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**RUSSIAN MANUFACTURING AND THE THREAT OF 'DUTCH DISEASE'  
A COMPARISON OF COMPETITIVENESS DEVELOPMENTS IN RUSSIAN AND UKRAINIAN  
INDUSTRY**

**ECONOMICS DEPARTMENT WORKING PAPERS No. 540**

by  
**Rudiger Ahrend, Donato de Rosa and William Tompson**

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**ABSTRACT/RÉSUMÉ****Russian Manufacturing and the Threat of ‘Dutch Disease’  
A Comparison of Competitiveness Developments in Russian and Ukrainian Industry**

This paper examines the development of Russian industry in comparison with that of Ukrainian industry during 1995–2004 in an effort to ascertain to what extent, if any, Russian manufacturing showed signs of succumbing to ‘Dutch disease’. Ukraine and Russia began the market transition with broadly similar institutions, industrial structures and levels of technology, and the economic reforms implemented in the two countries were also similar, although Ukraine was reckoned to lag behind Russia in many areas. The main difference between them is Russia’s far greater resource wealth. It follows that differences in industrial development since 1991 may to some degree be attributable to differences in initial natural resource endowments. In short, Ukraine could provide a rough approximation of how a resource-*poor* Russia might have developed over the transition.

*JEL classification:* J24, L60, O57, P23, P27, Q33

*Keywords:* Russia; Ukraine; Dutch disease; natural resources; oil; gas; transition; industry; productivity; competitiveness; revealed comparative advantage; restructuring; unit labour costs; wages

**Le secteur manufacturier russe et la menace du « syndrome néerlandais »  
Comparaison du développement de la compétitivité des industries russe et ukrainienne**

Cette étude analyse le développement de l’industrie russe en le comparant avec celui de l’industrie ukrainienne sur la période 1995-2004, afin d’établir - si tel était le cas - dans quelle mesure l’industrie manufacturière en Russie serait affectée par le ‘syndrome néerlandais’. L’Ukraine et la Russie ont commencé leur transition vers l’économie de marché avec des institutions, des structures industrielles et des niveaux de technologie globalement similaires et les réformes mises en œuvre dans les deux pays ont également suivi une voie similaire, même si l’Ukraine est considérée comme étant en retard par rapport à la Russie dans beaucoup de domaines. La différence principale entre les deux pays est la richesse en ressources naturelles, bien plus importante en Russie. Il en résulte que les différences dans le développement industriel depuis 1991 peuvent, dans une certaine mesure, être attribuées aux différences de dotations initiales en ressources naturelles. En résumé, l’Ukraine peut fournir une approximation fruste de la manière dont une Russie pauvre en ressources naturelles aurait pu se développer sur la période de transition.

*Classification JEL :* J24, L60, O57, P23, P27, Q33

*Mots clés :* Russie; Ukraine; syndrome hollandais; ressources naturelles; pétrole; gaz; transition; industrie; productivité; compétitivité; avantage comparatif révélé; restructuration; coût unitaire de main-d’œuvre; salaires

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## **Russian Manufacturing and The Threat of ‘Dutch Disease’ A Comparison of Competitiveness Developments In Russian and Ukrainian Industry**

by  
**Rudiger Ahrend, Donato de Rosa, William Tompson<sup>1</sup>**

### **Introduction**

A growing body of empirical research suggests that countries endowed with great natural resource wealth tend to lag behind comparable countries in terms of long-run real GDP growth. This finding has given rise to widespread debate about a so-called ‘resource curse’ or ‘paradox of plenty’.<sup>2</sup> A large number of hypotheses have been advanced to explain the resource curse, but the great majority of explanations fall into one of two categories: those that focus on the impact of resource wealth on the competitiveness of other tradables (the phenomenon known as ‘Dutch disease’) and those concerned with the effect of resource wealth on the quality of institutions, political processes and governance.<sup>3</sup> Both lines of argument have been the focus of lively debate in Russia in recent years, as the recent oil boom has raised fears about the impact of resource wealth on the country’s long-term economic and political development. The Russian authorities themselves have repeatedly expressed concern that the country’s resource-dependent industrial structure could have negative effects on the development of manufacturing<sup>4</sup> and many other observers have expressed the view that resource wealth was in danger of distorting Russia’s political development.<sup>5</sup>

This paper focuses on the set of issues connected with competitiveness in the manufacturing sector, often summarised under the term Dutch disease (see Box 1). However, whether or not a country suffers from Dutch disease is something of a judgment call,<sup>6</sup> and this paper stops short of

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1. OECD Economics Department and Directorate for Public Governance and Territorial Development. The authors are indebted to Andreas Woergoetter, Vincent Koen and Christian Gianella of the OECD Economics Department for useful discussions, comments, and drafting suggestions. Special thanks also go to Corinne Chanteloup for technical assistance. The views expressed in this paper are those of the authors and do not necessarily reflect those of the OECD or its member states. Responsibility for any errors of fact or judgement that remain in the paper rest, of course, entirely with the authors.
  2. See the classic statement of the resource curse hypothesis by Sachs and Warner (2001); on the ‘paradox of plenty’, see Karl (1997 and 1999).
  3. Other analyses focus on the consequences of commodity-price volatility, particularly for fiscal revenues, and on the interaction of commodity-price volatility with financial market imperfections, which can lead to inefficient specialisation. For an overview of explanations of the resource curse, with particular emphasis on the issue of weak financial markets, see Hausman and Rigobon (2003).
  4. See, for example, the comments of Prime Minister Mikhail Fradkov in September 2006 (*Vedomosti*, 12 September 2006).
  5. The impact of resource wealth on Russian politics is discussed at length in Tompson (2005).
  6. For a start, much depends on what exactly is understood by the term Dutch Disease (see Box 1). Even if there is agreement with respect to definitions, one may see the kind of pressures associated with

attempting to confirm or reject a diagnosis of Dutch disease for Russia. Its aim is far more modest: to offer insights into one key aspect of the problem – the ability of non-resource industry to adapt and maintain competitiveness, given the cost pressures that may arise in the presence of a dynamic resource sector. Hitherto, most discussion of Dutch disease in Russia has been based on a rather impressionistic assessment of current Russian performance against the sort of hypotheses found in the resource curse literature, rather than on careful economic analysis. This paper and a related paper by Gianella and Chanteloup (2006) exploring how exchange-rate movements affect Russian trade, represent an attempt to put the discussion of certain aspects of this important and very complex issue on a sounder footing.

The present paper examines the development of Russian industry in recent years in comparison with that of Ukrainian industry during the period to 2003–04.<sup>7</sup> The simple intuition underlying this approach is as follows. Ukraine and Russia began the market transition with broadly similar institutions, industrial structures and levels of technology; the main difference between them was Russia's far greater resource wealth. Moreover, during the 1990s, the economic reforms implemented in the two countries were also similar, although Ukraine was reckoned to lag behind Russia in many areas.<sup>8</sup> It follows that differences in industrial development since 1991 may to some degree be attributable to differences in initial natural resource endowments. In short, Ukraine arguably provides a rough approximation of how a resource-*poor* Russia might have developed over the transition.<sup>9</sup>

The analysis is divided into two parts. The first considers the question of whether and how the greater relative abundance of natural resources in Russia has affected structural change in that country relative to Ukraine. The second looks for evidence that the resource sector has actually *hindered* the development of non-resource sectors and tries to assess whether Russia has actually *suffered* from the size of its resource sector. The paper's main findings may be summarised as follows. First, it is difficult to avoid the conclusion that the development of Russia's manufacturing sector has been affected by the country's resource wealth. However, the evidence also suggests that – so far, at least – Russian economic performance has not *suffered* as a result: economic development has been vigorous and living standards in Russia have been much higher than in Ukraine. Of course, this may simply reflect the steadily rising terms of trade of recent years,<sup>10</sup> but there are no signs that the manufacturing sector in general is 'withering away'. On the contrary, although some sectors have clearly been finding it difficult to cope with the pressure of real appreciation in recent years, the evidence suggests that Russia overall would have been much worse off without its resource wealth.<sup>11</sup>

This, of course, leaves open the question of whether Russian economic development will be significantly handicapped by Dutch disease in the future. The period covered by this paper, after all, precedes the dramatic oil-price rises of 2005–06, which has led to an acceleration of real appreciation

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Dutch disease at work in an economy without concluding that it has 'succumbed' to the malady, in the sense of regarding what has happened as not necessarily deleterious to its long-term development

7. The end-date of the study reflects limitations on data availability. Many data series are no longer produced in either country as a result of shift from presenting the production side of the national accounts according to the 'General Classification of Branches of the National Economy' (OKONKh) to the more commonly used 'General Classification of Types of Economic Activity' (OKVED).
8. On the parallels between Russia and Ukraine in transition, see World Bank (2004).
9. Equally, one might view Russia as an example of what a hydrocarbon-rich Ukraine might have become.
10. For details, on recent terms-of-trade shifts and their impact, see OECD (2006) or Gianella (2006).
11. See Ahrend (2006a).

in Russia and, in the view of OECD (2006), has led to mounting pressure on non-resource tradable sectors. Russian policy choices will largely determine how successfully the economy adapts to its new terms of trade. The so-called resource curse is no *fatalité*, and there is no reason why Russia's development must necessarily be handicapped by its resource wealth.<sup>12</sup> Resource rich countries can develop successfully, as the experiences of countries like Canada, Australia, or Finland – not to mention the US in the late 19th and early 20th centuries – show. However, the number of countries that have managed large-scale hydrocarbon wealth prudently over a long period of time is relatively limited: the pitfalls that lie in Russia's path are not unavoidable, but they are real enough.

#### Box 1. What is Dutch disease?

The term Dutch disease was first coined to describe the decline of the manufacturing sector in the Netherlands and the rise in unemployment that accompanied it following the discovery of natural gas in the 1960s. It is broadly understood to denote the harmful economic consequences that may arise in certain conditions from a sudden increase in a country's wealth, following, for example, a natural resource discovery, a surge in export commodity prices or any other positive exogenous shock generating large foreign exchange inflows.<sup>13</sup> The risk that such inflows will generate harmful side effects are particularly great if structural rigidities impede adjustment to the shift in the terms of trade.

The most immediately visible 'symptom' of Dutch disease is the rapid appreciation of the real exchange rate that is often connected with natural resource booms. When – on the back of strongly rising income from natural resource exports – a country's total exports and demand for its currency are increasing rapidly, its real exchange rate will tend to appreciate. This appreciation will increase competitive pressure on domestic exporters in other sectors. The real appreciation of the domestic currency will also increase the purchasing power of domestic consumers in terms of foreign goods, further increasing the pressure on domestic manufacturers through the channel of import competition.<sup>14</sup> Even if factor markets are highly flexible and impediments to adjustment are minimal, the *speed* of appreciation may be such as to increase the cost of adjustment to the new terms of trade.

Corden and Neary (1982) identify two channels by which traditional tradable sectors may be crowded out by a booming resource sector and the non-tradable sector. First, increased productivity in the resource sector pushes wages up, bidding labour out of the production of the manufacturing sector (the so-called 'resource movement effect'). Moreover, since natural resource sectors may – given the resource rents that can be exploited – offer higher returns on investment, investment and thus economic development may be biased towards resource sectors. Secondly, increased incomes shift demand from the lagging tradable sector to non-tradables, where wages will also be pushed upward. This 'spending effect' will further drain factors of production out of the non-resource tradable sector.

Whether the kind of shifts described above should be called a 'disease' is a matter of debate among economists (Van Wijnbergen, 1984). As long as the net effect on output and employment is positive, the process may simply be seen as the economy's adaptation to its new environment and its increased wealth. This adaptation nevertheless requires that the economy be able to adjust rapidly to the shock, with limited rigidities on

12. See OECD (2004), OECD (2006), Ahrend (2006b) and Gianella (2006).

13. In Russia, the discovery of natural resources as such is not the source of the problem. Rather, it is the fact that their full weight in the economy became apparent only at the start of the transition, when the relative prices of primary raw materials, which had been held at artificially low levels under central planning, soared, as did resource exports.

14. Although discussions of Dutch disease are often bound up with debates about the exchange rate, the transmission mechanisms here described can operate even in countries that do not have their own national currencies. The resource-based industry is able to pay higher wages and also higher interest rates than other industries, thus making it difficult for the latter to remain competitive. On the experiences of Greenland and the Faroe Islands (which use the Danish krona) see Paldam (1997).

domestic labour or goods markets. Otherwise, a sluggish adjustment may lead to unemployment and a further squeezing of profit margins in the exposed sector (Neary, 1984).<sup>15</sup> The rigidity of labour markets in The Netherlands, for example, was a major factor impeding adjustment after the discovery of natural gas in the 1960s.

On the assumption that productivity spillovers and opportunities to 'learn by doing' in manufacturing (Krugman, 1987) are important determinants of long-run growth – an assumption that, implicitly if not explicitly, underlies most Dutch disease models – a fading manufacturing sector would be a major drag on a country's long-run economic development prospects.<sup>16</sup> This assumption should not be exaggerated – the contribution of natural resource sectors and non-tradables to technological development and innovation is often underrated<sup>17</sup> – but there are still good grounds for believing that a more diversified structure of industrial output and exports will be advantageous over the long run.

The shifts set in train by a resource-export boom may also generate negative consequences for other reasons:

- The positive shock may be temporary, in which case it may be difficult to reverse the reallocation process and renew the industrial base afterwards.
- Rapidly rising export windfalls may lead to unwarranted relaxation of fiscal discipline. A fiscal stimulus in the midst of a resource boom may add to many of the cost pressures on a manufacturing sector struggling to adjust to the new terms of trade. Corden (1984) argues that this was the main source of the weak performance of the Netherlands.
- Greater reliance on primary resource sectors is associated with greater volatility of growth, and volatility of growth tends to be associated with lower rates of long-run growth (Ramey and Ramey, 1995, or Martin and Rogers, 2000).

In any case, diagnosing a case of Dutch disease is not easy. The shift of employment from manufacturing to services is a common structural trend and is particularly pronounced in transition economies owing to the communist system's tendency to neglect services and over-develop industry. Moreover, some real appreciation is part of the catching-up process, as productivity gains in manufacturing are generally higher in transition economies than in developed ones – the Balassa–Samuelson effect. An economy like Russia's could therefore be regarded as succumbing to Dutch disease if it diverged from the Balassa–Samuelson trajectory to an unusually large extent, with negative consequences for growth and/or employment.

Source: OECD (2006).

### **Resource wealth and industrial development in transition: Russia and Ukraine**

Russia undoubtedly has vastly larger natural resource endowments than Ukraine. As a result, Russian industry has always been somewhat more focused on natural resource extraction.<sup>18</sup> That said,

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15. In this scenario, a resource discovery or terms of trade shock can induce a recession.
  16. Seminal models of Dutch disease are proposed by Bruno and Sachs (1982) and Sachs and Warner (1995).
  17. See Ahrend (2006b) and Wright and Czelusta (2002) for a discussion of the issue.
  18. Official statistics for the early-to-mid 1990s show industrial structures for Ukraine and Russia that are not that different, especially with respect to the role of natural resource sectors in the economy, but this picture is almost certainly misleading. First, prices for natural resources in the Soviet economy were far below world market prices, and the size of natural resource sectors was consequently underestimated. Hence, marked differences in the scale of resource extraction would have only led to minor differences in statistics, which may have disappeared when aggregating sub-sectoral data into published data on major industrial sectors. Secondly, the widespread use of transfer pricing since the beginning of the transition, which has been especially prevalent in export-oriented resource sectors,



there were many similarities between Ukrainian and Russian industry at the start of transition. Both countries started with significant manufacturing capacity in similar sectors, and the relative size of these sectors – as a share of *manufacturing industry* rather than of all industry or of all economic activity – was generally of roughly the same order. Moreover, technology levels in individual sectors were also usually comparable. Some estimates suggest that Russian industry was more capital intensive,<sup>19</sup> but they do not separate out Russia's highly capital-intensive mineral-extraction sectors. Their prominence would account for much, if not most, of the difference. It therefore seems reasonable to compare developments in specific manufacturing sectors in Ukraine and Russia, and, to the degree that there are differences, to ask how important differences in resource endowments between the two countries might be in explaining them.

In view of the above, the comparison of individual sectors and their development seems to make straightforward sense, but a comparison of *total* industry in Russia and Ukraine is more problematic, owing to the large share of hydrocarbons in Russian industry. As far as possible, therefore, we exclude the fuel and electricity sector<sup>20</sup> from comparisons of all industry in both countries.<sup>21</sup> In general, value added as a share of output, as well as productivity measures like output per worker, are much higher in the hydrocarbon sector, since there are substantial rents to be captured in hydrocarbon production. This means that excluding fuel and electricity will, especially for Russia, tend to show lower levels of value added or productivity and also reduce value added relative to output. However, both the electricity industry and parts of the fuel sector (most notably gas) have shown very poor performance over the last decade – especially in Russia. Excluding these sectors is therefore likely to improve *dynamic measures* (e.g. output growth, changes in productivity), at least in Russia.

Given that resources have always loomed larger in Russian industry, it is hardly surprising that a significantly larger share of industrial production growth has come from resource-based industries in Russia than in Ukraine (Figure 1).<sup>22</sup> While resource sectors contributed little to industrial growth in Ukraine, they contributed the largest part of post-crisis growth in Russia, with a peak of around 70% in 2001–04. However, the differences in the drivers of industrial growth in Russia and Ukraine were not only due to dissimilarities in initial industrial structures: non-resource sectors in Ukraine have been growing much faster than resource sectors, while the share of resource sectors in Russian industry

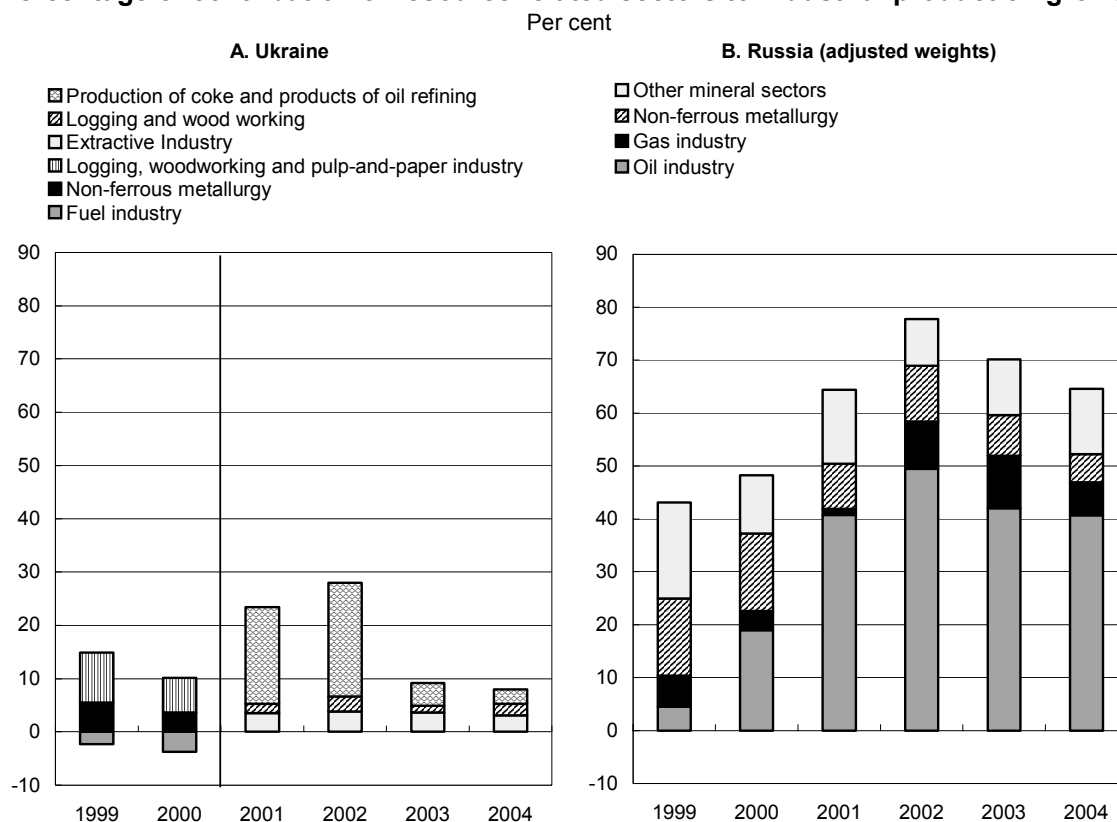
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has meant that a significant share of the value added generated by such sectors has been reported not within these sectors but within wholesale trade, i.e. in the service sector. As a result, the size of the natural resource sectors, and especially the oil sector, has been severely underestimated in official statistics throughout the transition – which would also have had a tendency to diminish real differences in the relative importance of industrial sectors. World Bank (2004) estimates that in 2000, the contribution of the fuel sector to industrial value added was not the officially recorded 29% but almost half.

