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Convergence during the oil crisis:

A Comparison of labour productivity in manufacturing of the planned and market economies

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Abstract

This paper examines labour productivity convergence in manufacturing of the planned and market economies in the setting of the oil price shocks of the 1970s. Using the wiiw COMECON Dataset and the KLEMS dataset, the paper constructs a single-digit industry-level productivity metric for selected industries and applies a difference-in-difference estimator to estimate the impact of the oil price shocks on convergence in productivity levels across industries between 1970 and 1985. Although the paper does not find an impact of the oil price shocks on convergence of the command economies, it does detect an accelerating impact on the convergence process of the market economies.

Keywords: Labor Productivity, Convergence, Planned Economies, Oil price shocks, Manufacturing, Productivity, Competitiveness, Difference-in-Difference, COMECON Dataset, KLEMS Dataset, Structural change

JEL classification: O47, N64, P23, L60, Q43

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1 Introduction

The ability to deliver innovation and dynamically respond to a changing environment is considered to be among the major mechanisms behind modern economic growth (Acemoglu, 2009; Aghion and Howitt, 2008). Coincidentally, it is also considered among the major problems of the socialist planned economies[1] (Kornai, 1992; Markevich and Vonyó, 2020). In fact, the scale of dynamic inefficiencies are considered to be so large that they outweighed the benefits of centralised resource allocation and are considered to be the main reason for the socialist bloc's failure to catch up to the productivity levels of the leading market economies (Gaidar, 2003). While this claim finds support in qualitative investigations (Gaidar, 2010), the quantitative comparative analysis remains limited, largely due to of a lack comparable data across countries.[2]

This paper attempts to overcome this limitation. Using the newly assembled wiiw COMECON Dataset (Schwarzhappel et al., 2024) together with EU KLEMS data (Timmer et al., 2007), the paper investigates how command and market economies reacted to the oil price shocks of the 1970s and, in particular, whether or not they had an impact on the speed of the industry-level economic convergence within the countries.

The author finds this setting particularly suitable for understanding dynamic responses of economic agents to changes in the environment. The oil price increases of the 1970s are an example of a long-lasting supply-side shock that led to immediate macroeconomic effects and long-term structural changes in the market economies (Hamilton, 1983; Mork, 1989; Kilian, 2009; Baumeister and Peersman, 2013).

This paper follows this literature and estimates whether or not the speed of convergence changed following the oil price shocks of the 1970s. It does so by embedding the oil price shocks within the convergence framework in the spirit of Mankiw, Romer and Weil (1992) and Rodrik (2013). To achieve this, the paper constructs single-digit industry-level productivity metrics for selected industries and applies a difference-in-difference estimator to estimate the impact of the oil price shocks on convergence in productivity levels across industries between 1970 and 1985 for command and market economies, respectively. The results do not demonstrate any impact of the oil price shocks on convergence in the command economies, but they do suggest an accelerating impact on the market economies. Based on this, the paper suggests that the shocks led to structural reallocations from the more to the less capital-intensive industries within market economies but not within socialist economies.

The paper features two main results. First, it documents that market economies experienced an acceleration in industry-level beta convergence following the shocks. According to the estimates, the half-life convergence time of the market economies across

[1] There is a discussion on why the term 'command economy' is more appropriate to describe the economic system of the East European socialist economies (Zaleski, 1980; Markevich and Vonyó, 2020). While the author recognises the arguments, this paper uses the terms 'command' and 'planned' economies interchangeably for the sake of simplicity.

[2] The author is not aware of comparative research on industry-level growth convergence comparing socialist and command economies and how it changed following the oil price shocks of the 1970s. Vonyó and Markevich (2020) do, however, provide an up-to-date review of the structural developments in the socialist economies in the literature.

selected industries decreased from 42 years to 28 years after 1975. Second, the paper shows that the economies of the Council for Mutual Economic Assistance (CMEA or COMECON) had little to no change in convergence speed, which remained close to 50 years across estimations. This difference falls well in line with previous literature noting the structural rigidity of the socialist economies (Gaidar, 2010; Kornai, 1992; Morys, 2021).

The paper contributes to several strands of literature. First, it contributes to the debate on changes in the long-term labour productivity growth in the context of the planned economies and in comparison to the market economies (Morys, 2021; Estrin and Urga, 1997; Vonyó and Markevich, 2020). Second, it is relevant for energy economics and macroeconomics focused on the heterogeneous impacts of energy shocks on medium- to long-term economic performance (Allcott and Keniston, 2018; Arezki, Obstfeld and Milesi-Ferretti, 2017; Kilian, 2009). Finally, the paper contributes to the wealth of literature on growth convergence (Barro and Sala-i Martin, 2004; Barro, 2015; Rodrik, 2013; Mankiw, Romer and Weil, 1992).

2 Data

2.1 Sources

The data used in the study come from two sources: the wiiw COMECON Dataset and the EU KLEMS dataset. Both datasets use national account statistics of the government statistical agencies and harmonise them across dimensions to deliver comparable data. Due to differences in the reporting methodologies – namely, while the COMECON countries used the Material Product System (MPS), the KLEMS countries applied the System of National Accounts (SNA) of the United Nations (UN) – it is worth describing the major differences between the two sources.

wiiw COMECON dataset. The wiiw COMECON Dataset is a comprehensive dataset of economic time series of historically planned economies that were part of the CMEA. The dataset covers demographic, economic, trade and financial data of Bulgaria, Czechoslovakia (CSSR), the German Democratic Republic (GDR), Hungary, Poland, Romania, the Soviet Union (USSR) and socialist Yugoslavia. See Schwarzhappel et al. (2024) for an introduction to the dataset and its features.

