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Are capital shares higher in poor countries? Evidence from Industrial Surveys[1]

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Abstract: This paper presents new evidence on the cross-country correlation between factor shares and per capita income. The evidence comes from UNIDO and OECD databases of industrial surveys designed to measure economic activity in the corporate manufacturing sector. We show that a statistically significant negative correlation is present in both data sets. The correlation is robust to controlling for methodological variations in the valuation, concept and definition of value added and labor income. It is also present within 3 and 4-digit industries. We argue that previous evidence on capital shares derived from national accounts statistics is consistent with the negative relation that we find on the industrial survey data.

[1] We are grateful to Tetsuo Yamada and Shyam Upadhyaya of UNIDO and Eric Gonard of OECD for providing information and answering questions related to the databases used in this paper. We are also grateful to Douglas Gollin and Refet Gurkanyak for providing data and clarifying methodological issues related to their papers, as well as to María Eugenia Boza, Chang-Tai Hsieh, Charles Jones, Richard Grossman, Ricardo Hausmann, and seminar participants at Wesleyan University for their comments and suggestions. Mónica García provided substantial assistance in the early stages of this project. All errors are our responsibility.

1. Introduction

Do factor shares vary systematically with the level of development? Until recently, most studies suggested that this was the case.[2] National accounts statistics typically reveal that employee compensation accounts for a systematically smaller fraction of GDP in poor countries. This fact appeared to pose a problem for the ubiquitous use in modern macroeconomics of the aggregate Cobb-Douglas production function.

Such conventional wisdom was recently thrown into question by Gollin (2002). Gollin showed that traditional estimates of economy-wide capital shares were biased upwards by the inclusion of the income of self-employed individuals under the category of operating surplus in national accounts statistics. He presented a set of adjustments to conventional calculations designed to correct for the overestimation of capital income arising from this fact. His conclusion, reaffirmed by Bernanke and Gurkaynak (2002) on a broader sample of countries, was that the cross-national variation in the corrected estimates did not appear to be linked systematically to income levels.

This paper revisits the issue of cross-national differences in factor shares by studying data from enterprise and establishment surveys and censuses collected by the United Nations Industrial Development Organization (UNIDO) and the Organization for Economic Co-operation and Development (OECD). In particular, we will use UNIDO's Industrial Statistics Database (INDSTAT) and the OECD's Structural and Demographic Business Statistics Database (SDBS). The surveys covered in these data bases are designed to accurately measure production, value added, employment and wages in the corporate manufacturing sector. Therefore the effect of self-employment on calculations derived from

[2] See, for example, Elias (1990), Young (1995).

this data is minimal or non-existent. We show that both databases display a significantly negative cross-sectional relationship between capital shares and per capita income.

Figure 1 offers a first glimpse at our evidence. It plots the partial residual scatter plot of a regression of the average 1990-2003 UNIDO capital share against the log of per capita income.[3] The strong negatively significant relationship indicates that capital shares decline by 6.25 percentage points by each log-point increase in per capita GDP. The component of capital shares that is systematically related to income is 11.1 percentage points higher in a typical African country such as Kenya than in a typical Latin American country such as Colombia, and 21.1 percentage points higher than in the US.

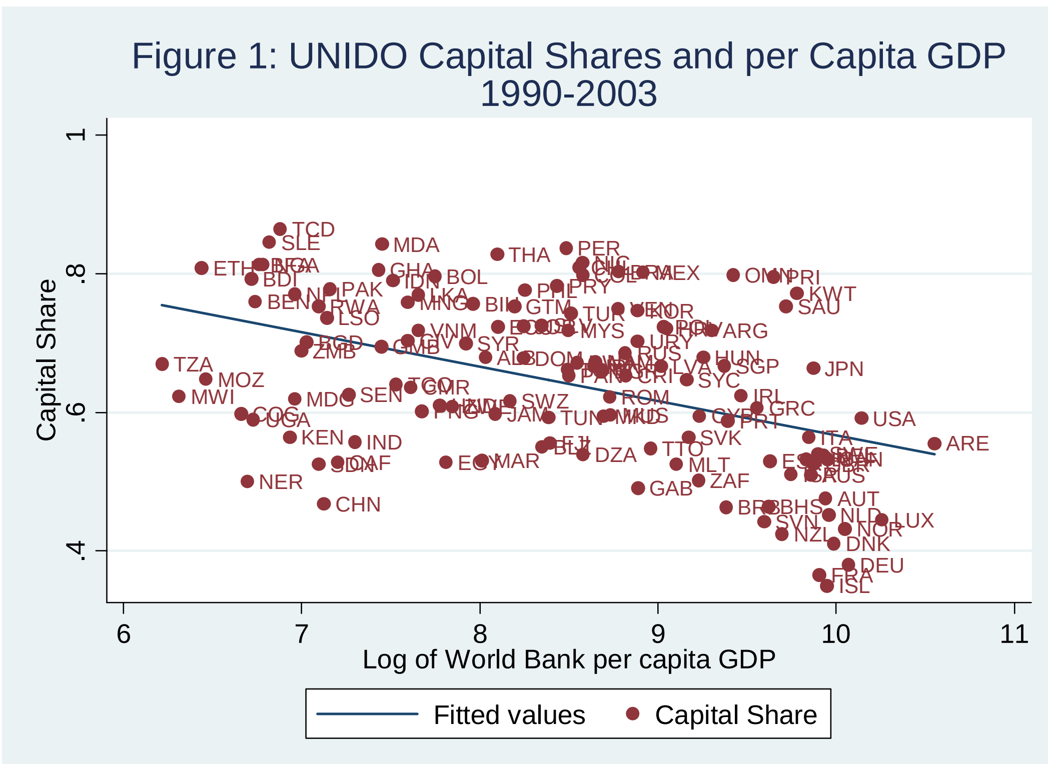

Figure 1: UNIDO Capital Shares and per Capita GDP 1990-2003

We will argue that this strong relationship between factor shares and GDP in the formal manufacturing sector is not inconsistent with the cross-national evidence from

[3] The capital share is defined as one minus the ratio of wages and salaries to value added. Section 3 and the appendix discuss in detail the calculation of our variables.

national accounts explored by Gollin (2002) and Bernanke and Gürkaynak (2002) nor with the approximate constancy of capital shares over long time-series in developed economies. As we will discuss below, recent theoretical developments suggest that the cross-sectional link between factor shares and the capital-labor ratio may be impacted by different forces than those that affect their relationship over time within countries. In section 4 we will argue that an accurate reinterpretation of the national accounts data shows that it is not inconsistent with a pattern such as is shown in Figure 1.

To our knowledge, the only author to previously analyze cross-national differences in capital shares using industrial survey data is Rodrik (1999), who studies the significant positive correlation between manufacturing wages and the extent of democracy using both UNIDO and Bureau of Labor Statistics data. Although the focus of Rodrik's research is the wage level and not factor shares, he presents some robustness tests using factor shares as the dependent variable and per capita income as one of the controls to eliminate spurious effects arising from wage and price inflation (Table IV, p. 722). The controls for per capita GDP all indicate a statistically significant negative relationship between capital shares and GDP, consistent with what we find in this paper. Imbs and Wacziarg (2003) study changes in the patterns of sectorial concentration of value added and employment and their relationship with per capita income using UNIDO and ILO data, but do not explore their relationship with factor shares.

We begin by discussing the recent theoretical and empirical literature on the form of the production function and its implication for factor shares in section 2. Section 3 discusses the characteristics of the UNIDO and OECD datasets. Section 4 presents our key empirical results and reexamines the evidence presented by Gollin (2002) and Bernanke and Gürkaynak. Section 5 concludes with suggestions for future research.

2. Review of existing literature.

Production technologies that generate constant factor shares are ubiquitous in macroeconomics. Perhaps the most important reason for this fact is the perception that constant factor shares are a stylized fact characterizing most modern economies.[4] This fact would appear to be inconsistent with an elasticity of substitution between capital and labor different from one.

Recent contributions, however, have shed doubt on the appropriateness of the unitary elasticity of substitution assumption. Of particular relevance is Antràs (2004), who argues that conventional estimates are biased upwards because they impose the restriction that technological change must be Hicks-neutral. Once that assumption is relaxed, he shows that estimates of the elasticity of substitution in the US data become significantly lower than 1, with some estimates even lower than ½. Caselli (2006) has also argued that traditional estimators can be biased upwards because of measurement error, and has shown that a less than unitary elasticity of substitution between labor and capital appears to explain adequately the cross-national variations in the ratios of output to physical and human capital.

