

ONLINE APPENDIX

Why is Europe Falling Behind? Structural Transformation and Services' Productivity Differences between Europe and the U.S.

1 Measurement of Sectoral Labor Productivity in Each European Country

Figures 1 and 2 plot the productivity levels for each sector in each country relative to the United States for the first and last sample periods. Figure 1 shows three different patterns for agriculture, manufacturing and services. First, the agricultural productivity levels (relative to the U.S.) were either stagnant or relative higher in 1970 compared to 2009 with the exceptions of France and Germany, where minor improvements were experienced. The productivity levels are surprisingly high for the United Kingdom, but still they show an important fall in relative productivity between 1970 and 2009. However, these differences do play a minor role in the aggregate labor productivity because the structural transformation has reduced the agricultural labor shares dramatically for each of these countries during our sample period.

Second, European countries have been catching up with the U.S. from 1970 to 2009 in manufacturing productivity without exception, although no country reached the U.S. labor productivity during our sample period. Whereas Austria, Belgium, France and the Netherlands experienced about a two-fold increase in manufacturing productivity, the productivity growth in manufacturing was more modest in Germany, the United Kingdom, Italy and Spain.

Last, with the notable exception of Belgium, no European country experienced a significant catch up in services relative to the U.S.; most countries have remained either stagnant