19. See Tiffin (2005).
20. It makes sense to exclude electricity, as this has so far been a largely non-market sector with both input prices (mainly gas prices) and output prices subject to regulation, often on the basis of non-economic motives. Moreover, for some indicators, official statistical sources treat the 'fuel-and-electricity complex' (*toplivno-energeticheskii kompleks*) as a single entity.
21. Limitations of the available data mean that we sometimes have no choice but to fall back on this kind of comparison.
22. As Ukraine changed its way of classifying industrial sectors in 2001, from 2001 onwards the Ukrainian figures are neither strictly comparable with the Russian, nor with the pre-2001 Ukrainian data. Even so, given the huge differential between Russia and Ukraine, there is not the slightest doubt that resource based sectors played a dramatically more important role for industrial growth in Russia than in Ukraine.

increased substantially in value added terms during 1995–2004. This shift occurred despite the fact that resource and non-resource sectors expanded *output* in roughly similar proportions, because value added as a share of output is much higher in the natural resource sectors, especially hydrocarbons.<sup>23</sup> Even on the official data (which seriously under-represent the size of the oil and gas sector<sup>24</sup>), the contribution of hydrocarbons to value added in industry grew from 23% in 1995 to around 30% in 2000. The real increase during that period is likely to have even been significantly greater than the officially reported 7 percentage points. Moreover, the oil-sector boom after 2000 is certain to have increased this share still further.

### Percentage of contribution of resource related sectors to industrial production growth



Source : State Statistics Committee of Ukraine, Russian Federal Service for State Statistics, World Bank and OECD calculations

A shift towards resource-based sectors in Russia – at a time when Ukraine was shifting more towards manufacturing – could be construed as a sign of Dutch disease, but it is not necessarily a negative development in itself. Russian companies have been rationally investing in those sectors where returns have been especially high – i.e. in natural resource sectors – and, so far at least, a relatively flexible labour market has permitted a fairly smooth adjustment (OECD, 2006). The strong development of these sectors might thus be the result of an efficient allocation of private capital. In Ukraine, by contrast, the absence of such a large resource base means that investment has of necessity been channelled primarily into manufacturing.

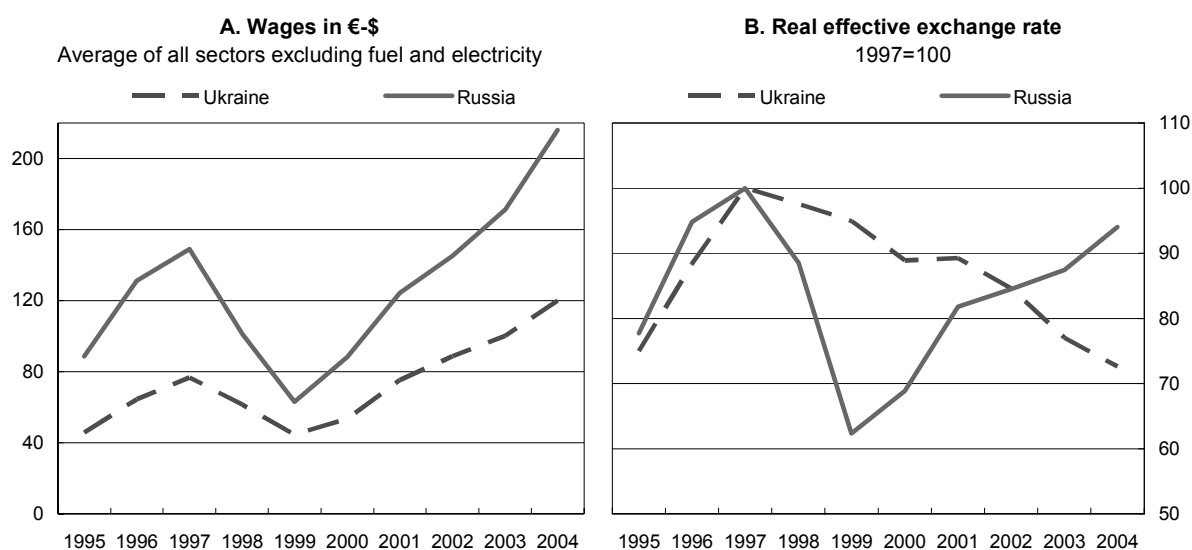
23. See Annex B for more detail on the ratios of value added to output in different sectors.

24. See note 16 above.

In any case, the aim of this section is simply to investigate whether the difference in resource endowments has led non-resource industrial sectors in Russia and Ukraine to develop differently, and if so, how. In the following we therefore compare Russian and Ukrainian non-resource sectors on a number of different indicators, including growth and wage levels, as well as some measures of labour productivity. This comparison highlights some fairly striking differences. The most obvious of these is that wages measured in international currency terms have been consistently much higher in Russia than in Ukraine – and this holds both for industry as a whole and for individual sectors (see also Appendix, Figure A1). The sole exception is the immediate aftermath of the August 1998 Russian financial crisis, when the spread between Russian and Ukrainian wages narrowed following a large devaluation of the Russian rouble.

Figure 2A shows Russian and Ukrainian wages in a fictional currency unit constructed as a basket composed in equal measure of Euros and US dollars (a presentation that has the advantages of simplicity and of largely eliminating the effects of fluctuations in the Euro-dollar exchange rate).<sup>25</sup> For notational simplicity we will, in the remainder of the text, refer to this fictional currency as the €-\$. It is striking that even when one excludes the fuel and electricity sector, where wage differentials between Ukraine and Russia are particularly large, Russian wages have been roughly twice the level than those in Ukraine.

**Figure 2. Evolution of wages and exchange rates**



Source: International Financial Statistics, Russian Federal Service for State Statistics, State Statistics Committee of Ukraine and OECD estimates.

In all likelihood, the commodity-export backed strength of the rouble and the relative weakness of the hryvnia account for a large part of this large wage differential. To be sure, strong export potential alone cannot sustain a higher wage level in foreign currency terms, unless it is backed by higher labour productivity. However, figures 2A and 2B, when taken together, suggest that Russian wages measured in €-\$ have been driven largely by exchange rate developments in recent years. Exchange rate movements, in turn, have been driven largely by changes in Russia's terms of trade. If export revenues from hydrocarbons had been significantly lower, it is likely that Russia would have

25. See OECD (2004) for an explanation of this measure.

had a substantially weaker real exchange rate and that, as a result, €-\$ wages would have been lower, at least in the short-to-medium term.<sup>26</sup>

Russia's higher wage levels, however, have been supported by higher levels of labour productivity. This can be seen when comparing Russian and Ukrainian data on both output per employee and value added per employee<sup>27</sup> (both calculated in €-\$). Figure 3A shows that output per employee has been significantly higher in Russia than in Ukraine. However, this difference in industry-wide labour productivity partly reflects the high share of resource rents in the output of the Russian hydrocarbon sector, and when the fuel sector is excluded, the difference in industrial labour productivity between Russia and Ukraine decreases significantly. Even so, output per employee in Russia's non-fuel industrial sectors has constantly been higher than in Ukraine (Figure 3B). This differential, moreover, is generalised across industries: in almost all sectors, output per employee in €-\$ has been higher in Russia than in Ukraine (see Appendix, Figure A4).

**Figure 3. Output per employee**



1. Russian data for the entire period as well as Ukrainian data prior to 2001 refer to total industry excluding fuel and electricity. From 2001, Ukrainian data refer to the manufacturing sector.

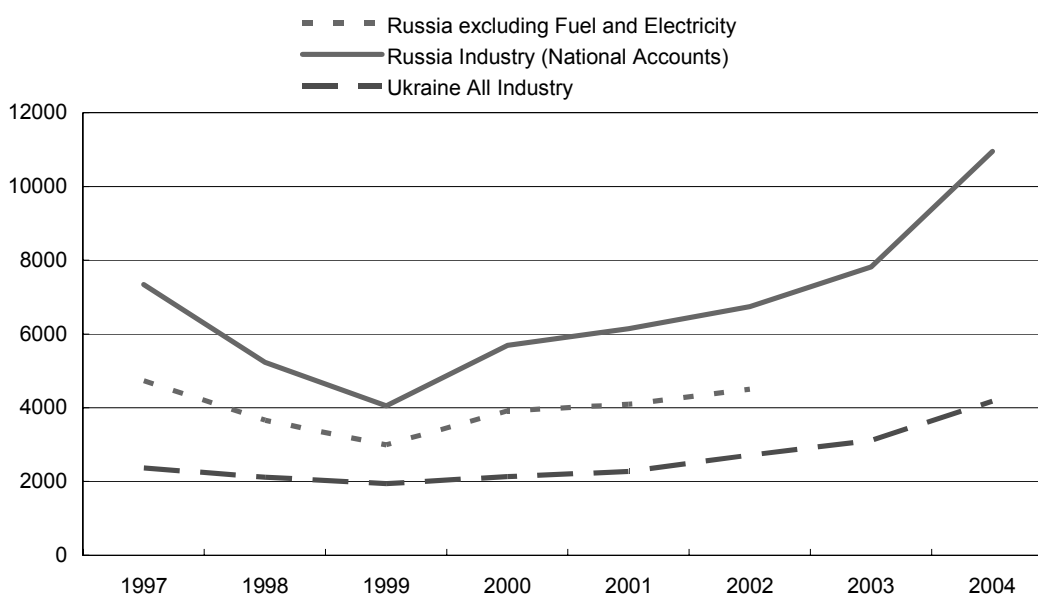
Source: Russian Federal Service for State Statistics, State Statistics Committee of Ukraine and OECD estimates.

The differential between Russia and Ukraine in labour productivity is larger still when measured in value added per employee (Figure 4) instead of output per employee. And although Russian data for value added per employee that would exclude the fuel and energy sector are unavailable for the most recent years, the available evidence seems to suggest that value added per employee in non-fuel industry was probably still significantly higher in Russia than in Ukraine in 2003–2004.<sup>28</sup> This raises

26. Even though in theory wages should in the long term equal the marginal product of labour.
27. Of the two measures, value added per employee is obviously preferable on theoretical grounds, but there are problems with respect to data availability and data quality.
28. The difference between value added per employee in Russian industry ex-fuel and electricity and value added per employee in Ukrainian industry was quite large in 2002. Moreover, the strong increase in industry-wide value added per worker in Russia would suggest that, in all likelihood, value added per worker in industry ex-fuel and electricity also increased in 2003–04. While there are no data to prove the point, this seems to suggest that value added in Russian industry ex-fuel and electricity was still higher than in Ukrainian industry.

the question of *why* output and value added per employee have been higher in Russia, a question addressed at a later stage. The key issue, as will be seen, is whether this is merely a reflection of the faster real appreciation of the rouble relative to the hryvnia rather than real productivity dynamics.

**Figure 4. Value added per employee in €-\$**

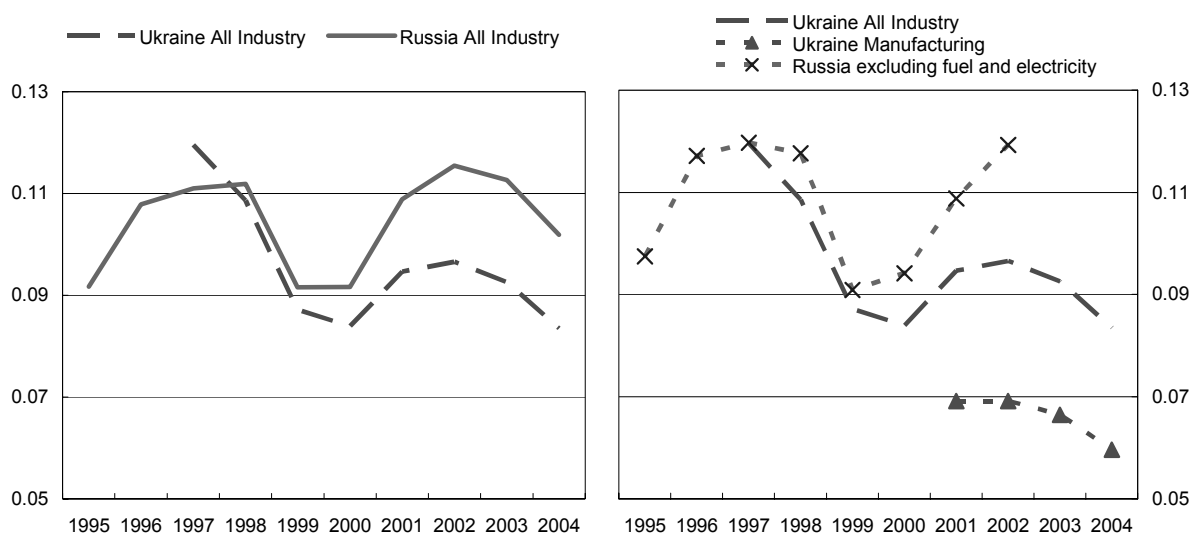


Source: Russian Federal Service for State Statistics, State Statistics Committee of Ukraine and OECD estimates.

Another, more direct measure of the impact of labour costs on industrial competitiveness is the share of wages in output and value added. Figure 5 shows that the wage share in output has been much higher in Russia than in Ukraine in recent years, in both total industry and in manufacturing. However, the picture changes when looking at the share of wages in value added (Figure 6). The wage share in value added in the Russian and Ukrainian manufacturing sectors seems to have been roughly equal through 2001.<sup>29</sup> In 2002, however, a gap began to open up, with Russia beginning to show a larger wage share in manufacturing than Ukraine. Unfortunately, the data needed to determine whether this development continued in 2003–04 are unavailable.

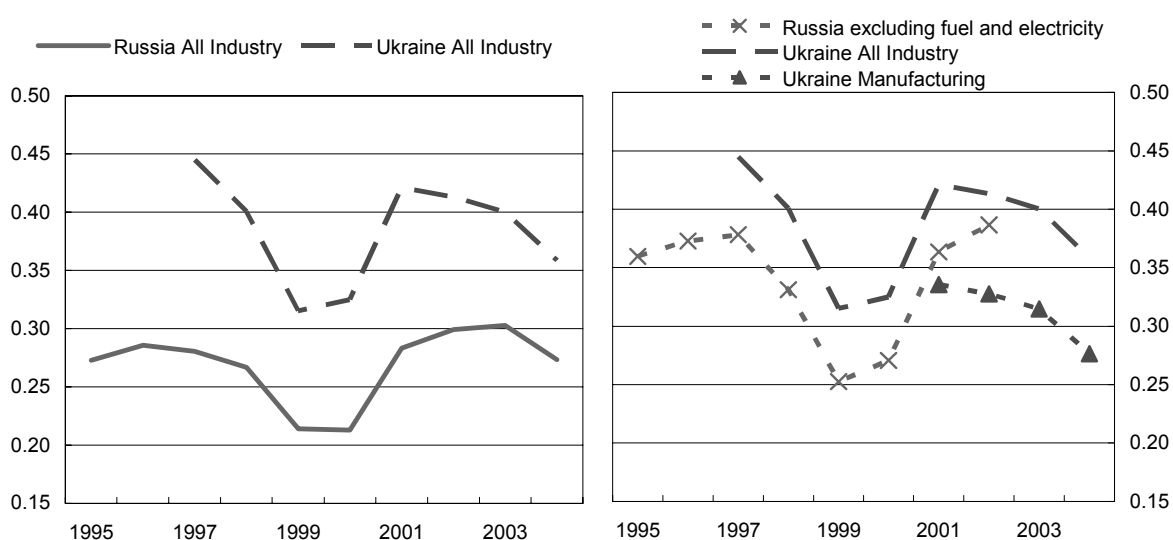
29. On the very plausible assumption that the wage share in Ukrainian manufacturing moved roughly in line with Ukrainian overall industry before 2001.

Figure 5. Wages as a share of output



Source: Russian Federal Service for State Statistics, State Statistics Committee of Ukraine and OECD estimates.

Figure 6. Wages as a share of value added

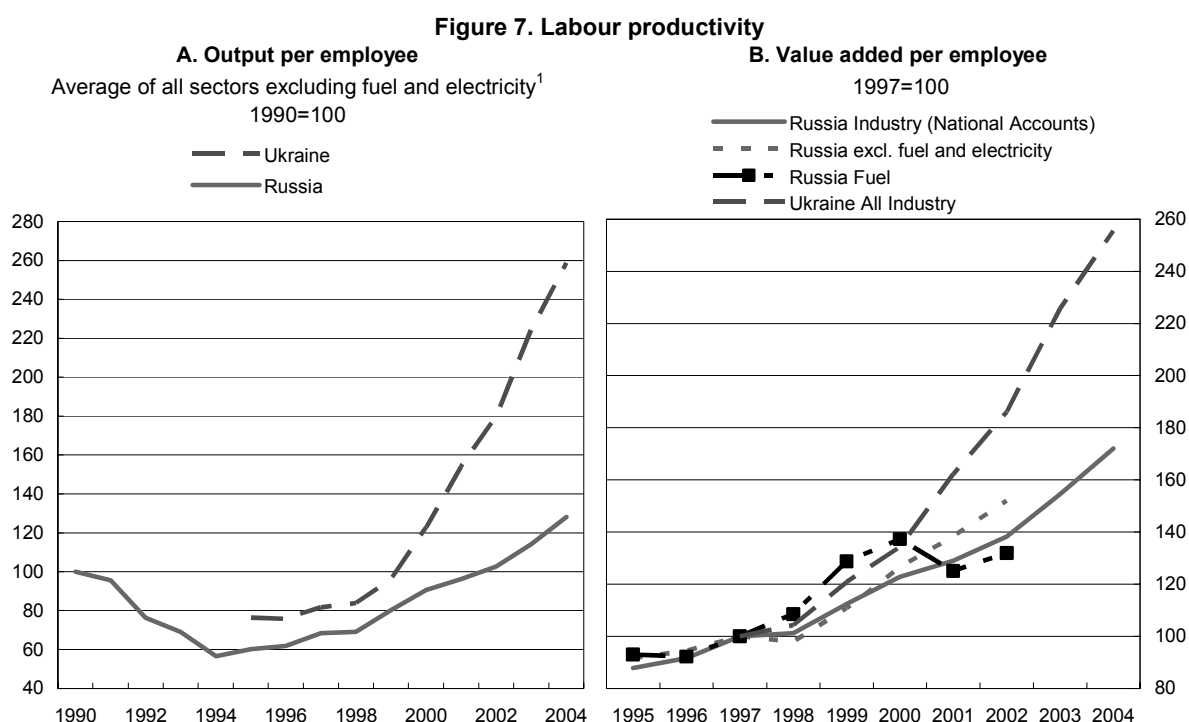


Source: Russian Federal Service for State Statistics, State Statistics Committee of Ukraine and OECD estimates.

However, while *levels* of labour productivity (measured by value added per employee in €-\$ terms) have been consistently much higher in Russia than in Ukraine over the last decade, Ukraine's performance in terms of productivity *growth* has been far better than Russia's since 2000. Figure 7A shows the *evolution* of labour productivity in volume terms since 1990. Surprisingly, we see that output per employee in *volume* terms – when measured against 1990 production volumes – actually held up *better* in Ukraine than in Russia. However, this does not contradict our finding that output per employee in €-\$ terms has been consistently higher in Russia. The latter finding reflects the fact that prices for Russian output have been higher than for Ukrainian goods. In theory, this could indicate that the quality of Russian output has been higher. However, it may also to some extent reflect market imperfections: Russian manufacturers do not export much except to the CIS, so the main issue for

them is the price they can command on the domestic market. If incomes are higher, domestic competition limited and there are some (formal or informal) barriers to imports in Russia, then Russian products are likely to be able to command higher prices than their Ukrainian counterparts.

Both countries display a U-shaped evolution for labour productivity, with the bottom reached in the mid-1990s. However, the decline in output per employee seems to have been slightly less extreme in Ukraine, and labour productivity growth after 2000 was very much faster there than in Russia. This result does not only hold in aggregate: the sector-by-sector comparison presented in Figure A6 below shows that productivity growth in Ukraine was faster than in Russia in almost all non-energy sectors. This also holds when looking at value added per employee in volume terms. Figure 7B shows that during 1997–99, this measure of productivity increased at about the same pace in Russia and Ukraine; however, from 2000, it increased at a much faster pace in Ukraine. This reinforces the sense that a large part of the gap seen in Figure 4 stems from rouble appreciation.



1. Russian data for the entire period as well as Ukrainian data prior to 2001 refer to total industry excluding fuel and electricity. From 2001, Ukrainian data refer to the manufacturing sector.

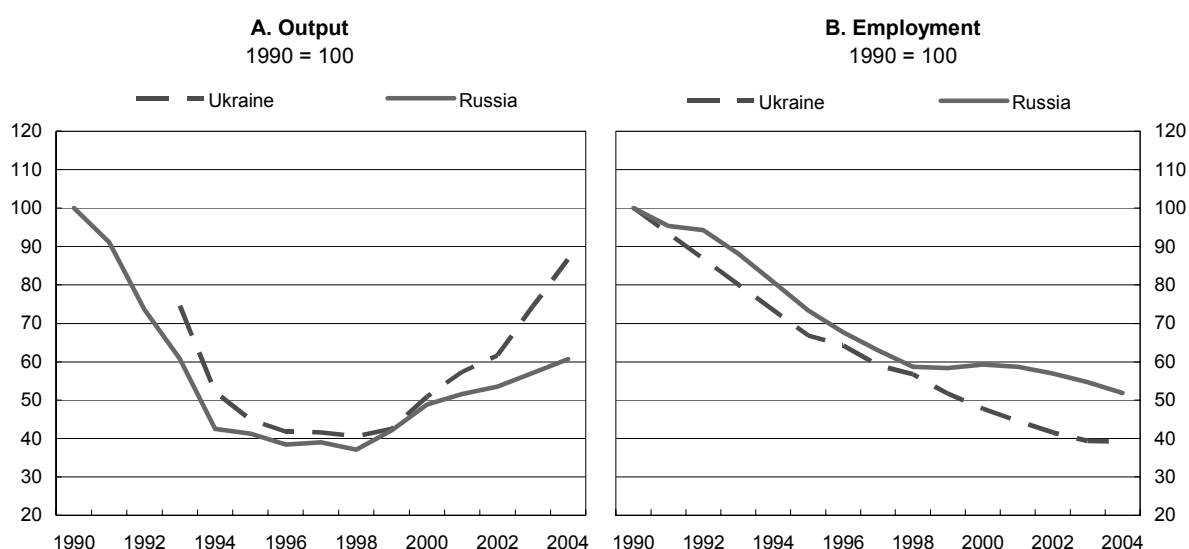
Source: Russian Federal Service for State Statistics, State Statistics Committee of Ukraine and OECD estimates.