Recent theoretical contributions have shown that production technologies with a less than unitary elasticity of substitution can be consistent with approximately constant capital shares in the medium and long-term. What is important here is to realize that the forces

[4] Kaldor (1963) is commonly credited with first making this observation. Actually , Kaldor did not state that the capital share was constant over time, but rather that it was constant "in societies and/or in periods in which the investment coefficient (the share of investment in output) is constant." (p. 178) Indeed, Kaldor though that the interesting stylized fact to account for was <u>not</u> the constancy of the capital share but rather its high correlation with the investment share.

shaping changes in factor returns over time may be different from the forces affecting technical change across units (be they firms or countries) at a given moment of time.

Two papers worthy of note are Acemoglu (2003) and Jones (2004). Acemoglu considers a model in which capital-intensive and labor-intensive goods are used, with a less than unitary elasticity of substitution, in an aggregate production technology. The process of technological change consists in inventing new intermediate goods. Intuitively, when capital-intensive goods are relatively scarce (the capital share is high) then the incentives to invent new goods that can take advantage of capital inputs is high. In the short run, the production technology will be CES with an elasticity of substitution less than one, but in the medium and long-run it will resemble a Cobb-Douglas, with constant factor shares.[5] Jones presents a related model in which there is a distinction between the local production function – the possibilities for production with a given technology – and the global production function, which takes into account the existing map of technologies. Innovation can make the global production function Cobb-Douglas even though the local production functions are CES.

Suitable interpretations of both of these models can account for a negative cross-country correlation between capital shares and income. Suppose that the Acemoglu model describes correctly the dynamics of technical change in advanced economies, but that poor countries do not carry out innovation but rather adopt whatever technologies are invented in rich nations (possibly with lower efficiency due to institutional weaknesses). At a given moment of time, there will be an existing technology (given in the Acemoglu model by the number of capital and labor-intensive intermediates) characterized by a less than unitary

[5] Acemoglu reviews several policy experiments, some of which can generate increases in medium and long-run factor shares. However, if there is some positive depreciation of technological capital, there is only one balanced growth path with a unique capital share.

elasticity of substitution on which countries will choose different combinations of factor inputs. Countries with lower capital-labor ratios will thus display higher capital shares in the cross section. Alternatively, in the Jones model, if innovations occur slowly, at any given moment of time the production possibilities will be much more restricted than the Cobb-Douglas form implies and can be consistent with a cross-sectional elasticity of substitution that is less than one.[6]

Indeed, recent analysis (usually concentrated on developed economies) has questioned whether the stylized fact of constant labor shares is correct. Krueger (1999) shows that raw labor's share of national income has varied significantly over the twentieth century in the US, while Jones (2003) and Bentolila and Saint-Paul (2003) show that there have been significant changes over time in the factor shares of most OECD economies. The latter set of authors estimate elasticities of substitution that vary significantly (some below one and some above one), but also show that factor shares change with labor adjustment costs and changes in union bargaining power, factors which may be relevant in explaining cross-national differences in the broader sample that we study.

In sum, there is nothing in the current state of either the empirical or theoretical literature that would lead us to treat the negative relationship between capital shares and per capita income shown in Figure 1 as an anomaly. Indeed, a good part of the recent literature can be interpreted as precisely predicting such a relationship.

3. The Data

[6] Jones carries out several simulation exercises and shows that the approximate constancy of the capital share only occurs in the long-run, with substantial movements occurring over shorter time periods. Over these shorter intervals, the economy tends to adopt a local CES production function until a technological innovation occurs that leads it to jump to another CES production function.

The United Nations Industrial Development Organization (UNIDO) currently collects yearly country-level data on industrial aggregates by industry for 181 countries.[7] This effort, which started in 1977, has allowed the construction of a data set that goes back to 1963 for the 3-Digit ISIC Revision 2 classification and to 1985 for the 4-Digit ISIC Revision 3 classification. The data is collected through annual questionnaires that are sent to the statistical offices of countries with an industrial level survey or census. The data is then checked for consistency and errors by UNIDO and supplemented with national and international statistical sources as well as data collected by statisticians engaged by UNIDO to work in specific countries. The statistical checks are designed to ensure cross-national comparability: as stated by UNIDO (2003), this database "is primarily intended to meet the statistical needs of researchers engaged in international, or cross-country, studies rather than country-specific investigations." (p. 3)

The UNIDO database includes measures of aggregate value added and wages and salaries for 136 countries, thus allowing us to form estimates of capital shares, defined as one minus the ratio of wages and salaries to value added.[8] There are two important features of the UNIDO estimates for our purposes. One is that industrial surveys are explicitly designed to survey firms that form part of a register of enterprises kept by the national statistical office and have a well defined set of accounts that permit quantitatively distinguishing payments to employees, output, and purchases of inputs. The second one is that all industrial surveys specify a cut-off point below which no attempt is made to measure economic activity.

These two characteristics make it very difficult for a significant number of unincorporated enterprises to form part of the sample of firms surveyed by country statistical

[7] This total includes countries that have ceased to exist (e.g.: USSR) since sample's starting date in 1963.
[8] Definitions of all variables used in our calculations are in the appendices,

offices. Informal sector firms will be omitted almost automatically by the fact that they are unlikely to form part of the statistical register and even less likely to have a sufficiently detailed set of accounts so as to answer the survey.[9] Self-employed individuals and small family firms will typically not have the minimum level of activity necessary to meet the cut-off criteria of the national statistical office. Even though these cut-off levels vary by country, most developing countries do not cover industries with less than five employees.[10] Even in advanced economies such as the US, the requirement that all establishments covered by the Annual Census of Manufactures have at least one paid employee implies that self-employed individuals do not form part of the sample.

A third characteristic of the UNIDO data that allows us to verify whether our results are contaminated by self-employment is precisely the possibility of calculating sector-specific capital shares at the 3 and 4 digit level. Even if some unincorporated enterprises were captured by the industrial surveys, this would be extremely unlikely to occur in highly capital intensive industries such as petroleum refining or production of iron and steel. If we find that the negative correlation between capital shares and GDP presented in Figure 1 carries over to these sectors, we can be confident that it is not due to a higher weight of self-employment in developing countries.

There are, however, some drawbacks of using the UNIDO INDSTAT data for cross-national comparisons. Despite UNIDO's efforts to provide uniform methodological guidelines to all participant countries through the *International Recommendations for*

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[9] The national accounts definition of informal sector, originally adopted by the 15th International Conference of Labour Statisticians in 1993, defines it as a subset of production units which are not constituted as separate legal entities independently of the households or household members who own them, and for which no complete sets of accounts (including balance sheets of assets and liabilities) are available which would permit a clear distinction of the production activities of the enterprises from the other activities of their owners and the identification of any flows of income and capital between the enterprises and the owners (ILO, 1993).

[10] We thank Dr. Shyam Upadhyaya of the UNIDO Research and Statistics Branch for clarifying this point.

Industrial Statistics published since 1983 (UN 1983), important methodological differences across participant countries persist. Even absent methodological differences, inconsistencies between the concepts reported by UNIDO and those used in national accounts statistics can make the comparison of our results with the previous literature problematic.

Two important sources of methodological differences across reporting countries have to do with the *concept* and *valuation* of value added. There are two concepts of value added that are used by reporting countries: the industrial census concept and the national accounts concept. The former differs from the latter (which is identical to the SNA concept) in that it deducts only industrial inputs – instead of all inputs - from output to calculate value added. Surveys that use the industrial census concept will tend to overestimate value added and may overestimate capital shares. This upward bias will be greater in countries with greater intensity in the use of non-industrial inputs. Countries may also choose to carry out valuation of value added at producers' prices, factor prices, or at a mixed concept such as basic prices.[11]

A third source of differences is related to the concept of labor income. Most countries report only wages and salaries, but some economies report employee compensation (a handful of countries report a mixed concept). The wages and salaries indicator includes monetary and in-kind payments but excludes employee contributions to public social security systems or to private funded insurance schemes. Countries that report only wages and salaries will have shares of employee compensation that are biased downwards and thus capital shares that are biased upwards; if these are primarily poor countries, then this variation in methodology could generate the illusion of a negative correlation between capital

[11] Value added at factor prices excludes net indirect taxes while value added at producers' prices includes it. Value added at basic prices includes taxes linked to production (e.g.: payroll taxes, taxes on vehicle use) but excludes taxes linked to production (e.g.: VAT).

shares and per capita income. Even within the group of countries that reports just employee compensation, a negative correlation between the relevance of social security and severance payments and per capita income would cause a higher overestimation of capital shares in poor countries.[12]

A last source of methodological differences refers to variations in the thresholds used to determine whether firms are included in the statistical office's sample when the survey/census is carried out. The existence of differences in cut-off points may generate systematic variations in sampled firm size across countries. Since poor countries are more likely than rich countries to set a higher threshold below which firms are not surveyed, it is possible that poor countries are systematically surveying larger and possibly also more capital intensive firms.

Fortunately, it is possible to classify countries in the UNIDO database according to the choice of valuation and concept of value added as well as by the type of labor income recorded. Differences in cut-off points are more difficult to deal with. Since the cut-off point can refer to any number of employees, sales or other measure of economic activity, the list of countries sharing the same cut-off point is almost always too small (in many cases just one) for meaningful comparisons to be carried out.