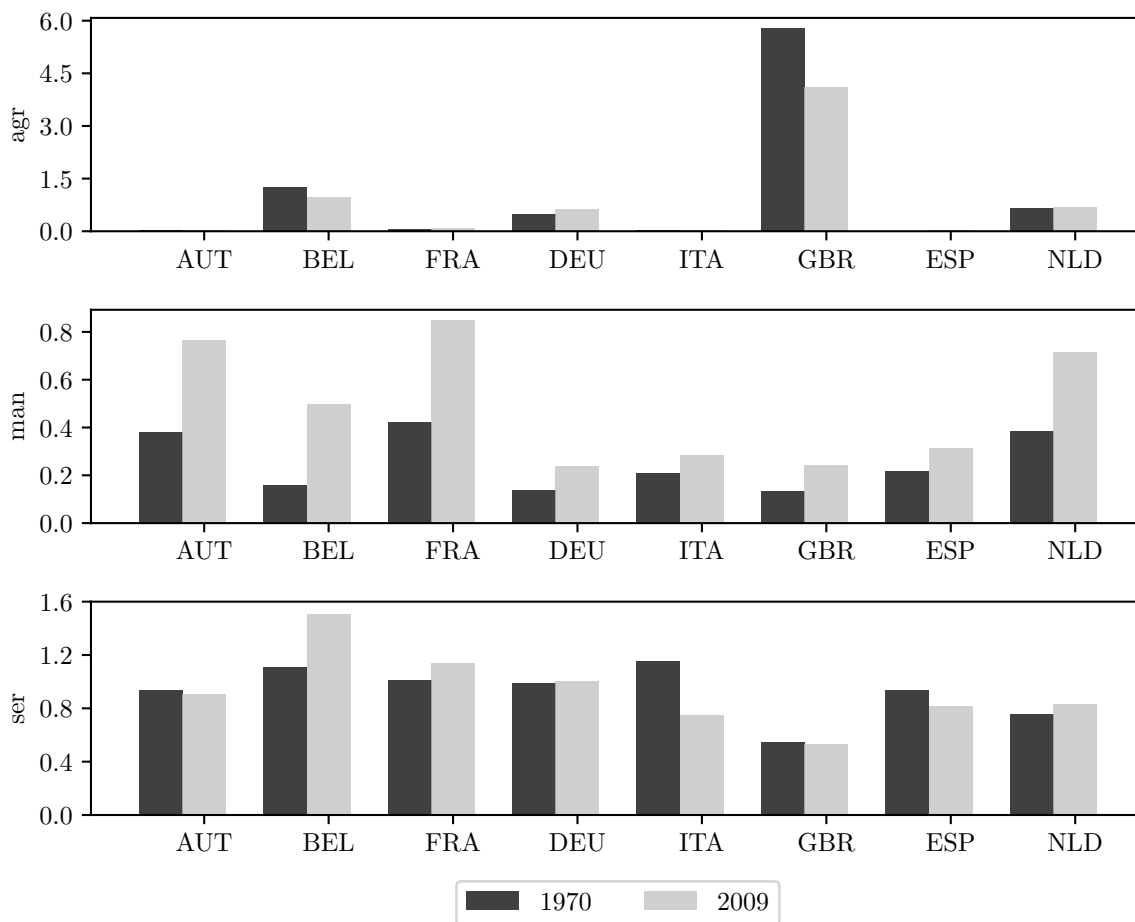


Figure 1: Recovered sectoral labor productivity levels in 1970 and 2009 for major European countries relative to the sectorial U.S. labor productivity level. Agriculture and manufacturing.

or have experienced a decline.

Figure 2 plots the relative labor productivity between 1970 and 2009 for each sector within services and for each European country. Within services, European countries are in generally more productive than the U.S. in telecommunications, education, and health services¹, but they are significantly less productive in wholesale and retail trade. Moreover,

¹It is interesting to note that health services are much less productive in the U.S. than in Europe. In addition, productivity gap widened significantly during the sample period. The labor productivity in this sector is a source of major concern for the U.S. as it employed approximately 17 percent of the labor force in 2009. Nevertheless, the finding that Europe is more productive than the U.S. in health services, as well as in education, should be taken with some caution. Whereas in the U.S. both education and health are services mainly provided by the private sector, in most European countries education and health systems are managed by the government, and the labor hired in these two sub-sectors qualifies as public employment. This fact raises potential concerns on the extent of comparability of sectoral productivity in education and health between Europe and the U.S., even though we use our model to correct potential measurement biases

