Online Appendix to "The Industry Anatomy of the Transatlantic Productivity Growth Slowdown: Europe Chasing the American Frontier"

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Datasets Utilized

The vintages of the annual data used in this project were downloaded between May, June, and early July of 2018, and consist of the 2012 and 2017 releases of the EUK-LEMS datasets. These data includes quantities, indices, and pre-calculated growth rates of output, capital, labor, and productivity, among other variables. With the exception of value added and a handful of indices (usually labor and capital services), labor productivity and growth rate data generally start post-1995 in the 2017 release. However, these data were also available in the 2012 releases, which estimated values back until 1970. To gain a full picture of the data for each country and industry back us far as possible, it was necessary to link the older release of the KLEMS from 2012 with the 2017 dataset.

Towards the end of July, EUKLEMS revised the 2017 release, in the process eliminating many pre-1995 datapoints. Since we downloaded the data prior to this revision, we have retained many of the now-missing pre-1995 values from the 2017 release, though these are likely available to some extent in the 2012 releases.

Merging the KLEMS Data Old to New

The primary method of merging was ratio linking, which was used for merging indices and quantities. For each variable in a given industry and country, we took the earliest value available in the 2017 data and identified the observation in the older dataset corresponding to the same variable.

We then computed the ratio of the 2017 datapoint to the 2012 datapoint for that year and multiplied all prior observations by this ratio. The consequence of using this procedure was that growth rates were preserved across the old and new data without any jumps or discontinuities at the point of merging.

In the case of pre-calculated growth rates, datapoints were simply appended. That is, if time t were the last year that the growth rate for a variable was available in the 2017 data, then at time t-1 and earlier, the growth rates for 2012 were used without any transformation. This method of appending growth rates is equivalent to ratio-linking indices, since ratio-linking ultimately multiplies the earlier subset of data by a uniform constant, preserving growth rates.

Growth Accounting and Capital/Hour Contributions

The EUKLEMS data provide a handful of pre-calculated growth rates in its releases. These include:

1. *VA_Q*, growth rate of real value added;
2. *VAConTFP*, contribution of TFP growth to real value added growth;
3. *VAConLC*, contribution of labor composition growth to *VA_Q*;
4. *VAConH*, contribution of hours growth to *VA_Q*;
5. *VAConKIT*, contribution of ICT capital services growth to *VA_Q*;
6. *VAConKNIT*, contribution of non-ICT capital services growth to *VA_-Q*;
7. *VAConK*, contribution of capital ser-

vices growth to *VA_Q*, which is the sum of *VAConKIT* and *VAConKNIT*;
8. and *LP1_Q*, the growth rate of value added per hour as calculated by the sum of contributions

These contributions to value added per hour are governed by the following equation:

$$VAQ_t = VAConTFP_t + VAConLC_t$$
$$+ VAConH_t + VAConKIT_t$$
$$+ VAConKNIT_t \quad (1)$$

Let s^{IT} be the share of ICT capital services in production, s^{NIT} the share of non-ICT capital, y value added growth, lc labor composition growth, h hours growth, k^{IT} ICT capital growth, and k^{NIT} non-ICT capital growth. Then, this equation can also be written as:

$$y_t = tfp_t + (1 - s^{IT} - s^{KIT})(lc_t)$$
$$+ (1 - s^{IT} - s^{KIT})(h_t)$$
$$+ s^{IT} k_t^{IT} + s^{NIT} k_t^{NIT} \quad (2)$$

Extensive *VAConKIT* and *VAConKNIT* data were not available for the U.S., so we primarily utilized *VAConK* by adding together *VAConKIT* and *VAConKNIT*. For consistency, we also did this with the Europe data. Because of the identity above, this equation can be simplified to:

$$y_t = tfp_t + (1 - s)(lc_t)$$
$$+ (1 - s)(h_t) + sk_t \quad (3)$$

where s is defined so that $sk_t = s^{IT}k_t^{IT} + s^{NIT}k_t^{NIT}$.

On the other hand, *LP1_Q* (or *lp*), which is value added per hour, can be written as:

$$LP1Q_t = lp_t = y_t - h_t = tfp_t$$

$$+ (1-s)(lc_t) + (1-s)(h_t)$$

$$+ sk_t - h_t = tfp_t + (1-s)(lc_t)$$

$$+ s(k_t - h_t)$$

$$= VAQ_t - h_t = VAConTFP_t$$

$$+ VAConLC_t + s(k_t - h_t) \quad (4)$$

Concretely, labor productivity growth is TFP growth + the contribution of labor composition + the contribution of capital per hour, i.e. capital's share multiplied by the growth rate of capital less the growth rate of hours. The contribution of capital per hour will be denoted by *ConK/H*.

One way to calculate *ConK/H* is to use nominal expenditure on labor and capital to retrieve labor's share, multiply the contributions of hours by $\frac{s}{1-s}$, and subtract this from VAConK. However, since *LP1_-Q*, *VAConTFP*, and *VAConLC* are already given by KLEMS, we can simply calculate ConK/H as a residual. That is,

$$LP1Q_t - VAConTFP_t$$

$$- VAConLC_t = ConK/H_t \quad (5)$$

We indeed employ this method in the data to calculate the contribution of capital per hour. Not only does this satisfy the identity above and allow the given contri-butions to add up to labor productivity, it also prevents any error related to computing *ConK/H* by hand using labor's share.

Calculating Earlier LP1_Q Values

There are two labor productivity variables of interest available in the KLEMS data: "*LP1_Q*" and "*LP_I*" — while the former is a growth rate calculated bottom-up as a sum of contributions, the latter is an index that directly divides value added by the hours index. The former is available only in the 2017 release, while the latter is available in both the 2012 and 2017 datasets. Since this project is concerned with breaking down labor productivity growth into its components, we utilize *LP1_Q* instead of *LP_I*.