In order to understand these productivity developments better, it is useful to examine the evolution of output and employment separately. Figure 8A shows that the fall in aggregate industrial output outside the fuel and electricity sector was roughly the same in Russia and Ukraine, bottoming out in both countries in 1998. However, while the early stages of the recovery proceeded more or less in tandem, output growth was much stronger in Ukraine than in Russia from 2001. Interestingly, 2001 was the year when strongly rising oil extraction and exports emerged as the main engine of Russian growth, while the boost Russian industry had received from the 1998 devaluation receded. On the employment side, it would seem that non-fuel sectors have shed far less employment in Russia than in Ukraine (Figure 8B).

This may indicate that resource wealth has actually *slowed* restructuring in Russia. The situation of Russian enterprises may on average have been less critical, as they profited from cheaper effective

energy prices.<sup>30</sup> Moreover, Ukraine also experienced a sharper contraction in domestic demand during the early-to-mid 1990s than did Russia, a fact that would seem to owe something to the role played by Russia's resource wealth in sustaining domestic demand, which for most Russian industrial enterprises is far more important than external demand. Thus, Ukraine's lack of a resource sector – a sector that performed comparatively well in the early phases of transition as a source of export revenues – may have induced a much more abrupt and sustained collapse in economic activity, and consequently domestic demand and employment in that country. The possibility that resource wealth may actually have slowed restructuring looks even more plausible in light of the sectoral data: in all sectors where Russian output fell more than Ukrainian output, employment in Russia nonetheless fell less (see Appendix, Figure A5).

**Figure 8. Output and employment**  
Average of all sectors excluding fuel and electricity



Source: Russian Federal Service for State Statistics, State Statistics Committee of Ukraine and OECD estimates.

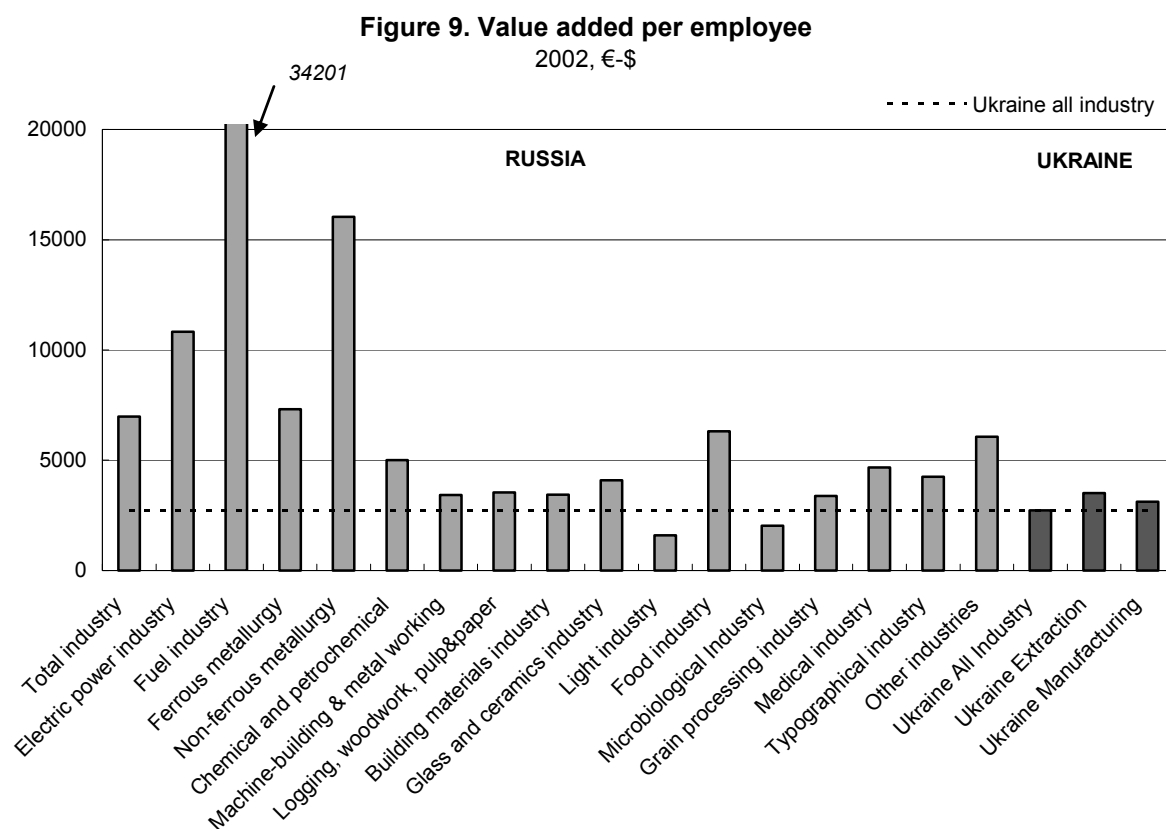
In short, the foregoing analysis suggests that while various industrial performance indicators improved faster in Ukraine than in Russia, especially after 2000, Russian industry (ex-fuel and electricity) remained more productive all along and it still is. Value added and output per employee are still higher in Russia. This to some extent explains why it has been possible for industrial wages in Russia to be higher than in Ukraine.

The interesting question is how one might explain higher levels of output and value added per employee in Russia. One possibility could be that – even if one excludes the fuel and energy sectors – Russia had larger shares of its industries in sectors with potentially higher output and value added per employee. However, this does not appear to have been the main explanation. Output per employee (in €-\$ terms) has been higher in almost all industrial sectors in Russia than in Ukraine (see Appendix, Figure A4). While there are no sectoral value-added data for Ukraine which would allow for direct

30. It would be interesting to investigate whether (and how) differences in the tax system have contributed to the different industrial developments in Russia and Ukraine. This question is, however, beyond the scope of this paper and must be left for further research.



industry-by-industry comparisons, the value added per employee (in €-\$ terms) of almost all Russian industrial sectors is higher than the *average* for Ukrainian industry as a whole (Figure 9).<sup>31</sup>



Source: Russian Federal Service for State Statistics, State Statistics Committee of Ukraine and OECD estimates.

There are several possible explanations for Russian industry's higher levels of output and value added per worker. They are not mutually exclusive, and it is possible that all of them play a role. First, Russian industry may have been already more productive at the start of transition. However, Ukraine was in Soviet times generally considered as profiting from a fairly modern industrial base, and there is no evidence that would suggest that its industrial base was significantly inferior to Russia's. Secondly, the higher level of value added per employee (in €-\$ terms) in Russia might result from lower input prices, particularly energy prices. This is almost certainly a major contributing factor, since Russia's continuing advantage in value added per worker, as revealed in Figure 9, contrasts sharply with trends in output per worker in a number of sectors: as is clear from Figure A4, Ukraine has narrowed the gap, or even overtaken Russia, in output per worker in a number of sectors. However, if this were the principal, or only, explanation, then one would expect to see output per employee (in €-\$ terms) converging to roughly similar levels in both countries<sup>32</sup> even as Russia showed higher levels of value added per employee. Yet €-\$ output per employee is higher in Russia than in Ukraine. Nonetheless, lower input (energy) prices probably do form part of the explanation, given that the difference in value added per employee is significantly larger than that for output per employee. Although Ukrainian

31. In addition, value added as a share of output has been consistently higher in Russia, even when the fuel and energy sectors are excluded (see Figure 1, Appendix B).

32. Or at even higher levels in Ukraine.

import prices for gas have been, and remain, much closer to Russian gas prices than to Western European levels, the prices paid by industry in Ukraine in past years nevertheless appear to have been well above those paid by Russian industrial consumers.<sup>33</sup>

A third possibility is that early reforms and privatisation in Russia might have increased the relative efficiency of its industry at a very early stage in the transition, giving Russian industry an edge from which it has been able to profit ever since. Certainly, Russia underwent more radical reforms in the first years of transition than did its neighbour. The faster introduction of new production and management techniques may have allowed Russian industry to produce goods that could sell for higher prices and had a higher share of value added. If this were indeed a major reason for the differences in productivity, one would also expect that the Russian advantage would gradually disappear as Ukraine caught up – which would at least partly explain the better dynamic performance of Ukraine in recent years. A more specific point that is related to this line of argument concerns the liberalisation of most foreign trade, one of the earliest and most radical of Russia's reforms. Melitz (2003) notes that increased competitive pressure from international trade stimulates intra-industry reallocation of market shares and factors of production. Exchange-rate appreciation, which may be ignited by reliance on resource exports, inevitably intensifies competitive pressure on both export and domestic markets. This outcome may be interpreted as an increase in an economy's *effective* exposure to trade, regardless of the trade policies actually implemented or the intentions of policymakers. Such a process may accelerate the weeding out of less competitive firms, via the reallocation of market shares and profits to more efficient players. The increased demand for labour caused by the expansion of more productive firms bids up the real wage, thus forcing their less productive counterparts, who cannot afford higher costs, to exit.

Higher wage and productivity levels in Russia may indeed be in part a product of the reallocation effects Melitz describes. Indirect evidence of this is provided by Bessonova *et al.* (2003), who find that competition from foreign imports or goods produced by firms with foreign investment has a positive impact on the productivity of domestic firms, which tend to restructure faster in response to the competitive threat. However, there is little reason to believe that early restructuring efforts have enabled Russian industrial enterprises to produce goods of much higher quality across the board. On the contrary, the markedly higher productivity growth recorded by Ukrainian industry, especially during 2000–04, would make it extremely difficult to sustain the argument that Russian goods command higher prices as a result of deeper restructuring. After all, the structural distortions that afflict the Russian and Ukrainian economies are similar – both suffer from weak competition and barriers to entry in many sectors.

It is these very distortions that may underlie much of what we see in the data. The fact that Russian enterprises can sell their output at higher prices is more likely to reflect the fact that Russian enterprises and sectors that do enjoy a significant degree of (formal or informal) protection are operating in an economy where incomes are higher and demand greater, owing in no small measure to resource wealth and the real appreciation of the rouble in recent years. One need not hypothesise that Ukrainian markets are consistently more open or more competitive than Russian ones: many segments of *both* economies are characterised by weak competition and local monopolies, sustained by implicit or explicit subsidies and barriers to entry. However, if Russia's resource rents enable it to sustain a stronger exchange rate, then the potential rents available to those agents who profit from restricted entry and lack of competition will be all the greater: to put it simply, the demand curves for

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33. The data do not permit a more categorical statement on the subject, owing to the need to take account of tariff levels, payment discipline, forms of payment and various subsidy schemes in order to assess the real effective price of gas to end-users. On the Russian case, see OECD (2002) and Ahrend and Tompson (2004).

manufactures in Russia are to the right of those in Ukraine, but Ukrainian suppliers cannot always enter those markets on equal terms. What *appear* to be higher levels of output (in €-\$) and value added per worker in some manufacturing sectors probably reflect the existence of such rents. This would particularly be the case in those sub-sectors of manufacturing that World Bank (2005) identifies as *de facto* non-tradables. This line of argument would not entirely contradict the preceding hypothesis (increased trade-related competition), as some sectors may have recorded competition-induced improvements in quality, while in others high prices may reflect distorted markets. Sectors that are (formally or informally) very protected would arguably respond to the resource boom like non-tradable sectors rather than like manufacturers struggling to cope with Dutch disease pressures.

Ultimately, it is very difficult (and beyond the scope of this paper) to determine which of the above-listed factors is most relevant. The topic is an important one that merits further research. On the basis of the evidence presented here, however, it seems likely that all four possibilities may have contributed to some extent, with their relative importance varying over time: early restructuring may well account for productivity differentials in the late 1990s, whereas the situation seems to have changed after that. As labour productivity in Ukraine rose very much faster than in Russia, the maintenance of higher levels of value added and output in €-\$ in Russia may increasingly have reflected rouble appreciation in a situation of substantial market imperfections.

### **Resource wealth, economic development and Russian welfare**

The preceding section leaves little doubt that the industrial sectors of Russia and Ukraine have been developing in different ways and also that the difference in resource endowments between Russia and Ukraine seems to have been one of the factors underlying their different development paths. However, this does not answer the question of whether or not Russia can be said to be falling under the ‘resource curse’ or suffering from ‘Dutch disease’. Such a diagnosis would imply that:

- Russia’s non-resource industrial sector had been *negatively affected* by its resource sector’s growth (or was likely to suffer from it in the future); and
- Russia’s resource wealth had had a negative impact on the economy as a whole, in terms of welfare and development prospects (or was likely to do so in the future).

In this context, it should be stressed that an appreciating currency is not only a source of potential competitiveness problems. It can also bring significant benefits to a country. First, a stronger exchange rate brings higher wages in foreign currency terms, which in turn implies higher purchasing power for households and firms, as relative prices of tradables fall (normally for both domestic and imported goods). This contributes to higher living standards for the population. Thus, in addition to the substitution effect (Russians buying relatively more imported goods as the real exchange rate strengthens), there is also an income effect: the increase in purchasing power that results from a strengthening exchange rate allows Russians to buy more domestically produced goods and services – whether tradables or non-tradables. On the production side, exchange-rate appreciation renders imported investment goods more affordable, thus potentially easing the task of industrial restructuring and compounding the beneficial reallocation effects induced by trade openness. Finally, an appreciating currency reduces the foreign debt burden in relative terms, and hence the share of its GDP a country has to use to service its debt.

As a start in determining whether Dutch disease pressures are undermining Russia’s economic performance, one may look for strong macro-evidence. The results of this exercise are, however, mixed. On the one hand there are some signs of trouble. During 2001–04, real GDP growth was much faster in Ukraine than in Russia, despite the rapid growth of Russian oil output and exports, and

Ukraine's non-resource industry was also expanding at a much faster rate. On the other hand, within Russia, both resource-based and non-resource-based industrial sectors have – on average – been growing output and exports at roughly similar speeds, which would indicate that any effect from natural resources to non-resource sectors may have been limited.<sup>34</sup> Moreover, unemployment continued to fall throughout the period, as labour-market flexibility facilitated a relatively smooth adjustment to changes in the terms of trade. While the shift of labour from the tradable sector to non-tradables continued (it even accelerated slightly after 2002), it was much slower than in the early stages of transition. The bulk of the reallocation during 2000–04 involved the movement of workers out of agriculture – not manufacturing – and into the non-public tertiary sector, chiefly trade and catering.

Turning to more detailed measures, the evidence from the previous section as well as that in Figure 10 show that productivity growth, though quite impressive in Russia, has been far weaker than in Ukraine when measured in terms of output per worker. Ukraine also outperformed Russia in terms of the growth of value added per worker, although the gap opened up later and was somewhat narrower. Moreover, since the gaps shown in Figure 10 are differences in annual percentage growth rates, their cumulative effect over a number of years would be large indeed. This is somewhat puzzling, as one would have expected exchange rate pressure from increasing natural resource exports to have put additional pressure on Russian enterprises to increase their productivity. As suggested above, it may be that resource wealth, combined with market imperfections, has *diminished* the pressure on some Russian manufacturing sectors to increase productivity via labour shedding, and has thus led to less restructuring on that front. It may also reflect delayed restructuring in Ukraine: World Bank (2004) notes that industrial restructuring in Ukraine accelerated markedly after 1999, as enterprises felt the effects of macroeconomic stabilisation and the hardening of budget constraints. On the other hand, the higher value added in Russian industrial production – though probably resulting in part from lower energy prices – suggests that Russian industrial enterprises have been able to sell their output at higher prices than their Ukrainian counterparts. In any case, in order to compare competitiveness – the main aim of this section – it is more useful to look at unit labour costs, to compare changes in value added per employee with changes in wages, and to look at changes in revealed comparative advantage.

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34. The exception was 2005, when manufacturing grew substantially faster than resource extraction.

Figure 10. Productivity Growth



1. Russian data for the entire period as well as Ukrainian data prior to 2001 refer to total industry excluding fuel and electricity.

From 2001, Ukrainian data refer to the manufacturing sector.

Source: Russian Federal Service for State Statistics, State Statistics Committee of Ukraine and OECD estimates.

In order to get a more accurate impression of the real state of labour cost competitiveness, Figure 11 reports the evolution of unit labour costs (ULCs) in Russia and Ukraine, taking the pre-crisis levels of 1997 as a reference point.<sup>35</sup> Results are reported both for all industry and for industry excluding fuel and electricity. Unsurprisingly, in the wake of the Russian financial crisis, the devaluations of the rouble and the hryvnia resulted in a significant cut in wages (in €-\$ terms) in both countries, and hence a significant reduction in unit labour costs. After 1999, however, ULCs grew much faster in Russia than Ukraine, largely on account of exchange rate effects. With the Ukrainian real exchange rate continuing to depreciate even after 1999, ULCs remained at roughly the low levels reached in 1999. As a result, Russia's situation with respect to relative ULCs deteriorated markedly after 2000. Thus, while Russia's 2004 ULCs were still well below pre-crisis levels, the country had lost a great deal of ground relative to Ukraine. These data suggest that Russian industry during 1999–2004 coped rather well with the pressures generated by an appreciating exchange rate, wage growth and rapidly rising domestic energy and transport tariffs, but that it has nevertheless been unable to prevent the erosion of its position vis-à-vis its Ukrainian competitors, who continue to benefit from a relatively cheaper exchange rate.

35. Unit labour costs are calculated on the basis of sectoral data on employment, production volumes (in 2000 prices) and average wages, expressed in €-\$.

**Figure 11. Unit labour cost**  
1997 = 1

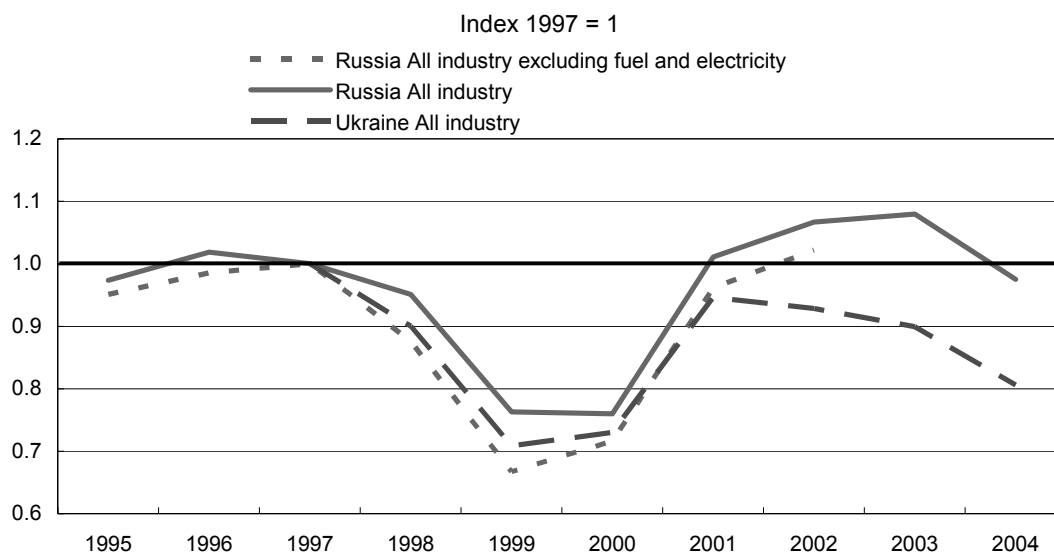


1. Russian data for the entire period as well as Ukrainian data prior to 2001 refer to total industry excluding fuel and electricity.

From 2001, Ukrainian data refer to the manufacturing sector.

Source: Russian Federal Service for State Statistics, State Statistics Committee of Ukraine and OECD estimates.

Calculating ULCs based on production volumes gives a reasonably good picture of the potential competitiveness of an industry. However, by construction, this does not allow one to take into account changes in the value added of production. Calculating ULCs based not on production volumes but on actual value added gives additional interesting insights. Figure 12 shows that, on this measure, it is not so clear that Ukraine outperformed Russia after 2000. Moreover, for both Russia and Ukraine, the value added-based ULCs for recent years were not very different from those of 1997. Russia, in particular, seems to have seen a tendency for value added-based ULCs to decline in recent years, in contrast to standard, volume-based ULCs. While the evidence is certainly not conclusive, this outcome tends to reinforce the view that REER appreciation and terms-of-trade changes provide much of the explanation for recent developments.