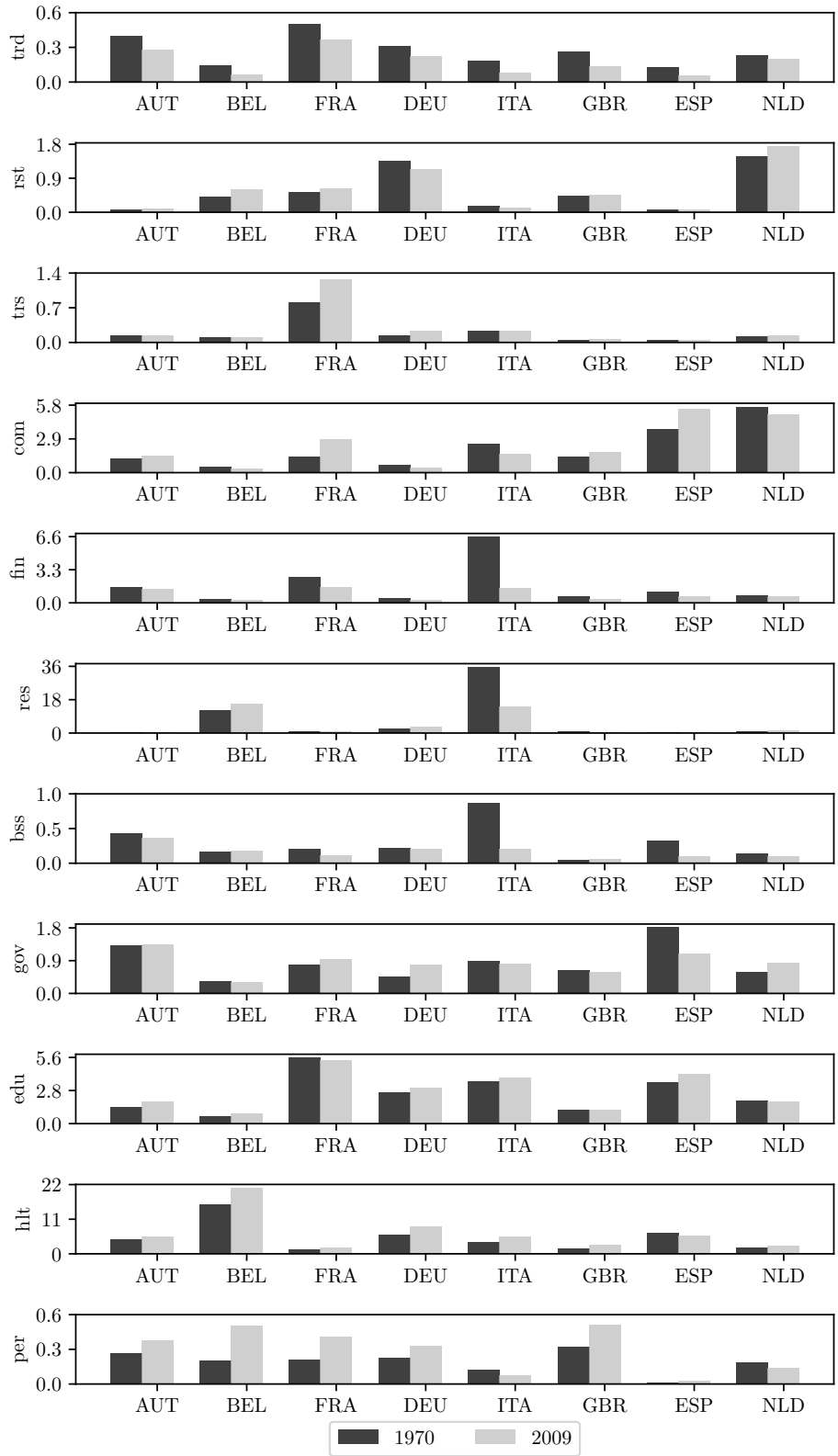


Figure 2: Recovered sectoral labor productivity levels in 1970 and 2009 for major European countries relative to the sectorial U.S. labor productivity level. Services.

the productivity levels for this sector have widen out between 1970 and 2009 in every single European country.

The sector of business services in Europe is also less productive compared to the U.S. without exception, although the productivity gaps have not widened in every country. For instance, Germany and Belgium did not experienced a fall in the relative productivity, but Italy on the other hand experienced a dramatic increase in the productivity gap between 1970 and 2009 in business services relative to the U.S. The employment shares of these two sectors have been relatively large in the years of our study, hence, the levels of labor productivity in wholesale and retail trade and in business services do matter significantly for the differences in aggregate productivity between Europe and the U.S. For the rest of the service sectors the evidence is mixed across countries. An important case to highlight is financial services. Austria, France, Italy and Spain were countries with more productive financial services compared to the U.S. in 1970, and in spite of the sharp drop in productivity, they were still more productive in 2009, except for the case of Spain. Nevertheless, without exception, all countries in Europe experienced an important reduction in their productivity relative to the U.S. in financial services.

2 Findings of the Counterfactual experiments for each European country

Table 2 illustrates our findings when we feed the labor productivity growth rates from 1970 to 2009. The top panel of Table 2 show the results of this exercise when a European country counterfactually experiences the observed labor productivity growth rate in the U.S., in order to assess changes in aggregate labor productivity as a consequence of changes in the productivity of a single sector. Each row of the top panel represents one of the 13 sectors in our model economy, and each column represents a European country with the exception

in the available data.

of the last column, which represents Europe as a weighted average of the countries in our European sample.

The results for agriculture are not conclusive. Whereas some countries would have performed better such as Belgium and the Netherlands, for the rest of the European countries our model predicts that the aggregate labor productivity level would be actually lower. Nevertheless, with the exception of the Netherlands, these results have minimal implications for aggregate productivity.

On the other hand, the message for manufacturing is not ambiguous. Had the European countries experienced the U.S. labor productivity growth in manufacturing during our sample period, their aggregate labor productivity in 2009 would be lower regardless of the country.