The OECD's SDBS database allows us to tackle this remaining question within a smaller subset of countries, as well as to confirm whether our results hold in a much higher quality data set. The SDBS data set is actually composed of two separate but related data sets: Structural Statistics for Industry and Services (SSIS) and Business Statistics by Size

[12] It may seem natural to assume that social insurance contributions are actually more important in developed countries with advanced welfare states. However, many developing countries have very stringent labor laws that apply to their formal sector, which is precisely the set of firms that will be covered by our data (see, e.g., Heckman and Pagés (2004)). Note also that what is relevant is the share of these payments in total labor income, which can be higher in developing countries even if their absolute levels are not.

Class (BSC). SSIS contains the data set that is reported to UNIDO but is also broader in scope and thus includes an additional set of variables. Indeed, in contrast to non-OECD countries that report the data directly to UNIDO, OECD countries report it directly to the OECD Secretariat, which harmonizes it and checks it for consistency before sending it to UNIDO. The recently released BSC data set is derived from the same industrial level surveys and censuses but includes information on all relevant variables grouped by five categories of employment size. Unlike the SSIS data set, it is actually a distinct data set from that reported to UNIDO not only because the distribution by size class is available only for a smaller subset of countries but also because different primary sources are often used.[13] Nevertheless, the differences between the capital share estimates derived from both sources is generally minor (see Table A1). The BSC data allows us to study differences in factor shares across countries within class sizes, ensuring that oversampling of firms of particular sizes is not biasing our results.

Appendix Table 1 displays the UNIDO, SSIS and BSC estimates for capital shares from our data for the 1990-2003 period. The difference between the UNIDO and the SSIS series using employee compensation as a measure of labor income averages 9.2 percentage points when the latter is valued at basic prices. This substantial difference is mainly due to the fact that UNIDO reports labor compensation excluding social security payments when it is available, which, in the case of the OECD countries, is almost always. Indeed, the differences between the UNIDO series and the comparable SSIS series using only wages and salaries is on average less than 0.1% and appears to be due mainly to differences in the

[13] See OECD(2006, p. 19) for a discussion of these differences.

timing for incorporation of updates.[14] Adopting valuation at basic prices increases the imputed capital share by 0.9 percentage and 1.7 percentage points on average in the SSIS and SBC samples respectively. The differences between the SSIS and SBC data are small, averaging 0.8 percentage points and 0.3 percentage points at basic and factor prices, respectively.

4. The results

We now turn to the analysis of the correlation between capital shares and income levels. We emphasize that our analysis is admittedly simple because we are not interested in testing a causal hypothesis or estimating an economic model, but rather on ascertaining whether a particular stylized fact is present in the data. Our objective is to find out whether there is a negative unconditional correlation between capital shares and per capita income in the data. Our estimates will thus center on understanding whether the coefficient on the log of GDP in the following equation is negative:

$$ks_i = \alpha_0 + \alpha_1 \ln(GDP_i)\,, \qquad (1)$$

with ks_i denoting the capital share and GDP_i a measure of PPP-adjusted per capita GDP for country i. As our purpose is to uncover whether a correlation exists, estimation of equation (1) by OLS on a cross-section of countries will be appropriate for most of our purposes.

Evidence from UNIDO Industrial Statistics

[14] The difference in magnitudes arising from variations in the concept of labor income is also consistent with what we know about the magnitude of social security contributions in our sample: the average share of social security contributions to GDP derived from the IMF's *Government Finance Statistics* for this sample of OECD economies is 9.8 percent (IMF, 2006).

Table 1 reports the results of simple cross-sectional estimates of equation (1) for the total manufacturing sector capital share derived from the UNIDO data set. Throughout the paper, we will present estimates using both Penn World Tables v. 6.1 and the *World Development Indicators* measure of PPP-adjusted per capita GDP (respectively PWT and WB henceforth). Estimates are reported separately for each decade, as well as for the sample as a whole. The estimates are consistent across measures of GDP and across time periods, indicating an average decline in the capital share of .05-.065 percentage points of GDP per log-point increase in per capita income.

The last two rows of Table 1 report panel estimates using country-decades as observations. While the panel specification in random effects yields a coefficient estimate that is similar to the cross-sectional estimates, the fixed effects specification yields an insignificant and quantitatively smaller coefficient. This is consistent with our interpretation of the Acemoglu and Jones models sketched in section 2, which predict that factor shares should decline with per capita income in a cross section but not necessarily in the individual country time series.

As discussed in section 2, the strong correlation between per capita incomes and GDP could be caused by differences in data definition across countries, if these are systematically related to income levels. Of particular interest are differences in the valuation and concept of value added and differences in the definition of labor income used. Since positive levels of net indirect taxes will tend to make value added at producers' prices higher than at factor prices, a systematic tendency by poorer countries to use producers' price valuation would generate the illusion of a negative correlation between income levels and capital shares. A similar effect would obtain if poor countries tend to use the industrial census concept or the definition of labor income as wages and salaries more often than rich countries. Fortunately, we have been able to compile data from UNIDO reports on the choice of value added valuation, concept and labor income definition for the countries included in the sample.[15] Table 2 shows the results of splitting the sample according to these characteristics. Columns (1)-(3) show that the choice of value-added valuation appears to make little difference to the results, with the coefficient estimate slightly lower in absolute value when the regression is run for the group of countries that report GDP at factor prices. In contrast, choice of value added concept appears to make an important difference: the coefficient estimate is much larger (-.107 for both the WB and PWT series respectively for the national accounts sample in column 4, vs. -.0291 and -.0285 for the industrial census sample in column 5). Nevertheless, the results are significantly negative regardless of the choice of value-added concept. Likewise, the coefficient point estimate is lower for the group of countries reporting wages and salaries (column 7, -.054 and -.052 for the WB and PWT series respectively) than for those reporting employee compensation (column 8, -.115, -.113). Columns (3), (6), and (9) show the results of running the regression on the joint sample, introducing category dummies respectively for valuation, concept choice and labor income definition.[16] When we do this, all coefficient estimates lie between -.05 and -.07 and all are significant with p-values less than .01. Column (10) shows the result of estimating on the whole sample using the complete set of valuation, concept, and labor income definition dummies: again the result is strongly negatively significant. The point estimate in regression (10) (-.0532 and -.0501 for

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[15] Data on choice of valuation is included in the UNIDO INDSTAT database. Information on choice of value added concept and definition of labor income was compiled from the country notes in the INDSTAT database and the country tables of UNIDO's *International Yearbook of Industrial Statistics.* See the Appendix for a detailed description of the construction of these categories.

[16] Columns (3) and (6) include those countries that follow other definitions or in which the definition changed over the period of study as a third category. None of the category dummies are significant, suggesting that the specification used in Table 1 may be adequate.

the WB and PWT series) is slightly lower than the estimate reported in Table 1 for the same period (-.061 and -.063), suggesting that the methodological differences in question may have exerted an upward bias on the absolute value of the coefficient, but that even after controlling for them the relationship remains strongly negative.

It is important to note that the exclusion of non-industrial inputs from value added could still bias the coefficient estimate of columns (5) and (6) in Table 2 if developing countries tend to use a greater share of non-industrial inputs in their intermediate inputs. This would be true if the low relative price of non-tradables in developing countries led to the adoption of more service-intensive techniques in manufacturing. Although not much research has been carried out on this topic, the detailed studies of van Ark (1993) point in the opposite direction. Van Ark calculates the share of non-industrial inputs in total intermediate inputs using information from production censuses and input-output matrices for six developed countries (France, Germany, Japan, Netherlands, the UK and the US) and three developing countries (India, Brazil and Mexico). The average share of non-industrial inputs for the developing group is 10.3% according to the production censuses and 18.9 according to the input-output calculations, slightly lower than the corresponding estimates for developed economies (13.3% and 20.0%, respectively).[17] Van Ark's estimates suggest that, if anything, the exclusion of non-industrial inputs may be leading us to overestimate the negative correlation between per capita income and capital shares.

Table 3 reports estimates carried out on the 3-digit data (Rev.2) from the UNIDO data set for the 1990-2003 period.[18] The table reports coefficient estimates of linear OLS regressions

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[17] These averages are derived from Table 4.3 of van Ark (1993), p. 59.