KLEMS dataset. The KLEMS dataset provides detailed information on the inputs and outputs of production processes across various industries for a selected set of countries – mostly the EU economies with a few other developed nations (see Table 2 for the complete list). The main goal behind compiling these data is to analyse productivity and economic growth. The acronym KLEMS stands for the primary inputs measured in the dataset: capital (K), labour (L), energy (E), materials (M) and services (S). See Timmer et al. (2007) for a detailed introduction to the dataset.

The two datasets differ markedly in terms of their scopes and methodologies for collecting data. The wiiw COMECON Dataset is broader in its overall scope. Apart from national accounts, productivity and labour markets, it also covers trade, consumption and finance. At the same time, the dataset is less harmonised across countries due to differences in economic structures, accounting and reporting practices of the COMECON member states.

Contrary to the tradition in the convergence literature, which uses growth of GDP per capita in the estimation process (Barro and Sala-i Martin, 2004), this paper uses gross output per employee as the main metric. We do so due to data limitations, as the industry-level, harmonised data for COMECON countries is available for gross output and labour force, but not for gross domestic product, which was the SNA concept.

KLEMS, on the other hand, is a more narrowly focused dataset compiled specifically for productivity research. As Table 1 shows, KLEMS has a greater geographic scope (29 versus 8) and covers more details on the input factors (108 industries versus 13).

Table 1: COMECON and KLEMS sample comparison

Item	COMECON	KLEMS
Period covered	1970-1985 (1965-1985)	1970-1985 (1970-2005)
Country count	7 (8)	18 (29)
Industry count	11 (13)	10 (108)
Geography	COMECON countries	EU countries, UK, Australia, USA

Note: Values in brackets show the total count available in the dataset. Regular numbers reflect the count used for the estimations in the paper. The KLEMS database refers to the 2008 version. KLEMS industries in brackets includes both aggregates and individual industries.
Source: wiiw COMECON database, EU KLEMS, own calculations

The EU KLEMS data have a greater coverage because they were collected within the SNA framework, which in most cases is more comprehensive than the MPS. Some of the differences have far-reaching consequences, making the cross-country comparisons of the command economies difficult to compare with the rest of the world.[3] For the purposes of this paper, it is worth noting the following limitations:

- **Prices in market and command economies:** In market economies, prices are determined by supply and demand dynamics. Under strong assumptions, the price paid reflects the marginal willingness to pay and reflects the buyer's preferences. In contrast, command economies set the prices administratively, with consumer preferences not being taken fully into account due to information asymmetry. As a result, prices in the planned economies were heavily distorted, which makes the output metrics less reliable.

- **Labour markets:** In market economies, labour markets are characterised by wage flexibility and diverse employment conditions. In command economies, however, employment and wages were controlled. All economically active populations in

[3] See, for instance, the discussion surrounding the internationally comparable GDP values in Marer et al. (1993); Schwarzhappel et al. (2024).

command economies were technically employed (after all, unemployment was criminalised), whereas wages rates were set centrally and consequently did not reflect marginal returns of labour input. As a result, a share of the labour force was employed despite actually being unproductive or while having negative productivity externalities on the enterprise. Hence, the number of active workers in the COMECON countries was inflated, whereas wages were heavily distorted on the individual level. This means that the productivity *levels* in the command economies could be lower and that the growth rates could be slower than they would have been otherwise.

- **Foreign exchange rates and cross-country comparisons:** In command economies, governments held tight control over the currency and capital, and the exchange rates were fixed. Since the foreign exchange (FX) market was under tight government control, neither domestic demand nor supply played any role in determining the FX rate. As a result, the official FX rates were frequently overvalued, which meant that they could not be credibly used for cross-country comparisons of economic performance or productivity.

- **Accounting differences:** Despite a shared methodological foundation in terms of their the focus on value added, the SNA and the MPS had marked differences in terms of accounting practices and philosophy. Centrally planned economies only recorded activities when they were considered productive (i.e. if they contributed to production of a physical good). As a result, this approach emphasises heavy industry and downplays the service sector. This limitation of the MPS results in a narrower view of economic performance and productivity, making it less comprehensive compared to the SNA's inclusive approach.

This paper uses gross output per employee per industry as its productivity metric. We construct the levels and growth rates of the metric for comparable industries in constant prices across regions and use its variation over time, industries and geographical dimensions to estimate the convergence equation (see Chapter 3 for details).

Due to a lack of reliable exchange rates of the COMECON countries, this paper controls for price differentials across countries using time- and country-fixed effects. In addition, the industry list it uses only includes those industries that can be compared (even if not fully), which means that the analysis only covers manufacturing industries. To do so, we apply the following mapping between the KLEMS dataset and the wiiw COMECON Dataset.

