A Cross-Country Estimation of the Elasticity of Substitution between Labor and Capital in Manufacturing Industries.

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Abstract

This paper presents a simple methodology to estimate the elasticity of substitution between labor and capital for firms operating in perfectly competitive markets with CRS production functions. It is applied in a cross-country sample to 28 3-digit ISIC manufacturing industries. The econometric procedure relies on measures of sectorial capital stock, that are estimated for a sample of more than 30 countries. Unlike older studies, the estimates are consistent with hicks-neutral cross-country technology differences. The results reveal that in most industries the elasticity of substitution is smaller than one, rejecting the null hypothesis of Cobb-Douglas production functions. The paper provides then an estimation of σ_{LK} at a level of aggregation extremely useful for research in the international trade literature.

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1 Introduction

This paper presents an estimation of the elasticity of substitution between labor and capital - σ -(as the only two production inputs) for 28 3-digit ISIC manufacturing industries. A cross-country estimation for 1990 is presented based on the predictions of the relationship between relative factor prices and relative factor intensities that follow from the optimizing process of perfectly-competitive firms which technologies can be represented with simple CES production functions. It is assumed that there exists many identical firms within each country-industry pair, so that each firm takes factor prices as given and chooses its capital-labor ratio according to traditional first-order conditions. An estimation of σ_{LK} is relevant for its implications for growth theory, income distribution, employment impact of trade flows, labor demand, etc. of different substitution possibilities between factors within different sectors.

The estimation for only two production factors is limited by the availability of data. This is of course a disputable approach, as we may think that factors of production in manufacturing industries could be classified in broader categories. The interpretation of such elasticity is subject to the feasibility of aggregating different types of labor into one category. (See Berndt and Christensen (1973a) for a discussion on the conditions for aggregating factors.) Although apriori one may think that aggregating skilled labor and capital is more viable than aggregating different employment categories, evidence presented for Chile by Corbo and Meller (1982) suggests that this is not necessarily the case. They argue that for most manufacturing industries there exists some evidence for building an aggregator of unskilled and skilled labor rather than skilled labor and capital. This is implicitly the approach developed here.

Section 2 of the paper presents the methodology used to estimate the elasticity of substitution, and a comparison with alternative methodologies. Section 3 discusses briefly the data. Section 4 reports the results and compares them with other results in the literature.

2 Methodology

Consider a CRS production function with constant elasticity of substitution between two factors of production labor L and capital K

$$X_{ic} = f(L_{ic}, K_{ic}) = (a_{ic}L_{ic}^{\rho_i} + b_{ic}K_{ic}^{\rho_i})^{1/\rho_i} \tag{1}$$

where X_{ic} refers to real value-added of good i in country c; L_{ic} and K_{ic} represent labor and capital inputs in sector i and $\rho_i \leq 1$. Note that we are allowing for a and b to differ across countries. As discussed bellow, this feature will make our estimation of a common σ_i across countries relevant even in the presence of cross-country hicks-neutral technology differences. The first order conditions of the maximization process of each firm that take factor prices as given are

$$w_c = (a_{ic}L_{ic}^{\rho_i} + b_{ic}K_{ic}^{\rho_i})^{1-\rho_i/\rho_i} a_{ic}L_{ic}^{\rho_i-1} \tag{2}$$

$$r_c = (a_{ic}L_{ic}^{\rho_i} + b_{ic}K_{ic}^{\rho_i})^{1-\rho_i/\rho_i} b_{ic}K_{ic}^{\rho_i-1} \tag{3}$$

Combining (2) and (3) we get for each industry i in country c the following relationship between factor prices - w/r and factor usage - K/L.[1]

$$\ln w_c/r_c = \ln a_{ic}/b_{ic} + (\rho_i - 1) \ln L_{ic}/K_{ic} \tag{4}$$

[1] Strictly speaking, equation (4) suggests a relationship between factor intensities and relative factor prices at the sectorial level. Without a theory for cross-industry differences in factor prices, (4) reveals that for a common vector of relative factor prices, different industries choose different production techniques. In the empirical section we account for possible differences in factor prices at the sectorial level.

The elasticity of substitution between labor and capital is given by $\sigma_i = 1/(1-\rho_i)$. Equation (4) reveals the traditional movement along a production isoquant of changes in relative factor prices. An increase in the relative cost of labor makes the firm use relatively more capital than before, at any scale of production. The size of the elasticity of substitution measures the ease of substitution along the isoquant, and have implications on the factor shares in value-added. Equation (4) provides the basis for the empirical estimation developed in section 4. I estimate for each 3-digit ISIC manufacturing industry the relationship in (4) for a cross-section sample of more than 30 countries.

The assumption of a common coefficient for $\ln L_{ic}/K_{ic}$ implies that the elasticity of substitution is the same across countries. However, a common σ is compatible with technology differences revealed through differences in a and b. An estimation based on a single intercept within each industry implies that a/b is similar across countries, meaning that (potential) technology differences are hicks neutral. This can be seen by dividing (2) and (3) to get

$$\frac{f_L}{f_K} = \frac{w}{r} = \frac{a}{b}\left(\frac{L}{K}\right)^{\rho-1} \tag{5}$$

Differences in a and b that keep the ratio constant imply no change in the optimal K/L for any given relative factor prices. This is exactly what hicks-neutral technology differences imply. As discussed in section 4, the lack of a panel data structure mandates the estimation with a common cross-country intercept for each industry. This is only consistent with hicks-neutral technological differences.

An alternative approach to estimate elasticities of substitution is developed by Behrman (1981) and others[2]. Starting from a CES production function like the one in equation (1) we can derive

[2] See Arrow, Chenery, Minhas and Solow (1961) and Hamermesh (1993).

the following expression for the first-order condition of maximizing firms (under constant returns to scale)[3]

$$\ln X_{ic}/L_{ic} = \alpha + \sigma \ln W_{ic} \tag{6}$$

with $\alpha = -\sigma \ln a$. This approach has been widely used, even for estimation of aggregate measures of elasticity of substitution between labor and capital (see Harmermesh (1993)). Econometric estimations of equation (6) provide direct measures of the elasticity of substitution. A complete estimation of equation (6) requires a panel structure of the data in order to allow for different intercepts that are consistent cross-country technology differences. Behrman avoids that problem by estimating a pooled regression for several countries and 27 3-digit ISIC manufacturing industries using average values for value-added, employment and wages between 1967 and 1973 and including industry and country dummies that allow him to differentiate the elasticity of substitution across different units of analysis. The great advantage of his method is that no data on capital stock and return on capital are required. Indeed, the United Nations database that he uses does not provide data to estimate capital stocks. This allows him to work with a sample of countries broader than the one used here (about 70 countries). The great disadvantage is that he lacks degrees of freedom to allow for cross-country differences in the elasticity of substitution and technology level. This problem is not relevant in an estimation based on equation (4)

[3] Taking logarithm from the first order condition with respect to labor (equation (2)) we get that $\ln w = \ln a + (1-\rho)\ln(X/L)$ that can be written as (6).

3 Data

The data is obtained from UNIDO Statistical Database for 180 countries between 1963 and 1996, containing series on employment, value-added, wages and salaries, output and gross fixed capital formation for 28 3-digit industry. The series of real capital stock can be estimated using the capital formation series, an estimation of depreciation rates and adequate investment deflators.

Table 1 reports the measures of capital stock for 1990 calculated for different countries for each 3-digit ISIC manufacturing category, in millions of 1990 US dollars. The series of capital stock was constructed using the yearly series of gross fixed capital formation from 1971 until 1990 in current US dollars. I considered a 5% depreciation rate and the investment deflator series for the United States to construct the capital stock series.[4] Due to data restrictions, I perform the empirical analysis in 1990 because it is year for which the set of countries with capital stock in maximized across industries. Tables 2, 3 and 4 report data on employment, nominal value-added and nominal payment of wages and salaries for the set of countries considered. These data allow us to calculate measures of L/K for each country/industry and estimations of wage-rental rate ratios. The wage rate considered is the average yearly wage of workers (Table 3/ Table 2) and the rental rate is computed as value-added minus labor payments divided by the capital stock (Table 4 - Table 3/Table 1).

4 Results

Table 5 reports the results of regressions of equation (4) for each industry. $(\rho_i - 1)$ represents the coefficient on $\ln L/K$, n represents the number of countries included in the regression and

[4]The results are not affected by different depreciation rates.