**Figure 12. 'Value added based' unit labour costs**

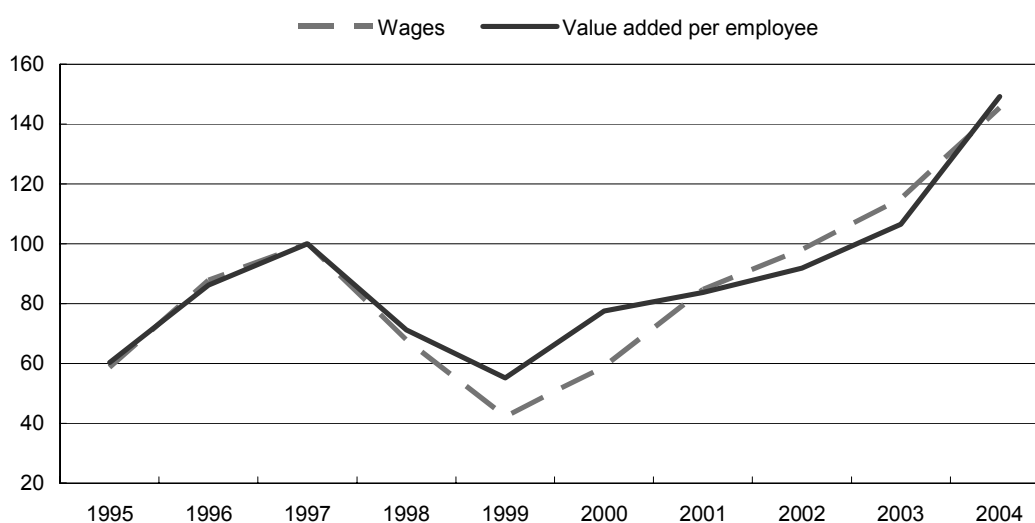
Source: Russian Federal Service for State Statistics, State Statistics Committee of Ukraine, OECD estimates.

To disaggregate further the above ULC measure, it is interesting to look at how wages and value added per employee have developed over time. It turns out that Russian industrial value added per employee in €-\$ terms, after sharply declining in the aftermath of the crisis, attained pre-crisis levels in 2002 and was roughly 50% higher in 2004. Wages fell somewhat more as a result of the crisis than did value added per employee, but they also recovered more strongly afterwards. As a result, when looking at the whole period from 1995 through 2004, changes in wages and value added per employee have been strikingly similar (Figure 10).

**Figure 13. Developments in value added per employee vs. wage developments**

€-\$, index 1997=100

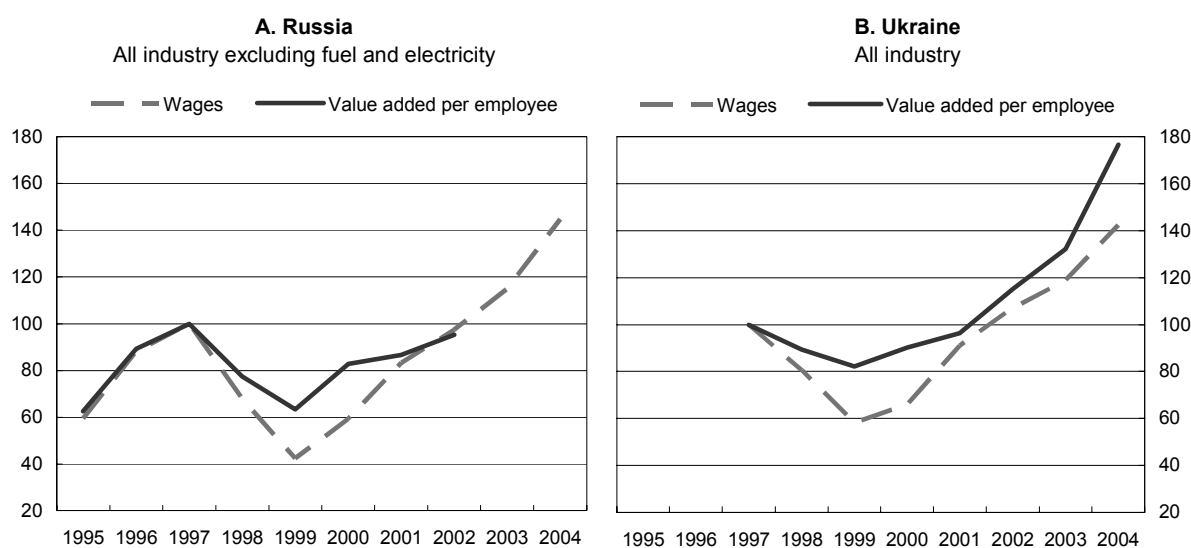
Russia (all industry)



Source: Russian Federal Service for State Statistics, State Statistics Committee of Ukraine and OECD estimates.

While value added-based unit labour costs in Russia did not increase between 1995 and 2004, this does not mean that ULCs were stable in any given sector or even in the industrial sector ex-fuel and electricity. While recent sectoral value added data that would allow for exact calculations are unavailable, the available statistical evidence strongly suggests that wages have been developing in line with productivity increases in virtually all significant industrial sectors,<sup>36</sup> with output per employee increasing at least at the speed of wages (see Appendix, Figure A7).<sup>37</sup> Figure 11 shows that for Russian industry (excluding fuel and electricity), wages and value added per employee moved in tandem from 1995 through 2002. Taken together with the individual sectoral figures, this suggests strongly that Russia's *non-fuel* industrial sectors did not suffer any significant increase in value added based unit labour costs during 1995–2004. However, comparing Russia to Ukraine shows that Russian industrial sectors have lost labour cost competitiveness relative to their Ukrainian counterparts.

**Figure 14. Developments in value added per employee vs. wage developments**  
€-\$, index 1997=100



Source: Russian Federal Service for State Statistics, State Statistics Committee of Ukraine and OECD estimates.

The ultimate test of whether a country's international industrial competitiveness is improving or declining is obtained by looking at the results of international competition – as for example measured by a country's revealed comparative advantages, and how they evolve over time.<sup>38</sup>

36. Westin (2005) points out that Russia's dollar wages are low compared with those in other transition countries at a similar stage of development.

37. Ironically the only exceptions are the fuel sector and the electricity sector themselves, where wage increases have far outstripped productivity increases. The reasons for this are probably inflated wage and employment growth in recent years in the state controlled electricity monopoly, RAO UES, and especially in the gas monopoly OAO Gazprom, where rent-seeking by insiders seems to have been flourishing (see Ahrend 2004 for further evidence). While there seems to have been some improvement of labour productivity in RAO UES in very recent years as it has been preparing for privatisation, there is no sign for that in OAO Gazprom.

38. RCA is an empirical indicator of trade specialization (see Neven, 1995) and is computed, for each

sector  $i$ , as:

$$RCA_i = \left( \frac{X_i}{\sum X_k} - \frac{M_i}{\sum M_k} \right) 100$$



Despite significant improvements in both the efficiency and competitiveness of most branches of Russian industry, few sectors have reached a degree of international competitiveness that would enable them to export on a significant scale. Russia's major RCAs are in hydrocarbons (oil, oil products and gas), together with some other resource-based (e.g. wood, pulp and paper), and energy-intensive products (non-ferrous metals, fertiliser), as well as steel and 'other transport equipment'. The number of sectors in which Russia has some RCA, however small, is surprisingly short (see Appendix C, Table C1). In all probability, Russia also has an RCA in arms, but official data are unavailable. On the other hand, Russia still has significant revealed comparative *disadvantages* in such manufactured products as industrial machinery and equipment, electronic consumer goods, cars, and medicinal and pharmaceutical products. In addition, it also has a substantial comparative disadvantage in meat production – Russia is the second-largest meat importer in the world, after Japan.

Overall, Russia saw a further deepening of its major revealed comparative advantages and disadvantages between 1997 and 2004 (see Table C3). For example, Russia's RCA in oil, which was already huge in 1997, further increased – which makes the strong fall in the RCA for gas even more striking.<sup>39</sup> The only other sectors in which Russia had some RCA in the past and which recorded noteworthy increases are the coal industry and, to a lesser degree, the forestry sector. At the same time, comparative disadvantages grew worse over the period in many of the sectors in which Russia already had large negative RCAs.

The deterioration in electronic consumer goods reflects increasing purchases of durables by the population and is thus a product of rising living standards. This outcome is not surprising, given that electronic consumer goods never were a strong point of Russian industry. Worrying – though not unexpected – was the sharp deterioration in the competitiveness of the automobile industry in 2000–04, which dwarfed the small improvement recorded in the wake of the August 1998 financial crisis. Finally, the pharmaceuticals sector also lost some ground, though it seems that the situation stabilised after 2000. There were also, however, some bright spots. The negative RCAs for cereals and cereal preparations, sugar and sugar preparations, and meat improved significantly. This, together with some improvement for miscellaneous edible products and preparations, indicates progress in the competitiveness of the agricultural and food processing sectors, though it is also to some degree a reflection of Russia's introduction of a degree of protection in some agricultural sub-sectors, as well as its success in securing better market access for its grain exports.<sup>40</sup>

Ukraine, in turn, has its major revealed comparative advantages in metals (steel, ferrous metals and metal ores), which accounted for roughly 44% of exports in 2005. Another sector with a significant competitive advantage is cereals. In addition, there are a multitude of diverse sectors where Ukraine has some – albeit rather minor – comparative advantage. On the import side – even when taking account of the large comparative disadvantage in oil and gas that Ukraine faces as a net importer of hydrocarbons – the situation is very similar to Russia, with Ukraine having revealed comparative disadvantages in road vehicles, machinery, and sophisticated electronic consumer goods. However, in contrast to Russia, where it is strongly negative, the RCA for less sophisticated electronic goods is close to zero in Ukraine, a fact that may well be related to the lower purchasing power of Ukrainian consumers rather than the superior quality of Ukrainian goods in this sector.

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39. The poor performance of the gas sector is mainly due to the dominant position of a state controlled monopolist, that – in the absence of significant gas sector reform – is a major burden on the development of the sector. See Ahrend/Tompson (2004) for details.

40. In general, agricultural RCAs cannot be regarded as unproblematic indicators of productivity and competitiveness trends, since they can be powerfully affected by changes in farm subsidy regimes or trade regulations.

To summarise, both countries' export performance has been heavily concentrated. However, there is evidence that Ukraine, in contrast to Russia, has been able to maintain – or acquire – export competitiveness in a variety of rather simple manufacturing sectors in which Russia does not seem to be competitive. Higher wage levels (measured in international currency terms) in Russia are likely to be a significant factor here. That said, Russia's RCAs do not reveal much evidence of Russia having *lost* industrial competitiveness since 1997 in sectors where it then demonstrated some comparative advantage (the major exception here being the automobile sector). By and large, as living standards rose, Russia imported more of the goods that it was already importing in the mid-1990s. This indicates that the sectors manufacturing these goods were either non-existent at the start of the transition or had largely disappeared by 1996–7. Increasing imports have been financed by higher oil exports.

## Conclusion

Fifteen years of transition have seen the industrial structures of Russia and Ukraine evolve in divergent directions. Not surprisingly, the contribution of resource sectors to industrial growth has been far larger in Russia than in Ukraine and has grown over time. The direct contribution of primary resource sectors to the growth of industrial production in Russia during 2001–04 was around 70%.<sup>41</sup> In Ukraine, the initially smaller contribution of primary resource sectors to industrial production growth has been further declining over time.

At a time of rising commodity prices, Russia's specialisation in natural resources does appear to underlie the large and growing gap between Russia and Ukraine with respect to labour costs: the stronger exchange rate resulting from booming resource exports appears to account for most of the difference in wages. That certainly represents a significant source of pressure on Russian manufacturers' competitiveness. However, higher wages have been accompanied by higher labour productivity in Russia, in terms of both output per employee and value added per employee. The share of wages in value added remained about the same in both countries, at least until 2002. However, labour productivity grew much faster in Ukraine during the period under study – output grew faster and there was more downsizing of the industrial labour force. These basic results hold for the overwhelming majority of sectors when individual branches of industry in Russia and Ukraine are compared.

These findings hardly suggest that booming resource exports have led, or are leading, to the deindustrialisation of Russia. Nevertheless, production trends, labour costs and productivity, and revealed comparative advantages all present mixed pictures:

- Until the Ukrainian slowdown of 2005, Russian manufacturing was growing at a much slower rate than Ukrainian manufacturing, although Russia's manufacturing sectors were managing to increase output at roughly the same speed as its resource sectors (faster in 2005). Export volumes, too, have been growing at roughly similar rates in Russia's resource and non-resource sectors since 2000 (Gianella and Chanteloup, 2006:7).
- ULCs in manufacturing rose much more rapidly in Russia than in Ukraine during the period under study when ULCs are computed using output volumes. However, Russian ULCs rose roughly in line with those of Ukraine when computed in terms of value added.

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41. This estimate, moreover, does not allow for any of the knock-on effects of resource-sector growth on other sectors. The actual – direct and indirect – contribution was larger still.

- Both output per employee and value added per employee rose faster than wages in Ukraine. In Russia, by contrast, output and value added grew roughly in line with wages during the period under study.
- Whereas Ukraine's revealed comparative advantages (RCAs) are mainly in manufacturing, Russia's are overwhelmingly in natural resources, and this specialisation has been intensifying.

The paper's findings with respect to Russian trade performance should be considered in light of Gianella and Chanteloup's (2006) conclusion that Russian non-fuel exports show 'normal'<sup>42</sup> sensitivity to movements in the real exchange rate, leaving little doubt that steady real rouble appreciation squeezes Russian manufacturing sectors. Moreover, it should be borne in mind that the period under study here pre-dates the dramatic rises in oil prices seen in 2005–06. World Bank (2005:4–5) suggests that by early 2005, Russian manufacturers were starting to struggle due to the real appreciation of the rouble. OECD (2006) observes that growth in 2004–05 was driven increasingly by non-tradables, although the contribution of tradable sectors picked up somewhat in the first half of 2006.

There are thus some indications that the resource sector's growth and rising commodity prices may have created problems for Russian manufacturers, but the effect does not appear to have been very large during most of the period under study. Strongly rising oil prices in 2004–06 may have intensified these pressures but one cannot draw firm conclusions on the basis of the available data. In any case, if one excludes such basic manufacturing as steel and manufacturing sectors that are closely linked to natural resource sectors, the contribution of manufacturing industry to the Russian economy is actually relatively small.<sup>43</sup> Moreover, Russia's highly flexible labour market<sup>44</sup> has resulted in a relatively smooth adjustment to the recent terms-of-trade changes: unemployment has continued to fall, and the intersectoral reallocation of the labour force has been relatively smooth in recent years.

On balance, then, it appears that Russia's resource wealth has forced (or perhaps allowed) Russia's manufacturing sector to be more productive in value creation. As a result, production volumes in Russian manufacturing have probably been below what could have been produced at lower real exchange rates, but Russian producers have still managed to command higher prices for their production. Being able to secure higher prices for their output has allowed Russian manufacturers to shoulder larger wage bills, reflected in comparatively high wages and employment levels. Apart from that, there seems to have been a stronger expansion of the non-tradable sector in Russia than in Ukraine. This, too, is likely to be a result of booming resource export earnings and, more particularly, of the income effect arising from a strengthening real exchange rate. The faster growth of services may also simply be a reflection of higher income levels in Russia – which are themselves in no small measure the product of resource wealth.

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42. Real exchange rate elasticities for non-fuel exports are of an order that would be expected from international experience.

43. Addressing the issue of whether natural resource sectors had a negative effect on the competitiveness of Russian manufacturing exports, Evsei Gurvich of the Economic Expert Group attached to the Russian Ministry of Finance has argued, crisply and provocatively, that 'it is hard to have a negative effect on something which does not exist'.

44. *De facto*, if not *de jure*: formally, the labour market is heavily regulated but, as OECD (2006) observes, much of the legislation on the books is not enforced..

It is questionable therefore whether the term Dutch disease is an appropriate description of the Russian situation, at least as it evolved until 2004. The very phrase itself implies that Russia has *suffered* from its resource wealth, but Russia's GDP per capita and household disposable incomes are much higher than in Ukraine, and Russia's natural resources are probably the main reason for that. While some enterprises and sectors have probably encountered difficulties, the available evidence suggest that Russia is probably much better off as a result of having a strong resource sector – even if that implies some negative impact on manufacturing. This does not mean that Russia will not in future suffer from the kind of political and economic problems associated with the resource curse. There is no need for it to do so, if it follows the right policies,<sup>45</sup> but the risk obviously remains.

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45. See Ahrend (2006b)

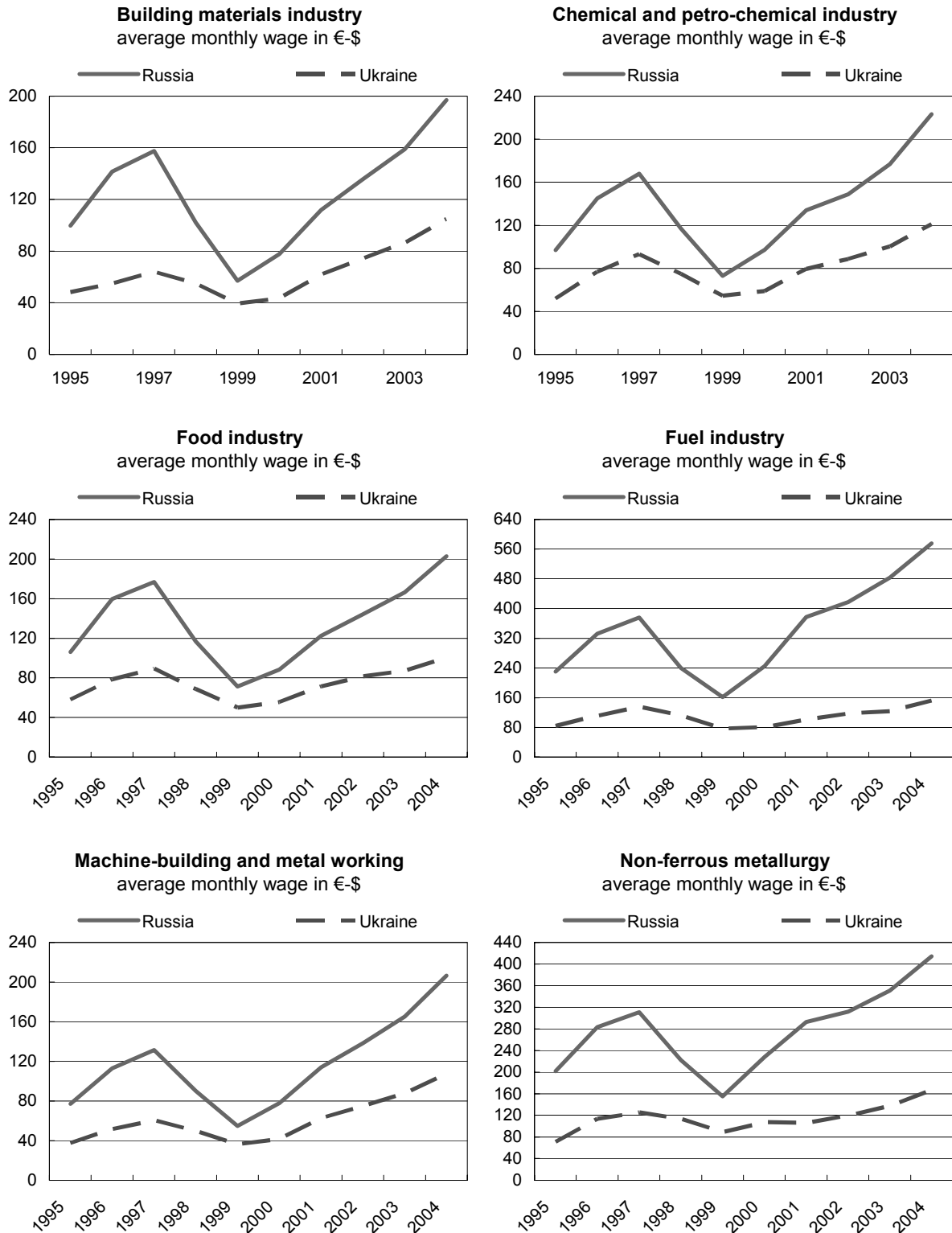
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**APPENDIX A: COMPARISON OF INDIVIDUAL INDUSTRIAL SECTORS**

Figure A1: COMPARISON OF SECTORAL WAGE LEVELS



Source: Russian Federal Service for State Statistics, State Statistics Committee of Ukraine and OECD estimates.



