

Appendix B for Acemoglu-Guerrieri “Capital Deepening and Non-Balanced Economic Growth” (Not for Publication)

National Income Product Accounts Data

All the data used in the paper refer to US data and are from the Gross Domestic Product by Industry Data of the National Income and Product Accounts (NIPA). Industries are classified according to the North American Industrial Classification System (NAICS). Throughout, we use the 22-industry level of detail data. This level of aggregation enables us to extend the sample back to 1948. We exclude the Government and Private household sectors as well as Agriculture, forestry, fishing, and hunting and Real estate and rental. Real estate is excluded since it has a very high capital share due to the value of assets in this sector, which does not reflect the share of capital in the production function of the sector.

Employment is total full-time and part-time employment (FTPT), in thousands of employees, in the indicated industries. We use this measure of employment because it is the only one for which the Bureau of Economic Analysis (BEA) released estimates based on NAICS classification going back to 1948. All other employment measures are calculated using SIC up to 1997. Real value added is equal to expenditure-weighted sum of real value added. More specifically, let \mathcal{S} denote a subset of the industries. Then real value added in this subset of sectors at time t is calculated as:

$$\text{RVA}_t^{\mathcal{S}} = \frac{\sum_{j \in \mathcal{S}} E_{j,t} \cdot \text{RVA}_{j,t}}{\sum_{j \in \mathcal{S}} E_{j,t}},$$

where $\text{RVA}_{j,t}$ is real value added in sector j at time t in 2000 dollars, calculated as the product of the real value added index (VAQI), which is chain weighted, and the year 2000 current-dollar value of the corresponding series (VA) divided by 100, and $E_{j,t}$ is expenditure on sector j at time t , approximated by nominal value added.

The share of capital in national income is computed as value added minus total compensation to employees over value added, i.e.,

$$\text{capital share}_t = \frac{E_t - W_t}{E_t}, \tag{B1}$$

where E_t is total nominal value added (VA) at time t and W_t is total nominal compensation to employees (COMP) at time t .

The value of initial capital stock is the initial value of private fixed assets in current dollars.

As discussed in the text, in Figure 1, and in Section 3, sectors are classified according to their capital intensity. Capital intensity in each sector is calculated as:

$$\text{capital share}_{j,t} = \frac{E_{j,t} - W_{j,t}}{E_{j,t}}, \quad (\text{B2})$$

where $E_{j,t}$ is nominal value added in sector j at time t and $W_{j,t}$ is nominal compensation to employees in sector j at time t . Because of the change in the classification of industries before and after 1987, we compute the capital share of each industry as the average between 1987 and 2004, which enables us to use the consistent NAICS classification for the compensation series (before 1987 this variable is only available with the SIC classification). Industries are then ranked according to their average capital intensity as shown in Table B1 below, and the capital share cutoff level for separating industries into high and low capital intensity industries is chosen to create two groups of industries with approximately 50% of employment each. According to this ranking, *low capital intensity industries* are: Construction; Durable goods; Transportation and Warehousing; Professional, scientific, and technical services; Management of companies and enterprises; Administrative and waste management services; Educational services; Health care and social assistance; Other services, except government. *High capital-intensive industries* are: Mining; Utilities; Non-durable goods; Wholesale; Retail trade; Information; Finance and Insurance; Arts, Entertainment, and Recreation; Accommodation and food services. These industries, their average capital shares and their allocations to sectors 1 and 2 are shown in Table B1.

Table B1: Industry Capital Shares

INDUSTRY	SECTOR	CAPITAL SHARE
Educational services	1	0.10
Management of companies and enterprises	1	0.20
Health care and social assistance	1	0.22
Durable goods	1	0.27
Administrative and waste management services	1	0.28
Construction	1	0.32
Other services, except government	1	0.33
Professional, scientific, and technical services	1	0.34
Transportation and warehousing	1	0.35
Accommodation and food services	2	0.36
Retail trade	2	0.42
Arts, entertainment, and recreation	2	0.42
Finance and insurance	2	0.45
Wholesale trade	2	0.46
Nondurable goods	2	0.47
Information	2	0.53
Mining	2	0.66
Utilities	2	0.77

Note: Average capital shares, 1987 and 2005, computed according to equation (B2).