[18] We report Revision 2 results because they are available for a much broader subset of countries (105) than the Revision 3 estimates. However, the results are, if anything, stronger on the revision 3 estimates. For the World Bank series, the coefficient estimate on total manufacturing is -.079, and all 24 coefficient estimates at the 3-digit level are negative when

of capital shares on GDP.[19] All 28 coefficient estimates are negative and significant, with approximately ¾ of them at 5% and 4/5 at 10%. The results of Table 3 also give us a way to evaluate the relevance of self-employment for our results. As pointed out in the previous section, the methods used to collect the industrial survey data make it unlikely that unincorporated enterprises form a relevant portion of the sample of firms surveyed. If they did, however, we would expect this to occur primarily in relatively labor-intensive sectors such as textiles and apparel. Thus we can evaluate whether there is any evidence that self-employment has an effect on our results by examining the coefficients reported in Table 3 for very capital-intensive industries. Measured by the average ratio of gross fixed capital formation to employees across the sample, the five most capital intensive three-digit sectors in manufacturing are Petroleum Refineries (353), Non-ferrous metals (372), Industrial Chemicals (351), Iron and Steel (371), and Pottery, China and Earthenware (361). Inspection of Table 3 reveals that the coefficients on income for these five sectors are not different from those of the whole sample: four of them are significant, with the median value (-.037 for the WB series, -.040 for the PWT one) are very similar to the median for all sectors (-.044, -.043 respectively).

Table 4 reports the summary of results of similar regressions carried out using the UNIDO 4-Digit (Rev.3) data. Out of 127 regressions that were run for each of the GDP series, 120 (94.5%) produced a negative coefficient, while 7 produced a positive coefficient. Only one of the positive coefficients was significant at 10% while approximately two-thirds

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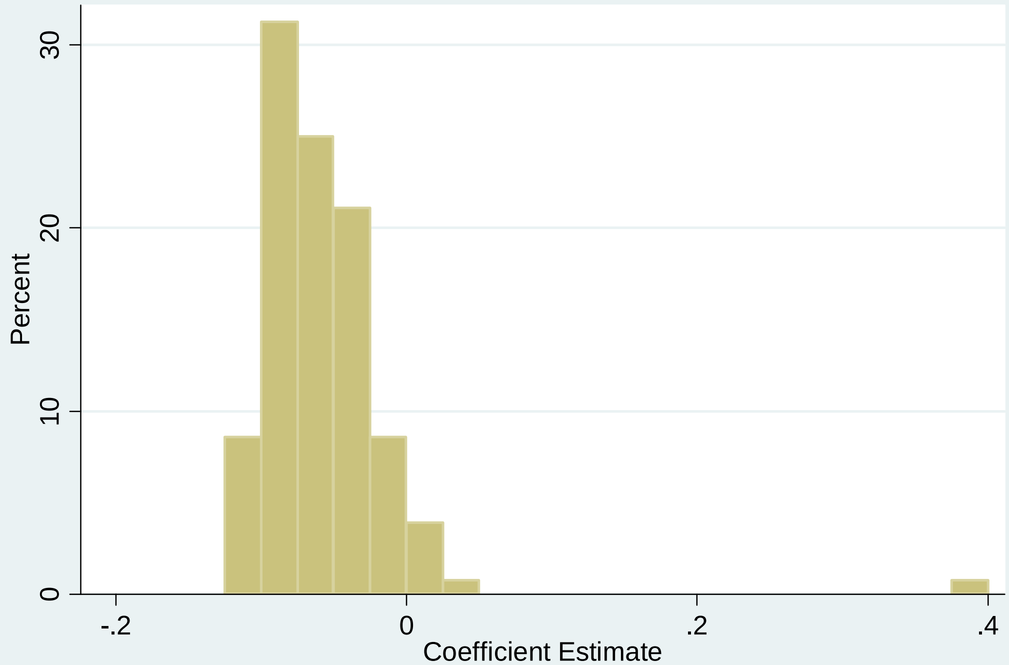
we use Revision 3 data, 20 of them with p-values lower than .05. Our analysis of the 4-digit data as well as the OECD data does use the Revision 3 estimates.

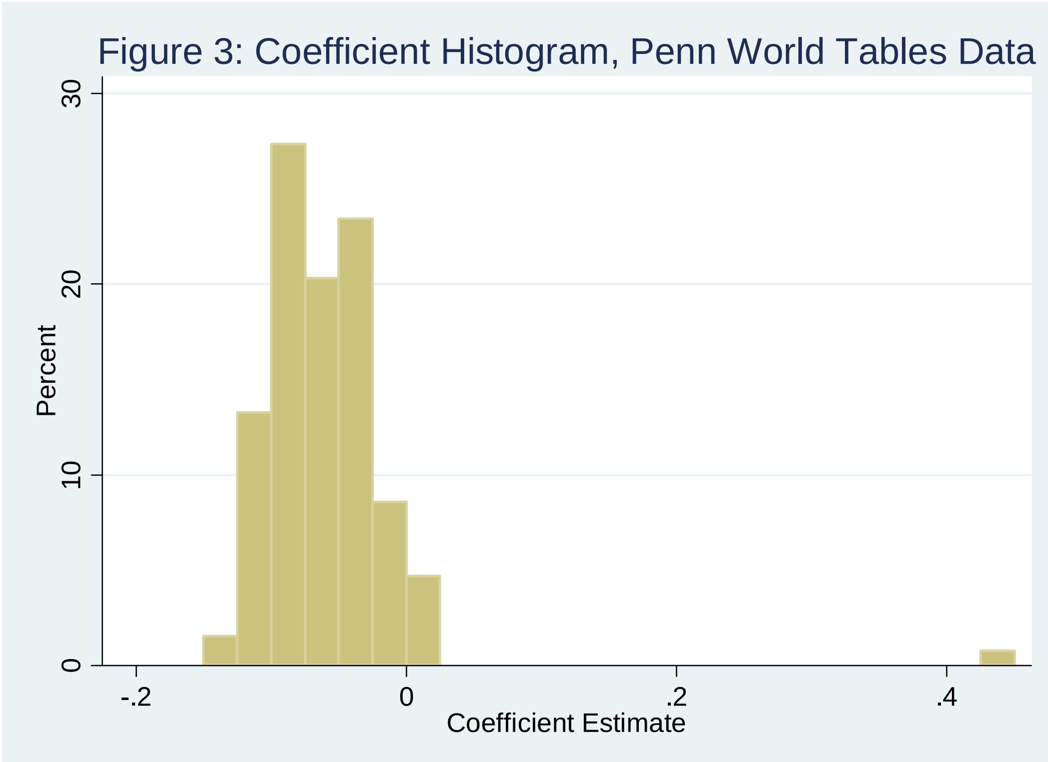
[19] We use OLS instead of SUR because although in principle SUR could lead to an increase in efficiency in the estimation, any gain would be offset by the loss in the number of estimations arising from the unbalanced nature of the data. SUR estimation of the 28 equations in table 3 reduces the sample to 34 observations, yielding negative coefficients on all equations, 26 of which are significant at 5%. The system in Table 4 cannot be estimated by SUR because the number of equations exceeds the number of common observations.

of the negative ones were.[20] Figures 2 and 3 show the frequency distribution of the coefficient estimates, indicating that the bulk of the estimates are concentrated in the range between -.025 and -.075.

Figure 2: Coefficient Histogram, World Bank Data



[20] Restricting to the most capital intensive sectors in the 4 digit data yields results that are less strong than at the 3-digit level but still broadly indicative of a negative relationship. The median coefficient for the fifteen most capital intensive sectors is -.027 and -.030 respectively for the World Bank and Penn World Tables series, with 12 of the 15 coefficient estimates for the most capital-intensive 4-digit sectors negative in both series. The comparison at the 4-digit level is clouded by the fact that the most capital-intensive 4-digit goods are only produced in richer countries. For example, production in the most capital intensive industry in the sample (Processing of Nuclear Fuel), the only industry to yield a positive significant coefficient in the sample, only takes place in 6 countries, of which one (Brazil) is a non-OECD country.



Evidence from OECD Structural and Demographic Business Statistics

We now turn to discussion of evidence from the OECD SDBS data set. Two distinct databases from part of the SDBS database: Structural Statistics for Services and Industry (SSIS), which is also the basis for the UNIDO data, and Business Statistics by Size Class (BSC). An advantage of the SSIS data set is that it reports separate series of value added by valuation and labor income by concept for member countries, thus allowing us to repeat the robustness tests of Table 2 on a higher quality, more detailed data set. It also reports information on labor income and value added by size classes, allowing us to control for variations in sampled firm size.