$\sigma_i (= 1/1 - \rho_i)$ is the implicit value for the elasticity of substitution between labor and capital. In all but five industries (Beverages, Tobacco, Petroleum Refineries, Iron & Steel, and non-electrical Machinery) the correlation coefficient between relative factor prices and factor intensity is greater than .7. Figure 1 plots for the 28 ISIC manufacturing industries the cross-country values of $\ln w/r$ and $\ln K/L$. These graphs show that the high correlations are not driven by outliers but reveal genuine economic relationships. Moreover, in most cases the assumption of a common intercept implicit in the regression appears to be reasonable. This suggests that if technology differences exists, a hicks-neutral approximation is a reasonable one. The null hypothesis of Cobb-Douglas technologies ($\rho - 1 = -1$) is rejected in most cases, as the p-value in the last column of table 5 suggests.

Table 6 presents a comparison of the estimates of σ reported in table 5 with those obtained by Behrman (1982). The first column in Table 6 replicates column 5 in Table 5. As already discussed, in most cases $\sigma > 1$ and the null hypothesis of Cobb-Douglas production functions is in general rejected. Column 2 presents the estimates of Behrman using pooled data for 70 countries. These coefficients come from an estimation of equation (6) that includes interactions of $\ln W_{ic}$ and sectorial dummies, to allow for cross-industry variations in σ. This procedure, however, does not include non-interactive dummies, and hence it implicitly assumes similar technologies across countries. The coefficients in column 2 imply that the null hypothesis of Cobb-Douglas technologies cannot be rejected at high levels of confidence. The correlation coefficient between the estimators in columns 1 and 2 is .55 (significant at 1%), but it is mainly driven by the coefficient of Tobacco industries. Without Tobacco, the correlation drops to .2 and becomes insignificant. Column 3 reports estimations of equation 6 using a similar procedure to Behrman but with the data used in this study. It can be easily checked that the results are very similar to those in column 2. Indeed, the correlation coefficient is .87 and the null hypothesis of Cobb-Douglas technologies cannot be rejected, too.

Evidence of Cobb-Douglas technologies is also presented in Corbo and Meller (1982) for 4-digit ISIC Chilean manufacturing industries. They use a translog approach to estimate directly the production function rather than the optimal factor usage from optimization processes. I do not have data of real value-added comparable across-countries, so I cannot estimate directly the production function. Moreover, Corbo and Meller argue that the direct estimation of a production function is a more reasonable approach in Chilean manufactures because there is(was) strong danger of specification error owing to the presence of non-competitive elements. In the study presented here, I believe that the assumption of competitive decisions of manufacturing firms in a cross-section of countries is a-priori a reasonable one.

Hamermesh (1993) summarizes several studies aimed to estimate the elasticity of substitution between labor and capital at high levels of aggregation - entire manufacturing sector or the whole economy. The most common approach is the one summarized in equation (6). The results are mixed, with σ ranging from 6.86 to 0.21 depending on the specification used. According to the author, direct estimation of σ is not a very promising route. His argument is that we know very little about the effect of changes in the return to work on variations in labor supply over the relatively short periods of time used. This criticism, that also affects the approach based on equation (4) seems valid for estimations of the elasticity of substitution based on aggregate production functions, as interactions of factor demands and factor supplies are required to identify the coefficients. However, for industry-specific estimates the criticism is weaker as we can argue that the effective factor supply for each sector is completely elastic at the factor price level.

References

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Table 1: Capital Stock for 1990