Table 2: Country samples and their use in the estimation

ISO3 Code	Country Name	Used in Estimation
wiiw COMECON Dataset		
BGR	Bulgaria	Yes
SUN	USSR (Soviet Union)	Yes
CSK	CSSR (Czechoslovakia)	Yes
DDR	GDR (East Germany)	Yes
HUN	Hungary	Yes
POL	Poland	Yes
ROU	Romania	Yes
KLEMS Dataset		
AUS	Australia	No
AUT	Austria	No
BEL	Belgium	No
CYP	Cyprus	Yes
CZE	Czech Republic	Yes
DEW	Germany (West)	No
DNK	Denmark	No
ESP	Spain	No
EST	Estonia	Yes
FIN	Finland	No
FRA	France	No
GER	Germany	No
GRC	Greece	No
IRL	Ireland	No
ITA	Italy	No
JPN	Japan	No
LTU	Lithuania	Yes
LUX	Luxembourg	Yes
LVA	Latvia	Yes
MLT	Malta	Yes
NLD	Netherlands	No
PRT	Portugal	No
SVK	Slovakia	Yes
SVN	Slovenia	Yes
SWE	Sweden	No
UK	United Kingdom	No
USA-NAICS	USA (NAICS)	Yes
USA-SIC	USA (SIC)	No

Table 3: Mapping of CMEA industries to KLEMS industries

CMEA Industry	**KLEMS Industry**
Electric energy	Electricity, gas and water supply
Fuels	Coke, refined petroleum products, nuclear fuel
Ferrous metallurgy	Basic metals
Machine building, metal processing	Machinery, nec
Construction materials	Construction
Glass, china and ceramics	Other non-metallic mineral products
Wood and wood processing	Wood and products of wood and cork
Pulp and paper	Pulp, paper and paper products
Textiles and knitwear	Textiles
Food, beverages, tobacco	Food products, beverages and tobacco
Non-ferrous metallurgy	NA

Sources: wiiw COMECON dataset, KLEMS dataset

3 Method

This paper investigates the impact of the energy shocks of the 1970s on productivity within the framework of 'beta' convergence. This framework assumes a neoclassical model of economic growth, which – under certain assumptions – allows one to estimate the speed at which developing regions are catching up to the leaders.[4] In this class of models, the starting level of capital is among the key determinants of the future growth speed. As Barro and Sala-i Martin (2004) demonstrate, the estimated linear regression coefficient (i.e. the 'beta' parameter) can be used to estimate the speed of convergence.

3.1 Baseline regression

The paper estimates the following 'convergence equation'. According to it, productivity growth in $t+1$ it determined by productivity level in period t:

$$\Delta y_{i,c,t+1} = \beta_0 + \beta_1 \times \ln y_{i,t} + \Sigma_c \beta_c c + \Sigma_t \beta_t t + \varepsilon_{c,i,t} \quad (1)$$

Where:

- $\Delta y_{i,c,t+1}$ stands for the productivity change of industry i in country c from period t to $t+1$
- $\ln y_{i,t}$ is the productivity level of industry i in country c
- Terms within $\Sigma_c \beta_c c$ stand for country dummies that capture time-invariant country-specific variation

[4]See Gerschenkron (1962) for an alternative view of the catching-up process.

- Terms within $\Sigma_t \beta_t t$ stand for time dummies that capture the time-specific variation, which is the same across countries and regions

As Barro and Sala-i Martin (2004) show, the following relationship holds for the specification above assuming that the economies grow in proximity to the steady-state solution of the Solow growth model (Solow, 1956):

$$\beta_1 = -(1 - e^{-\lambda t}) \tag{2}$$

Where λ is a convergence parameter that defines the speed at which industries catch up to the steady state. With β_1 estimated using equation 1, one can derive λ. This, in turn, allows one to derive the amount of time needed on average for countries to cover half of the productivity gap with respect to the richest countries (half-life): $\xi = \ln 2/\lambda$.

Including the multiple dummy terms $\Sigma_c \beta_c c$ and $\Sigma_t \beta_t t$ is necessary to account for differences in productivity across time intervals and productivity levels across countries. This allows controlling for the common effects of a global upswing/downswing of the business cycle and country-specific growth drivers, such as commodity-driven economic growth. This paper presents and estimates the parameter values and the half-life time for the KLEMS dataset and the wiiw COMECON Dataset separately in order to highlight differences in the outcomes across the two sets of countries.

3.2 Estimating the impact of the oil price shocks

To single out effects of the oil price shocks on the convergence process, this paper augments the original model in two ways. The first variation includes the oil shock term $\ln y_{i,t} \times \text{Post-1975}_t$.

$$\Delta y_{i,c,t+1} = \beta_0 + \beta_1 \times \ln y_{i,t} + \beta_2 \times \ln y_{i,t} \times \text{Post-1975}_t + \Sigma_c \beta_c c + \Sigma_t \beta_t t + \varepsilon_{c,i,t} \tag{3}$$

The term Post-1975_t is a dummy variable that is equal to 1 if the observed period t is greater than 1975 and 0 otherwise. Under this specification, β_2 reflects the impact of a potential structural break that could have occurred following the oil price increase. This formulation is equivalent to a difference-in-difference estimation.