We first look at the effect of value-added valuation and labor income definition in Table 5. We start out by restricting the UNIDO sample to the 26 OECD member economies. As discussed above, OECD member countries report their data directly to the OECD Secretariat, which subjects it to a series of consistency checks before sending it to UNIDO. Therefore this can be interpreted as a higher quality subsample. The coefficient estimate becomes much larger than in the whole sample, at -.16 and -.17 respectively for the WB and PWT series, retaining strong statistical significance. Figure 4 shows a scatterplot of this relationship for the WB GDP series. Columns 2-4 restrict the sample to the subset of economies for which the SSIS data set gives us a measure of employee compensation. We run the regression both using GDP at basic prices (column 2) and factor prices (column 3), as well as for a combined measure which uses factor prices where available, basic prices otherwise, and a category dummy. As we can see in Table 5, all measures give consistently negative coefficients. The same can be said about the regressions in columns (5)-(6), which carry out the same exercise using wages and salaries as the labor income concept. Note that there are no consistent changes between the absolute value of the coefficients when one changes the concept of labor income, indicating that biases arising from these methodological variations may not be serious. In general, all coefficients in the table are significantly higher than those derived from the sample as a whole, suggesting that the coefficient estimate in the broader lower quality UNIDO sample may be subject to attenuation bias. The estimates are smaller in absolute value and somewhat weaker statistically (though still significant at 5%) for the factor prices concept. The basic reason for this is that most of the poorer OECD economies only report value added at basic prices (see Appendix Table A1).[21] Thus, even though the

[21] Value added at basic prices is a slightly different concept from that at producers' prices, in that it includes only the taxes on production (such as payroll taxes or taxes on vehicles and buildings) but not on products (such as VAT). Neither

sample at factor prices is in some cases slightly larger than the sample at basic prices, the former excludes Korea, Mexico, and Turkey, which have considerably higher capital shares than the rest of the sample.

The OECD BSC database can help us deal with the issue of differences in thresholds. Since it includes data on firm groups by class size, it helps us evaluate whether our result holds even for firms of comparable size. We show these comparisons in Table 6, which display results of regressions by size groups of surveyed enterprises and by valuation (basic prices, factor prices, and the mixed data with a category dummy). All 36 coefficients reported on the table are negative, 20 of them with p-values lower than .01. The relationship appears weakest – though still showing a homogenously negative pattern - when using factor price valuation, in great part as a result of the fact that the poorer OECD economies drop out of this sample. In sum, there is nothing in this sample to suggest that the negative correlation between capital shares and per capita income is due to systematic differences in the sizes of enterprises surveyed by country.[22]

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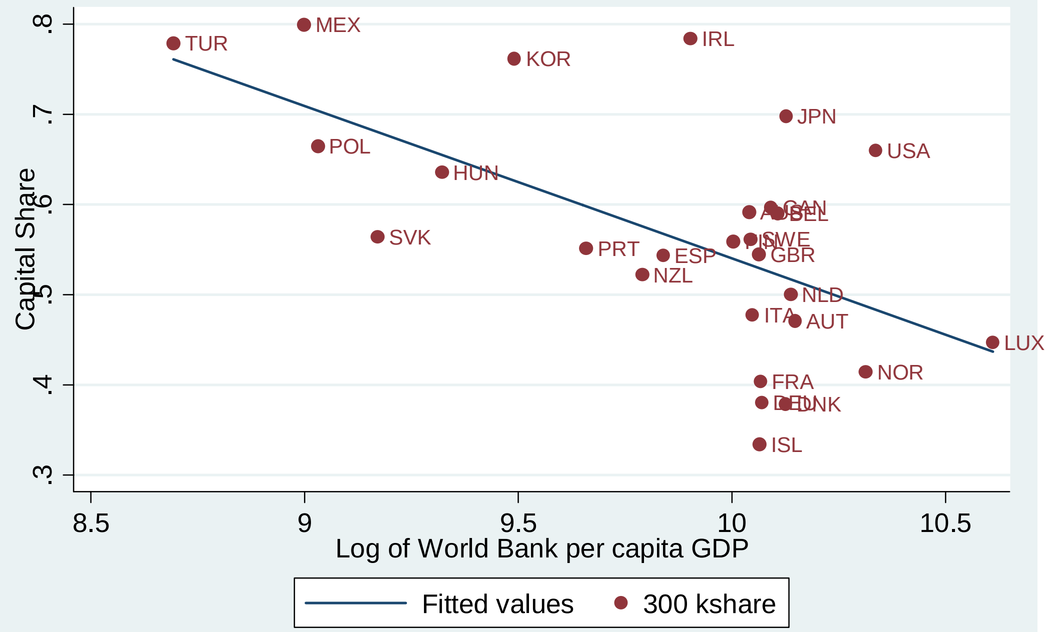
the SSIS nor the BSC database report a separate series at producers' prices.

[22] The only three OECD countries that use the census concept when defining value added are the US, Korea, and Canada. When we redo the exercises of Tables 5 and 6 excluding these three countries we get substantially the same results: all coefficients are negative and significant at 5% in the SSIS data, whereas all are negative and 26 are significant at 5% in the BSC data. Within these three economies, the pattern also resembles the one we find in the data, with Korea having a higher capital share than both the US and Canada (Table A-1).

Figure 4: OECD Subsample Capital Shares and per Capita GDP 1990-2003



Although we have tried to deal with the most evident possible sources of bias in the comparison of factor shares derived from industrial surveys in the data, it could still be the case that the comparison of these figures is clouded by methodological differences or other types of measurement error that we have failed or been unable to take into account. If the measurement error in question is systematically linked to per capita income, it could affect the observed correlation between our two variables of interest. The OECD data allows us to approach this issue from a more general standpoint by studying how the relationship between the industrial survey estimate and the national accounts estimate of capital shares varies across income levels for highly capital intensive industries. The intuition for this idea is the following. We know that the national accounts estimate of capital shares in very capital intensive sectors will not be contaminated by self employment. Therefore, for these very capital intensive sectors, the national accounts estimate can be assumed to be an adequate one. The gap between the national accounts estimate and the industrial survey estimate for these very capital intensive industries will thus give us a good measure of the bias of the latter. We can test whether this bias is systematically related to income levels by running a regression of the difference between both estimators on per capita GDP:

$$gap_i = ksis_i - ksna = \beta_0 + \beta_1 \ln GDP \,, \qquad (2)$$

where $ksna_i$ denotes the capital share estimated from the national accounts data and $ksis_i$ that estimated from the industrial surveys. If $ksis_i$ is biased upwards in poor countries, we would expect the estimate of β_1 in regression 2 to be negative. Regrettably, it is impossible to carry out this exercise on the UNIDO sample because the UN's system of national accounts does not report value added at a level of disaggregation higher than 1 digit. However, the OECD's Structural Analysis (STAN) database does provides us with information on the breakdown of GDP by type of income recipients at the 2-digit level. Table 8 reports the estimates of β_1 in estimates of equation (2) using the difference between the SSIS capital share and the national accounts capital share at basic prices for the five most capital-intensive industries in the OECD data.[23] The exercise yields little evidence that there is any systematic bias. Two of the sectors yield positive coefficient estimates; of the remaining three, none are statistically significant with the WB series and only one of them is significant (at 10%) in the PWT series.

The National Accounts Evidence: Another look.

[23] The STAN database does not report value added at the 2-digit level at factor price valuation.

The evidence presented to this moment appears to pose a puzzle. If Gollin (2002) and Bernanke and Gürkaynak's (2002, henceforth BG) conclusions are correct, then cross-national economy-wide capital shares do not display a negative correlation with per capita income. However, we have argued that the evidence from industrial surveys of the manufacturing sectors shows precisely such a correlation. How can these two pieces of evidence be reconciled?

Although it is possible to tell stories that would square a negative correlation between manufacturing capital shares and per capita income with the lack of such a correlation at the national level, we believe that there is a simpler explanation to this apparent puzzle. In our view, the evidence of previous authors is not inconsistent with estimates of the magnitudes that we have found. The reason is that the estimates that can be derived from their data, while not significantly different from zero, are also characterized by very wide confidence intervals. Therefore they are also not significantly different from our estimates.

We first look at Gollin's calculations. Gollin produces three adjustments to factor shares that are designed to correct for the inclusion of operating surplus of private unincorporated enterprises (OSPUE) in capital income. His adjustment 1 attributes all income from unincorporated enterprises to labor income. Adjustment 2 assumes that the labor share in the sector of unincorporated enterprises is the same as in the rest of the economy. Adjustment 3 imputes employee compensation for workers who are self-employed by using wage estimates from the rest of the economy based on national accounts data and assuming that the wage rate in the corporate and non-corporate sectors are equal. Gollin presents three scatter plots of these figures against the level of per capita income from the Penn World Tables (version

5.6), and argues that observation of these graphs shows no obvious relationship to income per capita.

Table 8 presents estimates of regression (1) using Gollin's data.[24] We use both PWT version 5.6 GDP per capita, which was the one available at the time Gollin wrote his paper, as well as the more recent PWT version 6.1 and WB series that we have used in the rest of the paper. Similarly to the conclusions reached by Gollin, we find that there is no significant relationship between any of the adjustments and per capita GDP. What we would like to point to, however, is the fact that the estimates in the second and third panel in Table 9, which correspond to Gollin's adjustments 2 and 3, are also not inconsistent with our parameter estimates for the whole sample in Table 1. Indeed, the *point estimates* obtained from the regression using Gollin's adjustment 3, which we view as the highest quality estimates presented by him, are almost identical to our estimates for the 1960-00 period in Table 1.

