigan - Multi. weights Group 4				2.65	2.71	2.52
Food_Bev_Tobacco	Netherlands	Specific	2.87	2.71	2.81	2.68	1.79	1.69
Food_Bev_Tobacco	Netherlands	Specific - adjust TAX			2.55	2.53	1.71	1.56
Food_Bev_Tobacco	Netherlands	Specific - adjust IT - Group 1	3.48	2.73	2.47	3.62	2.22	2.38
Food_Bev_Tobacco	Netherlands	Specific - adjust IT - Group 2		2.74	2.48	3.62	2.23	2.39
Food_Bev_Tobacco	Netherlands	Specific - adjust IT - Group 3			2.46	3.65	2.25	2.38
Food_Bev_Tobacco	Netherlands	Specific - adjust IT - Group 4				3.61	2.25	2.36
Food_bev_tobacco	Netherlands	Specific - Multi. weights Group 1	3.11	2.69	2.58	2.63	1.79	1.69
Food_bev_tobacco	Netherlands	Specific - Multi. weights Group 2		2.69	2.56	2.62	1.79	1.69
Food_bev_tobacco	Netherlands	Specific - Multi. weights Group 3			2.57	2.62	1.79	1.69
Food_bev_tobacco	Netherlands	Specific - Multi. weights Group 4				2.62	1.79	1.69
Total	Norway	GDP PPP	7.66	8.06	8.38	9.59	9.73	8.93
Manufacturing	Norway	Hoop1			7.89	10.45	12.16	10.83
Manufacturing	Norway	Hoop1 - adjust IT Group 3			8.97	11.63	14.07	11.04
Manufacturing	Norway	Hoop1 - adjust IT Group 4				11.6	14.1	11.0
Manufacturing	Norway	Hoop1 - adjust TAX			8.7	11.1	12.0	
Manufacturing	Norway	Hoop1 - Multi. weights Group 3			8.0	10.9	12.3	11.1
Manufacturing	Norway	Hoop1 - Multi. weights Group 4				10.9	12.3	11.1
Manufacturing	Norway	Hoop2			7.6	10.9	12.2	10.8
Manufacturing	Norway	Hoop2 - adjust IT Group 3			8.6	12.3	14.1	11.0
Manufacturing	Norway	Hoop2 - adjust IT Group 4				12.3	14.1	11.0
Manufacturing	Norway	Hoop2 - adjust TAX			8.39	11.51	12.05	
Manufacturing	Norway	Hoop2 - Multi. weights Group 3			8.4	10.4	12.3	11.1
Manufacturing	Norway	Hoop2 - Multi. weights Group 4				10.4	12.3	11.1
Machinery_and_Equipment	Norway	Harrigan			8.02	9.44	9.92	9.39
Machinery_and_equipment	Norway	Harrigan - adjust IT - Group 3			10.6	11.1	14.0	10.4
Machinery_and_equipment	Norway	Harrigan - adjust IT - Group 4				11.15	13.99	10.43
Machinery_and_equipment	Norway	Harrigan - adjust TAX			8.5	10.2	11.1	
Machinery_and_Equipment	Norway	Harrigan - Multi. weights Group 3			8.6	9.0	10.7	10.9
Machinery_and_Equipment	Norway	Harrigan - Multi. weights Group 4				9.1	10.7	10.9
Food_Bev_Tobacco	Norway	Specific			7.3	12.6	10.9	9.7
Food_Bev_Tobacco	Norway	Specific - adjust TAX			12.0	19.8	17.6	
Food_Bev_Tobacco	Norway	Specific - adjust IT - Group 3			6.9	11.3	12.1	11.0
Food_Bev_Tobacco	Norway	Specific - adjust IT - Group 4				11.3	12.1	11.0
Food_bev_tobacco	Norway	Specific - Multi. weights Group 3			8.6	12.8	10.9	9.7
Food_bev_tobacco	Norway	Specific - Multi. weights Group 4				12.8	10.9	9.7
Total	Sweden	GDP PPP	5.64	6.15	6.91	7.95	9.34	9.83
Manufacturing	Sweden	Hoop1				9.18	9.57	10.73
Manufacturing	Sweden	Hoop1 - adjust IT Group 4				9.0	9.6	10.8
Manufacturing	Sweden	Hoop1 - adjust TAX				9.44	9.90	11.29
Manufacturing	Sweden	Hoop1 - Multi. weights Group 4				9.7	9.7	10.7
Manufacturing	Sweden	Hoop2				9.44	9.57	10.73
Manufacturing	Sweden	Hoop2 - adjust IT Group 4				9.2	9.6	10.8
Manufacturing	Sweden	Hoop2 - adjust TAX				9.71	9.90	11.29
Manufacturing	Sweden	Hoop2 - Multi. weights Group 4				9.3	9.7	10.7
Machinery_and_Equipment	Sweden	Harrigan				8.28	8.89	9.70
Machinery_and_equipment	Sweden	Harrigan - adjust IT - Group 4				8.20	8.74	9.97
Machinery_and_equipment	Sweden	Harrigan - adjust TAX				8.21	8.85	9.88
Machinery_and_Equipment	Sweden	Harrigan - Multi. weights Group 4				8.92	8.82	9.84