Table 1: Counterfactual 1: Keeping the U.S. pace

	AUT	BEL	FRA	DEU	ITA	GBR	ESP	NLD	Europe
Counterfactual: $\gamma_i = \gamma_i^{USA}$									
agr	-0.1	1.3	-1.6	-1.2	-0.2	-0.2	-1.5	6.3	0.4
man	-11.0	-14.3	-12.2	-7.6	-4.2	-9.2	-4.9	-7.7	-8.9
trd	4.3	6.5	3.9	3.4	7.7	1.8	6.3	7.1	5.1
rst	-0.0	-0.1	-1.6	-1.2	0.1	-0.4	-0.3	-0.3	-0.5
trs	-1.5	-1.0	-0.5	0.6	0.9	-0.6	0.6	-0.2	-0.2
com	-1.2	1.5	-7.0	2.0	4.8	2.6	-7.0	-2.5	-0.9
fin	0.6	1.0	3.7	2.4	17.7	1.0	2.2	1.9	3.8
res	-0.3	-0.7	-0.3	-0.7	4.8	-0.5	0.4	0.3	0.4
bss	1.3	-0.2	4.0	0.6	11.7	2.6	6.6	-2.7	3.0
gov	-0.2	0.4	-1.0	-2.8	0.5	-1.8	3.5	0.4	-0.1
edu	-1.7	-1.4	0.5	-1.4	-0.9	0.4	-1.7	-0.1	-0.8
hlt	-3.7	-10.9	-5.9	-10.1	-7.3	-4.7	3.8	-8.4	-5.9
per	-1.0	-2.3	-1.8	-1.1	1.2	0.9	-1.5	-1.3	-0.9
$\gamma_i = \gamma_{i,i \in \text{Services}}^{USA}$	-3.5	-7.7	-6.4	-8.6	44.7	1.2	13.3	-6.1	3.4
$\gamma_i = \gamma_{i,\forall i}^{USA}$	-14.3	-20.4	-19.5	-16.8	38.6	-8.4	5.9	-7.5	-5.3

Notes: Counterfactual sectoral productivity growth is the one experienced by the U.S. between 1970 and 2009.

Naturally, Europe as a whole would have had a lower aggregate productivity. The upper bound of this decline is Italy, with a predicted drop of 4.2%, whereas the lower bound is Belgium, with an staggering drop of 14.7%. Manufacturing is not responsible for the European underperformance *vis-à-vis* the U.S. On the contrary, it helped Europe in its path toward convergence during our sample period.

With regards to services, our counterfactual experiment suggests that the slowdown in the aggregate labor productivity comes mainly from three sectors: wholesale and retail trade (trd), financial services (fin) and business services (bss). It also suggests that Europeans are significantly more productive in health services (hlt). Let's discuss the results of each of these four sectors in detail (for the rest of the sectors the results are ambiguous depending on the country, and the aggregate effect on labor productivity is not large).

First, during the sample period, the aggregate labor productivity in every single European country would have increased significantly had the wholesale and retail trade sector experienced the U.S. labor productivity growth in Europe. The lower bound for this prediction is for Great Britain, with an increase in aggregate labor productivity of 1.8%, whereas the upper bound is Italy with an increase of 7.7%. The prediction for Europe indicates that this sector alone would have been responsible for an aggregate labor productivity 5.1% higher than our benchmark prediction in 2009.

Second, financial services also would have helped to reduce the labor productivity gap had the European countries experienced the same labor productivity growth observed in this sector for the U.S. Europe as a whole would have had a labor productivity level 3.8% higher than our benchmark prediction. Furthermore, every single European country would have experienced higher aggregate labor productivity if their financial services were as productive as in the U.S., although the results for Italy are substantially higher to the rest of Europe.

Third, with the exception of Belgium and the Netherlands, the labor productivity would also be higher for the European countries if they have had the U.S. labor productivity growth in business services. Once again, the order of magnitude of this result is substantially higher

Table 2: Counterfactual 2: Taking off with the U.S.