The paper later extends this specification to control for a differentiated effect of the oil price shocks on the fuel/energy sectors compared with the rest of the economy. With the input prices rising, these industries were more heavily confronted with the cost pressure compared to the rest of the economy. To account for a differentiated industry impact, the paper estimates the following equation

$$\begin{aligned}\Delta y_{i,c,t+1} = {} & \beta_0 + \beta_1 \times \ln y_{i,t} + \beta_2 \times \ln y_{i,t} \times \text{Post-1975}_t \\ & + \beta_3 \times \text{Fuel/Energy}_i \\ & + \beta_4 \times \text{Fuel/Energy}_i \times \ln y_{i,t} \\ & + \beta_5 \times \text{Fuel/Energy}_i \times \ln y_{i,t} \times \text{Post-1975}_t \\ & + \sum_c \beta_c c + \sum_t \beta_t t + \varepsilon_{c,i,t}\end{aligned} \tag{4}$$

This equation includes three additional terms, which is the most complete specification used in the paper:

- Fuel/Energy_i: This is a dummy variable that is equal to 1 if the observation relates to a fuel or energy industry and 0 otherwise. This term controls for time-invariant differences in growth rates for the fuel/energy industries.

- $\text{Fuel/Energy}_i \times \ln y_{i,t}$: This term controls for differences in the impact of the original productivity level on growth rates for the fuel/energy industries.

- $\text{Fuel/Energy}_i \times \ln y_{i,t} \times \text{Post-1975}_t$: This is an interaction term that controls for a possible structural break of the oil shock crisis specifically on the fuel/energy industries.

If the oil price shocks had any impact on the convergence process, then β_2 should be significantly different from 0. If it acted as a facilitator, β_2 must be positive. If the oil price shocks acted as an impediment hindering the catching-up process, β_2 must be negative. To differentiate among the models, the paper refers to 1 as the 'baseline' model, 3 as the 'energy shock' model, and 4 as the 'full convergence' model.

4 Results and Discussion

4.1 Exploratory data analysis

The first look at the wiiw COMECON Dataset reveals the productivity slowdown in the command economies between 1965 and 1985. Whereas the average productivity growth across industries for each COMECON member was between 3% and 8%, the range has shifted to between 1% and 3% in the early 1980s (Figure 1). For instance, Bulgaria, which started with a high growth rate of 8% in 1965, slows down to 3% by 1980. Similarly, the CSSR, the GDR and the USSR, all of which initially reported high growth, experience a notable decline in the latter years. Romania's sharp drop in 1980 is particularly striking, which reflects the consequences of the austerity measures and industrial inefficiencies of the late Ceaușescu regime. Poland's trajectory mirrors the regional trend of decelerating growth, while the USSR maintains a somewhat steadier, albeit low, growth rate, indicating pervasive economic challenges across the socialist bloc.

The same pattern holds when one looks at the average industry growth rates across countries. Figure 2 shows how different industries fared under the strains of economic policies and structural inefficiencies. The electric energy sector, notably in Romania, exemplifies the adverse effects of austerity, with the growth rate turning negative by 1980, likely due to electricity rationing and other resource constraints imposed by the Ceaușescu government. In contrast, industries such as machine building and metal processing managed to sustain modest growth, suggesting some resilience in sectors that were critical to the state-driven industrialisation policies of the time.

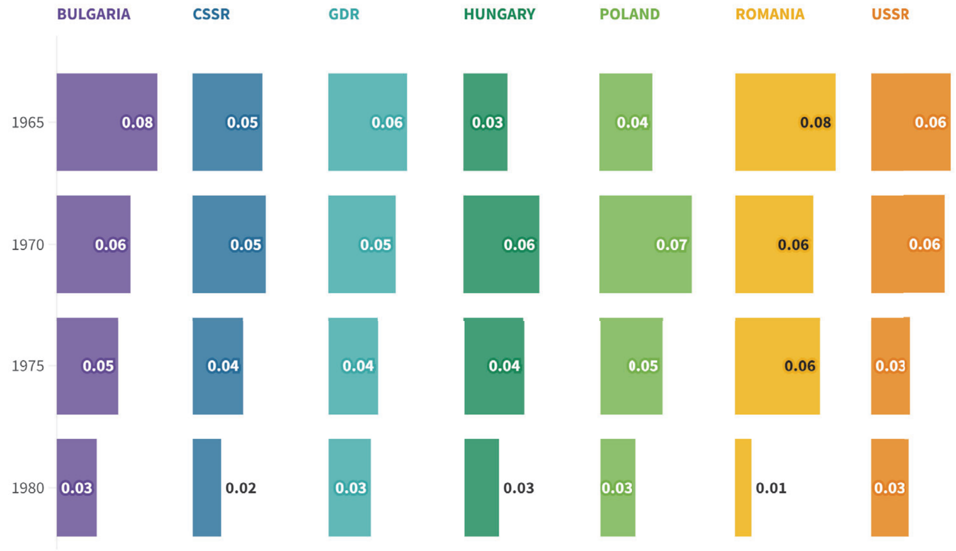

Figure 1: Gross output per employee, average by country

Source: wiiw COMECON Database; own calculations
Note: The growth rates reflect average geometric growth rates across the industries for each country.