Figure A1 (suite) : **COMPARISON OF SECTORAL WAGE LEVELS**

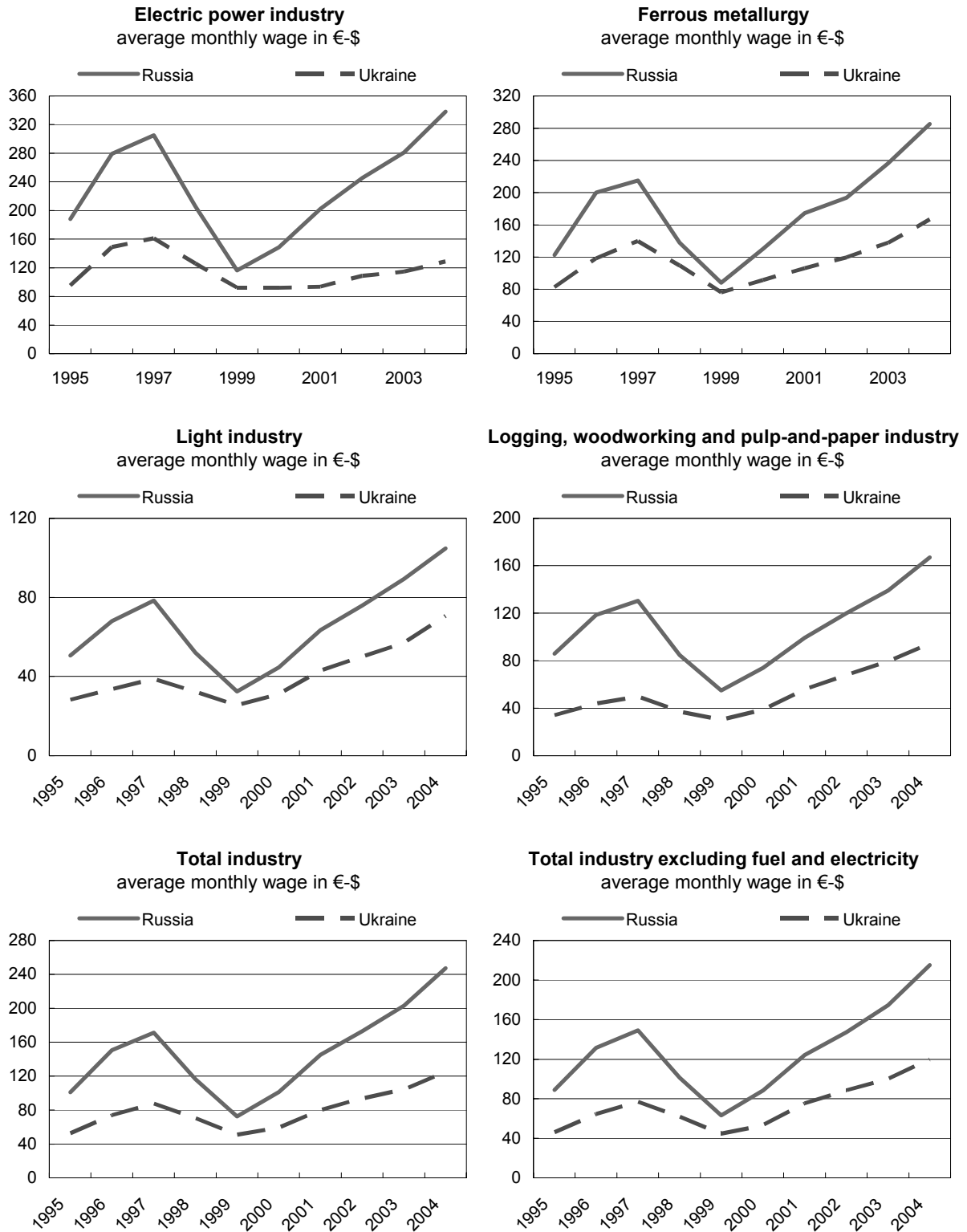
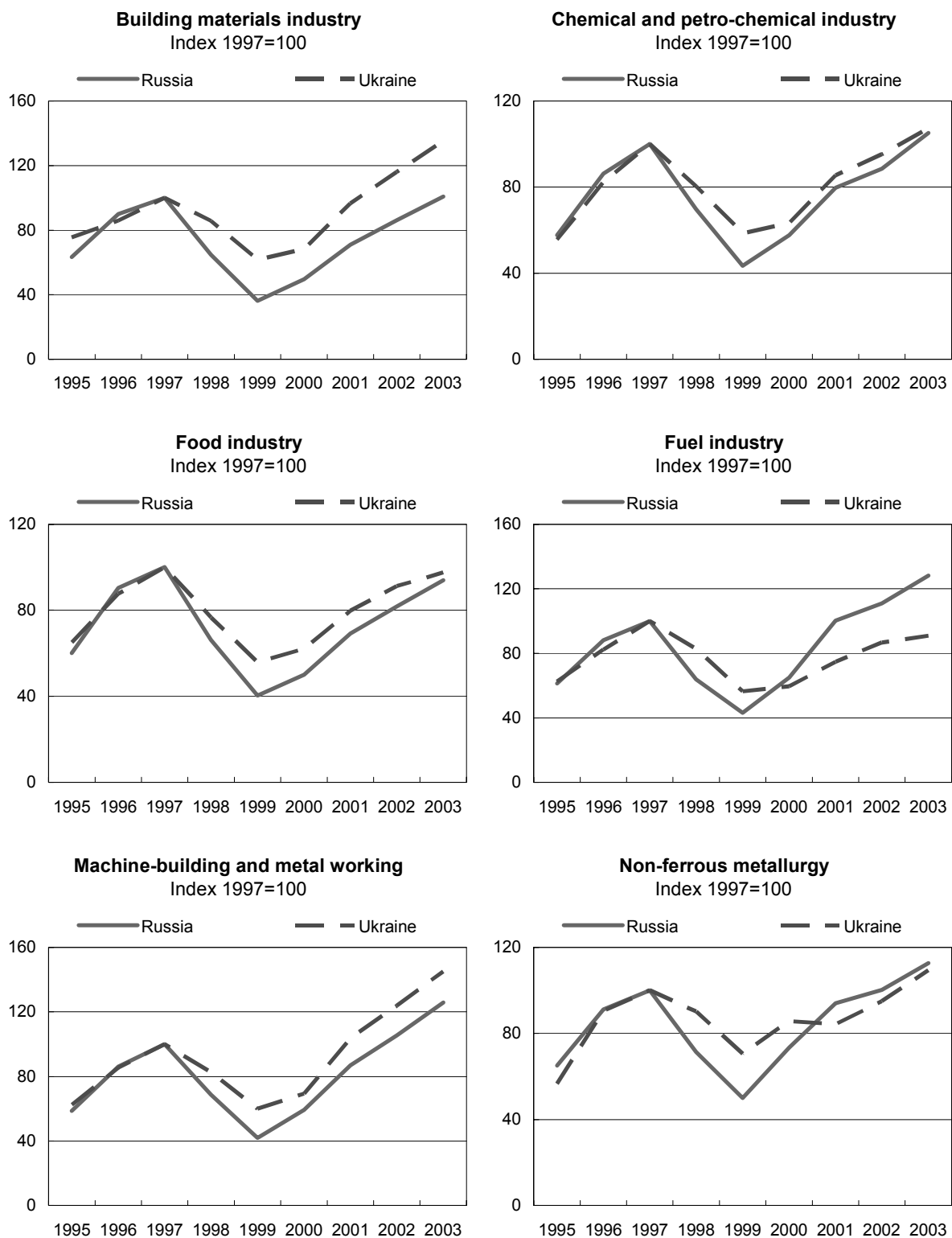


Figure A2: COMPARISON OF SECTORAL WAGE DEVELOPMENTS



Source: Russian Federal Service for State Statistics, State Statistics Committee of Ukraine and OECD estimates.

**Figure A2 (suite) : COMPARISON OF SECTORAL WAGE DEVELOPMENTS**

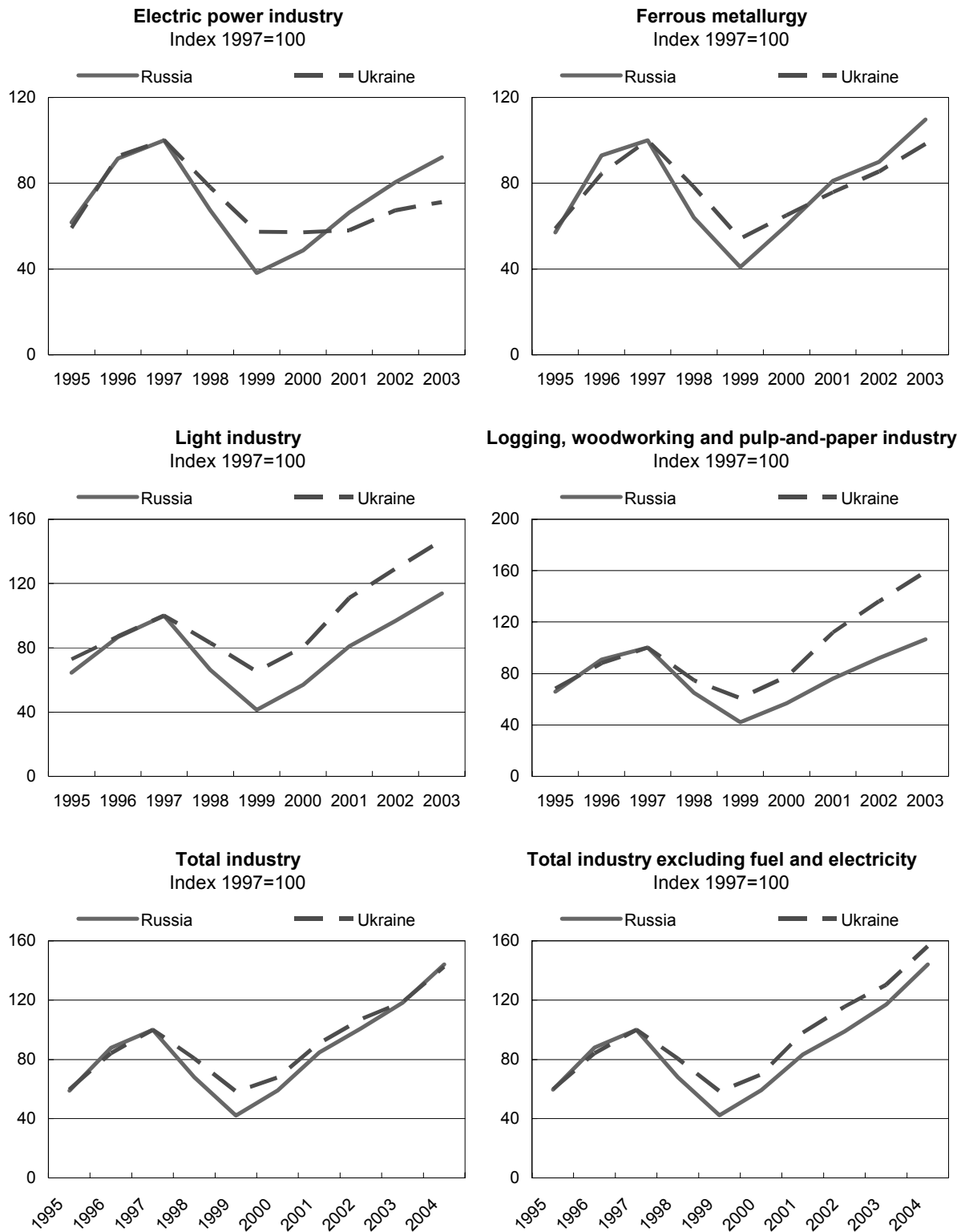
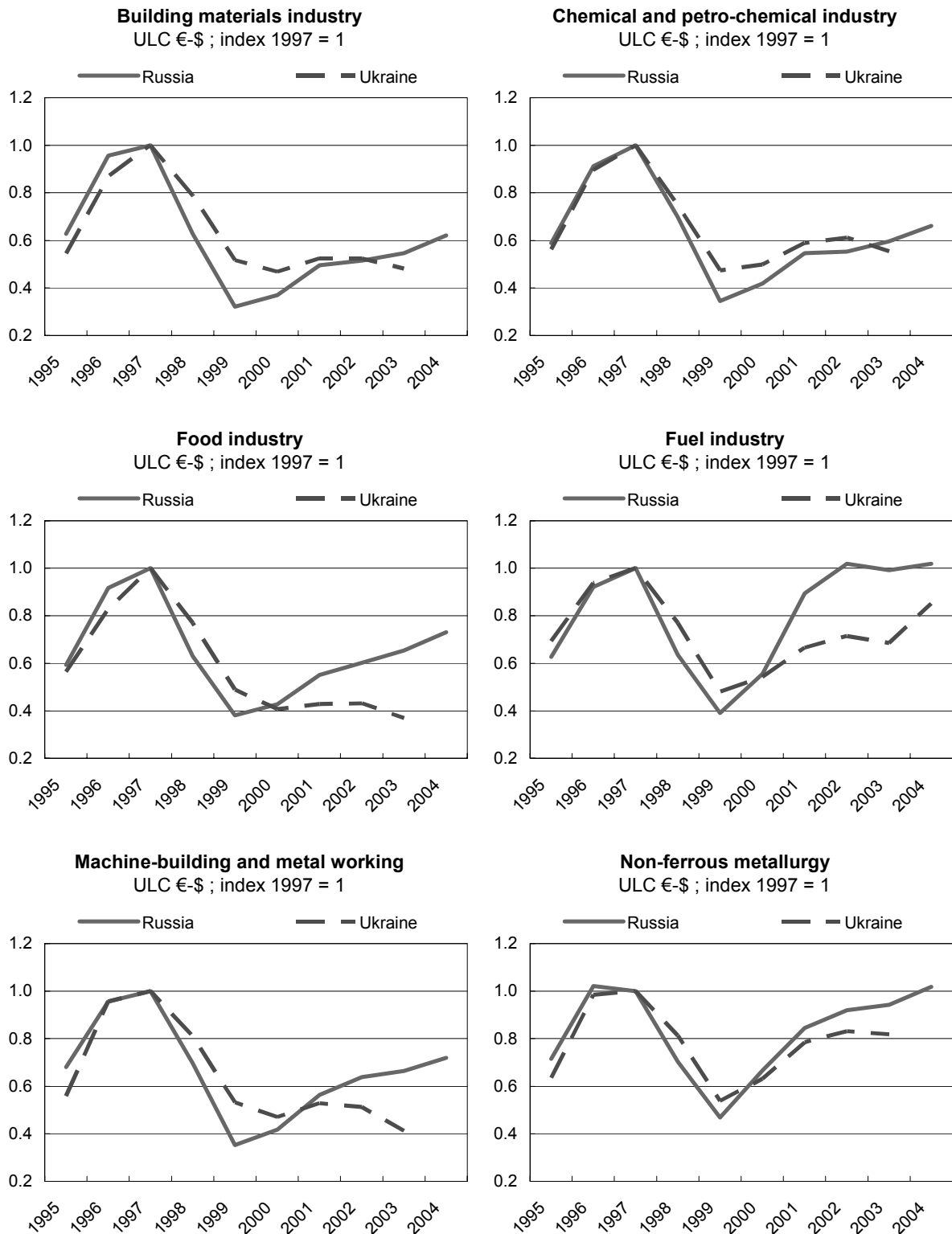


Figure A3 : UNIT LABOUR COSTS BY INDUSTRIAL SECTOR



Source: Russian Federal Service for State Statistics, State Statistics Committee of Ukraine and OECD estimates.

Figure A3 (suite): UNIT LABOUR COSTS BY INDUSTRIAL SECTOR

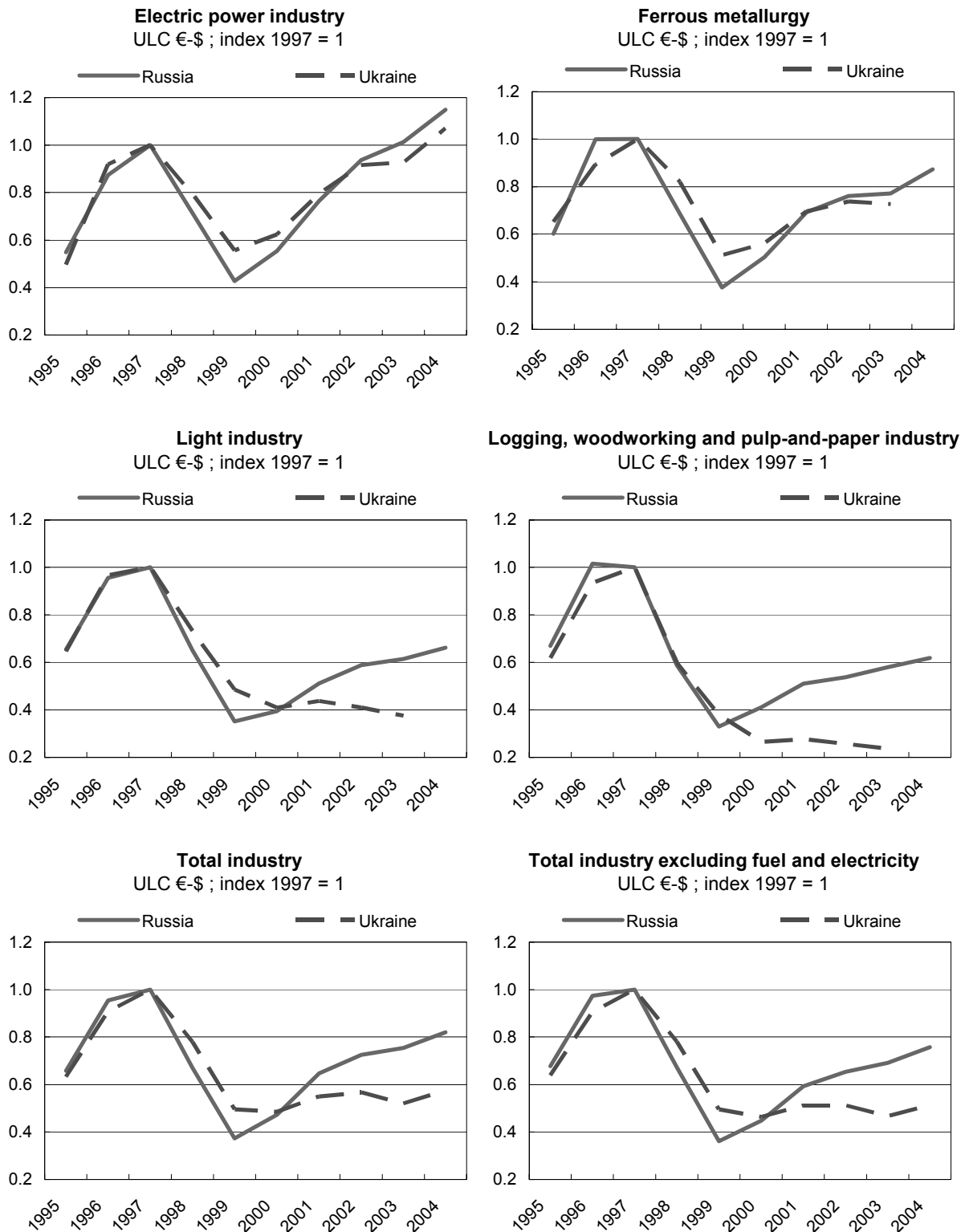
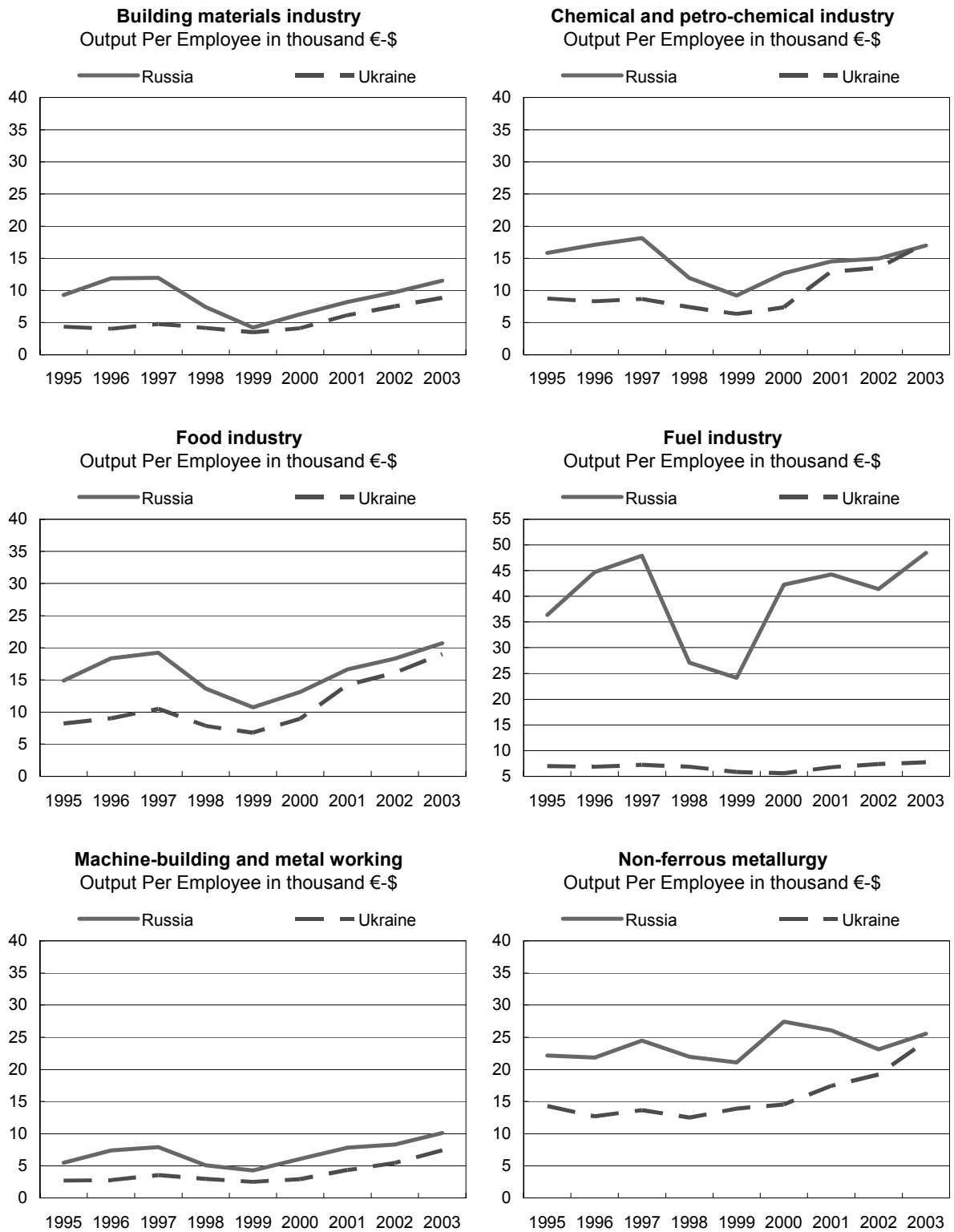


Figure A4 : **SECTORAL LEVELS OF OUTPUT PER EMPLOYEE**



Source: Russian Federal Service for State Statistics, State Statistics Committee of Ukraine and OECD estimates.

