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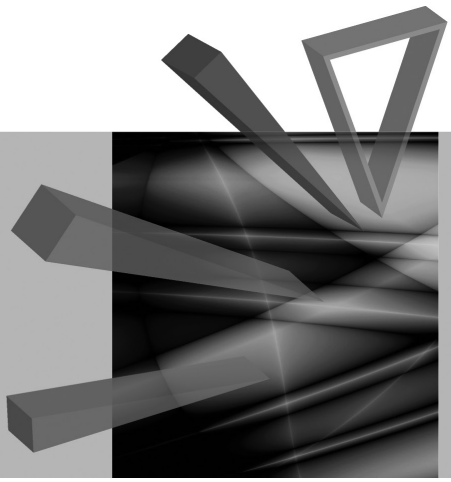
256

Innovation Sources of Economies in Eastern Asia



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Guenter Heiduk
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IS INNOVATION-BASED COMPETITIVENESS IN TRADE CRISIS-RESISTANT? THE CASE OF CHINA[1]

Summary: At the time of world output growth, emerging and developing economies' trade performs better than advanced economies' trade, at least since the beginning century. The intuition that during a global recession the diversified trade of the latter is more resistant to a downturn than of the former does not seem to hold, at least for the 2008/2009 crisis. An investigation on China's trade shows a disproportionate high performance in growth periods and a disproportionate high resistance in crisis periods. There is evidence that China's changing trade structure from comparative advantage-based low-tech, labour-intensive exports to innovation-based high-tech exports occurred "just in time" with the crisis. The driving forces behind this timely change have to be explored in a future in-depth analysis.

Keywords: China, competitiveness, trade, economic and financial crisis.

1. Introduction

The financial and economic crisis that emerged in the USA in autumn 2007 and rapidly spread out to Europe and many other countries has had a profound impact on international trade, especially in 2009. The fast recovery in 2010 seems to be astonishing but it fits the experience that trade often reacts disproportionately highly to changes in world output. The breakdown of countries/regions and/or industries sheds light on considerable differences in the exposure to external shocks. Advanced economies are hit harder than emerging and developing countries by decreasing output and trade and benefit less from crisis recovery (see Figure 1). In 2009 the volume of world trade dropped by 12% (WTO). When comparing the three leading trading countries, China's total export value decreased even stronger than the world export, but less dramatic than Germany's and United States' exports (see Figure 2). China's fast recovery of its exports is particularly noticeable. Regarding the exposure

[1] Preliminary note: At the current stage (beginning June 2012) the following paper looks rather like an unfinished collection of data than an analytically based study. This shortcoming is partly due to the lack of data for 2011. The period of time after the year of the crisis (2009) is too short for evaluating the recovery. In the case of presenting the paper in November, an improved version will be available.

of industries to the economic recession in 2009, it may be surprising that world exports of high-tech products dropped more than medium-low-tech and low-tech products (see Figure 3).[2] China's exports in the respective three industries look quite similar, except for the faster recovery in the high-tech industry. Highly specialised countries in low-tech exports are usually more exposed to external demand shocks than countries with a high-technology export bundle, especially when high-tech is spread over several industries (e.g., machinery, electronics and chemicals). The differentiation between final products and intermediate products showed that on a global scale the former dropped less than the latter.[3] There is evidence that trade structure matters for growth.[4]

A large part of China's high-tech exports result from foreign invested enterprises (FIEs). Their exports are mostly parts and components which are assembled in their home countries or in countries with attractive markets. In this case it would be plausible that the recession in developed countries like the USA and EU member states will also spread to China via decreasing exports of intermediate products in high-tech industries. Depending on the contribution of these manufacturing sectors to the GDP, China's growth rate will also decrease. If the domestic economy is large and relatively independent from external developments, then the exposure to external shocks is lower. Reasons for China's relatively high independence from external shocks are its large public/semi-public sector (including the state-owned companies), low public debt, high saving rate and therefore high potential to increase domestic consumption. Last but not least, the relation between export growth and GDP growth is neither theoretically nor empirically completely clarified. A large number of studies explain the trade augmenting the effect of GDP growth endogenously by a relatively high productivity growth in tradable goods but often point to the probability of a reverse causality.[5] Another strand of literature highlights trade openness, tariff reductions, increasing differences in labour costs between countries, growth of MNCs via FDI, emergence of global production networks resulting from the vertical specialisation of MNCs as a cause of the high growth rates in world

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[2] OECD 2003 taxonomy of manufacturing industries: Office+Telecom Equipment = High-tech industry; Iron+Steel: Medium-low-tech indsutry; Textiles+Clothing = Low-tech Industry. OECD, 2003.