Millions of 1990 US dollars

UNIDO Code	Country	Food Products (311/312)	Beverage (313)	Tobacco (314)	Textile (321)	Apparel (322)	Leather (323)	Footwear (324)	Wood (331)	Furniture (332)	Paper Products (341)	Printing and Publishing (342)	Chemicals (351)	Other Chemicals (352)	Petroleum Refineries (353)	Misc. Products of Petroleum & Coal (354)	Rubber (355)	Plastic (356)	Pottery (361)	Glass (362)	Other Non-Metallic Mineral Products (369)	Iron & Steel (371)	Non-Ferrous Metals (372)	Fabricated Metal Products (381)	Machinery except Electrical (382)	Electrical Machinery (383)	Transport Equipment (384)	Professional & Scientific Equipment (385)	Other Manufacturing Industries (390)
40	Austria	2969.0	..	179.5	1607.5	390.8	82.1	212.8	1157.1	..	3498.5	1094.2	2076.1	1514.8	1116.1	97.7	397.1	795.3	98.6	764.1	2068.1	2790.5	645.7	2347.3	2516.6	3610.5	..	234.6	202.8
52	Barbados	52.3	..	..	..	6.6	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	18.5	..	..	..	..	3.6
56	Belgium	5490.0	1658.2	232.4	3445.0	546.0	..	26.9	438.6	..	1750.3	2512.6	..	..	..	..	413.6	..	2869.6	..	..	3843.2	983.8	..	..	..	..	..	961.7
100	Bulgaria	1249.3	367.6	157.6	926.5	188.8	..	71.8	405.9	130.4	350.5	82.6	1123.9	741.6	..	790.3	370.1	319.1	90.8	160.5	837.1	1462.9	..	900.5	..	1258.4	964.6	..	1238.5
124	Canada	7642.1	2136.1	..	2321.8	375.1	69.4	111.9	4987.9	525.4	21866.0	2830.0	11325.1	2748.8	6505.8	125.1	1845.9	1433.2	140.1	751.2	2557.3	6427.3	8068.0	3773.6	3098.7	4111.7	13561.7	803.1	..
170	Colombia	1118.2	452.9	36.5	1013.2	145.0	45.4	66.9	93.7	32.2	325.3	271.2	525.7	314.4	543.1	16.7	92.1	297.2	68.3	100.0	761.8	729.8	31.9	265.1	100.5	190.1	257.7	50.5	72.0
196	Cyprus	134.4	78.8	7.5	41.8	67.1	7.2	..	24.9	31.4	33.6	36.3	34.9	33.1	7.0	..	6.5	34.9	4.8	..	..	..	..	56.2	31.7	8.9	8.3	..	12.3
200	Czechoslovakia	3215.3	682.4	48.4	1951.6	295.9	147.9	324.3	746.2	275.7	1568.7	346.3	2750.1	419.3	1285.2	375.3	446.8	..	91.3	763.7	1471.0	2808.3	419.9	1376.1	5506.9	1903.2	3164.9	171.5	367.8
208	Denmark	3516.9	661.4	118.4	513.8	156.4	15.2	..	447.1	438.6	572.2	877.6	1319.2	1046.2	278.1	..	..	511.7	43.1	..	1228.1	256.1	..	1213.3	1967.2	813.3	600.4	319.6	239.5
218	Ecuador	1138.2	254.3	48.8	488.8	33.6	26.8	16.9	91.1	60.0	174.6	99.5	79.1	254.4	368.3	..	72.0	257.0	36.8	63.2	307.4	118.3	..	238.0	..	164.6	91.9	15.9	14.1
242	Fiji	164.6	..	..	..	..	..	..	30.9	..	6.3	..	..	10.3	..	..	1.6	..	..	..	..	..	..	7.9	..	..	2.0	..	..
246	Finland	3182.3	575.1	..	569.1	274.0	47.7	76.0	2013.1	436.9	9880.6	1993.3	2374.2	876.6	805.6	56.3	127.0	384.1	45.6	201.0	1288.2	1806.2	495.6	1362.0	2260.1	1399.4	1600.3	192.3	120.3
250	France	41047.4	..	..	10927.0	..	1763.6	..	11578.2	..	9499.2	10440.4	16326.0	10319.0	19147.1	..	10572.0	..	..	3475.6	13182.9	8292.1	15383.7	20912.5	17453.1	29001.9	35826.8	..	..
280	Germany, West	..	..	1636.5	..	..	..	625.7	..	3737.1	13190.7	8271.2	..	..	..	..	4529.5	11999.5	986.8	..	..	..	..	..	..	..	..	4759.2	..
348	Hungary	3156.4	553.1	46.9	914.8	191.0	106.1	124.4	173.2	189.4	395.1	340.9	1925.0	940.2	844.9	..	213.8	256.2	191.8	299.7	987.8	1568.3	591.6	437.3	981.4	1378.8	1315.8	400.9	336.3
372	Ireland	2133.8	633.8	53.6	439.8	93.5	..	13.6	123.7	53.7	143.0	334.3	1446.5	..	..	..	..	..	27.4	..	648.1	120.6	..	..	742.9	724.4	169.2	329.0	..
380	Italy	12359.5	3331.6	582.9	12783.4	2555.7	956.6	1265.1	2111.5	2453.3	5652.0	4300.7	17288.8	..	5137.1	..	2684.8	4870.8	9769.1	..	..	15969.5	2933.4	8191.7	14847.4	12968.3	19163.1	1653.3	883.9
392	Japan	37942.7	9542.1	..	14976.0	2827.5	307.5	347.1	4461.2	2759.1	26948.3	20685.5	43240.0	23104.5	12094.3	2299.6	8807.6	21110.4	2056.4	7603.2	15969.1	58029.9	14771.3	27545.1	65594.2	107532.0	91855.6	10260.9	5240.1
410	Korea, Rep	6751.2	2006.8	432.4	11708.2	1665.1	732.5	336.5	926.7	568.9	3250.5	1533.2	9501.2	3496.0	4262.0	599.3	2911.4	3131.4	274.2	1425.5	5182.1	17444.2	1884.0	4615.8	6394.1	17267.3	14478.5	921.6	1248.5
414	Kuwait	242.8	78.2	..	..	6.0	..	..	13.7	9.4	..	93.7	303.1	..	..	..	..	..	..	..	270.4	50.7	..	54.9	19.5	..	26.1	..	..
442	Luxembourg	125.5	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1018.5	..	185.7	..	..	..	..	..
484	Mexico	1226.7	1012.3	103.3	793.2	..	..	..	62.1	..	973.6	..	1852.1	888.1	..	151.5	301.0	..	..	628.6	1592.3	1958.4	418.1	363.5	274.7	545.0	..	..	..
496	Mongolia	2572.3	..	..	1742.5	..	1002.2	..	1264.1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	493.4	..	..	..	..	202.4
528	Netherlands	9202.4	1755.5	524.8	1173.4	..	..	66.6	621.9	415.4	2568.9	3665.5	10635.0	..	4531.5	..	410.1	1795.4	424.3	1073.2	..	..	..	3041.4	2959.4	6568.2	2752.3	299.1	168.8
554	New Zealand	2982.5	..	..	325.1	..	..	..	496.5	..	1113.0	..	1309.4	..	..	..	..	..	246.1	..	..	1065.4	..	637.2	..	..	..	..	64.5
578	Norway	3195.0	486.6	..	224.3	54.7	..	11.0	1057.8	270.8	1716.0	1107.1	1705.5	519.8	2067.3	..	81.8	371.6	22.0	110.1	873.4	1042.1	1673.4	803.7	1258.3	843.7	1020.2	54.6	86.0
616	Poland	7906.9	710.1	..	3179.3	614.1	183.0	360.6	1128.8	..	1422.7	482.2	4574.5	1323.2	..	1193.2	..	..	301.2	437.8	2456.1	5845.1	1210.9	2879.7	7366.0	3209.9	5050.3	371.1	324.2
620	Portugal	1566.2	563.5	84.0	2165.6	458.7	86.1	238.2	572.9	151.6	1619.5	396.7	1278.9	393.5	..	..	133.6	300.9	382.0	323.2	969.4	706.0	113.6	673.7	298.4	662.1	686.1	36.1	47.5
642	Romania	..	..	..	1893.2	409.5	..	..	1716.9	..	809.7	65.2	..	..	..	..	..	..	..	..	..	..	..	15996.3	..	..	..	..	1186.4
702	Singapore	417.2	277.4	50.9	130.9	212.8	7.8	16.3	103.2	103.1	238.7	544.5	577.1	256.5	..	..	70.6	433.2	..	..	217.8	137.8	43.2	910.3	1456.8	4308.2	830.0	276.6	180.2
716	Zimbabwe	410.2	218.0	111.4	354.5	54.6	..	44.6	30.3	26.8	76.7	96.1	153.0	93.8	..	..	38.9	93.6	103.6	..	..	364.0	..	202.2	..	114.0	80.3	74.4	..
818	Egypt	2121.1	369.1	..	3818.6	21.2	171.9	123.6	94.2	38.8	586.8	246.0	3156.0	1226.6	2042.3	313.8	296.9	256.1	..	98.5	6135.2	2300.3	1947.7	651.7	585.2	445.3	763.4	..	25.0
826	United Kingdom	18397.1	6719.4	849.9	5235.5	1770.2	315.5	376.8	2260.9	1919.0	7046.4	9905.4	23963.7	10274.2	4974.0	591.4	1892.0	6118.7	745.3	2028.5	7721.4	9610.2	2603.9	8233.1	15297.8	14409.5	21530.9	2076.6	1345.8
840	United States	63769.1	15826.2	5552.9	25218.3	5655.2	781.6	694.6	15864.4	6412.1	72080.9	46349.0	82182.1	35198.6	39427.9	3340.7	9382.3	26027.3	939.5	9178.8	20390.9	38586.7	18955.6	39301.1	90229.9	87353.0	107890.0	29881.0	7317.2

Source: UNIDO Database, FRED and author´s calculations.