One might worry that the capital intensity of different industries may change over our sample period because of technological reasons or because of changes in relative factor prices. The next two tables show that the classification of industries according to capital industry is highly stable over time. These two tables show the Spearman's rank correlation matrix among alternative rankings of industries based on average capital share in different time periods and using different industry classifications in order to document this point. In these two tables, we denote the ranking based on average capital share between dates t and t' by $\sigma_{t,t'}$. As noted in the text, the NAICS classification starts in 1987, so we can only compare the stability of capital intensity rankings between 1987 and 2005 using the NAICS data. To supplement this, we compute capital shares choosing data for SIC industries matched to the NAICS classification (using the correspondence tables constructed by the US Census Bureau). This enables us both to show the similarity of the rankings according to NAICS and SIC classifications and also to extend the comparison of the classifications to 1948 (though ending in the year 2000, since this is the last available year for the SIC classification). We denote the rankings between dates t and t' that use data based on SIC by $\hat{\sigma}_{t,t'}$.

Table B2 reports the Spearman’s rank correlation matrix among our benchmark ranking, $\sigma_{87,05}$, that averages capital share over all the years for which the NAICS data are available, rankings that use the same data for 5 year subperiods (in particular, between 1987 and 1991; 1992 and 1997; and so on), and the rankings using the SIC data for the period 1948-2000. This table shows a high degree of correlation between the NAICS rankings across different subperiods. In particular, all of the correlation indices are greater than 0.94. The last row of the table also shows that there is a significant correlation between the SIC ranking using data between 1948 and 2000 and the NAICS classification, though now the correlation is somewhat lower, around 0.75.

Table B2: Spearman Correlation Matrix for Capital-Intensity Rankings (NAICS)

	$\sigma_{87,05}$	$\sigma_{87,91}$	$\sigma_{92,96}$	$\sigma_{97,01}$	$\sigma_{02,05}$	$\hat{\sigma}_{48,00}$
$\sigma_{87,05}$	1.00					
$\sigma_{87,91}$	0.96	1.00				
$\sigma_{92,96}$	0.99	0.98	1.00			
$\sigma_{97,01}$	1.00	0.95	0.98	1.00		
$\sigma_{02,05}$	0.99	0.94	0.97	0.99	1.00	
$\hat{\sigma}_{48,00}$	0.73	0.75	0.72	0.76	0.74	1.00

Note: This table reports the Spearman correlation matrix for different capital intensity rankings of the NAICS at the 22-industry level of detail, measuring each industry’s capital intensity as the average value over the whole sample available with the NAICS data, 1987-2005 ($\sigma_{87,05}$), and over 5 year subperiods, 1987-1991 ($\sigma_{87,91}$), 1992-1996 ($\sigma_{92,96}$), and so on. The last row ($\hat{\sigma}_{48,00}$) is obtained using SIC data for the whole sample available with SIC data, 1948-2000, and matching the industries based on the SIC classification to the NAICS classification using the correspondence tables constructed by the US Census Bureau. See text for details.

Table B3 reports the Spearman’s rank correlation matrix among rankings that use SIC data only, again averaging capital shares over 5 years periods. This table also shows a considerable amount of stability in rankings based on capital intensity. Most correlation coefficients are above 0.8, though when we compare the rankings in the late 1990s to those in the early 1950s, the correlation becomes as low as 0.50.