	AUT	BEL	FRA	DEU	ITA	GBR	ESP	NLD	Europe
Counterfactual:									
$\gamma_i = \gamma_i^{USA}$									
agr	-0.3	1.3	-0.8	-1.5	-0.2	0.3	-0.2	-1.0	-0.3
man	-2.8	-1.5	-1.4	-1.3	3.1	0.9	2.5	-1.7	-0.3
trd	4.0	4.3	4.2	2.3	4.2	1.6	3.0	2.4	3.2
rst	0.5	0.2	-0.1	-0.7	0.1	-0.2	0.7	-0.1	0.0
trs	-0.2	-0.1	0.1	0.6	0.3	0.6	0.8	-0.4	0.2
com	-0.9	1.0	-4.2	-0.1	-3.3	-6.5	-3.0	-5.9	-2.9
fin	-1.0	-0.5	1.7	1.7	1.0	0.7	0.3	-0.7	0.4
res	0.2	2.2	-0.0	0.0	2.6	0.3	0.9	0.4	0.8
bss	0.9	2.2	2.6	3.1	4.5	2.8	3.7	-0.8	2.4
gov	0.1	0.1	-0.5	-0.8	-1.1	-0.5	-0.4	-0.6	-0.5
edu	-0.4	0.4	0.9	0.2	0.1	1.5	-2.4	0.4	0.1
hlt	-1.9	-3.4	-1.2	-8.1	-1.6	-0.2	0.4	-5.7	-2.7
per	-0.5	-0.7	-0.8	-0.4	0.4	-0.3	-0.4	-0.7	-0.4
$\gamma_i = \gamma_{i,i \in \text{services}}^{USA}$	0.7	5.7	2.6	-2.3	7.4	-0.3	3.6	-11.6	0.7
$\gamma_i = \gamma_{i,\forall i}^{USA}$	-2.4	5.4	0.4	-5.2	10.6	0.9	6.0	-14.2	0.2

Notes: Counterfactual sectoral productivity growth is the one experienced by the U.S. between 1990 and 2009.

for Italy compared to the rest of Europe.

Last, our results also illustrate that Europe would have had lower aggregate productivity have they had the U.S. labor productivity growth observed in health services. With the exception of Spain, every single European country would have underperformed have they had the U.S. labor productivity growth in the health sector.

Table 2 shows the results of the numerical experiments for the period 1990-2009 by comparing the benchmark prediction to the counterfactual aggregate labor productivity. Among several differences with respect to our previous counterfactual, we would like to highlight that the results for health services are in the same direction compared to the entire sample period, but the order of magnitude of the result is about half of what it was for the 1970-2009 period, although still represent a large distance between the benchmark

and the counterfactual aggregate productivity for each country, again with the exception of Spain. In addition, for the period between 1990 and 2009 a new sector emerges in which the Europeans would be worse off if they have had the U.S. labor productivity growth: Communications. With the exception of Belgium, all countries in Europe would have had lower aggregate productivity have they had the U.S. labor productivity in communications, and this difference is large in France, Italy, Great Britain, Spain and the Netherlands.

Table 3 shows the implied change in aggregate productivity when the labor productivity in wholesale and retail trade, business services and financial services converges to the U.S. labor productivity level in 2009. No European country would have experienced a reduction of its observed aggregate labor productivity have their labor productivity converged to the U.S. by 2009 in either wholesale and retail trade or in business services. Whereas the lower bound of the prediction is of 15% if France have had a catch up in whole sale and retail trade, the lower bound of the increase in aggregate labor productivity is of 10.3% for Austria have they experienced a catch up in business services.

On the other hand, financial services are not unambiguously a source of slowdown between Europe and the U.S. The last row of Table 3 shows that have Europe experienced a full catch up in the labor productivity of financial services relative to the U.S. 2009 level, Austria, France and Italy would have had lower aggregate labor productivity. Moreover, even Germany – the most successful counterfactual scenario with an aggregate productivity

Table 3: Counterfactual 3: Catching Up with the U.S.

	AUT	BEL	FRA	DEU	ITA	GBR	ESP	NLD	Europe
Counterfactual:									
γ_i s.t. $A_i = A_i^{USA}$									
trd	19.0	30.6	15.0	22.1	33.8	22.7	33.8	29.4	25.8
bss	10.3	13.4	17.7	15.1	13.3	24.2	15.3	27.9	17.1
fin	-1.9	4.6	-2.3	5.8	-2.5	2.3	1.8	4.3	1.5

Notes: Counterfactual sectoral productivity growth is the one insuring full catch-up of the U.S. by the sector in 2009.

5.8% higher compared to its 2009 benchmark prediction – falls short when compared to the lower bound of the predictions for wholesale and retail trade or for business services.