A similar story can be told with the BG data. The first two panels of Table 9 present regressions using two further adjustments generated by BG. Adjustment BG1 is the same as Gollin's adjustment, but carried out on a broader set of observations. Adjustment BG2, which is the factor share measure actually used in their statistical analysis, uses a combination of three estimates.[25] As the results of regressions on these measures show, the estimates derived from the BG data are negative and insignificant, with confidence intervals that overlap with our range of estimates.

[24] It is important to point out that neither Gollin nor BG use regressions of factor shares on GDP, as we do, to establish their arguments.

[25] For the countries for which OSPUE data is available, BG use Gollin's adjustment, recalculated for an expanded data set. For those in which it is unavailable, they assume that the share of the corporate sector in total private sector income is the same as its share in employment to construct an estimate of imputed OSPUE which they then use to construct the adjustment. In the countries for which this estimate cannot be constructed, they use Gollin's adjustment 3, again recalculated for their expanded data set.

A danger of Gollin's adjustment 3 and both BG adjustments is that they may overestimate the labor share in countries in which national accounts statistics underreport the contribution of the non-corporate sector to GDP. Since this is most likely to happen in poor countries with deficient data collection and large informal sectors, it could bias the correlation between factor shares and GDP downwards. Both Gollin and BG recognize this fact; the latter authors, indeed, note that many of their calculations produce labor shares greater than 1. BG address this problem by restricting their sample to countries with a corporate employment share greater than 50%, arguing that data quality is likely to be higher in countries where the corporate sector is larger. Obviously, the choice of threshold is somewhat arbitrary and one may wish to adopt a stricter criterion. The second two panels of Table 9 show the effect of adopting a 70% threshold. Note that in this case the point estimates derived from the BG estimates become remarkably close to our estimates, and in one case become significantly negative at a 5% significance level (adjustment BG1, WB series).

We read these results as indicating that the Gollin and BG evidence is not inconsistent with the existence of an inverse relationship between per capita income and capital shares. Given the width of the typical confidence intervals derived from their analysis, the conclusion that there is no evidence of a systematic relationship was probably the most reasonable inference that could be made based on their data sets. We believe that our findings, read in conjunction with their analysis, suggest that we can start to narrow the possible set of results towards those indicating that capital shares are negatively related to per capita income.

5. Concluding Comments

This paper has shown that capital shares in the formal manufacturing sector decline with per capita income. Developed economies have manufacturing capital shares that are on average approximately ten percentage points higher than middle income economies and twenty points higher than low income economies. This pattern occurs within 3 and 4-digit sectors as well as for many different definitions of value added and labor income. Unlike factor shares that are derived from national accounts data, the data used in this paper are not affected by international differences in self-employment rates and thus constitute a much cleaner indicator of the functional distribution of income.

The evidence presented in this paper is circumscribed to the corporate manufacturing sector. Whether the cross-country correlation with per capita GDP that we have uncovered will extend to sectors such as services and agriculture is a question that must be left for future research. However, the fact that we find strong evidence that the correlation with per capita income is present within highly disaggregated sectors is suggestive that there may be economy-wide forces operating on the determination of factor shares, forces which are also likely to have an effect outside of manufacturing.

Uncovering what these forces are is a natural direction for future research. One strategy that immediately comes to mind is replacing the Cobb-Douglas assumption with an alternative technology that has a less than unitary elasticity of substitution such as the CES production function. Such an approach could readily account for the observed correlation and would be consistent with some of the empirical contributions surveyed in section 2. But that is not the only possible avenue of analysis. Differences in factor shares could alternatively be due to the existence of factor market distortions that generate differences between factor returns and marginal products, as long as these distortions are systematically related to income levels. To take one example, it is well known that richer countries also have more developed organized labor movements.[26] This phenomenon may be the expression of deeper differences in the bargaining power of the owners of factors of production which would constitute another natural explanation for the correlation that we have observed. Factor endowments and government policies can also form the basis for other explanations. Developing credible empirical tests that allow us to distinguish between these competing hypotheses constitutes the logical next step in the construction of a theory of the functional distribution of income.

A complementary avenue of analysis consists in using the data presented in this paper to take a new look at some results in the literature that had relied on national accounts estimates of factor shares. A number of conclusions in the modern macro and growth literature have been drawn on models that take as a given the absence of a systematic relationship between factor shares and income. A reexamination of these results is an obvious direction for further research. Some natural candidates are the adequacy of the Solow model or explaining cross-country patterns of income (Mankiw, Romer and Weil, 1991), the relevance of productivity differences in accounting for income differences (Parente and Prescott, 2000), and the equalization of the marginal product of capital across countries (Caselli and Feyrer, 2006).

[26] For example, the simple correlation between logo f per capita GDP and total union membership as a percent of the labor force from Artecona and Rama (1999) is .49.

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Appendix 1: Variable Definitions and Sources

UNIDO

Wages and salaries include all payments in cash or in kind paid to "employees" during the reference year in relation to work done for the establishment. Payments include: (a) direct wages and salaries; (b) remuneration for time not worked; (c) bonuses and gratuities; (d) housing allowances and family allowances paid directly by the employer; and (e) payments in kind. The UNIDO recommendation is to exclude employers' contributions in respect of their employees paid to social security, pension and insurance schemes, as well as the benefits received by employees under these schemes and severance and termination pay. However, a number of countries report data inclusive of severance payments and social security contributions

Value added: The census concept differs from the national accounts concept in that it is defined as the value of census output less the value of census input, which covers: (a) value of materials and supplies for production (including cost of all fuel and purchased electricity); and (b) cost of industrial services received (mainly payments for contract and commission work and repair and maintenance work). The valuation may be in factor cost or in producers' prices, depending on the treatment of indirect taxes and subsidies.

Categories: Countries were grouped by category for the analysis of Table 2 in terms of value-added valuation, concept and labor income definition. Valuation is reported in INDSTAT and can take five values: Producers; Prices, Factor Prices, Valuation not defined, Valuation changed during the period (1990-03), or Missing. Countries with Valuation not defined are excluded from columns (1) and (2) in Table 2 but included in column (3). Countries whose valuation changed over time may be included in (1) and (2) as separate observations but are grouped together with those for which valuation was not defined for column (3). Category indicators for value added and labor income concept were collected from the country notes reported in INDSTAT and in the UNIDO *International Yearbook of Industrial Statistics*. Countries reporting "no deviations from the standard UN concepts and definitions" are coded as reporting wages and salaries as labor income concept and the census concept as value added concept (see UN, 1983 for the definition of the standard concepts). Following UNIDO (personal communication) all EU countries were classified as reporting the national accounts concept. Countries that did not report whether there was a deviation or not are treated as missing observations. The value added concept category variable can take three values: Census, National Accounts, or Missing. The labor income concept category variable take four values: Wages and Salaries, Compensation of Employees, Intermediate (e.g.: including social security but not severance pay) or Missing. For OECD countries, the classification was confirmed by verifying that the reported labor income measure was equal to the corresponding one reported in the SSIS data. The intermediate concept is excluded from the regressions in columns (7) and (8) but included as a third category in regression (9). Similarly to what was reported by Rodrik (1999, p. 736), we find no significant revisions of definition in any country for the period covered.

OECD SSIS/BCS

Value Added at basic prices is calculated as Turnover + Capitalised (own-account) Production+ Net change in stocks- Purchases of goods and services (the value of all goods and services purchased during the accounting period for resale or (intermediate) consumption in the production process. These values should reflect the actual price paid after deducting for deductible items such as VAT. Value added at factor costs subtracts taxes less subsidies on production from value added at basic prices.

Employee Compensation includes the total remuneration, in cash or in kind, payable to an employee in return for work done by the latter during the reference period. No compensation of employees is payable in respect of unpaid work undertaken voluntarily, including the work done by members of a household within an unincorporated enterprise owned by the same household. Compensation of employees does not include any taxes payable by the employer on the wage and salary. It includes therefore wages and salaries of employees and other employers' social contributions. The latter include the actual social contributions payable by employers to social security schemes or to private funded social insurance schemes to secure social benefits for their employees; or imputed social contributions by employers providing unfunded social benefits.

Wages and salaries for employees include all payments in cash or in kind payable to employees by way of remuneration for work done during the reference period. They exclude social security, pension, retirement and other contributions payable by the employer but include social contributions, income taxes etc made by the employee even if they are actually withheld and paid on their behalf by their employer. Payments for agency workers are not included in the wages and salaries of the unit using the workers but are instead recorded with the agency.

In both data sets, capital shares are defined as 1 minus the share of wages and salaries (or employee compensation) over value added. Industry-periods that present a capital share smaller than zero or greater than 1 are set to missing.

Penn World Tables

Version 6.1: Real GDP per Capita (Constant Price Chain Series)

Version 5.6: Taken from Gollin (2002).