Food_Bev_Tobacco	Sweden	Specific				11.6	10.1	9.6
Food_Bev_Tobacco	Sweden	Specific - adjust TAX				11.0	10.6	10.0
Food_Bev_Tobacco	Sweden	Specific - adjust IT - Group 4				12.6	13.6	12.1
Food_bev_tobacco	Sweden	Specific - Multi. weights Group 4				11.5	10.1	9.6

Total	United Kingdom	GDP PPP	0.28	0.37	0.51	0.55	0.60	0.64
Manufacturing	United Kingdom	Hoop1	0.36	0.48	0.54	0.64	0.71	0.75
Manufacturing	United Kingdom	Hoop1 - adjust IT Group 1	0.36	0.47	0.54	0.62	0.74	0.76
Manufacturing	United Kingdom	Hoop1 - adjust IT Group 2		0.47	0.54	0.62	0.73	0.76
Manufacturing	United Kingdom	Hoop1 - adjust IT Group 3			0.54	0.62	0.73	0.76
Manufacturing	United Kingdom	Hoop1 - adjust IT Group 4				0.62	0.73	0.76
Manufacturing	United Kingdom	Hoop1 - Multi. weights Group 1	0.36	0.46	0.55	0.66	0.71	0.75
Manufacturing	United Kingdom	Hoop1 - Multi. weights Group 2		0.46	0.55	0.66	0.71	0.75
Manufacturing	United Kingdom	Hoop1 - Multi. weights Group 3			0.55	0.66	0.71	0.75
Manufacturing	United Kingdom	Hoop1 - Multi. weights Group 4				0.66	0.71	0.75
Manufacturing	United Kingdom	Hoop2	0.35	0.47	0.55	0.67	0.71	0.75
Manufacturing	United Kingdom	Hoop2 - adjust IT Group 1	0.36	0.47	0.55	0.66	0.74	0.76
Manufacturing	United Kingdom	Hoop2 - adjust IT Group 2		0.47	0.55	0.66	0.73	0.76
Manufacturing	United Kingdom	Hoop2 - adjust IT Group 3			0.55	0.66	0.73	0.76
Manufacturing	United Kingdom	Hoop2 - adjust IT Group 4				0.66	0.73	0.76
Manufacturing	United Kingdom	Hoop2 - Multi. weights Group 1	0.36	0.47	0.55	0.64	0.71	0.75
Manufacturing	United Kingdom	Hoop2 - Multi. weights Group 2		0.47	0.55	0.63	0.71	0.75
Manufacturing	United Kingdom	Hoop2 - Multi. weights Group 3			0.55	0.64	0.71	0.75
Manufacturing	United Kingdom	Hoop2 - Multi. weights Group 4				0.64	0.71	0.75
Machinery_and_Equipment	United Kingdom	Harrigan	0.38	0.54	0.55	0.64	0.86	0.76
Machinery_and_equipment	United Kingdom	Harrigan - adjust IT - Group 1	0.39	0.52	0.52	0.63	0.89	0.77
Machinery_and_equipment	United Kingdom	Harrigan - adjust IT - Group 2		0.52	0.52	0.63	0.89	0.77
Machinery_and_equipment	United Kingdom	Harrigan - adjust IT - Group 3			0.52	0.63	0.89	0.77
Machinery_and_equipment	United Kingdom	Harrigan - adjust IT - Group 4				0.63	0.89	0.77
Machinery_and_Equipment	United Kingdom	Harrigan - Multi. weights Group 1	0.37	0.55	0.55	0.64	0.87	0.76
Machinery_and_Equipment	United Kingdom	Harrigan - Multi. weights Group 2		0.55	0.55	0.65	0.87	0.76
Machinery_and_Equipment	United Kingdom	Harrigan - Multi. weights Group 3			0.55	0.65	0.87	0.76
Machinery_and_Equipment	United Kingdom	Harrigan - Multi. weights Group 4				0.65	0.87	0.76
Food_Bev_Tobacco	United Kingdom	Specific	0.31	0.44	0.61	0.64	0.54	0.56
Food_Bev_Tobacco	United Kingdom	Specific - adjust IT - Group 1	0.33	0.41	0.61	0.60	0.65	0.64
Food_Bev_Tobacco	United Kingdom	Specific - adjust IT - Group 2		0.41	0.61	0.60	0.65	0.64
Food_Bev_Tobacco	United Kingdom	Specific - adjust IT - Group 3			0.61	0.60	0.65	0.64
Food_Bev_Tobacco	United Kingdom	Specific - adjust IT - Group 4				0.60	0.65	0.64
Food_bev_tobacco	United Kingdom	Specific - Multi. weights Group 1	0.34	0.45	0.59	0.64	0.54	0.56
Food_bev_tobacco	United Kingdom	Specific - Multi. weights Group 2		0.45	0.59	0.63	0.54	0.56
Food_bev_tobacco	United Kingdom	Specific - Multi. weights Group 3			0.59	0.63	0.54	0.56
Food_bev_tobacco	United Kingdom	Specific - Multi. weights Group 4				0.63	0.54	0.56