Table 2: Employment Level for 1990

Thousands of Workers

UNIDO Code	Country	Food Products (311/312)	Beverage (313)	Tobacco (314)	Textile (321)	Apparel (322)	Leather (323)	Footwear (324)	Wood (331)	Furniture (332)	Paper Products (341)	Printing and Publishing (342)	Chemicals (351)	Other Chemicals (352)	Petroleum Refineries (353)	Misc. Products of Petroleum & Coal (354)	Rubber (355)	Plastic (356)	Pottery (361)	Glass (362)	Other Non-Metallic Mineral Products (369)	Iron & Steel (371)	Non-Ferrous Metals (372)	Fabricated Metal Products (381)	Machinery except Electrical (382)	Electrical Machinery (383)	Transport Equipment (384)	Professional & Scientific Equipment (385)	Other Manufacturing Industries (390)
40	Austria	52.8	12.7	1.4	37.1	24.1	2.8	8.4	19.3	30.8	20.0	24.6	20.3	18.7	3.7	1.1	7.1	13.7	3.0	9.0	25.9	36.5	9.6	57.9	73.0	83.0	31.7	6.8	7.1
52	Barbados	1.6	0.6	..	0.1	1.1	..	..	0.3	..	0.6	..	0.4	0.2	..	..	..	..	..	0.3	..	..	..	0.6	0.7	..	0.1	..	0.1
56	Belgium	75.8	12.8	4.9	54.2	36.0	2.3	1.6	12.8	20.4	17.9	35.0	79.0	..	..	..	4.6	18.5	3.2	13.4	20.3	39.9	12.0	259.5	..	..	..	..	9.5
100	Bulgaria	105.7	21.6	15.3	112.0	64.1	12.0	19.7	24.3	22.4	14.9	8.9	32.7	31.6	..	14.1	18.8	12.8	5.8	16.8	36.8	25.9	12.3	82.2	201.2	145.2	83.1	..	179.8
124	Canada	197.8	24.0	5.0	72.0	94.0	5.0	11.0	102.9	66.0	114.0	142.0	33.0	68.0	15.0	3.0	25.0	62.0	1.0	12.0	40.8	53.0	44.0	135.0	148.0	123.0	203.9	17.3	49.0
170	Colombia	79.3	23.3	2.0	52.8	46.8	8.1	15.2	6.3	8.7	11.8	21.9	16.7	26.1	5.4	1.0	6.4	18.6	5.3	7.0	20.5	9.3	2.2	28.5	15.8	18.2	19.0	3.9	8.7
196	Cyprus	5.9	1.9	0.4	2.2	11.3	0.9	2.1	1.9	2.3	0.8	1.8	0.1	1.3	0.1	..	0.1	1.2	0.1	0.1	2.4	..	..	2.7	1.4	0.7	0.4	0.0	1.1
200	Czechoslovakia	168.0	34.0	4.0	200.0	93.0	25.0	67.0	56.0	59.0	45.0	28.0	89.0	27.0	23.0	22.0	27.0	8.0	10.0	73.0	75.0	168.0	24.0	164.0	500.0	189.0	204.0	20.0	46.0
208	Denmark	87.4	7.0	2.0	16.3	11.6	1.0	1.7	14.3	20.2	11.0	55.3	10.6	17.6	0.6	2.8	2.9	12.7	1.9	2.7	14.5	4.4	1.9	45.5	80.7	31.5	25.9	15.3	11.2
218	Ecuador	27.1	7.4	0.8	14.5	3.8	1.0	1.7	3.3	3.1	4.0	4.2	1.7	6.5	1.7	0.2	1.6	5.8	1.3	0.6	4.7	1.5	0.3	6.7	0.7	4.2	2.2	0.5	0.8
242	Fiji	6.5	0.6	..	7.1	..	0.3	..	1.5	1.0	0.2	0.8	..	0.5	..	..	0.1	0.3	..	..	0.3	..	..	0.8	0.2	..	0.3	..	0.3
246	Finland	46.6	5.5	1.1	10.9	14.7	1.4	3.2	30.4	10.9	44.4	37.8	13.7	10.3	3.1	0.7	2.6	7.6	1.3	3.2	15.6	12.8	4.3	31.9	52.4	28.5	27.7	5.8	3.6
250	France	462.5	43.8	5.1	209.9	144.7	19.9	52.5	93.2	83.5	107.4	233.6	118.3	184.3	23.4	..	94.0	121.2	..	56.2	89.1	188.4	48.3	354.4	439.8	474.0	535.6	67.9	100.2
280	Germany, West	376.3	86.5	15.5	228.8	143.2	20.9	30.5	103.9	141.7	163.3	180.4	308.0	286.4	23.0	..	98.4	286.2	36.9	70.4	138.9	259.5	105.0	660.3	1173.9	1032.6	952.0	144.2	53.6
348	Hungary	169.0	25.0	5.0	76.0	62.0	10.0	28.0	15.0	26.0	13.0	21.0	37.0	26.0	6.0	..	8.0	18.0	12.0	15.0	28.0	44.0	20.0	50.0	136.0	120.0	67.0	44.0	36.0
372	Ireland	36.7	4.7	1.3	11.8	10.9	0.6	0.7	4.5	3.1	3.4	11.0	4.0	9.6	0.4	..	2.4	7.0	0.7	3.9	6.5	1.5	0.2	12.6	15.9	22.1	7.5	7.9	2.9
380	Italy	162.7	25.2	15.8	224.1	152.9	27.1	74.3	37.1	69.1	61.9	82.7	86.6	50.8	13.1	5.7	46.8	91.9	52.2	30.1	64.2	142.1	35.3	169.1	379.5	266.2	320.5	34.3	36.1
392	Japan	1138.0	74.0	9.0	634.0	488.0	44.0	34.0	303.0	168.0	257.0	581.0	179.0	222.0	21.0	12.0	152.0	456.0	69.0	70.0	316.0	338.0	123.0	889.0	1406.0	1824.0	929.0	216.0	220.0
410	Korea, Rep	177.7	24.0	7.2	349.0	231.5	40.5	28.6	40.6	42.2	59.8	71.3	52.3	76.0	7.1	11.0	182.0	99.9	16.0	25.5	83.1	88.3	32.5	175.3	209.2	448.9	242.9	44.7	90.8
414	Kuwait	7.7	1.8	..	1.2	8.4	..	..	1.3	3.7	0.9	2.8	1.1	0.7	4.9	0.0	0.2	1.1	..	0.5	4.5	0.7	..	5.8	4.7	0.6	2.0	..	1.3
442	Luxembourg	2.5	0.9	..	0.9	..	..	..	0.4	..	1.7	..	4.9	0.5	..	..	..	..	3.5	..	..	10.2	0.9	4.5	2.8	1.7	0.5	..	..
484	Mexico	97.0	85.0	5.2	68.8	29.7	..	23.5	4.9	7.2	33.1	11.2	57.3	66.2	..	4.4	17.0	26.9	7.5	24.4	31.0	47.4	18.1	51.6	33.2	94.9	114.4	2.6	6.4
496	Mongolia	12.0	0.4	..	7.3	11.8	3.3	4.1	6.8	2.2	..	1.5	..	0.8	..	..	..	..	0.3	..	3.6	0.2	..	0.8	..	0.3	..	0.2	1.2
528	Netherlands	107.8	11.2	6.5	21.2	7.9	1.8	2.4	12.6	10.0	24.4	60.7	57.6	31.9	6.4	1.8	5.6	25.6	6.3	6.2	16.8	33.4	..	64.4	78.6	112.2	57.1	7.2	2.6
554	New Zealand	56.5	3.0	0.6	10.4	12.2	2.1	1.9	12.5	5.3	9.5	15.8	4.4	5.4	0.8	0.2	1.9	6.4	0.3	1.1	4.2	3.3	3.3	17.0	11.8	10.6	7.7	0.9	2.9
578	Norway	43.9	4.4	0.6	5.7	2.1	0.5	0.4	15.2	6.8	11.8	32.4	8.3	5.5	1.2	0.8	1.2	5.7	0.8	1.5	6.1	7.4	10.4	21.2	33.0	16.3	23.8	1.6	2.5
616	Poland	366.0	29.0	10.0	286.0	160.0	27.0	85.0	65.0	77.0	42.0	40.0	108.0	55.0	16.0	13.0	34.0	41.0	24.0	45.0	102.0	136.0	30.0	196.0	416.0	236.0	276.0	37.0	62.0
620	Portugal	99.8	18.0	1.8	158.3	145.3	9.8	59.4	54.9	38.1	18.5	33.6	12.4	23.8	..	..	6.6	16.8	25.6	10.6	37.8	15.1	5.2	79.7	40.5	41.1	39.5	4.2	15.0
642	Romania	259.3	..	6.2	414.3	258.0	126.7	..	94.0	203.6	43.3	26.3	182.8	..	25.9	6.6	86.3	..	175.9	..	..	173.2	..	189.1	602.5	171.1	346.1	50.2	10.1
702	Singapore	10.6	2.4	0.7	3.4	27.7	0.7	0.8	2.6	6.5	4.6	15.8	4.8	5.2	3.3	..	1.6	14.9	0.8	..	4.4	1.7	0.8	28.4	67.3	101.8	26.1	8.3	6.5
716	Zimbabwe	25.3	6.7	5.4	23.3	20.7	1.2	6.1	5.6	4.9	4.7	5.9	3.0	5.8	..	..	2.9	3.2	0.8	0.9	5.9	16.0	1.4	15.8	3.5	6.4	7.0	0.1	1.8
818	Egypt	204.2	18.3	17.5	269.4	24.9	3.2	9.6	8.5	5.8	23.3	14.3	50.8	50.3	17.2	1.2	2.8	18.3	8.4	14.1	51.6	51.3	20.6	49.7	39.6	31.0	62.6	6.6	1.5
826	United Kingdom	503.0	69.0	13.0	224.0	210.0	17.0	45.0	78.0	114.0	148.0	304.0	144.0	170.0	9.0	8.0	65.0	169.0	44.0	42.0	123.0	151.0	59.0	337.0	557.0	508.0	531.0	85.0	71.0
840	United States	1333.0	137.0	41.0	829.0	807.0	48.0	67.0	508.0	438.0	590.0	1538.0	402.0	485.0	72.0	40.0	205.0	670.0	38.0	141.0	364.0	413.0	247.0	1297.0	2066.0	1541.0	1914.0	902.0	369.0

Source: UNIDO Database, FRED and author´s calculations.

