Input-output coefficients: econometrical approach

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Technological shifts and IO coefficients

Investments

Technological innovations

Production technology shift

Cost structure shift

IO coefficients in column
Methods and main technological shifts

Methods:
- Balance-based
- Technological (expert)
- Econometrical

We use:
- Linear trend (expert)
- Econometrical

Shifts:
- Transport electrification
- Partly and fully autonomous driving
- Digitalization
- Materials used
Transport electrification

Public transport electrification

Production: KamAZ, LiAZ, GAZ, Volgabus, Pk Transportn}"ye Sistemy, Zao "Trolza"

Electric batteries: LioTech-Innovations, import

Trucks electrification

Development: KamAZ, GAZ

Electric batteries: import
Partly and fully autonomous driving

Partly:
- GPS
- Automatic braking system
- Cruise control and monitoring
- Parking assist system

Fully:
- Development and testing: Yandex, Cognitive Technologies, GAZ
Transport electrification

Automobiles and automobile equipment production

- Batteries replace ICE
- Electrical equipment replaces diagonal

Non-ferrous metal in electric engine vs. ferrous metals in ICE

- Non-ferrous metals replace ferrous metals

Land transport services: electricity replace fuel
Partly and fully autonomous driving

Automobiles and automobile equipment production

Increase of electric and communication equipment share in automobile production cost

Electrical equipment replaces diagonal

Communication equipment replaces diagonal
Transport electrification & autonomous driving

to “Automobiles, highway transport equipment"

From “Electrical equipment” (red line, left axis)
Diagonal (blue line, right axis)

Relation “Electrical equipment” / Diagonal

+16%
Transport electrification & autonomous driving

to “Automobiles, highway transport equipment "

From “Communication equipment” (red line, left axis)

Diagonal (blue line, right axis)

Relation “Communication equipment” / Diagonal +54%
Transport electrification & autonomous driving

to “Automobiles, highway transport equipment”

From “Non-ferrous metals” (red line, left axis)
From “Ferrous metals” (blue line, right axis)

Relation “Non-ferrous metals” / “Ferrous metals” +55%
Digitalization

All sectors

Improvement in management

Decrease in trade and transport margins

Communication services replace Trade and Transport for all sectors
Digitalization (Petroleum refining case) to “Petroleum refining"

From “Communication” (red line, left axis)
From “Trade” (blue line, right axis)

Relation “Communication” / “Trade” +227%
Digitalization (Petroleum refining case)

to “Petroleum refining"

From “Communication” (red line, left axis)
From “Transport” (blue line, right axis)

Relation “Communication” / “Transport” +312%
Digitalization (Machinery case)

to “Machinery”

From “Communication” (red line, left axis)
From “Trade” (blue line, right axis)

Relation “Communication” / “Trade” +200%
Digitalization (Machinery case)

to “Machinery”

From “Communication” (red line, left axis)
From “Transport” (blue line, right axis)

Relation “Communication” / “Transport” +278%
Composite materials extensive use (Construction case)

Construction

Extensive use of composite materials in construction materials production

Chemicals replace Ferrous metals & Wood
Composite materials vs. Ferrous Metals

to “Construction”

From “Chemicals” (red line, left axis)
From “Ferrous metals” (blue line, right axis)

Relation “Chemicals” / “Ferrous metals” +29%
Composite materials vs. Wood

From “Chemicals” (red line, left axis)
From “Wood” (blue line, right axis)

Relation “Chemicals” / “Wood” +10%

To “Construction”
Automobiles and automobile equipment production

Extensive use of composite materials in automobile equipment production

Chemicals replace Ferrous metals
Composite materials vs. Ferrous Metals

to “Automobiles, highway transport equipment”

From “Chemicals” (red line, left axis)

From “Ferrous metals” (blue line, right axis)

Relation “Chemicals” / “Ferrous metals” 

+30%
Composite materials vs. Ferrous Metals

From “Chemicals” to “Automobiles, highway transport equipment“
From “Ferrous metals” to “Automobiles, highway transport equipment“

Relation (red line, left axis)
Investments (blue line, right axis)

Relation (red line, left axis)
Cumulated investments, 10% retirement (blue line, right axis)
Composite materials vs. Ferrous Metals
From “Chemicals” to “Automobiles, highway transport equipment” / From “Ferrous metals” to “Automobiles, highway transport equipment”

Predicted (red line, left axis)
Actual (blue line, right axis)

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<th>Reg-Coef</th>
<th>Mexval</th>
<th>Elas</th>
<th>NorRes</th>
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| SEE               | 0,00     | RSQ = 0,94 | RHO = 0,42 | Obser = 16,00 |
| SEE+1             | 0,00     | RBSQ = 0,94 | DW = 1,15 | DoFree = 14,00 |
| MAPE              | 1,57     |           |        |         |

MAPE = 1,57
Composite materials vs. Ferrous Metals

From “Ferrous metals” to “Automobiles, highway transport equipment“
New (red line): decline 0.5% yearly, 7.5% by 2030
Old (blue line)

From “Chemicals” to “Automobiles, highway transport equipment“
New (red line)
Old (blue line)
Electrification of transport (Non-ferrous Metals vs. Ferrous Metals)

From “Ferrous metals” to “Automobiles, highway transport equipment“
New (red line): decline 0.5% yearly, 7.5% by 2030
Old (blue line)

From “Non-ferrous metals” to “Automobiles, highway transport equipment“
New (red line)
Old (blue line)
Electrification of transport & autonomous driving

Diagonal “Automobiles, highway transport equipment “
New (red line): decline 0.1% yearly, 1.5% by 2030
Old (blue line)

From “Electrical equipment” to “Automobiles, highway transport equipment“
New (red line)
Old (blue line)
Autonomous driving

Diagonal “Automobiles, highway transport equipment “

New (red line): decline 0.1% yearly, 1.5% by 2030

Old (blue line)

From “Radio, television, communication equipment” to “Automobiles, highway transport equipment “

New (red line)

Old (blue line)
Digitalization (Machinery case)

From “Communication” to “Machinery“

New (red line): growth 0.5% yearly, 7.5% by 2030

Old (blue line)

From “Wholesale and retail trade” to “Automobiles, highway transport equipment“

New (red line)

Old (blue line)
Digitalization (Machinery case)

From “Communication” to “Machinery”

New (red line): growth 0.5% yearly, 7.5% by 2030

Old (blue line)

From “Transport and storage” to “Automobiles, highway transport equipment”

New (red line)

Old (blue line)
Outputs (constant 2010 prices, mln.rub)
New (red line)
Old (blue line)

"Communication"

"Wholesale and retail trade"

"Transport and storage"
Macro (constant 2010 prices, mln.rub)
New (red line)
Old (blue line)
Conclusions and future plans

1. First step
2. Many coefficients are still linearly dynamicized
3. Some helpful methods can be applied
4. Cost structure in developed countries might be a reference point for cost structure in Russia in future
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