**Figure A4 (suite) : SECTORAL LEVELS OF OUTPUT PER EMPLOYEE**

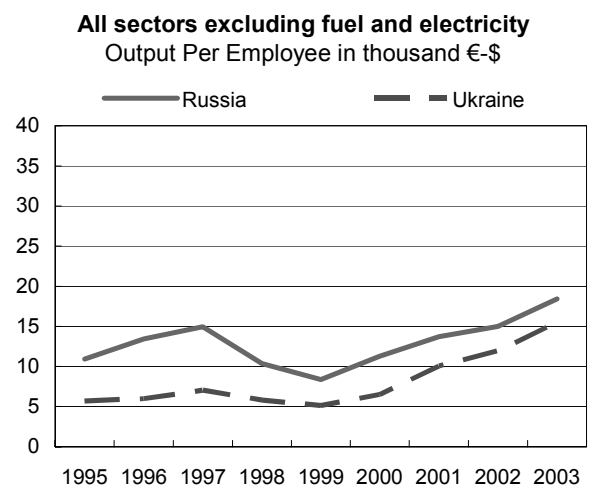
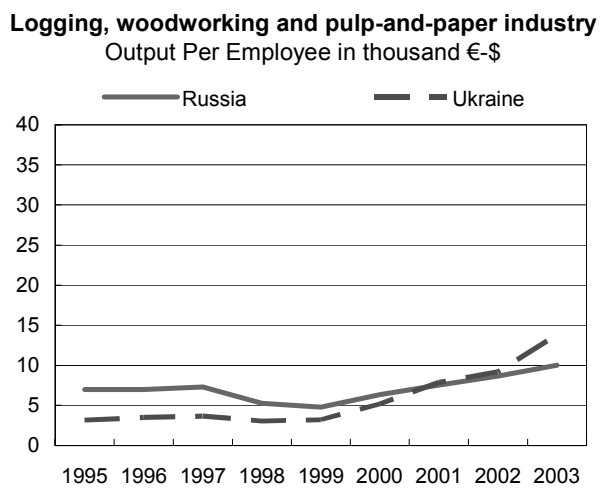
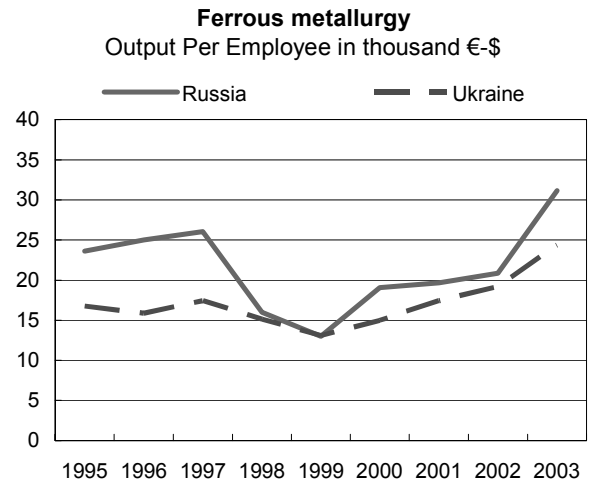
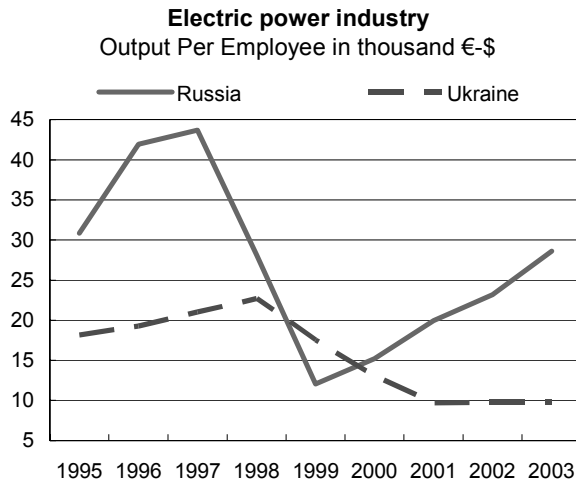


Figure A5 : **OUTPUT VERSUS EMPLOYMENT BY INDUSTRIAL SECTOR**

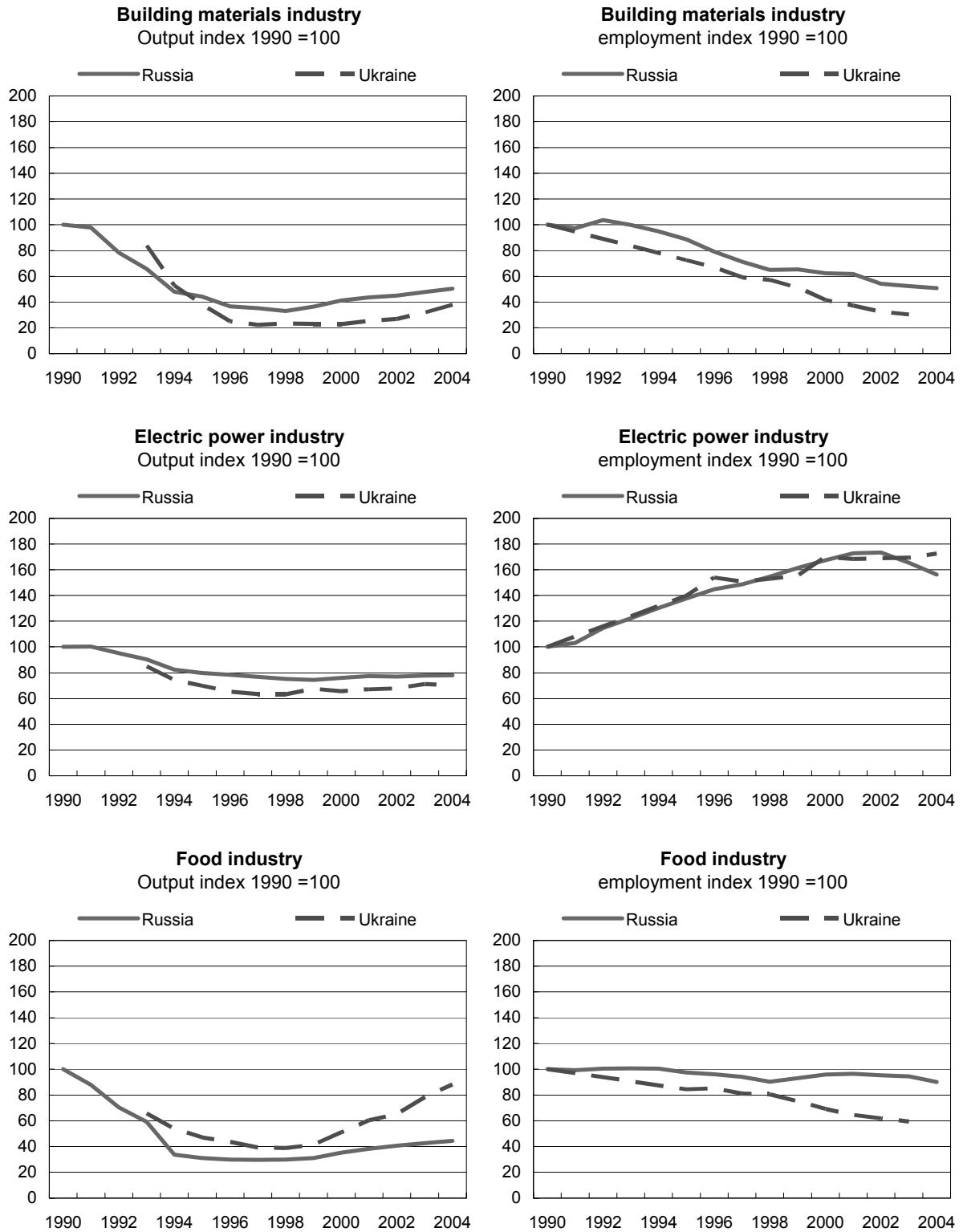




Figure A5 (suite): **OUTPUT VERSUS EMPLOYMENT BY INDUSTRIAL SECTOR**

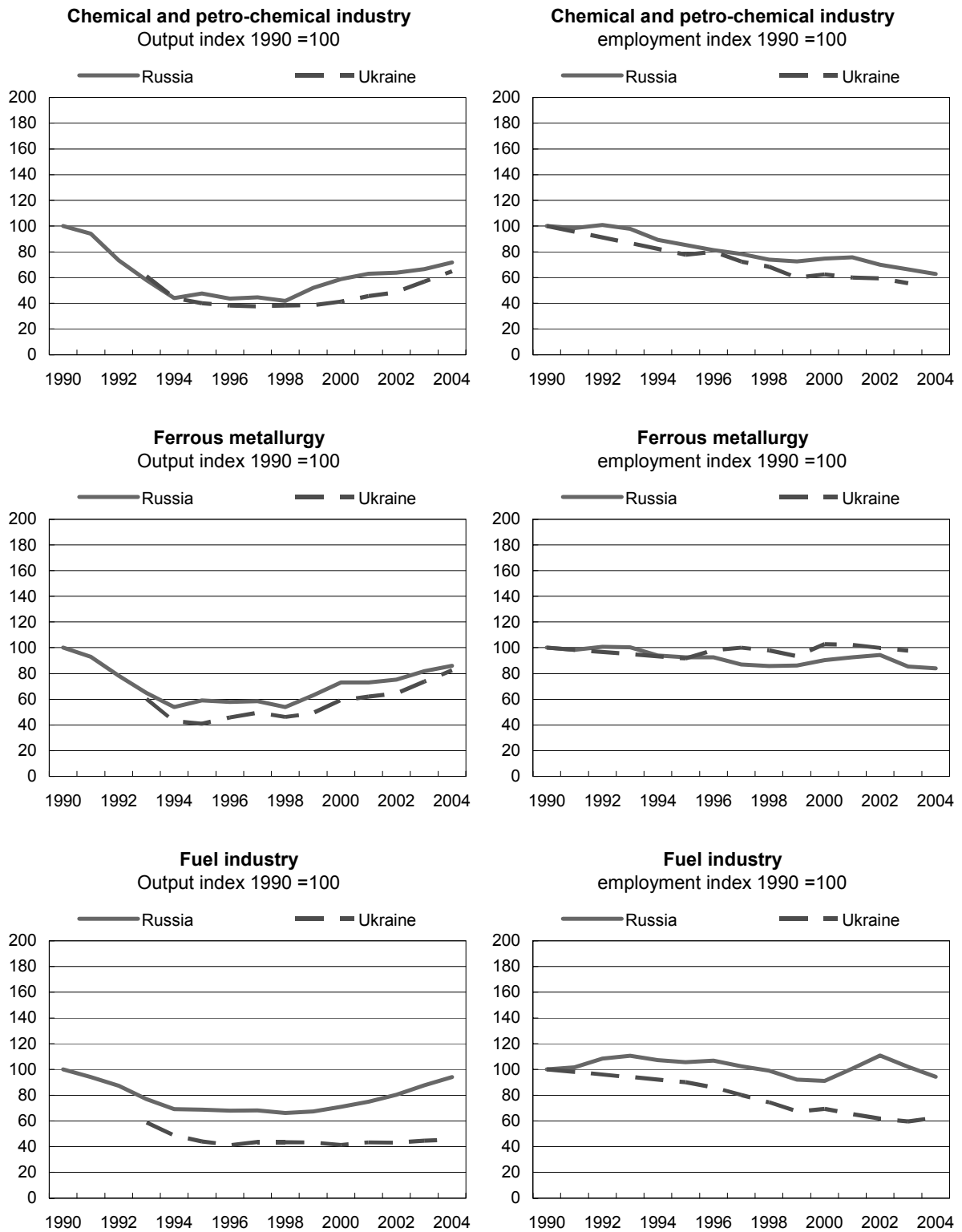
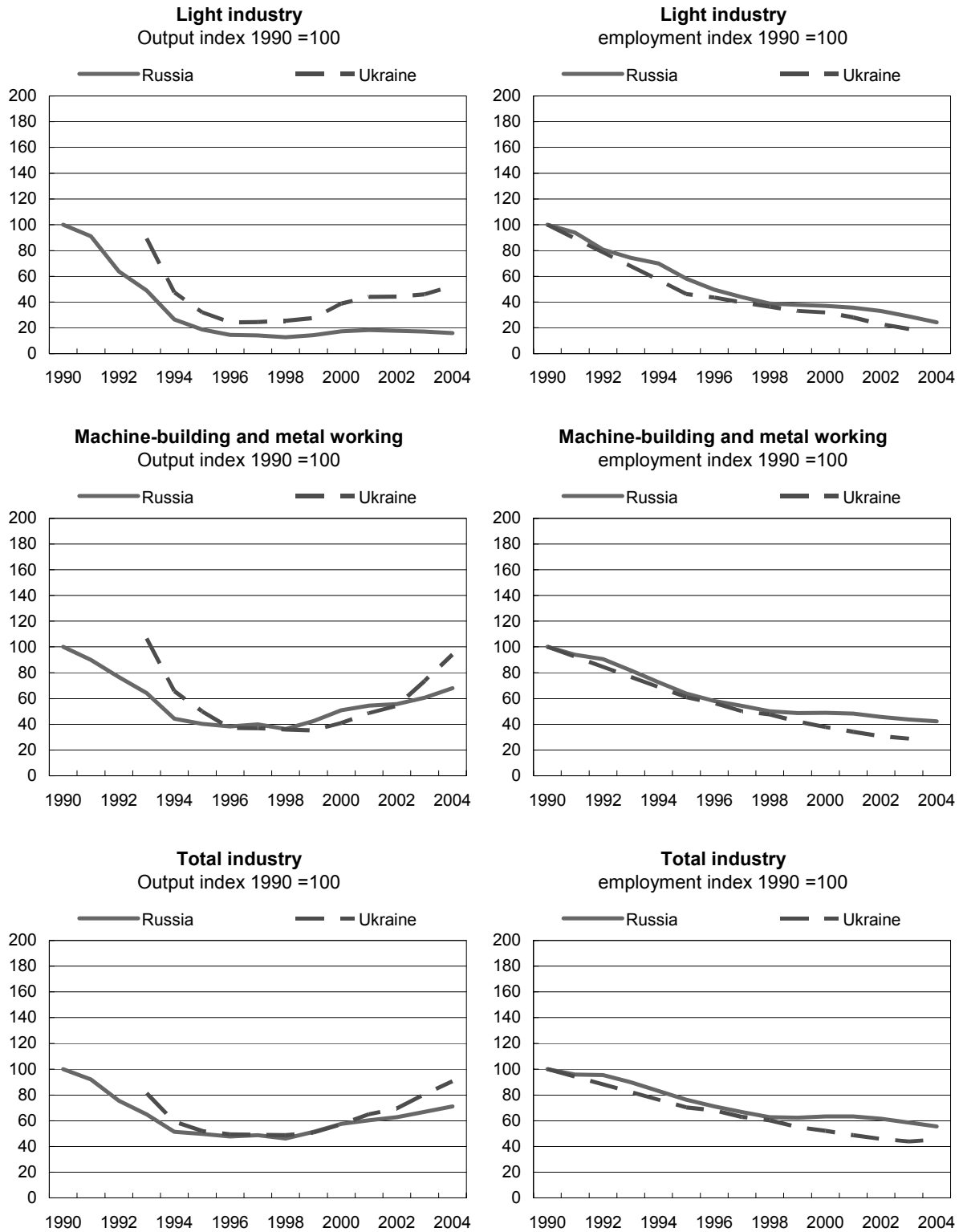


Figure A5 (suite): **OUTPUT VERSUS EMPLOYMENT BY INDUSTRIAL SECTOR**

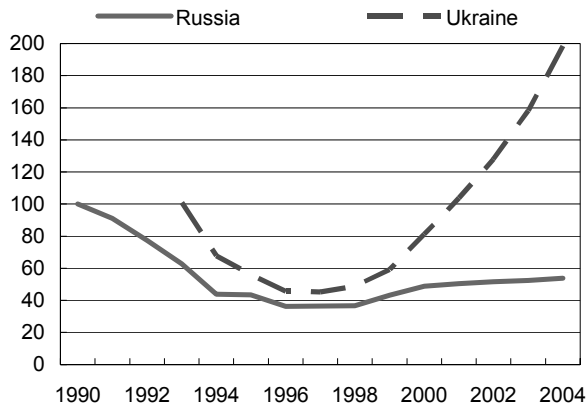


Source: Russian Federal Service for State Statistics, State Statistics Committee of Ukraine and OECD estimates.

Figure A5 (suite): **OUTPUT VERSUS EMPLOYMENT BY INDUSTRIAL SECTOR**

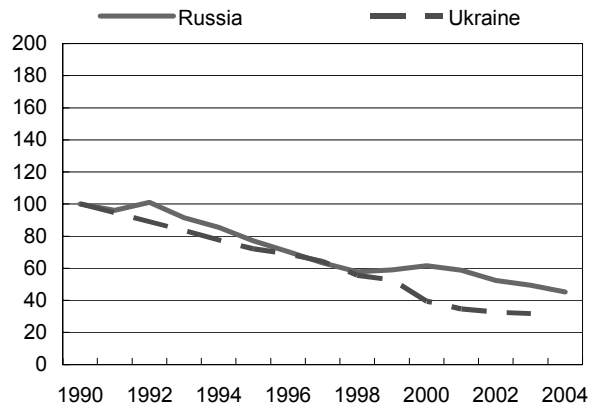
**Logging, woodworking and pulp-and-paper industry**

Output index 1990 =100



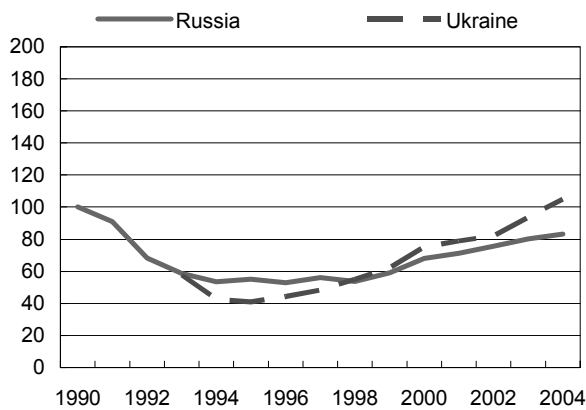
**Logging, woodworking and pulp-and-paper industry**