Table 3: Wages and Salaries for 1990

Millions of US Dollars

UNIDO Code	Country	Food Products (311/312)	Beverage (313)	Tobacco (314)	Textile (321)	Apparel (322)	Leather (323)	Footwear (324)	Wood (331)	Furniture (332)	Paper Products (341)	Printing and Publishing (342)	Chemicals (351)	Other Chemicals (352)	Petroleum Refineries (353)	Misc. Products of Petroleum & Coal (354)	Rubber (355)	Plastic (356)	Pottery (361)	Glass (362)	Other Non-Metallic Mineral Products (369)	Iron & Steel (371)	Non-Ferrous Metals (372)	Fabricated Metal Products (381)	Machinery except Electrical (382)	Electrical Machinery (383)	Transport Equipment (384)	Professional & Scientific Equipment (385)	Other Manufacturing Industries (390)
40	Austria	1207.8	366.0	48.1	748.7	346.2	48.9	132.1	387.9	576.0	616.6	760.8	643.0	548.2	177.0	37.1	220.8	291.8	70.1	231.8	765.8	1072.9	266.4	1428.4	2066.4	2317.7	812.0	135.7	160.5
52	Barbados	18.0	8.5	..	0.6	5.3	..	..	2.0	..	7.2	..	5.4	2.6	..	..	..	..	..	3.8	..	..	..	5.9	3.8	..	0.7	..	0.8
56	Belgium	1453.1	315.3	114.7	869.5	433.2	35.0	22.2	578.2	..	425.8	847.0	2445.6	..	124.7	28.3	118.1	421.4	..	303.9	502.6	1458.4	..	1461.2	1144.0	1556.5	1823.1	106.4	148.1
100	Bulgaria	190.0	43.7	27.9	191.7	97.5	21.4	32.0	43.2	38.9	24.9	17.2	71.0	59.7	..	42.0	35.8	23.8	11.6	33.5	72.2	65.0	29.5	153.3	385.0	253.9	169.7	..	..
124	Canada	4833.0	811.6	207.4	1541.9	1541.9	93.4	200.6	2789.8	1320.7	3975.9	4011.9	1327.6	2008.1	656.5	76.3	719.1	1399.6	30.0	331.7	1189.6	1937.8	1629.3	3448.0	3963.1	3448.0	6491.4	458.5	973.6
170	Colombia	181.1	70.4	5.4	112.9	63.8	14.4	23.7	11.4	12.2	38.3	47.5	68.5	82.0	30.3	2.2	21.5	39.3	11.7	18.7	50.6	26.5	5.9	59.8	29.0	46.4	51.8	9.3	18.3
196	Cyprus	50.0	23.8	6.4	16.0	70.0	6.7	16.5	16.5	19.4	7.5	20.3	1.0	11.9	3.8	..	1.3	11.6	0.7	0.7	30.6	..	..	24.5	12.9	6.4	4.4	0.0	8.7
200	Czechoslovakia	350.4	75.8	8.9	375.5	162.1	49.0	144.8	114.8	114.8	94.7	59.6	212.3	56.3	60.7	56.3	63.5	16.2	19.5	153.2	172.7	440.1	58.5	347.1	1144.3	388.9	456.8	44.6	90.3
208	Denmark	2284.8	254.2	62.4	404.1	222.7	20.2	42.0	365.3	502.4	353.6	1434.9	367.1	634.6	27.8	99.2	83.1	350.3	54.5	76.4	469.7	132.5	53.3	1322.4	2436.3	983.3	779.3	502.9	271.1
218	Ecuador	93.6	14.5	3.1	34.2	5.0	1.3	2.7	7.0	6.5	12.4	12.1	7.6	25.5	8.2	1.9	9.6	13.3	3.1	2.1	20.8	6.6	1.4	18.5	1.4	11.8	6.5	2.3	1.4
242	Fiji	27.2	3.3	..	12.1	..	0.6	..	6.6	2.1	1.2	3.3	..	2.4	..	..	0.4	0.9	..	..	2.5	..	..	2.5	0.7	..	0.9	..	0.6
246	Finland	1240.8	175.2	38.8	234.9	279.8	28.4	63.1	748.1	253.0	1553.1	1183.9	449.2	304.3	121.4	23.2	66.9	204.5	33.1	91.6	452.7	411.8	141.2	896.2	1627.3	811.6	854.1	181.6	89.2
250	France	14609.3	1962.2	244.1	4998.6	4109.8	746.9	1038.7	2379.1	2385.0	3800.3	8581.9	5293.4	7534.8	1387.3	..	2502.7	3997.6	..	1810.7	4069.2	4917.1	2352.9	13427.9	16711.8	17251.9	18867.5	2548.6	2705.6
280	Germany, West	9068.7	2732.2	543.2	5456.1	2675.7	423.2	667.9	2630.9	3902.5	4767.0	5819.9	12771.0	10263.2	1088.4	..	3010.8	7737.1	839.3	2037.5	4241.7	8156.2	3314.8	19147.4	39384.0	32631.7	33659.7	4168.2	1258.9
348	Hungary	440.2	60.8	14.0	155.0	106.9	24.0	50.7	34.9	54.2	38.7	66.3	115.8	84.5	26.8	..	27.3	49.4	30.3	37.7	73.5	130.0	65.7	121.9	346.2	284.2	162.8	120.5	64.3
372	Ireland	734.2	156.1	41.0	192.2	126.9	8.8	10.3	74.9	41.2	79.7	276.6	148.0	244.3	13.2	..	55.4	133.3	11.6	92.5	162.1	40.0	3.5	229.2	352.3	426.2	193.0	162.8	46.1
380	Italy	5902.7	1086.7	452.4	6487.8	3816.0	752.0	1625.1	1019.1	1937.2	2275.3	3937.1	3666.6	2236.0	704.4	220.3	1667.6	3000.6	1853.8	1091.7	2214.3	5358.5	1352.1	5489.5	14341.9	9908.2	11783.7	1193.6	1391.4
392	Japan	21382.7	1857.9	545.6	11817.1	6305.7	801.2	669.9	6146.8	3625.9	6982.5	18461.2	6968.7	7763.0	994.5	379.9	4254.4	10725.9	1498.7	2141.0	8294.8	13039.6	3950.5	23675.7	43759.9	46432.8	31328.1	5787.7	4993.4
410	Korea, Rep	1384.4	261.4	106.5	2730.9	1496.8	344.7	201.8	345.2	349.1	580.0	803.2	719.9	812.4	148.8	117.8	1338.3	845.1	115.7	309.4	834.9	1188.4	342.9	1655.5	2152.1	4101.8	3296.7	379.9	700.2
414	Kuwait	32.9	8.4	..	4.8	16.2	..	..	5.0	15.8	4.2	14.0	34.7	4.6	177.0	0.2	0.6	4.5	..	2.4	23.4	3.1	..	27.2	15.0	3.6	6.5	..	7.8
442	Luxembourg	46.8	25.6	..	26.2	..	..	..	7.5	..	49.5	..	164.6	9.8	..	..	..	..	85.7	..	..	358.3	26.5	117.2	97.2	36.9	9.8	..	..
484	Mexico	391.5	355.0	29.6	250.7	89.3	..	84.3	15.5	24.3	168.3	54.6	376.9	478.9	..	24.3	126.6	105.4	32.0	146.8	191.7	297.7	95.7	238.9	188.3	392.9	635.4	13.5	26.8
496	Mongolia	15.3	1.1	..	9.1	18.7	5.4	5.6	12.9	0.6	..	1.8	..	0.9	..	..	..	..	0.4	0.3	14.3	0.3	..	4.1	..	0.3	..	0.2	13.4
528	Netherlands	2901.2	425.6	208.7	521.7	146.1	41.2	48.3	296.6	224.6	702.9	1807.3	2187.3	1015.4	308.1	59.3	158.7	678.2	157.6	177.9	460.8	1073.6	..	1676.1	2205.5	3393.3	1629.9	182.9	60.4
554	New Zealand	1129.9	..	..	143.8	191.5	..	..	284.6	..	239.2	337.7	94.3	112.2	24.9	3.8	41.7	111.6	115.7	..	..	159.3	..	300.1	213.0	165.9	223.7	11.9	40.6
578	Norway	1118.4	138.2	24.4	133.2	41.9	10.7	8.1	386.1	163.3	351.9	899.2	303.4	171.7	53.4	29.6	33.7	153.8	19.2	42.7	192.5	239.3	375.3	585.2	1134.6	519.7	718.9	56.2	65.0
616	Poland	463.0	40.7	15.1	315.5	157.9	28.4	84.1	78.1	82.3	52.7	46.4	157.4	75.3	40.2	23.7	38.5	49.1	27.0	53.8	120.4	237.8	54.2	229.7	544.0	288.0	365.8	44.4	77.3
620	Portugal	463.0	40.7	15.1	315.5	157.9	28.4	84.1	78.1	82.3	52.7	46.4	157.4	75.3	40.2	23.7	38.5	49.1	27.0	53.8	120.4	237.8	54.2	229.7	544.0	288.0	365.8	44.4	77.3
642	Romania	423.1	..	12.2	656.4	386.8	192.7	..	136.7	319.5	76.4	46.1	347.4	..	52.8	15.4	151.0	..	308.8	..	..	348.6	..	328.9	1088.0	303.6	654.7	87.5	16.8
702	Singapore	114.1	35.1	14.0	30.4	178.4	5.7	5.0	24.1	54.8	54.4	209.0	107.7	85.8	112.5	..	17.8	137.8	10.1	..	48.4	26.9	11.6	310.9	708.8	1001.3	347.8	87.4	54.1
716	Zimbabwe	95.9	31.6	18.4	75.2	47.9	2.2	19.5	15.8	10.9	24.7	39.8	23.1	33.3	..	..	13.0	14.1	1.7	4.4	22.1	92.4	5.1	56.0	14.1	30.5	32.1	0.7	4.8
818	Egypt	314.9	37.6	45.6	457.7	28.7	6.3	15.0	13.0	9.6	36.0	37.7	146.9	133.4	84.8	3.1	5.1	29.1	14.5	27.7	107.5	147.1	56.5	95.5	86.5	79.2	125.0	21.0	3.3
826	United Kingdom	9194.3	1686.9	417.3	3599.2	2365.2	269.9	671.2	1480.9	2319.0	3478.5	8208.8	4304.2	4456.9	330.3	220.2	1413.4	3546.0	758.2	958.8	2926.3	3625.9	1422.3	7280.1	13599.6	11243.4	13739.9	1844.9	1227.0
840	United States	29230.0	4240.0	1520.0	15130.0	10820.0	860.0	990.0	10090.0	8160.0	18080.0	38810.0	15280.0	15700.0	3200.0	1280.0	5360.0	14920.0	830.0	3820.0	9350.0	13910.0	7390.0	31880.0	61930.0	43760.0	67150.0	29950.0	7350.0