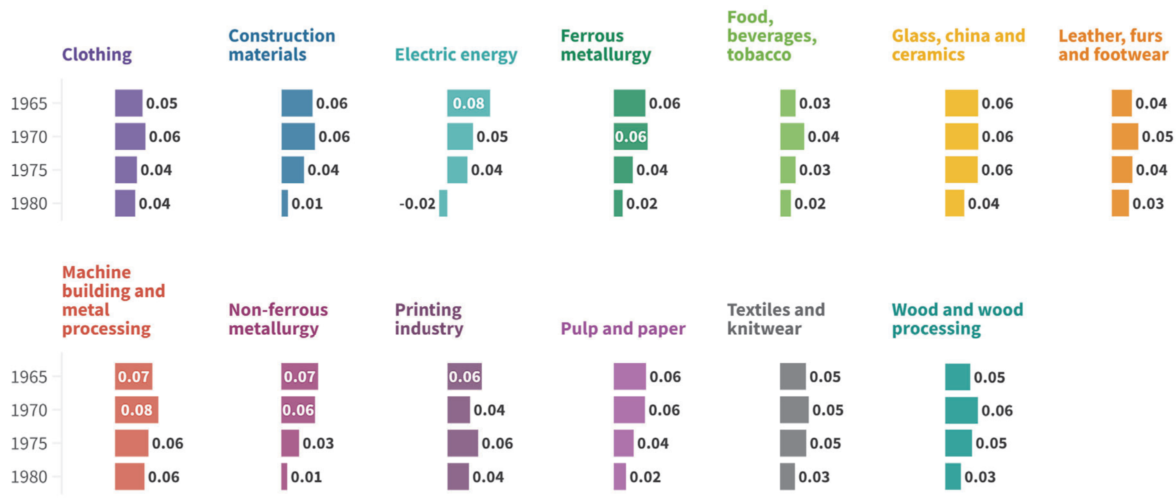

Figure 2: Growth in gross output per employee, average by industry

Source: wiiw COMECON Database; own calculations
Note: The growth rates reflect average geometric growth rates across the countries for each industry. The decline in productivity in the electric energy industry is driven by Romania, whose economy was subject to heavy austerity measures imposed by the Ceausescu government in the late 1970s and early 1980s, including electricity rationing.

One can draw several conclusions regarding productivity growth in the COMECON countries. First, the decline was non-monotonous. Specifically, in some cases, we observe an increase in average productivity rates in the 1970-1975 period compared to the previous period, which was driven largely by the economic expansion of some sectors in Hungary and Poland.