employment index 1990 =100



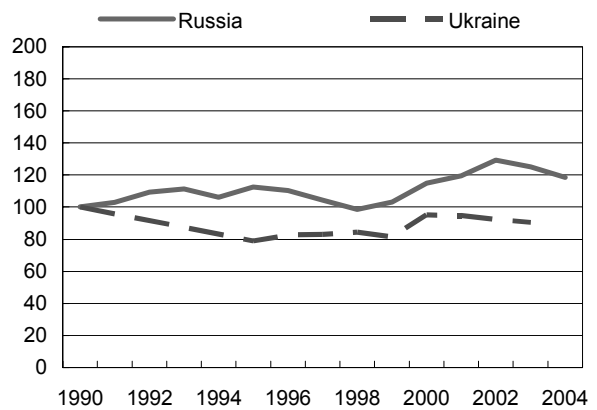
**Non-ferrous metallurgy**

Output index 1990 =100



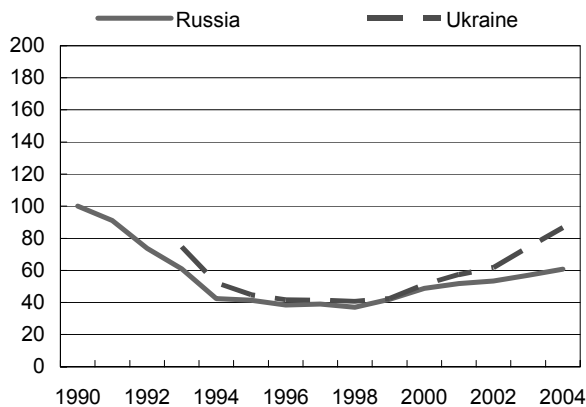
**Non-ferrous metallurgy**

employment index 1990 =100



**Output excluding fuel,electricity**

Output index 1990 =100



**Employment excluding fuel and electricity**

employment index 1990 =100

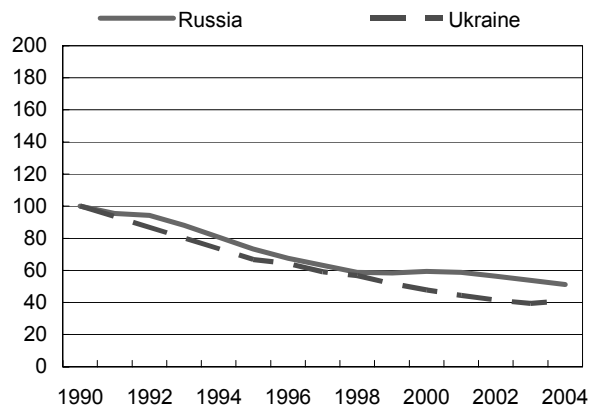
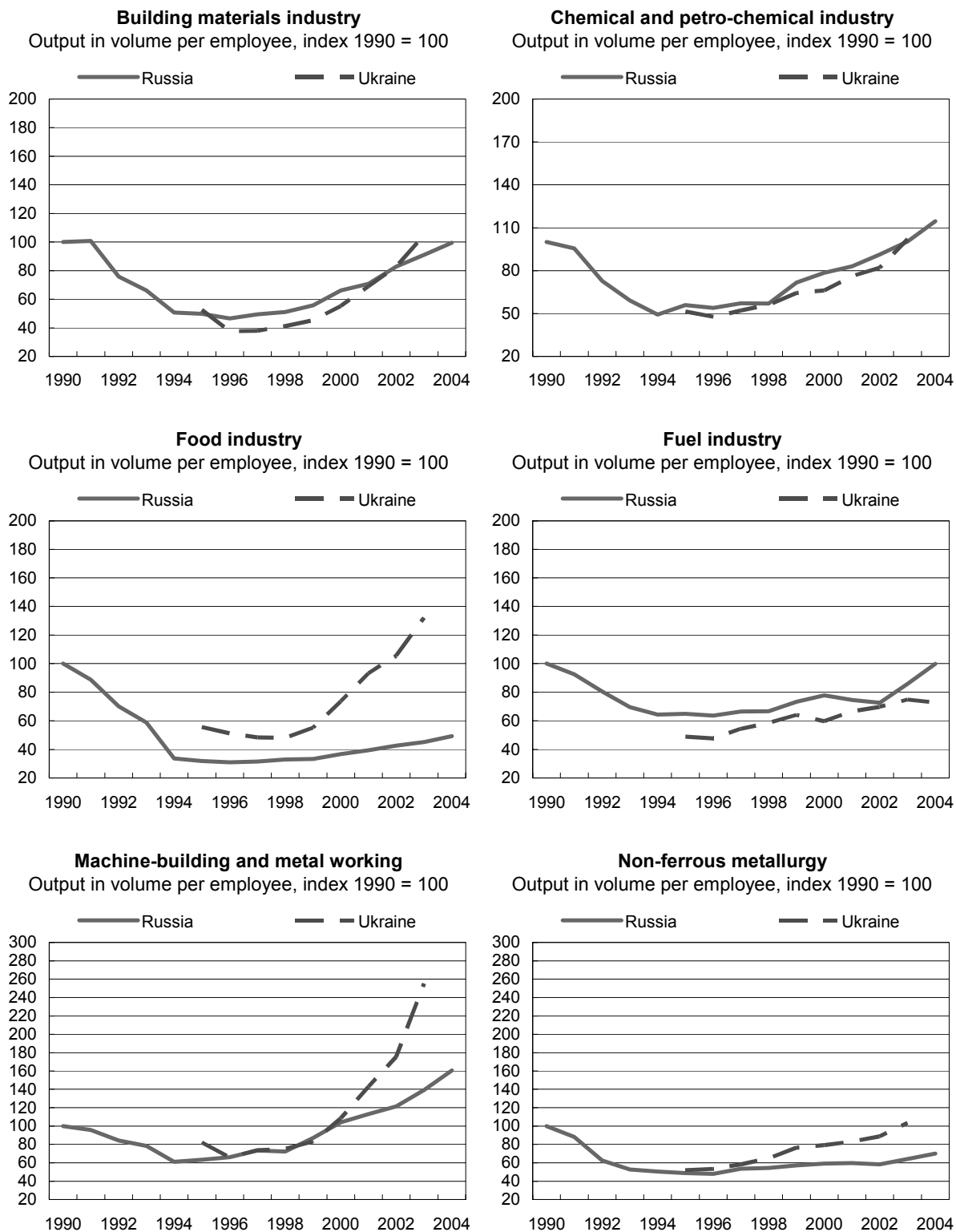


Figure A6 : LABOUR PRODUCTIVITY DYNAMICS



Source: Russian Federal Service for State Statistics, State Statistics Committee of Ukraine and OECD estimates.

Figure A6 (suite) : **LABOUR PRODUCTIVITY DYNAMICS**

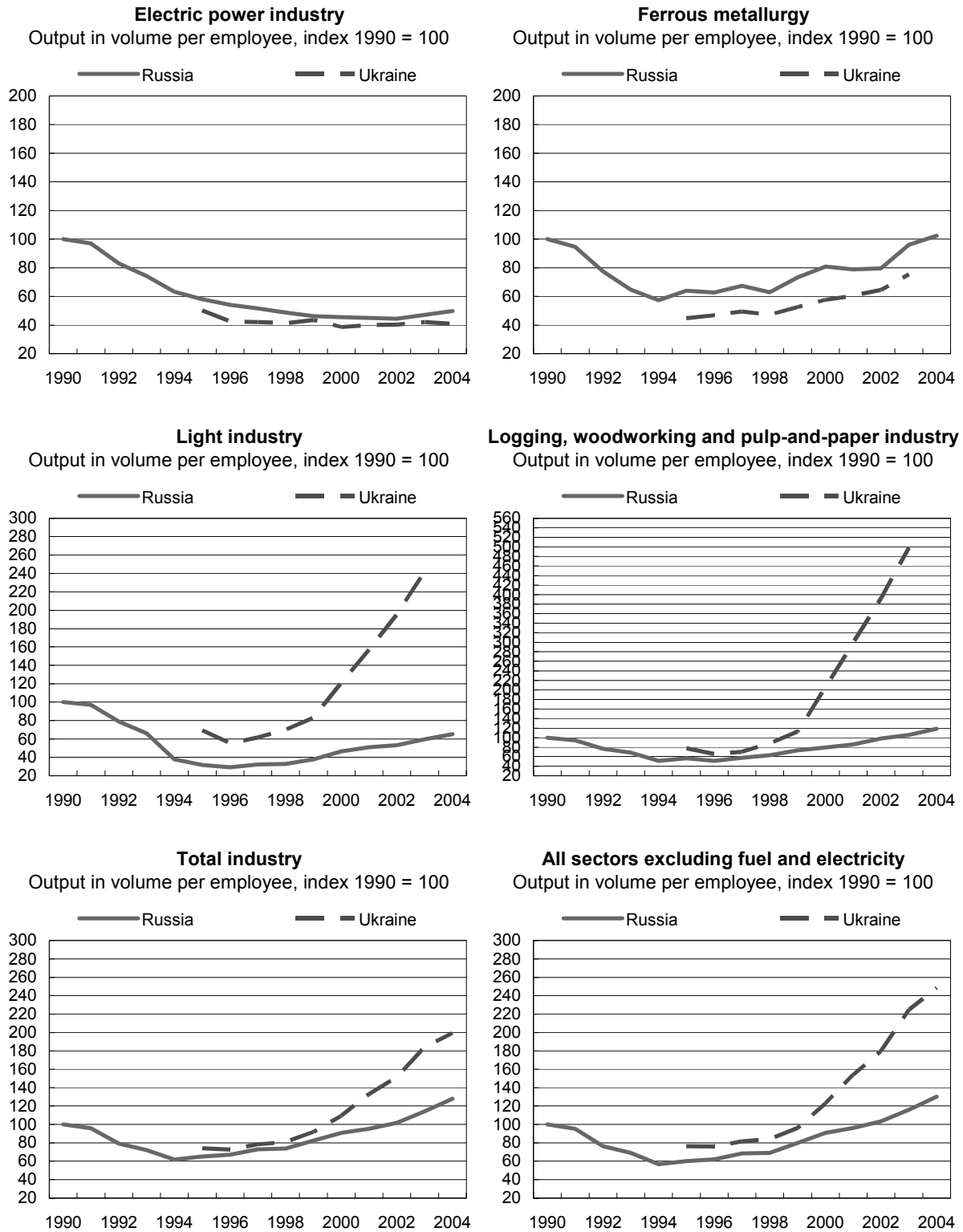
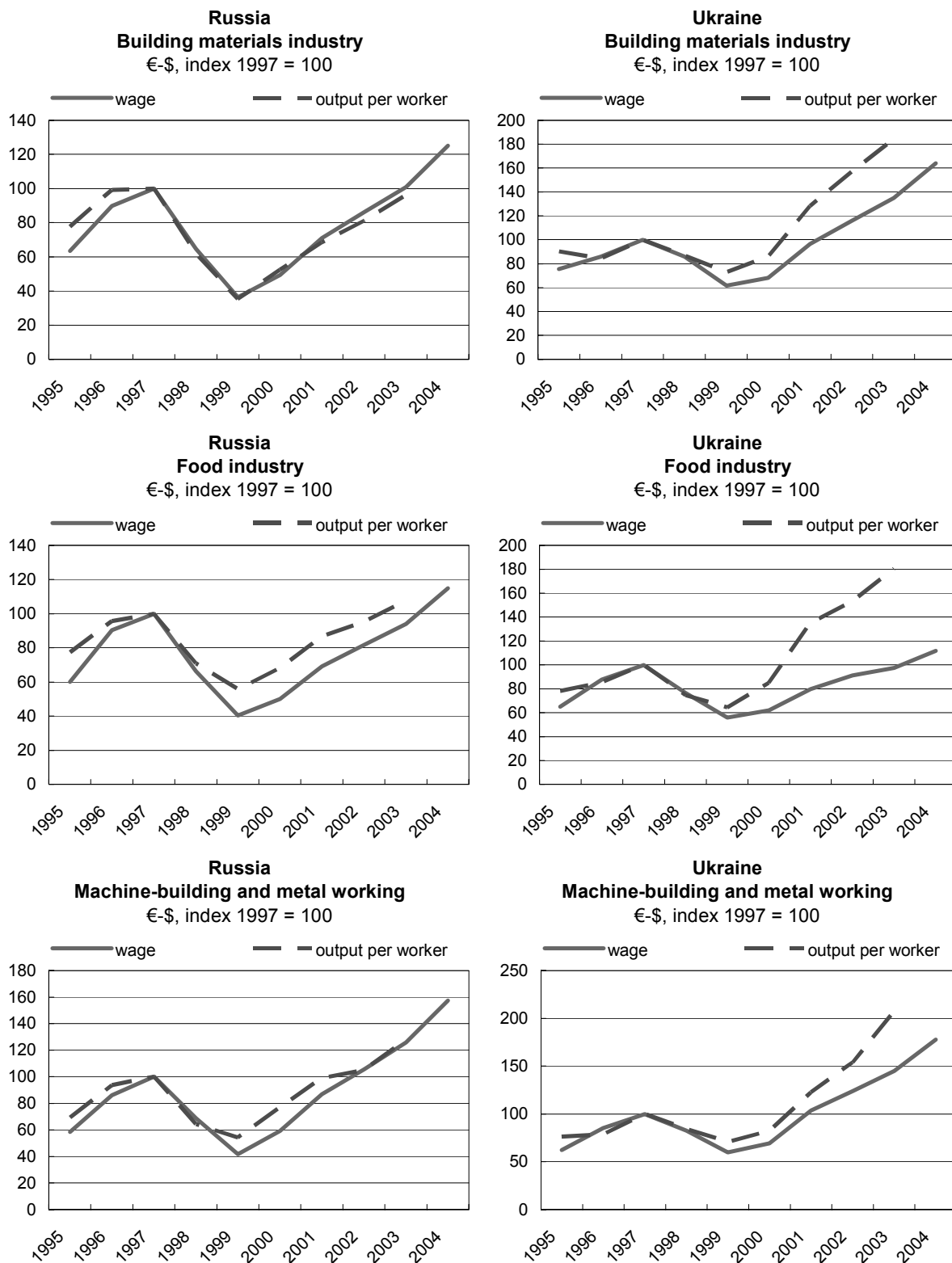


Figure A7 : OUTPUT PER EMPLOYEE VS WAGE DYNAMICS BY SECTOR



Source: Russian Federal Service for State Statistics, State Statistics Committee of Ukraine and OECD estimates.

Fig. A7 (suite) : **OUTPUT PER EMPLOYEE VS WAGE DYNAMICS BY SECTOR**

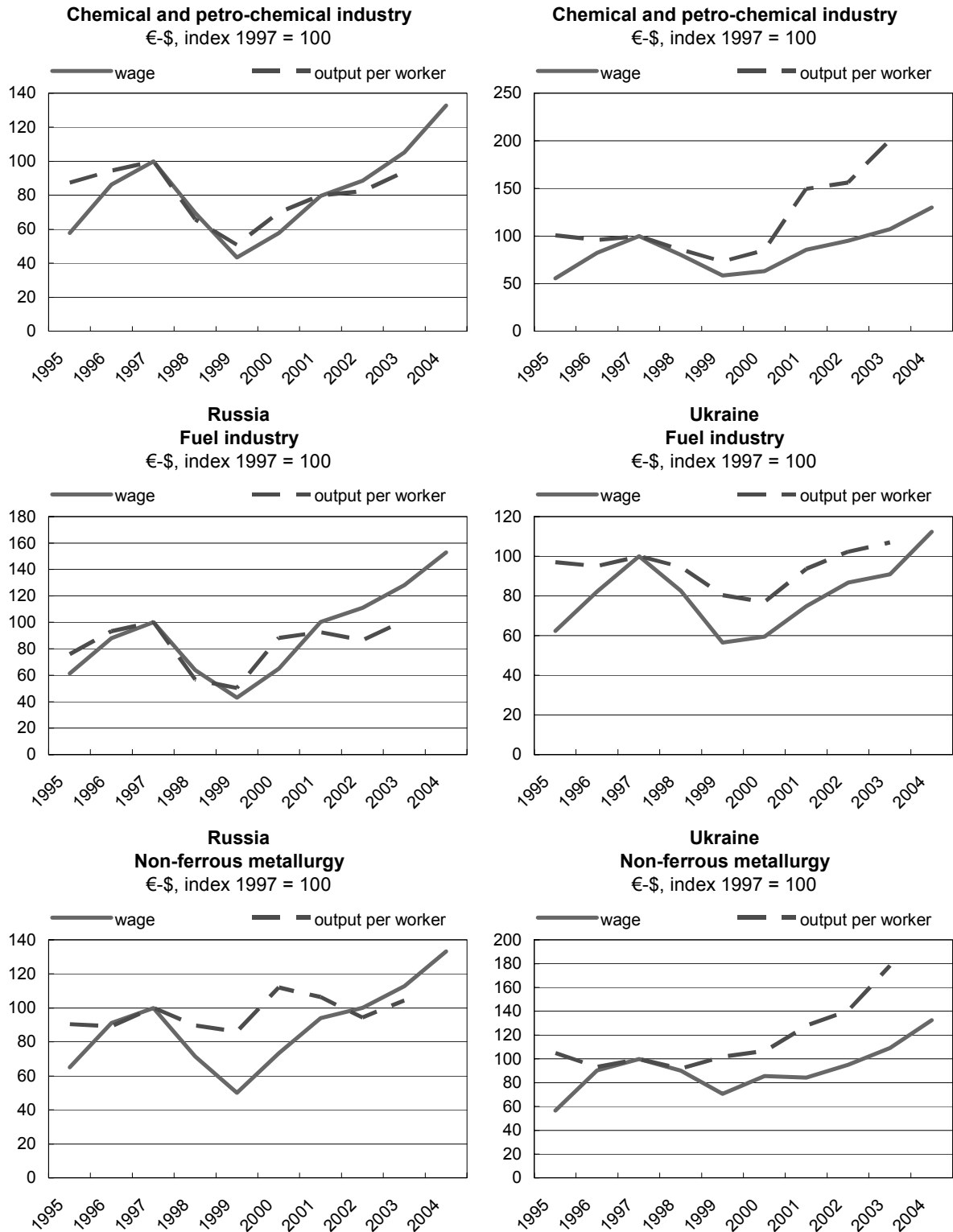


Fig. A7 (suite) : **OUTPUT PER EMPLOYEE VS WAGE DYNAMICS BY SECTOR**

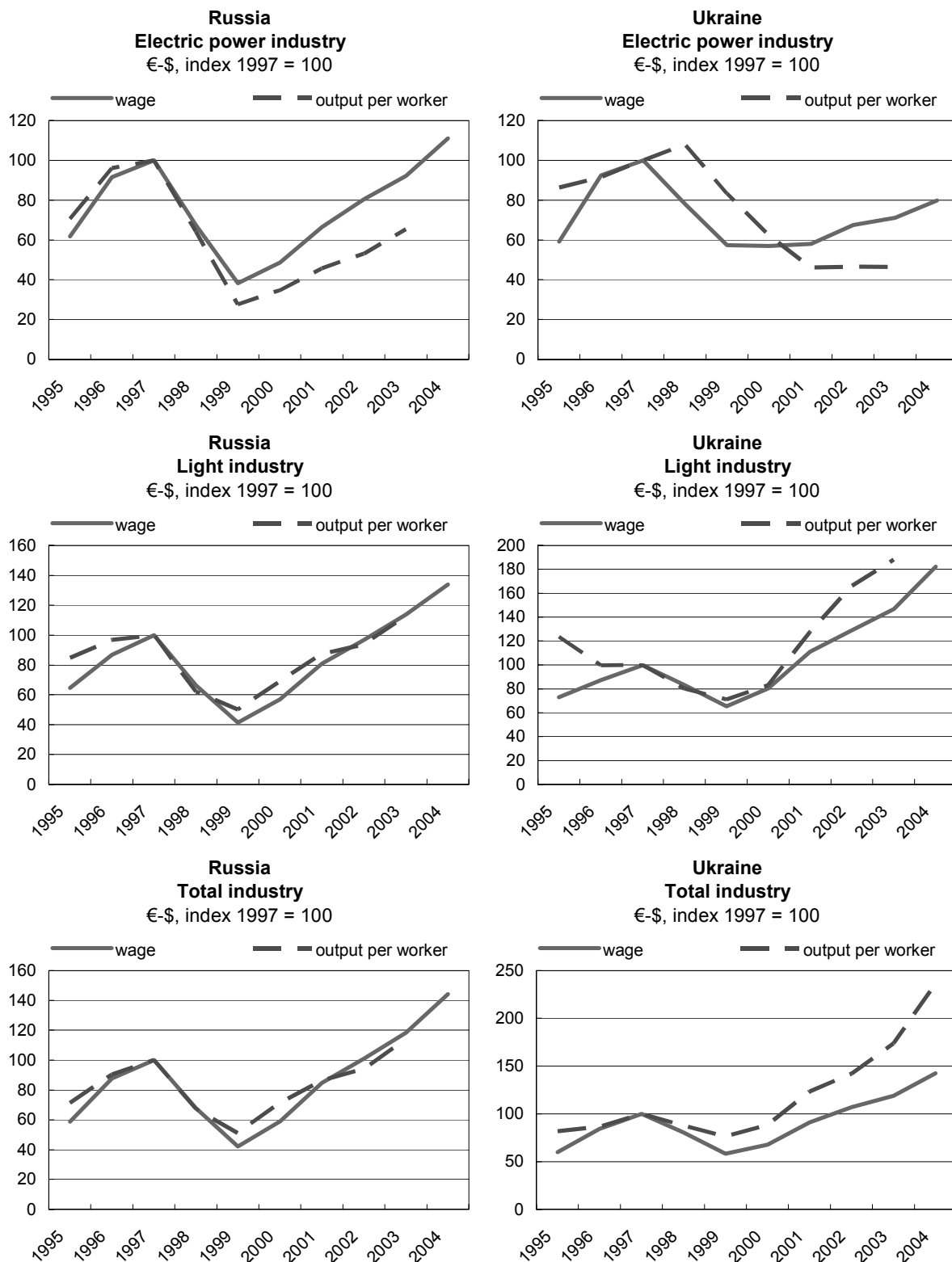
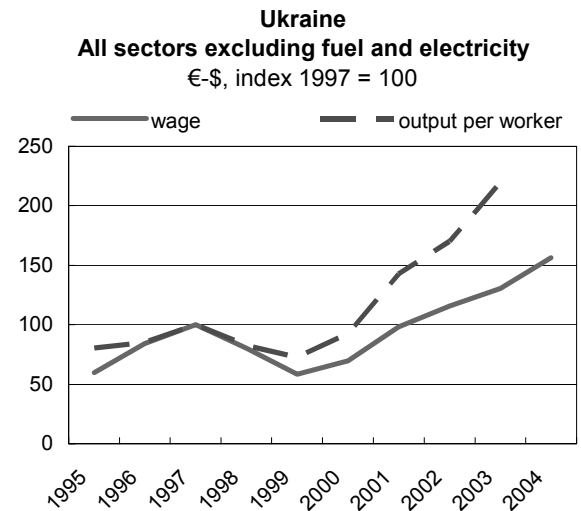
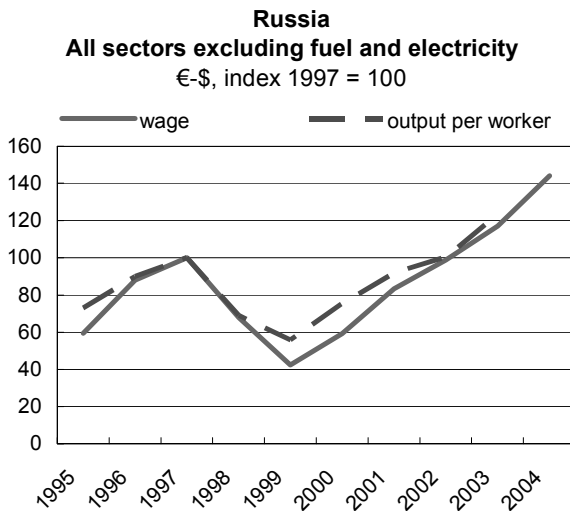
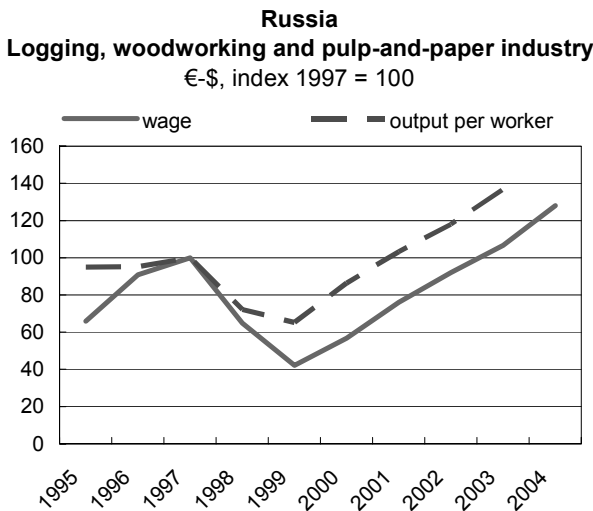
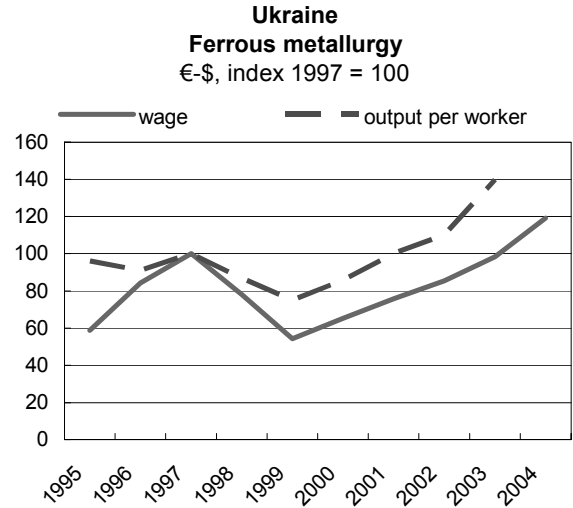
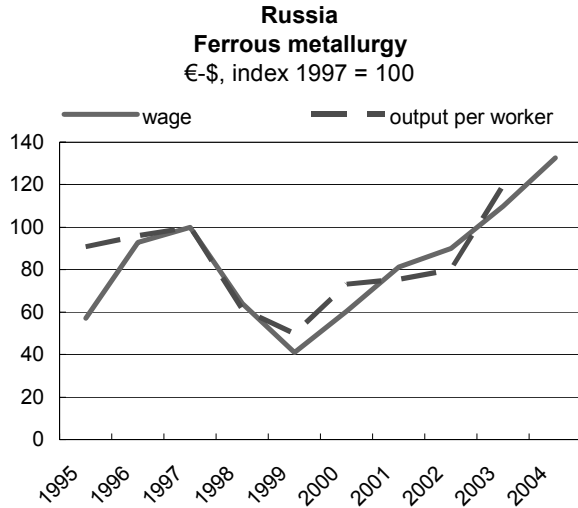