Source: UNIDO Database, FRED and author´s calculations.

Table 4: Value Added for 1990

Millions of US Dollars

UNIDO Code	Country	Food Products (311/312)	Beverage (313)	Tobacco (314)	Textile (321)	Apparel (322)	Leather (323)	Footwear (324)	Wood (331)	Furniture (332)	Paper Products (341)	Printing and Publishing (342)	Chemicals (351)	Other Chemicals (352)	Petroleum Refineries (353)	Misc. Products of Petroleum & Coal (354)	Rubber (355)	Plastic (356)	Pottery (361)	Glass (362)	Other Non-Metallic Mineral Products (369)	Iron & Steel (371)	Non-Ferrous Metals (372)	Fabricated Metal Products (381)	Machinery except Electrical (382)	Electrical Machinery (383)	Transport Equipment (384)	Professional & Scientific Equipment (385)	Other Manufacturing Industries (390)
40	Austria	2302.3	840.6	1417.4	1291.1	547.1	82.1	213.1	879.1	993.9	1333.3	1162.9	1277.0	1069.6	488.8	64.6	311.0	544.6	111.6	517.6	1472.8	2088.4	434.4	2533.6	3292.2	3926.5	1651.9	221.6	248.9
52	Barbados	29.9	11.2	..	0.6	5.4	..	..	2.5	..	10.8	..	9.3	4.1	..	..	..	..	..	5.7	..	..	..	10.3	3.9	..	0.8	..	0.6
56	Belgium	6044.2	846.0	310.0	2131.5	917.8	55.6	..	321.3	1613.3	1042.2	1677.0	4482.9	1198.5	473.4	..	272.0	..	1782.4	..	..	2197.0	1140.2	13530.2	..	..	..	..	2458.7
100	Bulgaria	27.5	2.2	1.5	3.6	..	..	..	2.2	2.9	0.4	0.7	1.3	..	..	..	0.2	..	..	..	3.2	..	..	1.0	..	0.1	1.1	..	0.4
124	Canada	12701.7	2948.3	977.1	2974.0	2828.3	162.8	334.3	4465.3	2245.5	8750.7	7670.7	4808.1	6256.6	2271.2	291.4	1397.0	2896.9	68.6	642.8	2802.6	3231.1	3222.6	6453.7	7576.5	7465.1	14124.5	925.6	1705.6
170	Colombia	1306.1	927.8	173.2	816.3	221.0	65.7	99.6	54.3	37.8	300.6	213.0	521.6	597.3	151.3	33.8	131.4	223.0	59.7	113.5	338.5	280.7	55.7	278.7	123.6	270.8	332.5	69.9	84.1
196	Cyprus	100.8	73.0	40.9	32.1	117.6	10.8	29.7	39.1	35.8	16.8	37.0	3.2	27.4	6.8	..	3.0	25.1	1.7	1.5	69.1	..	..	54.8	23.8	11.8	8.8	0.1	19.3
200	Czechoslovakia	916.4	257.9	24.0	790.0	223.4	65.7	255.7	288.6	154.3	254.6	127.0	698.1	176.6	315.9	209.5	131.5	49.0	45.7	298.1	411.1	1270.8	236.2	601.7	2596.7	894.2	903.1	83.6	192.2
208	Denmark	4072.3	757.0	203.1	610.3	259.0	24.7	65.0	485.6	642.0	628.1	1591.8	1106.7	1537.2	117.6	207.0	122.0	635.4	70.8	113.9	941.1	281.0	72.6	1837.4	3050.4	1318.9	1127.9	622.3	489.1
218	Ecuador	228.1	33.4	1.4	94.5	10.4	3.6	5.5	15.9	9.4	34.5	26.8	17.5	75.3	374.0	3.9	17.1	42.0	7.0	8.1	59.7	18.6	2.5	43.9	2.8	32.4	21.8	2.9	3.5
242	Fiji	60.2	13.9	..	16.0	..	0.8	..	10.8	3.1	5.1	6.2	..	7.3	..	..	0.9	3.5	..	..	5.0	..	..	5.5	1.2	..	1.4	..	1.2
246	Finland	2575.9	665.9	176.5	386.0	428.4	47.6	92.6	1578.7	515.0	3603.5	2113.8	1371.5	706.9	674.5	121.1	133.1	425.3	73.5	162.7	1053.2	850.3	363.0	1759.6	3355.0	1832.6	1405.5	344.2	168.2
250	France	25554.1	5382.1	1919.1	7666.1	5806.8	1129.6	1419.8	4182.3	3972.8	6822.6	12499.8	10872.1	12426.7	15128.6	..	3340.9	6662.4	..	3089.6	7522.8	8433.5	4533.3	20095.5	24819.2	25769.6	28616.1	4109.0	4318.6
280	Germany, West	28589.1	11911.0	12633.2	11848.7	5886.7	944.4	1152.5	6178.9	7884.9	13489.8	10255.2	35536.8	27941.2	19657.5	..	6413.6	17312.5	1554.6	4790.8	12031.0	19204.2	7733.3	39180.5	82542.1	72566.2	67433.2	8010.8	2849.2
348	Hungary	739.6	165.7	42.4	299.4	220.1	37.1	84.4	88.1	119.9	128.5	189.7	404.3	436.6	460.4	..	79.2	144.8	54.8	82.2	199.4	337.5	201.0	275.3	756.6	666.8	396.1	292.6	101.2
372	Ireland	3059.6	789.5	165.1	347.7	206.3	21.0	18.5	169.9	85.8	189.9	559.2	755.4	1713.4	30.3	..	117.8	330.6	28.0	144.1	558.1	91.5	9.9	468.1	2229.4	1835.0	308.1	609.7	131.7
380	Italy	9598.5	2014.9	555.9	10327.2	4876.1	1234.5	2231.0	1615.9	2900.4	3877.8	6171.4	5906.0	3973.8	1717.7	406.5	2254.4	4799.3	2859.5	1673.5	4299.3	8117.0	1787.8	8013.5	20329.7	14990.4	14549.7	1761.1	1890.5
392	Japan	66675.9	10304.6	2002.9	27046.1	11920.7	1864.8	1478.0	14006.5	8729.9	22287.5	47938.4	38075.8	46764.3	4841.5	1540.2	11402.7	30796.3	2983.6	8467.4	26652.4	48539.3	11976.0	62904.9	126562.6	133883.6	95593.6	12797.8	13730.2
410	Korea, Rep	6046.7	1889.1	2794.0	6832.8	3400.7	1144.5	593.8	875.6	972.2	2122.6	2530.5	4181.5	4925.7	2865.1	517.0	3062.6	2734.0	274.5	991.3	3697.3	6187.3	1200.8	5144.5	7004.4	15065.8	10242.2	1143.9	1769.0
414	Kuwait	70.0	21.0	..	15.8	54.7	..	..	10.1	30.3	31.0	5.5	43.9	15.0	1672.0	0.4	1.9	16.3	..	12.4	73.2	10.7	..	55.1	18.8	27.8	2.3	..	16.8
442	Luxembourg	66.8	73.5	..	96.2	..	..	..	15.2	..	86.2	..	354.3	28.0	..	..	..	..	235.4	..	..	623.0	61.9	209.6	157.6	103.1	18.8	..	..
484	Mexico	2177.5	2209.6	679.8	765.7	217.0	..	142.4	53.4	68.0	705.7	170.0	2089.8	2025.1	..	172.3	464.1	441.1	145.5	626.9	985.8	1799.0	706.4	945.2	745.5	1540.5	3384.7	81.3	96.2
496	Mongolia	71.1	51.1	..	65.6	30.4	21.9	20.4	21.6	0.4	..	7.9	..	5.1	..	..	..	..	1.0	0.8	22.2	0.6	..	16.2	..	3.1	..	0.7	29.2
528	Netherlands	6036.4	1500.3	1847.9	1002.2	233.9	69.7	72.5	477.2	361.9	1618.4	3217.0	5591.6	1845.7	1095.0	131.3	284.5	1304.8	303.7	358.1	1016.0	2108.3	..	2903.4	3551.5	5286.3	2464.1	308.1	110.9
554	New Zealand	1675.2	215.4	44.7	232.1	202.2	54.3	40.6	322.8	125.9	552.4	536.9	248.8	211.2	137.2	8.9	62.0	228.5	256.5	..	..	112.8	139.0	479.7	339.5	259.5	322.2	23.9	85.9
578	Norway	1307.1	660.3	478.1	191.2	58.1	15.8	11.2	619.0	236.1	787.3	1380.7	811.4	392.8	194.7	63.3	57.5	278.1	27.0	77.3	360.6	346.7	826.1	783.9	1590.3	750.5	1027.7	81.8	89.3
616	Poland	2595.2	1838.4	379.3	1221.9	432.2	120.1	262.5	324.7	306.9	348.3	165.7	1055.9	649.4	1418.9	248.7	209.4	273.8	107.5	226.8	602.4	1886.7	950.6	1080.6	2604.3	1420.2	1855.2	172.7	258.3
620	Portugal	1305.2	343.8	592.0	1654.2	984.6	126.0	452.1	532.1	232.6	576.7	522.8	432.3	480.9	..	..	54.2	236.5	291.3	173.4	723.6	272.5	80.7	825.5	528.4	833.6	582.9	35.5	141.2
642	Romania	1649.4	641.9	410.1	1448.8	691.0	66.9	365.5	312.1	321.0	169.4	142.7	111.4	441.3	133.7	35.7	129.3	396.8	570.6	120.4	40.1	650.9	22.3	869.3	2434.0	1208.1	704.4	..	227.4
702	Singapore	321.9	138.9	64.0	71.6	294.0	10.9	9.1	54.5	89.3	189.2	514.5	583.8	600.3	917.1	..	34.7	326.7	33.5	..	148.6	96.9	40.6	730.4	2737.3	2707.6	890.3	200.5	114.4
716	Zimbabwe	237.1	301.9	75.9	255.0	102.1	7.2	66.5	43.3	31.6	64.3	93.5	114.9	126.9	..	..	36.6	47.0	2.6	9.1	54.4	184.2	12.7	135.4	43.2	87.7	80.7	2.5	12.7
818	Egypt	949.2	46.1	133.5	847.1	52.9	6.7	22.2	16.8	13.0	84.0	76.0	338.5	486.4	1155.9	35.9	7.6	72.5	62.1	41.8	330.5	313.7	175.6	144.5	142.1	160.5	237.4	37.3	8.2
826	United Kingdom	25001.0	6605.4	2361.6	6996.0	4652.2	532.7	1260.7	3196.2	4527.9	7990.4	19532.0	14098.6	14808.8	4403.6	745.8	3000.8	8203.5	1456.0	2077.5	8984.7	8043.7	2770.0	14933.1	29901.8	22231.0	28783.1	3640.1	2770.0
840	United States	119830.0	21140.0	22560.0	34960.0	25480.0	2210.0	2320.0	20830.0	16910.0	57200.0	103180.0	73480.0	81770.0	22820.0	4390.0	13430.0	37320.0	1840.0	10080.0	23980.0	31780.0	17510.0	70360.0	145060.0	112400.0	154030.0	76520.0	18720.0