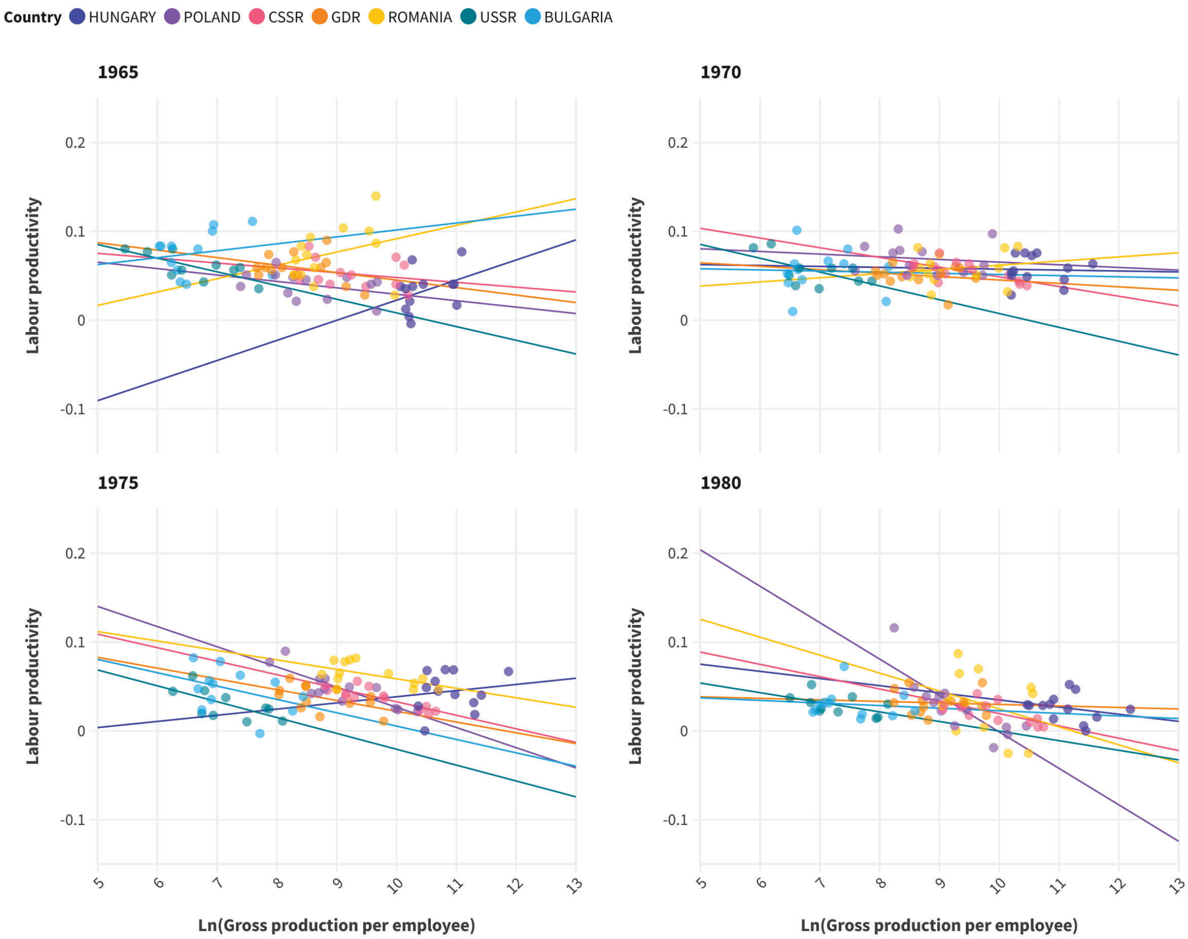

Figure 3: Labour productivity trends, by country and year

Source: wiiw COMECON Database; own calculations
Note: The outlier with the 20% decline in the 1980s panel is the Romanian energy sector. The Romanian economy was subject to heavy austerity measures imposed by the Ceausescu government in the late 1970s and early 1980s, including electricity rationing.

Second, it is during the last period in our sample (1980-1985) that the productivity slowdown is clearly pronounced across *all* countries. Although most of the countries recorded smaller growth rates than at the beginning of the dataset (i.e. during the 1975-1980 period), there were exceptions, such as Poland and Hungary. This changed in the 1980s, when the slowdown became universal with a sharp decline in growth rates across all countries in addition to being of a greater magnitude compared to the previous years. It is also notable that both Romania and the USSR experienced a notable decline in productivity in the 1980s following the increase in oil prices despite being oil exporters on the global market.

Third, the data hint at inefficiencies in the development strategies of the COMECON countries. Note that, except for machine building and metal industries, heavy industries only grew marginally faster than consumer-oriented sectors, such as food and clothing. This result is strongly at odds with the policy strategies in the planned economies, where policy makers viewed heavy industries as the main engine of growth and prioritised their expansion.

What one might conclude from the descriptive analysis above is that, apart from a general trend of productivity slowdown in the 1980s, the COMECON countries exhibited substantial variation in their individual growth paths. This heterogeneity is also reflected when examining the growth data at the industry level. The scattered data points and the differing slopes of the trend lines in Figure 3 highlight the dispersion per country over all of the observed periods in greater detail.

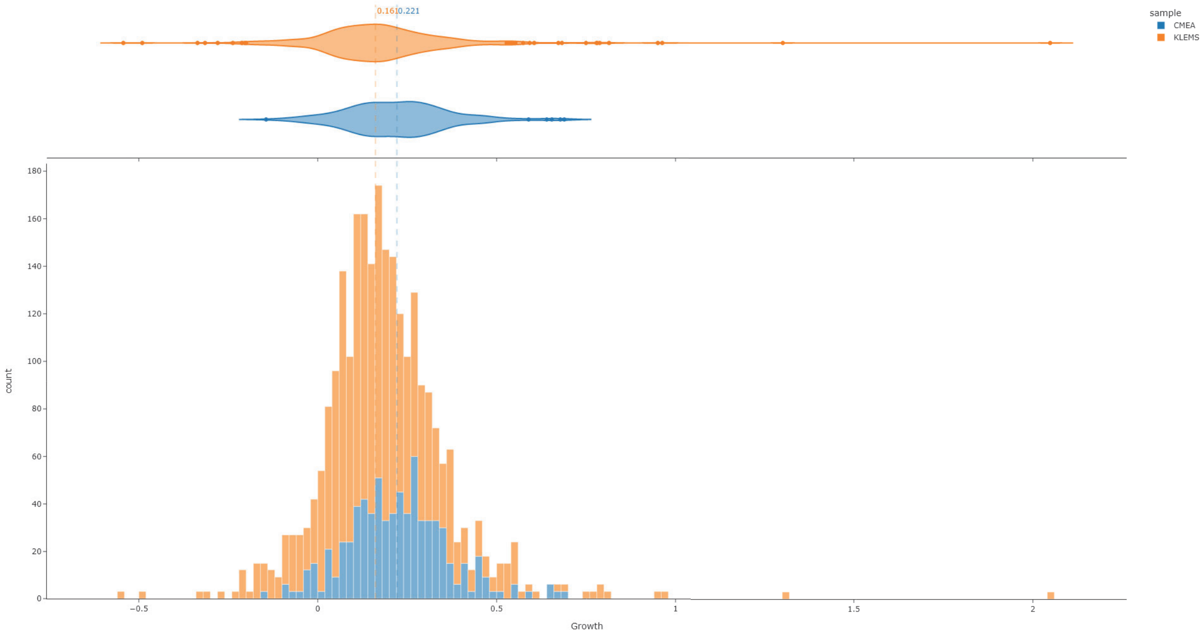

Figure 4: Distribution of growth rates of KLEMS and COMECON countries

Sources: wiiw COMECON Database, EU KLEMS database; own calculations
Note: Time period covered: 1970 to 1985. Each observation refers to an industry-country-year tuple. The KLEMS sample only contains industries covered in the wiiw COMECON Database.

While the general trend is negative across most of the countries, the slopes differ strongly across the countries and time periods with some unexpected results. For example Romania, Bulgaria and Poland show a positive relationship between the initial productivity and the subsequent growth rate between 1965 and 1970. In the period between 1970 and 1975, the relationship is barely noticeable, with the exception of the USSR. The negative relationship between the productivity level and subsequent growth rates only becomes clearly visible starting in 1975.