However, since *LP1_Q* is unavailable in the 2012 data, we use the growth of the *LP_I* index to proxy for any earlier years where *LP1_Q* is unavailable — we append the growth rate of *LP_I* to any data points prior to the earliest year where *LP1_Q* is available.

A Note on Anomalous UK Data

Upon a cursory observation of the UK KLEMS series for *LP1_Q*, the year 1995 sticks out as an anomaly: the data source has labor productivity growth for the total economy listed at 23.5 percent, mining at 58 percent, and much of manufacturing above 15 percent. Although this result is likely due to an error in the original dataset, the data cannot be properly corrected if the source of that error is unknown. To correct for this problem, we cal-

culate the level of UK labor productivity in 1995 as the average of the values in 1994 and 1996.

Aggregating the Commodities and Services industries

The KLEMS data are divided into two types of industries: commodities producing, alphanumeric industries A through F (Agriculture through Construction) and services producing industries G through S (Wholesale & Retail through Arts & Entertainment). To examine trends within both of these types of industries, we create aggregates for "Commodities" and "Services" by combining data from different subindustries into a single aggregate. In the case of nominal variables like gross output and value added, we simply add the values of each sub-industry. For indices and growth rates, we compute a weighted sum of the values of each sub-industry's index or growth rate, where the weights are the shares of nominal value added of that industry in the entire value added of an aggregate. For example, the weight for the commodities producing "Agriculture" industry would be the value-added of Agriculture divided by the sum of value added for industries Agriculture through Construction, i.e. the total value-added of commodities.

Creating the EU-10 Aggregate

To examine productivity behavior in a European aggregate, we use the same weighting technique as described above for Commodities and Services. In this case, the source of our weights are the real PPP-adjusted GDPs of European countries, taken from the Conference Board Total Economy (TED) database, divided by the sum of those GDPs. We utilize a procedure of moving weights; since the data for different European variables start at different times, we take account of whether those countries are available in the dataset before assigning weights. For example, for the year 1974, only Germany, Italy, and the UK have data available for TFP growth. Because of this, we take the weight for Germany in 1974 to be the GDP for Germany divided by the sum of the GDPs of Germany, Italy, and the UK (rather than the entirety of the EU-10). As more countries enter into the dataset, we incorporate these new countries into the weights: when the Netherlands enters the dataset in 1980, for example, the weight for Germany is the GDP for Germany divided by the sum of the GDPs of Germany, Italy, the UK, and the Netherlands.

European Value Added

Although it is straightforward to convert growth rates or indices to aggregates with the TED GDP weights, calculating nominal value added poses a challenge, as the EU KLEMS country-level datasets are all in terms of millions of national currency. To circumvent this issue, we used the TED GDP data as representative of the KLEMS Total Economy aggregate ("TOT") and normalized each country's industry's value-added to TED PPP units.

To calculate PPP adjusted value added for country j and industry i, we took the industry's share of TOT value added and multiplied it by the TED GDP for that

country:

$$VA_{i,j}^{adj} = \frac{VA_{i,j}^{KLEMS}}{VA_{TOT,j}^{KLEMS}} GDP_j^{TED}$$

Then calculating aggregate value-added for the EU-10 only required summing up the VA terms of each individual country.

Extending the US Further: The WorldKLEMS Dataset

Although EUKLEMS mostly has U.S. growth rates back until 1977 (and some nominal indices back to 1970), a dataset from Dale Jorgensen and his collaborators on the WorldKLEMS website provides detailed data on the US back until 1947 in a similar format to the EUKLEMS data. We use the 2013 release of the data; the vintage was downloaded in mid-July of 2018. The range of this data is from 1947-2010. Instead of linking these data directly to the 2017 release of EUKLEMS, we first linked the earliest data in the 2017 release to the earliest points in the 2012 release, and then linked the WorldKLEMS data to the earliest point of the 2012 data.

The primary limitation of this World-KLEMS data is that the industry categories use an older revision of the ICIS (Rev 3), while the EUKLEMS data uses Rev 4. Hence, we have linked older industry categories into the newer ones. Table A1 details those re-classifications of data — some were left unlinked, while others were formed by aggregation. Aggregation of smaller industries into larger ones was done in the same way as the commodities and services aggregates discussed above, using value added weights for indices and growth rates and direct addition for nominal quantities.

The only industries that were could not be successfully merged were 58-60, 61, 62-63, M-N, R, and S, indicated in orange in Table A1. Of these, the only unmarked industry which was consequential to our analysis was M-N, Professional Services. For that reason the Professional Services industry is omitted for the period 1950-72 in several of the tables and figures.

Table A1: WorldKLEMS Industries and Merges with EUKLEMS Data

WorldKLEMS Data	EUKLEMS Data	
WorldKLEMS Code	EUKLEMS Code	Industries Merged from WorldKLEMS
TOT	TOT	TOT
MARKT	MARKT	MARKT
AtB	A	AtB
C	B	C
D	C	D
15t16	10-12	15t16
17t19	13-15	17t19
20	16-18	20, 21t22
21t22	19	23
23t25	20-21	24
23	22-23	25, 26
24	24-25	27t28
25	26-27	30t33
26	28	29
27t28	29-30	34t35
29	31-33	36t37
30t33	D-E	E
34t35	F	F
36t37	G	G
E	45	50
F	46	51
G	47	52
50	H	60t63
51		
52		
H	I	H
I	J	64
60t63	58-60	
64	61	
JtK	62-63	
J	K	J
K	L	K
70	M-N	
71t74	O-U	LtQ
LtQ	O	L
L	P	M
M	Q	N
N	R-S	O
O	R	
	S	