Total	United States	GDP PPP	1.00	1.00	1.00	1.00	1.00	1.00
Manufacturing	United States	Hoop1	1.00	1.00	1.00	1.00	1.00	1.00
Manufacturing	United States	Hoop1 - adjust IT Group 1	1.00	1.00	1.00	1.00	1.00	1.00
Manufacturing	United States	Hoop1 - adjust IT Group 2		1.00	1.00	1.00	1.00	1.00
Manufacturing	United States	Hoop1 - adjust IT Group 4			1.00	1.00	1.00	1.00
Manufacturing	United States	Hoop1 - adjust IT Group 4				1.00	1.00	1.00
Manufacturing	United States	Hoop1 - adjust TAX	1.00	1.00	1.00	1.00	1.00	1.00
Manufacturing	United States	Hoop1 - Multi. weights Group 1	1.00	1.00	1.00	1.00	1.00	1.00
Manufacturing	United States	Hoop1 - Multi. weights Group 2		1.00	1.00	1.00	1.00	1.00
Manufacturing	United States	Hoop1 - Multi. weights Group 3			1.00	1.00	1.00	1.00
Manufacturing	United States	Hoop1 - Multi. weights Group 4				1.00	1.00	1.00
Manufacturing	United States	Hoop2	1.00	1.00	1.00	1.00	1.00	1.00
Manufacturing	United States	Hoop2 - adjust IT Group 1	1.00	1.00	1.00	1.00	1.00	1.00
Manufacturing	United States	Hoop2 - adjust IT Group 2		1.00	1.00	1.00	1.00	1.00
Manufacturing	United States	Hoop2 - adjust IT Group 4			1.00	1.00	1.00	1.00
Manufacturing	United States	Hoop2 - adjust IT Group 4				1.00	1.00	1.00
Manufacturing	United States	Hoop2 - adjust TAX	1.00	1.00	1.00	1.00	1.00	1.00
Manufacturing	United States	Hoop2 - Multi. weights Group 1	1.00	1.00	1.00	1.00	1.00	1.00

Appendix Table 1

Manufacturing	United States	Hoop2 - Multi. weights Group 2		1.00	1.00	1.00	1.00	1.00
Manufacturing	United States	Hoop2 - Multi. weights Group 3			1.00	1.00	1.00	1.00
Manufacturing	United States	Hoop2 - Multi. weights Group 4				1.00	1.00	1.00
Machinery_and_Equipment	United States	Harrigan	1.00	1.00	1.00	1.00	1.00	1.00
Machinery_and_equipment	United States	Harrigan - adjust IT - Group 1	1.00	1.00	1.00	1.00	1.00	1.00
Machinery_and_equipment	United States	Harrigan - adjust IT - Group 2		1.00	1.00	1.00	1.00	1.00
Machinery_and_equipment	United States	Harrigan - adjust IT - Group 3			1.00	1.00	1.00	1.00
Machinery_and_equipment	United States	Harrigan - adjust IT - Group 4				1.00	1.00	1.00
Machinery_and_equipment	United States	Harrigan - adjust TAX	1.00	1.00	1.00	1.00	1.00	1.00
Machinery_and_Equipment	United States	Harrigan - Multi. weights Group 1	1.00	1.00	1.00	1.00	1.00	1.00
Machinery_and_Equipment	United States	Harrigan - Multi. weights Group 2		1.00	1.00	1.00	1.00	1.00
Machinery_and_Equipment	United States	Harrigan - Multi. weights Group 3			1.00	1.00	1.00	1.00
Machinery_and_Equipment	United States	Harrigan - Multi. weights Group 4				1.00	1.00	1.00
Food_Bev_Tobacco	United States	Specific	1.00	1.00	1.00	1.00	0.82	0.83
Food_Bev_Tobacco	United States	Specific - adjust TAX	1.00	1.00	1.00	1.00	0.82	0.83
Food_Bev_Tobacco	United States	Specific - adjust IT - Group 1	1.00	1.00	1.00	1.00	1.00	1.00
Food_Bev_Tobacco	United States	Specific - adjust IT - Group 2		1.00	1.00	1.00	1.00	1.00
Food_Bev_Tobacco	United States	Specific - adjust IT - Group 3			1.00	1.00	1.00	1.00
Food_Bev_Tobacco	United States	Specific - adjust IT - Group 4				1.00	1.00	1.00
Food_bev_tobacco	United States	Specific - Multi. weights Group 1	1.00	1.00	1.00	1.00	0.82	0.83
Food_bev_tobacco	United States	Specific - Multi. weights Group 2		1.00	1.00	1.00	0.82	0.83
Food_bev_tobacco	United States	Specific - Multi. weights Group 3			1.00	1.00	0.82	0.83
Food_bev_tobacco	United States	Specific - Multi. weights Group 4				1.00	0.82	0.83