It is also worth noting that COMECON countries typically demonstrated higher growth rates than the market economies over the observed time period. Figure 4 shows that the distribution mass of the COMECON growth rates is shifted to the right compared with those of the KLEMS countries. The median growth rate of the KLEMS economies over the five-year period was 16.1%, which was on average 6 percentage points (pp) less than in the COMECON countries. Qualitatively, this is the result that one would expect from less developed countries within the convergence framework.

4.2 Estimation of the convergence speed

The descriptive results above suggest that while convergence may have happened within the COMECON industries, the effect was heterogeneous across both countries and time periods. But how did the industry-wise convergence of COMECON countries fare compared with that of the market economies, and what was the impact, if any, of the oil price shocks on the convergence process? To answer this, the paper estimates equations 1, 3, 4 for the COMECON and KLEMS samples separately in Table 4.

Columns (1) and (4) show the estimation for the 'baseline' models for COMECON and KLEMS countries, respectively. In this specification, the coefficient $\beta_1^{COMECON} < \beta_1^{KLEMS}$, indicating *quicker* cross-industry convergence of the planned economies compared with the market economies. This difference, however, is not large and standard errors indicate a considerable overlap of the estimations around the point estimates.

However, the story changes once one considers the impact of the oil price shocks on the growth process. While including the 'energy shock' has little to zero impact on the COMECON countries (see column 5), the convergence estimation process for KLEMS countries indicates the presence of a structural break, as both β_1^{KLEMS} and β_2^{KLEMS} are statistically significantly different from 0 at the 5% level. This indicates that the industry-level convergence of the market economies was very slow – half of that of the COMECON countries – prior to the oil price shocks and doubled in speed thereafter.

However, the estimation for the 'full' model shows that this effect is 'spoiled' by the variation present in the energy and fuel industries. Once one controls for that, market economies demonstrate both the greater 'baseline' speed of convergence ($\beta_1^{KLEMS} = -0.079 < \beta_1^{COMECON} = -0.067$), particularly after the oil price shocks ($\beta_2 = -0.039$).

Figure 5 highlights the differences in the model results by calculating the half-life convergence period across the models and country samples, which is inversely proportional to the convergence coefficient ($\beta_1 + \beta_2$). For the 'baseline' model, the convergence time is barely different across the country samples: 53 years for the KLEMS countries compared to 46 years for the COMECON countries.

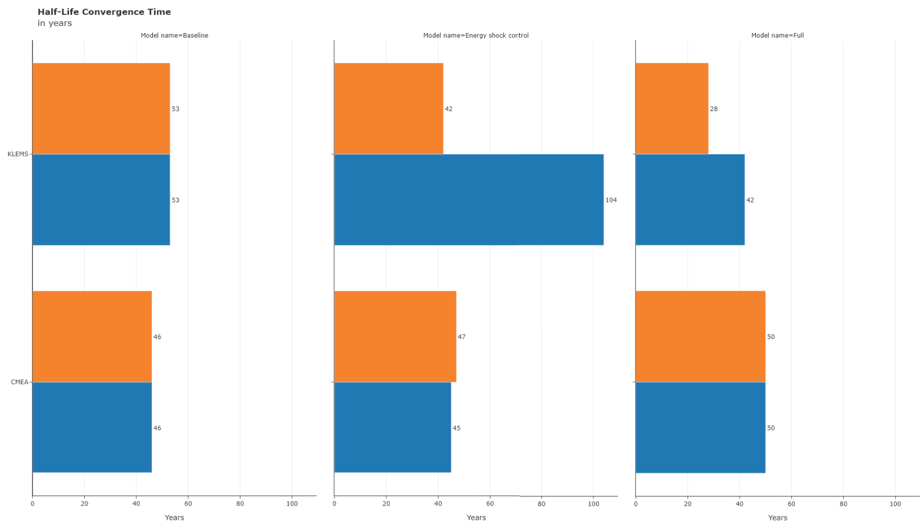

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Figure 5: Half-life convergence time: years to cover half of the income gap

Source: wiiw COMECON Database; own calculations
Note: While blue bars indicate the baseline convergence value, orange bars reflect the half-life convergence time after considering the oil price shocks.

Figure 6: Convergence in manufacturing by energy/fuel and other industries

Source: EU KLEMS database; own calculations
Note: Growth rates reflect the compound annual growth rate over the five-year period for presentation purposes.

Table 4: Regression Results for Growth in Gross Output per Employee

	Dependent variable: Growth in gross output per employee					
	(1)	(2)	(3)	(4)	(5)	(6)
Sample	COMECON	COMECON	COMECON	KLEMS	KLEMS	KLEMS
Ln(Gross output per employee)	-0.073***	-0.074***	-0.067***	-0.063***	-0.033**	-0.079***
	(0.012)	(0.014)	(0.015)	(0.011)	(0.014)	(0.022)
Oil crisis x GOPE		0.003	0.000		-0.046***	-0.039**
		(0.011)	(0.012)		(0.015)	(0.019)
Energy/fuel industry			0.184			0.198
			(0.208)			(0.151)
Energy/fuel industry x GOPE			-0.018			-0.005
			(0.023)			(0.029)
Energy/fuel industry x Oil crisis			-0.411			-0.226
			(0.264)			(0.171)
Energy/fuel industry x Oil crisis x GOPE			0.033			0.023
			(0.029)			(0.032)
Observations	241	241	241	624	624	624
No. of groups	7	7	7	18	18	18
R^2	0.131	0.131	0.182	0.056	0.071	0.102
Within R^2	0.207	0.125	0.279	0.062	0.025	0.043