World Development Indicators (World Bank, 2005)

GDP per capita, PPP (constant 2000 international $)

Table 1: Cross-Sectional and Panel Regressions of UNIDO Capital Shares on Log GDP		
	Penn World Tables GDP	World Bank GDP
1960-69	-0.0507 (3.69)*** 71	
1970-79	-0.0619 (5.22)*** 88	-0.0526 (4.34)*** 90
1980-89	-0.0651 (5.36)*** 96	-0.0561 (5.18)*** 103
1990-03	-0.0607 (5.14)*** 101	-0.0628 (5.59)*** 106
1960-00	-0.0542 (4.99)*** 117	-0.0497 (5.22)*** 124
Random Effects	-0.0508 (5.37)*** 356	-0.0470 (5.06)*** 299
Fixed Effects	-0.0174 (0.74) 356	0.0232 (0.91) 299
Hausmann Specification Test	2.5	10.57**

Values reported are coefficient estimates on the log of GDP, with associated t-statistic and number of observations below. ***-1%, **-5%, *-10*. Panel estimates include decade dummies.

Table 2: Regressions by definitions of value added and labor income, UNIDO Data 1990-2003

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Valuation	Producers' Prices	Factor Prices	Combined	National Accounts	Industrial Census	Combined	Wages and Salaries	Employee Compensation	Combined	All
World Bank GDP	-0.0572	-0.0415	-0.0571	-0.1070	-0.0291	-0.0527	-0.0538	-0.1151	-0.0676	-0.0532
	(2.85)***	(2.26)**	(4.78)***	(4.89)***	(2.02)**	(4.2)***	(4.13)***	(4.56)***	(5.5)***	(3.67)***
	41	16	106	32	57	89	68	22	95	86
Penn World Tables GDP	-0.0547	-0.0444	-0.0543	-0.1069	-0.0285	-0.0501	-0.0517	-0.1126	-0.0659	-0.0501
	(2.7)**	(2.26)**	(4.25)***	(4.38)***	(2.02)**	(3.95)***	(3.8)***	(4.33)***	(5.17)***	(3.4)***
	40	15	101	30	56	86	66	21	92	83

Values reported are coefficient estimates on the log of GDP, with associated t-statistic and number of observations below. ***-1%, **-5%, *-10*. Columns 3, 6, and 9 include dummies for each category. For the purposes of these columns, countries that change category over the sample and those that did not report valuation or concept are treated as an additional category. Column (10) includes all the category dummies.

Table 3: UNIDO Estimates by 3-Digit Sector, 1990-03 Cross-Section

	311 Food products	313 Beverages	314 Tobacco	321 Textiles	322 Wearing apparel, except footwear	323 Leather products	324 Footwear, except rubber or plastic	331 Wood products, except furniture	332 Furniture, except metal
World Bank GDP	-0.0583 (3.42)*** 108	-0.0518 (5.51)*** 101	-0.0036 (0.21) 86	-0.0425 (2.89)*** 103	-0.0607 (3.63)*** 88	-0.0604 (2.55)** 86	-0.0349 (2.26)** 80	-0.0234 (1.58) 101	-0.0245 (1.71)* 92
Penn World Tables GDP	-0.0559 (3.1)*** 103	-0.0508 (5.4)*** 96	-0.0012 (0.07) 83	-0.0370 (2.37)** 98	-0.0609 (3.21)*** 84	-0.0631 (2.33)** 82	-0.0296 (1.76)* 75	-0.0274 (1.7)* 96	-0.0242 (1.65) 87
	341 Paper and products	342 Printing and publishing	351 Industrial chemicals	352 Other chemicals	353 Petroleum refineries	354 Misc. petroleum and coal products	355 Rubber products	356 Plastic products	361 Pottery, china, earthenware
World Bank GDP	-0.0304 (2.15)** 104	-0.0508 (3.39)*** 94	-0.0195 (1.09) 99	-0.0313 (2.08)** 92	-0.0331 (2.66)*** 74	-0.0212 (0.62) 50	-0.0522 (3.73)*** 87	-0.0717 (7.32)*** 87	-0.0369 (1.85)* 85
Penn World Tables GDP	-0.0348 (2.31)** 99	-0.0480 (2.85)*** 89	-0.0163 (0.82) 94	-0.0258 (1.57) 88	-0.0350 (2.66)*** 72	-0.0127 (0.33) 48	-0.0520 (3.42)*** 84	-0.0693 (6.23)*** 83	-0.0424 (2.02)** 81
	362 Glass and products	369 Other non-metallic mineral products	371 Iron and steel	372 Non-ferrous metals	381 Fabricated metal products	382 Machinery, except electrical	383 Machinery, electric	384 Transport equipment	385 Professional & scientific equipment
World Bank GDP	-0.0576 (3.24)*** 76	-0.0423 (3.34)*** 92	-0.0521 (2.47)** 90	-0.0414 (2.41)** 73	-0.0555 (4.08)*** 100	-0.0558 (3.3)*** 89	-0.0727 (4)*** 89	-0.0525 (2.95)*** 89	-0.0448 (2.54)** 73
Penn World Tables GDP	-0.0639 (3.49)*** 71	-0.0443 (3.49)*** 87	-0.0471 (2.02)** 86	-0.0399 (2.19)** 70	-0.0541 (3.59)*** 95	-0.0512 (2.98)*** 85	-0.0674 (3.23)*** 85	-0.0452 (2.48)** 86	-0.0419 (2.26)** 69
	390 Other manufactured products								
World Bank GDP	-0.0384 (2.37)** 97								
Penn World Tables GDP	-0.0341 (1.95)* 93								
Summary of Coefficient Estimates		**Negative**				**Positive**			
	Total	**All**	**p<.01**	**p<.05**	**p<.10**	**All**	**p<.01**	**p<.05**	**p<.10**
World Bank GDP	**28**	**28**	**14**	**22**	**24**	**0**	**0**	**0**	**0**
Penn World Tables GDP	**28**	**28**	**12**	**20**	**23**	**0**	**0**	**0**	**0**

Table 4: Summary of Results, UNIDO 4-Digit Estimation									
	Total	Negative				Positive			
		All	p<.01	p<.05	p<.1	All	p<.1	p<.5	p<.1
World Bank GDP	127	120	62	76	86	7	0	0	1
Penn World Tables GDI	127	120	60	74	78	7	0	0	1

Table 5: Regressions for OECD Economies, Total Manufacturing

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Source	UNIDO	SSIS	SSIS	SSIS	SSIS	SSIS	SSIS
Size	All firms	All firms	All firms	All firms	All firms	All firms	All firms
Labor income definition	Mixed	Employee Compensation	Employee Compensation	Employee Compensation	Wages and Salaries	Wages and Salaries	Wages and Salaries
Value added concept	Mixed	Basic Prices	Factor Prices	Mixed	Basic Prices	Factor Prices	Mixed
World Bank GDP	-0.1696	-0.2147	-0.0918	-0.1318	-0.1663	-0.1230	-0.1228
	(4.91)***	(3.97)***	(2.28)**	(3.64)***	(3.9)***	(2.78)**	(4.54)***
	27	15	19	24	18	18	26
Penn World Tables GDP	-0.1627	-0.2437	-0.1055	-0.1455	-0.1723	-0.1408	-0.1339
	(4.11)***	(4.08)***	(3.2)***	(4.6)***	(3.23)***	(3.27)***	(5)***
	26	15	18	23	18	17	25

Values reported are coefficient estimates on the log of GDP, with associated t-statistic and number of observations below. ***-1%, **-5%, *-10*. Columns (4) and (7) use Value Added at Basic Prices when data at factor prices is unavailable and controls for a dummy variable to reflect the methodological variation,

Table 6: OECD Regressions by firm class size, BSC data base

Size	(1) All firms	(2) <10	(3) 10-19	(4) 20-49	(5) 50-250	(6) 250+
	Basic Prices					
World Bank GDP	-0.2273 (4.39)*** 13	-0.1181 (3.13)*** 13	-0.2441 (5.11)*** 12	-0.2244 (3.02)** 12	-0.2457 (3.98)*** 13	-0.2660 (6.87)*** 13
Penn World Tables GDP	-0.2605 (4.59)*** 13	-0.1324 (3.14)*** 13	-0.2820 (5.14)*** 12	-0.2602 (3.07)** 12	-0.2793 (4.1)*** 13	-0.3009 (7.18)*** 13
	Factor Prices					
World Bank GDP	-0.1127 (3.17)*** 19	-0.0560 (1.08) 18	-0.0857 (2.52)** 18	-0.0470 (1.09) 18	-0.0534 (0.94) 17	-0.1326 (3.52)*** 18
Penn World Tables GDP	-0.1244 (4.32)*** 18	-0.0437 (0.83) 17	-0.0978 (2.79)** 17	-0.0643 (1.45) 17	-0.0773 (1.4) 16	-0.1568 (4.48)*** 17
	Mixed					
World Bank GDP	-0.1441 (3.69)*** 23	-0.0854 (2)* 22	-0.0965 (3.09)*** 21	-0.0662 (1.5) 21	-0.1613 (2.52)** 22	-0.1678 (4.64)*** 23
Penn World Tables GDP	-0.1562 (4.32)*** 22	-0.0831 (1.83)* 21	-0.1065 (3.24)*** 20	-0.0797 (1.81)* 20	-0.1772 (2.76)** 21	-0.1888 (5.55)*** 22

Values reported are coefficient estimates on the log of GDP, with associated t-statistic and number of observations below. ***-1%, **-5%, *-10*.Mixed Value Added uses Value Added at Basic Prices when data at factor prices is unavailable and controls for a dummy variable that is one on those occassions.