Table B3: Spearman Correlation Matrix for Capital-Intensity Rankings (SIC)

	$\hat{\sigma}_{48,00}$	$\hat{\sigma}_{48,52}$	$\hat{\sigma}_{53,57}$	$\hat{\sigma}_{58,62}$	$\hat{\sigma}_{63,67}$	$\hat{\sigma}_{68,72}$	$\hat{\sigma}_{73,77}$	$\hat{\sigma}_{78,82}$	$\hat{\sigma}_{83,87}$	$\hat{\sigma}_{88,92}$	$\hat{\sigma}_{93,97}$	$\hat{\sigma}_{98,00}$
$\hat{\sigma}_{48,00}$	1.00											
$\hat{\sigma}_{48,52}$	0.60	1.00										
$\hat{\sigma}_{53,57}$	0.77	0.95	1.00									
$\hat{\sigma}_{58,62}$	0.77	0.94	0.99	1.00								
$\hat{\sigma}_{63,67}$	0.77	0.92	0.96	0.98	1.00							
$\hat{\sigma}_{68,72}$	0.86	0.88	0.96	0.97	0.98	1.00						
$\hat{\sigma}_{73,77}$	0.88	0.83	0.94	0.95	0.93	0.97	1.00					
$\hat{\sigma}_{78,82}$	0.94	0.76	0.90	0.90	0.88	0.94	0.98	1.00				
$\hat{\sigma}_{83,87}$	0.97	0.73	0.88	0.87	0.86	0.92	0.94	0.98	1.00			
$\hat{\sigma}_{88,92}$	0.96	0.56	0.74	0.74	0.71	0.82	0.85	0.90	0.94	1.00		
$\hat{\sigma}_{93,97}$	0.99	0.50	0.69	0.69	0.69	0.80	0.82	0.89	0.93	0.96	1.00	
$\hat{\sigma}_{98,00}$	0.98	0.50	0.69	0.69	0.71	0.81	0.81	0.88	0.92	0.92	0.99	1.00

Note: This table reports the Spearman correlation matrix for different capital intensity rankings of the NAICS at the 22-industry level of detail, measuring each industry's using SIC data over different horizons. We compare rankings obtained averaging industries' capital share over the whole sample available with SIC data, 1948-2000 ($\hat{\sigma}_{48,00}$), and over 5 year subperiods, 1948-1952 ($\hat{\sigma}_{48,52}$), 1953-1957 ($\hat{\sigma}_{53,57}$) and so on. Industries based on the SIC have been matched to the industries based on the NAICS using the correspondence tables constructed by the US Census Bureau. See text for further details.

We next check the robustness of the pattern shown in Figure 1 in the Introduction. Recall that this pattern, which involves more rapid growth of real output in the high capital-intensive sector and more rapid growth of nominal output and employment in the low capital-intensive sector, is a distinctive prediction of our model. In particular, we would like to ensure that this pattern is not an artifact of the exact cutoff we use in the classification (which also determines the industries that are in the different groups), the specific source of data, and sample period. Table B4 documents the robustness of this pattern by showing the relative growth rate of real value added (output), employment and nominal value added in the high capital intensity industries (compared to low capital intensity industries) in each case with a different classification. The first column corresponds to our benchmark classification and shows that between 1948 and 2005, real value added in high capital intensity industries has grown by 19% more than in low capital intensity industries. In the meantime, employment in these high capital intensity industries has declined by 22% and nominal value added has declined by 18% relative to low capital intensity industries. Recall that our benchmark classification

placed approximately 50% of employment in each of the two sectors. The second and third columns report the same statistics, but using alternative cutoffs so that 60% (column 2) and 40% (column 3) of total employment is in the industry grouping with low capital intensity. In the former case, Accommodation and food services move into the low capital intensity group. In the latter, Transport and warehousing move into the high capital intensity group. In both cases, however, the general patterns remain very similar to the benchmark. For example, with the 60% cutoff, there is a 21% increase in the relative (real) value added of high capital intensity industries, a 36% decline in their relative employment, and a 19% decline in their nominal output. With the 40% cutoff, the relative increase in real value added is 44%, the relative decline in employment is 19%, and the relative decline in nominal output is 9%. Columns 4 and 5 show similar results with the SIC data for the periods 1948-2000 and 1977-2000. We do not have real value added data before 1977 with the SIC classification, so the first row is missing in the fourth column. The remaining rows in these columns are again similar to the benchmark, though when focusing on the narrower sample of 1977-2000, the relative increase in real value added is only 2%. Finally, in column 6 we report the results for the longer horizon 1929-2000. The only measure of nominal value added by industry available starting in 1929 is data on income by industry from the *Historical Statistics of the United States* (the original source for these data is the BEA). The series of full-time and part-time employees by industry in the NIPA tables also extends back to 1929. As in column 4, we do not have real value added data, so that the first row of this column is missing. The other two rows show a pattern consistent with the rest of the table, with a more rapid growth of employment and nominal value added in the less capital-intensive industries than in more capital-intensive industries.