***Notes**:* Significance levels: *p<0.1; **p<0.05; ***p<0.01. GOPE stands for gross output per employee. All models include time- and country-fixed effects. The data for the USSR do not include fuel production in the 1975-1985 period because the data were not reported.
***Sources**:* Schwarzhappel et al. (2024), Timmer et al. (2007)

This changes, however, for the KLEMS sample when considering the impact of the oil price shocks. Specifically, in the 'energy shock' specification, the baseline half-life convergence time is a staggering 104 years, which drops to 42 years in the post-1975 period, whereas the figures are 42 and 28 years, respectively, in the 'full' model.

Figure 6 helps us to understand why accounting for the energy/fuel industries is important for market economies. While the negative relationship between the productivity level and growth rates existed before 1970, it disappeared 10 years later. In fact, the slope becomes slightly positive by the end of the investigated sample. This is also reflected in the estimation results (see column 6), where the point estimate for the triple interaction term (Energy/fuel industry $\times$ Oil crisis $\times$ GOPE) is positive.

4.3 Discussion

The estimation results allow for several conclusions. The main takeaway for the COMECON countries is that the result is largely insensitive to the oil price shocks. Although the wiiw COMECON Dataset does not allow the exact reasons for this to be pinned down, the existing literature suggests two possible reasons.

First, it was during the oil price shocks that the USSR entered the global market as a major oil producer. While the oil deliveries were priced at global benchmarks for the non-COMECON members, members of the USSR satellites enjoyed subsidies for some time. The introduction of the Bucharest price formula – effectively a rolling average – gradually lowered the subsidy level, but the effect was gradual and it was not until the mid-1980s that the impact of the oil price shocks was fully priced in. Therefore, the price changes reached most of the COMECON economies with a delay.

Second, both enterprises and consumers were insulated from the direct impact of the oil price shocks due to administrative price-setting and the greater role of redistribution. Whereas market economies would quickly price in differences in costs, the price changes in command economies were stable. They had to be approved by the government, which was a sensitive political issue, as both price stability and low unemployment were considered to be among the advantages of the socialist system compared to the volatile and speculative market economies. With domestic prices staying fixed, the worsening of terms of trade accumulated either through depletion of national reserves or – if they were fully depleted – by excessive borrowing in hard currency. While the latter was risky, it was also in the interest of stakeholders from heavy industries, which enjoyed large subsidies from the state and avoided internalising costs.

Finally, for oil-exporting countries of the bloc (i.e. the USSR and Romania), the oil price shocks were a positive development. The rise in oil prices acted as a production subsidy and a source of fiscal revenue, which was later used for redistributive programs and front-loaded investment in other industries regardless of possible returns on investment.

While this paper does not have enough data to calculate the extent to which each channel contributed to the observed outcome, existing stimuli were not conducive to capital reallocation away from the more capital- and energy-intensive industries in the planned economies. Hence, it is not surprising that the estimations do not provide any evidence in support of greater convergence speed following the oil price shocks.

For market economies, however, the change in convergence speed for non-energy industries following the oil price shocks was quite profound. First, the regression analysis highlights – in line with previous literature – the importance of controlling for the heterogeneous impacts of oil price shocks on different industries. This is clearly visible in differing convergence speeds of the 'energy shock' model and the 'full' model.

Second, the 'full' model – which this paper treats as the most credible one – suggests that the oil price shocks acted as a convergence accelerator in the market economies. This sounds plausible give that, at this time, the market economies were unprepared for the shocks and did not have mechanisms (e.g. strategic oil reserves) that would allow for a smoothing of the supply shortages in the near term.

5 Conclusion

This paper examines the convergence dynamics of the COMECON economies compared to market economies in the 1965-1985 period. Using industry-level productivity data from the wiiw COMECON Dataset and the KLEMS dataset, the study estimates and compares convergence speeds across these economic systems before and after the oil price shocks of the 1970s. The main finding of the paper is that while COMECON and market economies showed beta convergence at the industry level, the economies reacted differently to external shocks in the long term.

The oil price shocks of the 1970s impacted convergence differently in the two systems. For COMECON economies, the oil shocks had no visible effect on convergence speed, likely due to subsidised energy prices, delayed price transmission and insulation from global prices. On the other hand, market economies, after controlling for heterogeneous impacts across industries, experienced accelerated convergence following the oil price shocks. Their half-life convergence time decreased from 42 years before 1975 to 28 years after 1975.

These findings support the literature that has emphasised the advantages that market economies have when it comes to responding to changes in the economic environment. While COMECON economies initially showed mildly faster convergence, their economic structures hindered adaptation to global economic changes. This research contributes to the literature on economic convergence and the heterogeneous impacts of external shocks on long-term development.

The study also highlights the potential to go beyond the country-level analysis by conducting industry-level estimations in the spirit of Rodrik (2013) so as to advance discussions regarding the history of late socialism and the role of economic incentives in adaption to economic shocks.

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