Source: UNIDO Database, FRED and author´s calculations.

Table 5: Elasticity of Substitution between Labor and Capital

CES Production Function

Industry (3 digit ISIC)	r - 1	se	n	R^2	s	p-value (r=0)
Food Products (311/312)	-1.324	0.21	31	0.58	0.76	0.14
Beverage (313)	-1.161	0.26	24	0.47	0.86	0.54
Tobacco (314)	-0.471	0.41	18	0.08	2.12	0.21
Textile (321)	-1.076	0.18	28	0.58	0.93	0.67
Apparel (322)	-1.421	0.23	25	0.63	0.70	0.08
Leather (323)	-1.159	0.24	20	0.57	0.86	0.51
Footwear (324)	-1.733	0.17	21	0.84	0.58	0.00
Wood (331)	-1.414	0.16	29	0.74	0.71	0.02
Furniture (332)	-1.233	0.15	22	0.77	0.81	0.14
Paper Products (341)	-1.243	0.16	29	0.69	0.80	0.14
Printing and Publishing (342)	-1.472	0.21	26	0.67	0.68	0.04
Chemicals (351)	-1.255	0.18	26	0.67	0.80	0.17
Other Chemicals (352)	-1.346	0.21	22	0.68	0.74	0.11
Petroleum Refineries (353)	-0.928	0.27	18	0.43	1.08	0.79
Misc. Products of Petroleum & Coal (354)	-1.083	0.31	12	0.56	0.92	0.79
Rubber (355)	-1.522	0.17	24	0.78	0.66	0.01
Plastic (356)	-1.691	0.19	20	0.81	0.59	0.00
Pottery (361)	-1.207	0.15	22	0.76	0.83	0.19
Glass (362)	-1.044	0.17	18	0.69	0.96	0.81
Other Non-Metallic Mineral Products (369)	-1.582	0.19	21	0.78	0.63	0.01
Iron & Steel (371)	-1.066	0.32	25	0.32	0.94	0.84
Non-Ferrous Metals (372)	-1.514	0.26	18	0.68	0.66	0.06
Fabricated Metal Products (381)	-1.094	0.13	30	0.71	0.91	0.49
Machinery except Electrical (382)	-1.046	0.27	22	0.43	0.96	0.87
Electrical Machinery (383)	-1.452	0.20	24	0.71	0.69	0.03
Transport Equipment (384)	-1.131	0.23	23	0.54	0.88	0.57
Professional & Scientific Equipment (385)	-0.982	0.21	20	0.55	1.02	0.93
Other Manufacturing Industries (390)	-0.726	0.20	23	0.39	1.38	0.18

Table 6: Comparison of Alternative Approaches

Industry (3 digit ISIC)	Claro Eq. (4)	Behrman Eq. (6)	Claro Eq. (6)
Food Products (311/312)	0.76	0.91	0.93
Beverage (313)	0.86	0.97	0.98
Tobacco (314)	2.12	1	1.04
Textile (321)	0.93	0.88	0.91
Apparel (322)	0.70	0.87	0.90
Leather (323)	0.86	0.87	0.91
Footwear (324)	0.58	0.86	0.91
Wood (331)	0.71	0.88	0.90
Furniture (332)	0.81	0.86	0.89
Paper Products (341)	0.80	0.91	0.94
Printing and Publishing (342)	0.68	0.87	0.91
Chemicals (351)	0.80	0.94	0.95
Other Chemicals (352)	0.74	0.94	0.97
Petroleum Refineries (353)	1.08	0.99	1.04
Misc. Products of Petroleum & Coal (354)	0.92	0.89	0.98
Rubber (355)	0.66	0.91	0.90
Plastic (356)	0.59	0.9	0.94
Pottery (361)	0.83	0.87	0.93
Glass (362)	0.96	0.88	0.93
Other Non-Metallic Mineral Products (369)	0.63	0.91	0.94
Iron & Steel (371)	0.94	0.89	0.93
Non-Ferrous Metals (372)	0.66	0.89	0.95
Fabricated Metal Products (381)	0.91	0.89	0.91
Machinery except Electrical (382)	0.96	0.86	0.92
Electrical Machinery (383)	0.69	0.89	0.92
Transport Equipment (384)	0.88	0.87	0.90
Professional & Scientific Equipment (385)	1.02		0.93
Other Manufacturing Industries (390)	1.38		0.93