Table B4: US Data robustness checks

	(1) <i>Benchmark</i> <i>(1948-2005)</i>	(2) <i>Cutoff 60%</i> <i>(1948-2005)</i>	(3) <i>Cutoff 40%</i> <i>(1948-2005)</i>	(4) <i>SIC Data</i> <i>(1948-2000)</i>	(5) <i>SIC Data</i> <i>(1977-2000)</i>	(6) <i>SIC Data</i> <i>(1929-2000)</i>
growth % Y_2/Y_1	19%	21%	44%	<i>n.a.</i>	2%	<i>n.a.</i>
growth % L_2/L_1	-22%	-36%	-19%	-27%	-20%	-39%
growth % Y_2^N/Y_1^N	-18%	-19%	-9%	-24%	-9%	-37%

Note: Column 1 in Table B4 reports the growth rate of real output (real value added), employment (full-time and part-time employees) and nominal output (value added) in the high capital intensity sector relative to the low capital intensity sector, constructed according to our benchmark classification shown in Table B1. Columns 2 and 3 report the same statistics using alternative sectoral classifications, where the capital share cutoff for dividing industries into high and low capital intensity sectors is chosen to create a group of high-capital intensity industries including approximately 60% and 40% of total employment, instead of 50% as in the benchmark. The last three columns report the same statistics for the benchmark sectoral classification using the SIC data for different sample periods. See text for further details.

Finally, we have also looked for other sources of data to go back further than 1929. *The Historical Statistics of the United States* provides a number of employment series, though in most cases data are only available at a higher level of aggregation than the NIPA and the related data we have used so far. The series with the finest industry classification in the *Historical Statistics of the United States* is based on Sobek (2001) and covers only the time period 1910-1990, which is only slightly earlier than the data we have reported in Table B4. These data are available in 10 year intervals and use the 1950 Census industry classification. Matching these to the NACIS classification, we computed employment growth in the high and low capital intensity sectors.¹⁴ The results from this exercise are consistent with those in Table B4 and show that employment in high capital intensity industries declines by about 10% relative to employment in low capital intensity industries between 1910 and 1990. The remaining sources of data on employment by industry have higher levels of aggregation, making the type of exercise we are performing here more difficult. One source of data on employment by industry is the Bureau of Labor Statistics, which covers the period 1919-1999. However, a significant fraction of the industries are missing before 1939. We matched the industry classification of this dataset to the NACIS classification,¹⁵ and computed employment growth in high and low capital intensity

¹⁴One of the 1950 census industry groups, “Transportation and Communication,” combines two industries that are in different groups, thus for this exercise we have dropped the Transportation and Communication industry.

¹⁵With this classification, for the same reason as with the Sobek data, we had to drop the composite industry

industries. The results show that employment in high capital intensity industries declines by about 70% relative to employment in low capital intensity industries between 1939 and 1999. The *Historical Statistics of the United States* also provides two other series, one from Lebergott (1964) and Weiss (1992) covering the period 1800-1960, and the other from Lebergott (1984) for 1900-1940. Unfortunately, given the more crude industry classifications, we were not able to create a consistent match with to the NAICS classifications, especially with the former dataset. It is also possible that the ranking of industries according to capital share, which appears to be fairly stable in the postwar era, may be quite different when we go back before 1900. In any case, using these data we were not able to obtain consistent patterns on relative employment growth across high and low capital intensity industries. We believe that this reflects the less fine industry aggregation in these data and the possible changes in the ranking according to capital intensity, though it may also be due to data quality or because the patterns we have documented for the past 80 years do not apply to the period before.

Additional References for Appendix B

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