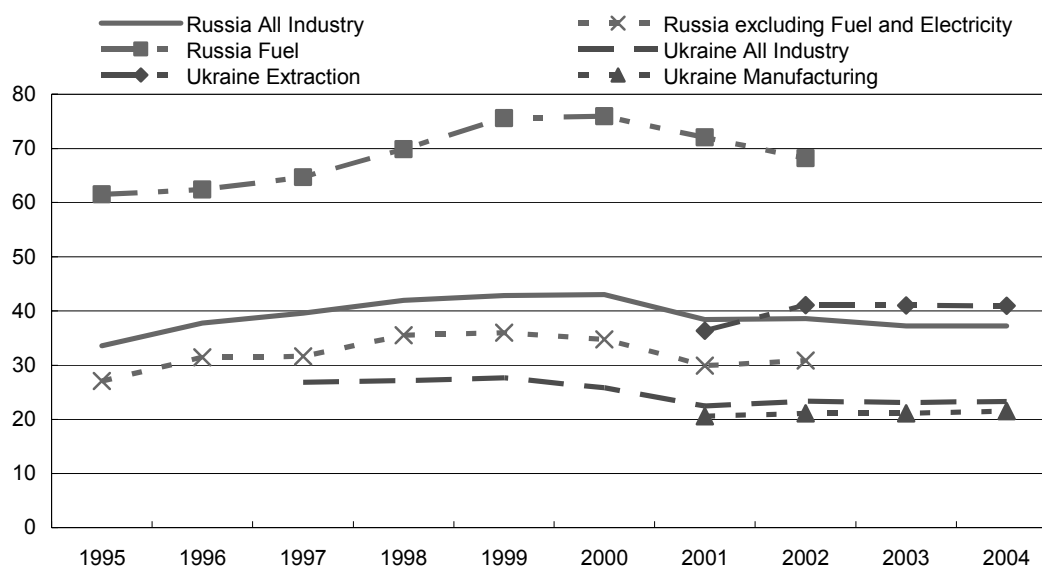


Fig A7 (suite) : OUTPUT PER EMPLOYEE VS WAGE DYNAMICS BY SECTOR



## APPENDIX B: SHARE OF VALUE ADDED IN GROSS OUTPUT

**Figure B.1. Value Added Share of Gross Output**  
per cent



Source: Russian Federal Service for State Statistics, State Statistics Committee of Ukraine and OECD estimates.

Figure B1 shows that the share of value added in gross output has been significantly higher in Russia, and that there is little evidence to suggest that Ukraine has been catching up on that front. However, as shown in the main text, Ukraine has been increasing value added per employee much faster. This apparent contradiction disappears when one recognises that Ukrainian industry has been shedding labour much more rapidly in recent years.<sup>46</sup> This has been driving up value added per employee, but not value added as a proportion of output. As previously noted, this confirms the view that Russian industry, including manufacturing, can afford higher wages, even though Russia has been shedding less labour than Ukraine.

46. Other possibilities explaining this differential could be that Ukrainian manufacturing industry uses more, or more expensive, intermediary inputs in its production – the latter could, for example, result from energy prices being higher in Ukraine. However, the shares of value added in output – and the differential between them – have been roughly constant over time. This would imply either that Ukraine would have constantly been using a larger share of intermediate inputs or that the differential in energy prices between Russia and Ukraine has been roughly constant over time. The second clearly has not been the case, and it is hard to see why the first should have

### APPENDIX C: REVEALED COMPARATIVE ADVANTAGE (RCA)

Table C1. **Russia - Revealed comparative advantage (RCA)**

A. Sectors with positive RCAs

SITC, rev 3	RCA									Export share	
	1997	1998	1999	2000	2001	2002	2003	2004	2004	Cumul.	
33 Petroleum, petroleum products and related materials	23.8	16.5	23.9	31.7	32.1	36.9	36.7	39.9	41.1	41.1	
93 Special transactions and commodities not classified according to kind	-14.7	-21.8	-17.7	-22.9	2.9	8.8	4.5	8.7	16.9	58.0	
34 Gas, natural and manufactured	18.3	17.9	15.3	15.3	17.7	15.1	12.9	6.3	7.0	65.0	
68 Non-ferrous metals	8.3	11.5	8.4	6.9	5.8	5.7	4.9	5.2	5.9	70.8	
67 Iron and steel	5.7	5.0	3.6	2.8	2.0	3.6	2.9	4.6	8.2	79.1	
24 Cork and wood	2.0	2.0	2.5	2.0	2.1	2.5	2.2	2.1	2.2	81.2	
56 Fertilizers (other than those of group 272)	1.8	2.0	1.9	1.5	1.6	1.6	1.5	1.6	1.6	82.8	
32 Coal, coke and briquettes	0.7	0.6	0.5	0.9	0.9	1.0	1.1	1.4	1.8	84.6	
51 Organic chemicals	0.7	0.4	0.3	0.6	0.3	0.4	0.4	0.5	1.2	85.8	
25 Pulp and waste paper	0.4	0.4	0.4	0.5	0.5	0.5	0.4	0.4	0.4	86.2	
23 Crude rubber (including synthetic and reclaimed)	0.4	0.3	0.3	0.2	0.2	0.3	0.3	0.3	0.4	86.6	
52 Inorganic chemicals	0.6	0.7	0.5	0.2	-0.3	-0.4	0.0	0.2	0.8	87.4	
35 Electric current	0.6	0.5	0.2	0.1	0.1	0.1	0.2	0.1	0.2	87.6	
61 Leather, leather manufactures, n.e.s., and dressed furskins	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	87.7	
21 Hides, skins and furskins, raw	0.4	0.4	0.2	0.1	0.1	0.1	0.0	0.0	0.0	87.8	

Source: United Nations, *Commodity Trade Statistics Database (COMTRADE)*.

Table C1. Russia - Revealed comparative advantage (RCA) (continued)

## B. Sectors with largest negative RCAs

SITC, rev 3	RCA									Import share	
	1997	1998	1999	2000	2001	2002	2003	2004	2004	Cumul.	
78 Road vehicles (including air-cushion vehicles)	-2.5	-2.0	-1.2	-1.5	-3.7	-4.4	-6.0	-8.9	9.9	9.9	
74 General industrial machinery and equipment, n.e.s., and machine parts, n.e.s.	-4.5	-3.7	-3.6	-2.9	-4.6	-6.0	-5.3	-5.1	5.8	15.6	
77 Electrical machinery, apparatus and appliances, n.e.s., and electrical parts thereof (including non-electrical counterparts, n.e.s., of electrical household-type equipment)	-2.2	-2.1	-1.7	-1.7	-3.5	-4.7	-4.8	-5.0	5.5	21.2	
72 Machinery specialized for particular industries	-3.4	-3.3	-3.5	-3.3	-4.1	-4.8	-4.4	-4.5	4.8	26.0	
76 Telecommunications and sound-recording and reproducing apparatus and equipment	-2.1	-1.8	-1.6	-1.8	-3.3	-4.1	-3.1	-4.0	4.2	30.2	
54 Medicinal and pharmaceutical products	-2.5	-2.2	-2.1	-2.8	-4.4	-3.7	-4.0	-3.8	3.9	34.2	
05 Vegetables and fruit	-2.7	-2.4	-2.5	-2.6	-2.9	-3.5	-3.5	-3.4	3.5	37.7	
01 Meat and meat preparations	-4.1	-3.5	-3.1	-2.3	-4.2	-5.4	-3.8	-2.9	2.9	40.6	
89 Miscellaneous manufactured articles, n.e.s.	-1.2	-1.2	-0.2	-0.5	-2.3	-2.6	-2.4	-2.3	2.8	43.4	
69 Manufactures of metals, n.e.s.	-0.9	-0.5	0.7	0.5	-0.9	-1.7	-1.6	-1.8	2.4	45.8	
55 Essential oils and resinoids and perfume materials; toilet, polishing and cleansing preparations	-1.1	-1.0	-0.7	-0.8	-1.4	-1.9	-1.8	-1.8	2.0	47.7	
64 Paper, paperboard and articles of paper pulp, of paper or of paperboard	-0.6	-0.3	-0.5	-0.7	-1.4	-1.9	-1.8	-1.7	2.3	50.0	
75 Office machines and automatic data-processing machines	-0.7	-0.5	-0.6	-0.6	-1.2	-1.5	-1.4	-1.6	1.6	51.7	
87 Professional, scientific and controlling instruments and apparatus, n.e.s.	-1.3	-1.1	-0.9	-1.1	-1.3	-1.5	-1.6	-1.6	1.9	53.6	
11 Beverages	-1.3	-1.3	-0.7	-0.8	-1.2	-1.4	-1.5	-1.4	1.5	55.1	
07 Coffee, tea, cocoa, spices, and manufactures thereof	-1.2	-1.2	-1.4	-1.3	-1.7	-2.0	-1.7	-1.4	1.5	56.6	
66 Non-metallic mineral manufactures, n.e.s.	-0.7	1.4	-0.6	-0.7	-1.1	-1.4	-1.3	-1.4	1.6	58.2	
65 Textile yarn, fabrics, made-up articles, n.e.s., and related products	-0.7	-0.6	-1.0	-1.2	-1.6	-1.4	-1.4	-1.3	1.5	59.7	
28 Metalliferous ores and metal scrap	0.0	0.9	-0.9	-2.5	-2.8	-2.1	-1.4	-1.2	2.7	62.4	
59 Chemical materials and products, n.e.s.	-0.8	-0.6	-1.0	-0.9	-1.3	-1.4	-1.2	-1.1	1.3	63.7	

Source: United Nations, *Commodity Trade Statistics Database (COMTRADE)*.

Table C2. Ukraine - Revealed comparative advantage (RCA)

## A. Sectors with positive RCAs

SITC, rev 3	RCA							Export share	
	1997	1998	1999	2000	2001	2002	2003	2003	Cumul.
33 Petroleum, petroleum products and related materials	23.8	16.5	23.9	31.7	32.6	36.9	38.9	40.4	40.4
34 Gas, natural and manufactured	18.3	17.9	15.3	15.3	17.9	15.1	13.7	14.0	54.4
93 Special transactions and commodities not classified	-14.7	-21.8	-17.7	-22.9	1.6	8.8	7.9	8.5	62.8
68 Non-ferrous metals	8.3	11.5	8.4	6.9	5.9	5.7	5.2	6.0	68.8
67 Iron and steel	5.7	5.0	3.6	2.8	2.1	3.6	3.0	6.5	75.3
24 Cork and wood	2.0	2.0	2.5	2.0	2.1	2.5	2.4	2.4	77.7
56 Fertilizers	1.8	2.0	1.9	1.5	1.7	1.6	1.5	1.6	79.3
32 Coal, coke and briquettes	0.7	0.6	0.5	0.9	0.9	1.0	1.1	1.6	80.8
79 Other transport equipment	-1.3	-0.4	0.0	0.6	-0.4	-0.9	1.1	2.8	83.7
25 Pulp and waste paper	0.4	0.4	0.4	0.5	0.5	0.5	0.4	0.5	84.2
51 Organic chemicals	0.7	0.4	0.3	0.6	0.4	0.4	0.4	1.2	85.4
23 Crude rubber (including synthetic and reclaimed)	0.4	0.3	0.3	0.2	0.2	0.3	0.3	0.4	85.8
35 Electric current	0.6	0.5	0.2	0.1	0.1	0.1	0.2	0.3	86.1
04 Cereals and cereal preparations	-1.4	-0.8	-1.9	-1.5	-0.8	0.1	0.1	1.0	87.1
61 Leather, leather manufactures and dressed furskins	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	87.2
21 Hides, skins and furskins, raw	0.4	0.4	0.2	0.1	0.1	0.1	0.04	0.1	87.3
71 Power-generating machinery and equipment	0.0	0.6	0.8	0.3	0.3	0.1	0.03	1.5	88.8

Source: United Nations, *Commodity Trade Statistics Database (COMTRADE)*.

Table C2. Ukraine - Revealed comparative advantage (RCA) (continued)

## B. Sectors with largest negative RCAs

SITC, rev 3	RCA							Import share	
	1997	1998	1999	2000	2001	2002	2003	2003	Cumul.
78 Road vehicles	-2.5	-2.0	-1.2	-1.5	-3.7	-4.4	-6.6	7.5	7.5
74 General industrial machinery and equipment, and machine parts	-4.5	-3.7	-3.6	-2.9	-4.6	-6.0	-5.9	6.6	14.2
77 Electrical machinery, apparatus and appliances, and electrical parts thereof	-2.2	-2.1	-1.7	-1.7	-3.5	-4.7	-5.3	5.9	20.0
72 Machinery specialized for particular industries	-3.4	-3.3	-3.5	-3.3	-4.1	-4.8	-4.8	5.2	25.2
54 Medicinal and pharmaceutical products	-2.5	-2.2	-2.1	-2.8	-4.4	-3.7	-4.4	4.5	29.7
01 Meat and meat preparations	-4.1	-3.5	-3.1	-2.3	-4.2	-5.4	-4.1	4.2	33.9
05 Vegetables and fruit	-2.7	-2.4	-2.5	-2.6	-2.9	-3.5	-3.9	4.0	37.9
76 Telecommunications, sound-recording, reproducing apparatus and equipment	-2.1	-1.8	-1.6	-1.8	-3.3	-4.1	-3.4	3.6	41.5
89 Miscellaneous manufactured articles	-1.2	-1.2	-0.2	-0.5	-2.3	-2.6	-2.7	3.2	44.6
64 Paper, paperboard and articles thereof	-0.6	-0.3	-0.5	-0.7	-1.4	-1.9	-2.0	2.8	47.4
55 Essential oils and resinoids and perfume materials; toilet, polishing and cleansing preparations	-1.1	-1.0	-0.7	-0.8	-1.4	-1.9	-2.0	2.2	49.6
06 Sugars, sugar preparations and honey	-1.9	-2.2	-3.1	-1.9	-3.2	-2.3	-1.9	2.0	51.6
07 Coffee, tea, cocoa, spices, and manufactures thereof	-1.2	-1.2	-1.4	-1.3	-1.7	-2.0	-1.8	1.9	53.5
87 Professional, scientific and controlling instruments and apparatus	-1.3	-1.1	-0.9	-1.1	-1.2	-1.5	-1.8	2.3	55.8
69 Manufactures of metals	-0.9	-0.5	0.7	0.5	-0.9	-1.7	-1.8	2.5	58.3
11 Beverages	-1.3	-1.3	-0.7	-0.8	-1.2	-1.4	-1.6	1.7	60.0
65 Textile yarn, fabrics, made-up articles, and related products	-0.7	-0.6	-1.0	-1.2	-1.6	-1.4	-1.6	1.9	61.9
28 Metalliferous ores and metal scrap	0.0	0.9	-0.9	-2.5	-2.8	-2.1	-1.6	2.5	64.4
75 Office machines and automatic data-processing machines	-0.7	-0.5	-0.6	-0.6	-1.2	-1.5	-1.5	1.5	65.9
66 Non-metallic mineral manufactures	-0.7	1.4	-0.6	-0.7	-1.1	-1.4	-1.4	1.7	67.6

Table C3. **Russia - Changes in revealed comparative advantage, 1997-2004**

SITC Rev 3	Title	RCA		Difference
		2004	1997	
<b>10 largest positive changes</b>				
33	Petroleum, petroleum products and related materials	48.19	26.83	21.37
01	Meat and meat preparations	-3.18	-5.73	2.55
06	Sugars, sugar preparations and honey	-1.01	-2.69	1.68
79	Other transport equipment	-0.42	-1.89	1.47
04	Cereals and cereal preparations	-0.59	-2.04	1.45
12	Tobacco and tobacco manufactures	-1.02	-2.28	1.27
32	Coal, coke and briquettes	1.78	0.70	1.08
74	General industrial machinery and equipment; machine parts	-5.51	-6.44	0.93
09	Miscellaneous edible products and preparations	-0.63	-1.39	0.76
82	Furniture, and parts thereof; bedding, mattresses	-0.63	-1.02	0.38
<b>10 largest negative changes</b>				
34	Gas, natural and manufactured	7.68	21.07	-13.39
78	Road vehicles (including air-cushion vehicles)	-9.63	-3.68	-5.95
68	Non-ferrous metals	6.30	9.41	-3.11
77	Electrical machinery, apparatus and appliances; electrical parts thereof	-5.41	-3.23	-2.18
76	Telecommunications and sound-recording and reproducing equipment	-4.32	-3.02	-1.29
57	Plastics in primary forms	-1.03	0.04	-1.07
75	Office machines and automatic data-processing machines	-1.72	-0.94	-0.78
64	Paper, paperboard and articles of paper pulp, of paper or of paperboard	-1.74	-1.06	-0.67
54	Medicinal and pharmaceutical products	-4.13	-3.55	-0.58
35	Electric current	0.09	0.65	-0.57

Note : The "non-classified" items category is excluded from the calculations underlying this table.

Source: United nations, *Commodity Trade Statistics Database (COMTRADE)*.

Table C4. Ukraine - Changes in revealed comparative advantage, 1997-2003

SITC Rev 3	Title	RCA		Difference
		2003	1997	
<b>10 largest positive changes</b>				
93	Special transactions and commodities not classified according to kind	7.87	-14.69	22.57
33	Petroleum, petroleum products and related materials	38.90	23.76	15.14
79	Other transport equipment	1.07	-1.30	2.37
04	Cereals and cereal preparations	0.06	-1.42	1.48
32	Coal, coke and briquettes	1.14	0.68	0.45
24	Cork and wood	2.38	1.96	0.42
12	Tobacco and tobacco manufactures	-1.34	-1.64	0.30
09	Miscellaneous edible products and preparations	-0.82	-1.00	0.17
61	Leather, leather manufactures, n.e.s., and dressed furskins	0.05	-0.02	0.07
25	Pulp and waste paper	0.44	0.39	0.06
<b>10 largest negative changes</b>				
34	Gas, natural and manufactured	13.68	18.27	-4.59
78	Road vehicles (including air-cushion vehicles)	-6.63	-2.49	-4.14
77	Electrical machinery, apparatus and appliances, n.e.s., and electrical parts thereof (including non-electrical counterparts, n.e.s., of electrical household-type equipment)	-5.25	-2.20	-3.05
68	Non-ferrous metals	5.21	8.26	-3.05
67	Iron and steel	3.00	5.67	-2.67
54	Medicinal and pharmaceutical products	-4.36	-2.53	-1.83
28	Metalliferous ores and metal scrap	-1.57	-0.05	-1.52
72	Machinery specialized for particular industries	-4.85	-3.40	-1.45
89	Miscellaneous manufactured articles, n.e.s.	-2.69	-1.25	-1.44
64	Paper, paperboard and articles of paper pulp, of paper or of paperboard	-2.02	-0.64	-1.39

Source: United nations, *Commodity Trade Statistics Database (COMTRADE)*.



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