Table 7: Capital Intensity and Coefficient of GDP on Gap between National Accounts and OECD-Industrial Survey Estimates

Code	Description	Annual Investment per Worker (2000 US$)	World Bank per Capita GDP	Penn World Tables per Capita GDP
23	Coke and petroleum products; nuclear fuel	4,433,786	0.040665 (0.37)	0.033137 (0.29)
16	Tobacco products	2,487,179	-0.119910 (1.16)	-0.118319 (1.17)
24	Chemicals and chemical products	1,316,775	-0.002702 (0.04)	-0.007081 (0.11)
27	Basic metals	1,163,566	0.036311 (1.22)	0.036717 (1.01)
32	Radio, TV, communication equipment	955,268	-0.268303 (1.83)	-0.315122 (2.04)*

Table 8: Regressions using Gollin's Adjustments to National Accounts Capital Shares									
	Adjusment 1: All income from self-employment is wage income			Adjustment 2: Factor shares excluding self-employment			Adjustment 3: Adjustment for Informal Sector		
Log of World Bank GDP	0.0063			-0.0143			-0.0543		
	(0.33)			(0.74)			(1.44)		
Log of PWT GDP (v6.1)		0.0173			-0.0067			-0.0483	
		(0.89)			(0.32)			(1)	
Log of PWT GDP (v5.6)			0.0150			-0.0141			-0.0429
			(0.71)			(0.65)			(0.87)
Constant	0.2011	0.0985	0.1054	0.4505	0.3783	0.4242	0.8591	0.7991	0.7312
	(1.11)	(0.54)	(0.55)	(2.48)**	(1.93)*	(2.15)**	(2.3)**	(1.69)	(1.59)
Confidence Interval for Log of GDP									
Lower limit	-0.0331	-0.0228	-0.0287	-0.0541	-0.0500	-0.0590	-0.1338	-0.1502	-0.1467
Upper limit	0.0457	0.0574	0.0587	0.0254	0.0366	0.0308	0.0252	0.0536	0.0609
Number of observations	30	28	26	30	28	26	19	19	19
R-Squared	0.0042	0.0274	0.0227	0.0265	0.0048	0.0212	0.1719	0.114	0.0955

Table 9: Regressions using Bernanke and Gurkaynak's Adjustments to National Accounts Capital Shares								
	Adjustment BG1: Labor Force Adjustment		Adjustment BG2: Combined National Accounts and Labor Force		Adjustment BG1: Labor Force Adjustment		Adjustment BG2: Combined National Accounts and Labor Force	
Employment Threshold	50%	50%	50%	50%	70%	70%	70%	70%
Log of PWT GDP (v6.1)	-0.0143		-0.0260		-0.0424		-0.0345	
	(0.74)		(1.54)		(1.48)		(1.38)	
Log of WB GDP		-0.0180		-0.0296		-0.0582		-0.0385
		(1)		(1.97)*		(2.44)**		(1.81)*
Constant	0.4459	0.4807	0.5802	0.6128	0.7162	0.8720	0.6552	0.6941
	(2.44)**	(2.78)***	(3.71)***	(4.34)***	(2.59)**	(3.72)***	(2.75)***	(3.38)***
Confidence Interval for Log of GDP								
Lower limit	-0.0532	-0.0545	-0.0599	-0.0598	-0.1013	-0.1072	-0.0854	-0.0818
Upper limit	0.0247	0.0184	0.0079	0.0006	0.0164	-0.0092	0.0165	0.0048
Number of observations	48	49	53	54	28	29	35	36
R-Squared	0.013594	0.026299	0.063632	0.101146	0.088992	0.194942	0.127422	0.197463

Table A1: Capital shares from UNIDO and OECD data sets, 1990-2003

		OECD					
		SSIS				BSC	
		Wages and salaries		Employee Compensation		Employee Compensation	
Country	UNIDO	Basic Prices	Factor Prices	Basic Prices	Factor Prices	Basic Prices	Factor Prices
Albania	0.644						
Algeria	0.618						
Argentina	0.631						
Australia	0.591	0.583		0.490		0.440	
Austria	0.470	0.460	0.482	0.298	0.331	0.298	0.335
Bahamas, The	0.557						
Bangladesh	0.694						
Barbados	0.600						
Belgium	0.590	0.569	0.546	0.395	0.366	0.395	0.365
Belize	0.547						
Bolivia	0.889						
Bosnia and Herzegovina	0.756						
Botswana	0.723						
Brazil	0.802						
Bulgaria	0.660						
Burundi	0.801						
Cameroon	0.614						
Canada	0.597	0.602					
Central African Republic	0.480						
Chile	0.817						
China	0.486						
Colombia	0.833						
Costa Rica	0.643						
Cote d'Ivoire	0.633						
Croatia	0.723						
Cyprus	0.526						
Czech Republic		0.595	0.607	0.418	0.460		0.461
Denmark	0.378	0.353	0.355	0.316	0.316	0.316	0.316
Ecuador	0.824						
Egypt, Arab Rep.	0.673						
El Salvador	0.654						
Ethiopia	0.809						
Fiji	0.524						
Finland	0.559		0.569		0.450		0.452
France	0.403		0.491		0.276		0.276
Gabon	0.428						
Gambia, The	0.819						
Germany	0.380		0.383		0.234		0.227
Ghana	0.835						
Greece	0.583						
Honduras	0.524						
Hungary	0.635		0.636		0.493		0.491
Iceland	0.333						
India	0.682						
Indonesia	0.842						
Iran, Islamic Rep.	0.709						
Iraq	0.580						
Ireland	0.784		0.765		0.718		0.718
Israel	0.350						
Italy	0.477		0.592		0.415		0.414
Jamaica	0.662						
Japan	0.698		0.726				
Jordan	0.755						
Kenya	0.632						
Korea, Rep.	0.762	0.763		0.717		0.730	
Kuwait	0.748						

		OECD					
		SSIS				BSC	
		Wages and salaries		Employee Compensation		Employee Compensation	
Country	UNIDO	Basic Prices	Factor Prices	Basic Prices	Factor Prices	Basic Prices	Factor Prices
Latvia	0.666						
Luxembourg	0.447	0.476	0.467	0.394	0.382	0.421	0.384
Macedonia, FYR	0.466						
Malawi	0.687						
Malaysia	0.734						
Malta	0.531						
Mauritius	0.561						
Mexico	0.800	0.812		0.740		0.693	
Moldova	0.842						
Mongolia	0.758						
Morocco	0.625						
Namibia	0.673						
Nepal	0.785						
Netherlands	0.500	0.502	0.511	0.414	0.407	0.414	0.410
Netherlands Antilles	0.400						
New Zealand	0.522	0.519		0.504			
Niger	0.500						
Nigeria	0.927						
Norway	0.414	0.424	0.384	0.344	0.299	0.326	0.289
Oman	0.798						
Pakistan	0.778						
Panama	0.601						
Paraguay	0.782						
Peru	0.831						
Philippines	0.799						
Poland	0.665				0.519		0.537
Portugal	0.551	0.575	0.544	0.440	0.399	0.440	0.399
Puerto Rico	0.826						
Qatar	0.802						
Romania	0.622						
Russian Federation	0.685						
Senegal	0.642						
Sierra Leone	0.913						
Singapore	0.696						
Slovak Republic	0.564	0.554	0.536	0.388	0.365	0.452	0.422
Slovenia	0.511						
South Africa	0.464						
Spain	0.543		0.534		0.399		0.399
Sri Lanka	0.811						
Suriname	0.700						
Swaziland	0.718						
Sweden	0.561		0.536		0.328		0.321
Syrian Arab Republic	0.767						
Tanzania	0.778						
Thailand	0.848						
Trinidad and Tobago	0.622						
Tunisia	0.667						
Turkey	0.779	0.812		0.772		0.794	
United Kingdom	0.545	0.485	0.479	0.415	0.407	0.416	0.405
United States	0.659	0.691					
Uruguay	0.765						
Venezuela, RB	0.860						
Vietnam	0.718						
Yugoslavia	0.781						
Zambia	0.741						
Zimbabwe	0.719						