Figure 1: Cross-country Correlations of Relative Factor Prices and Factor Intensities

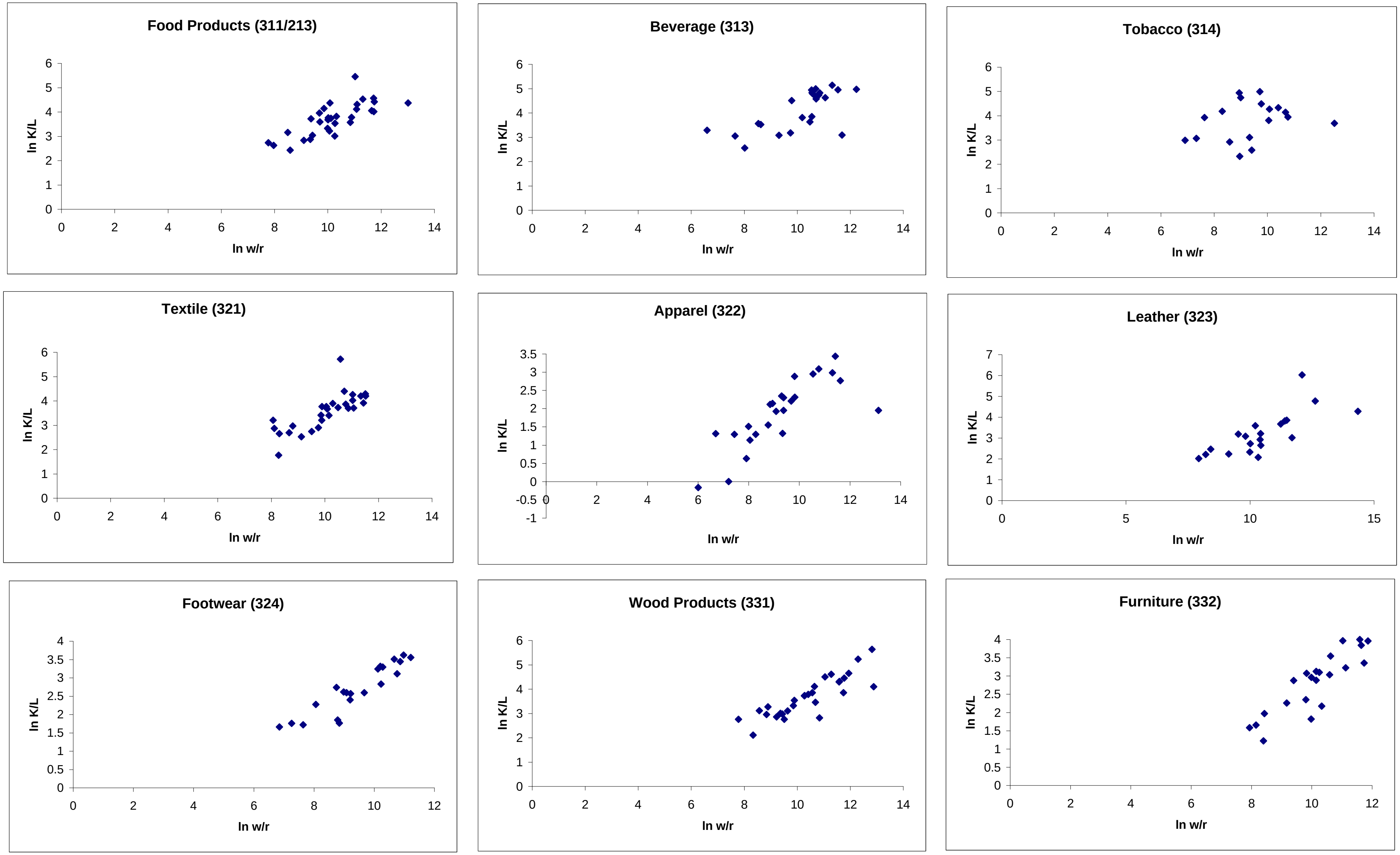

Figure 1: Cross-country Correlations of Relative Factor Prices and Factor Intensities

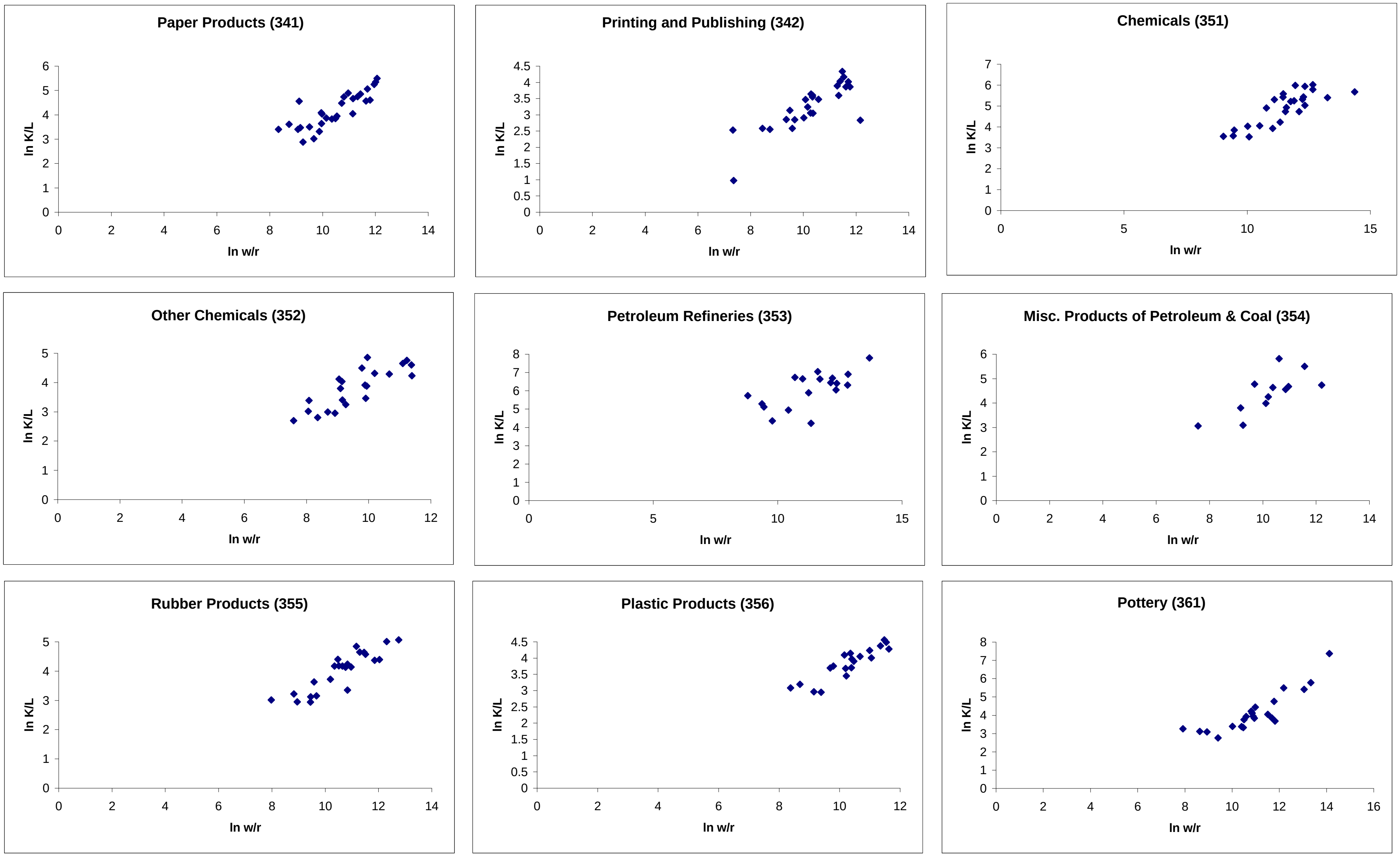

Figure 1: Cross-country Correlations of Relative Factor Prices and Factor Intensities