[3] E. Czarny, P. Folfas, K. Sledziewska, *International Trade in Intermediate and Final Goods during the Crisis*, Paper presented at the International Conference "Europe in the World Economy Beyond the Sovereign Debt Crisis", 31.05–01.06.2012, Warsaw School of Economics.

[4] D. Lederman, W.F. Maloney, Trade structure and growth, *Policy Research Working Paper* 2003, No. 3025, World Bank, Washington, DC.

[5] For example, B. Balassa, Exports and Economic Growth: Further Evidence, *Journal of Development Economics* 1978, Vol. 5, pp. 181–189; L. Rivera-Batiz, P.M. Romer, Economic integration and endogenous growth, *The Quarterly Journal of Economics* 1991, Vol. 106 (2), pp. 531–555; T.O. Awokuse, Causality between exports, imports and economic growth: Evidence from transition countries, *Economic Letters* 2007, Vol. 94 (3), pp. 389–395; B.C. Karahasan, Causal links between trade and economic growth – Evidence from Turkey and European Union countries, *MPRA Paper* 2011, No. 29809, Munich.

trade and countries' growth.[6] With respect to China, the bi-directional causality between exports and growth seems to hold for China[7] or at least for the eastern part of China, whereas no evidence can prove the existence of long-term stationary causality between imports and GDP growth.[8] Opposite results suggest the still open interdependencies between China's exports, imports and its GDP growth. Instead of causality between export expansion and economic in China, the analysis of the period 1970–2000 found Granger causality between economic growth and imports.[9] Even the intuition that the reallocation of resources toward manufacturing exports causes the rapid economic growth is not supported by Granger causality tests, although the export-led hypothesis is.[10] In order to shed light on the controversial results, growing interest is devoted to the circular relation between imports, FDI, exports and growth, especially related to China.[11] This immediately leads to the development of China's trade competitiveness in high-tech industries.

2. China's emerging trade competitiveness in high-tech industries[12]

By using the concept of revealed comparative advantage (RCA) to measure China's emerging trade competitiveness in 2005–2010, the SITC classification does not deliver satisfactory results regarding changes with respect to the technological level, factor input and skill intensity. China's trade classified by the technological level (OECD taxonomy) shows the following dynamic pattern (see Figure 5):

– The RCA index of medium-low-technology industries scored the highest comparative advantage, but it has losing its growth dynamics since 2005. The

[6] R. Chang, L. Caltani, N. Loayza, Openness is good for growth: The role of policy complementarities, *Journal of Development Economics* 2009, Vol. 90, pp. 33–49; T. Gries, M. Redlin, *Trade Openness and Economic Growth: A Panel Causality Analysis*, Paper presented at the International Conference "China and the World Economy", 16–18 March, Seattle 2012.

[7] J.S. Mah, Economic growth, exports and export composition in China, *Applied Economics Letters* 2007, Vol. 14, pp. 749–752.

[8] Y. Li, Z. Chen, C. San, Research on the relationship between foreign trade and GDP growth of East China – Empirical analysis based on causality, *Modern Economy* 2011, Vol. 1, pp. 118–124.

[9] T.C. Tang, New evidence on export expansion, economic growth and causality in China, *Applied Economics Letters* 2006, Vol. 13, pp. 801–803.

[10] J.S. Mah, *op. cit*.

[11] X. Liu, C. Wang, Y. Wei, Causal links between foreign direct investment and trade in China, *China Economic Review* 2001, Vol. 12, pp. 190–202; D. Rodrik, What's so special about China's exports?, *China and the World Economy*, Vol. 14 (5), pp. 1–19; W.H. Tsen, Exports, domestic demand and economic growth in China: Granger causality analysis, *Review of Development Economics* 2010, Vol. 14 (3), pp. 625–639.

[12] This section is part of an ongoing research conducted at the World Economy Research Institute, World Economy Collegium, Warsaw School of Economics within research project No. 3926/B/H03/2011/40 funded by the National Science Centre on "Human Capital and Innovation as Factors of Long-Term Competitive Advantages in International trade. Implications for Poland".

improvement was particularly high in 2006–2007. Since then the trend has flattened to the modest of this RCA index.
- The development paths of RCA indices for high-technology and low-technology industries showed an almost parallel run. The former scored around 0.2 higher. The differences in the higher medium-low-technology RCA decreased in 2006/2007 and have amounted since then to around 0.4 and 0.6, respectively.
- The most dynamic trajectory was exhibited by the medium-high-technology RCA index, reducing the negative gap to the medium-low-tech RCA index from 1.38 in 2005 to 0.17 in 2010 and surpassing the low-technology RCA index in 2008 and one year later also the high-technology index.
- The only RCA index scoring higher than 1 has been observed in medium-low--technology industries since 2008. If the trend of the RCA index in medium--high-tech industries had continued in 2011, then its score should have surpassed the threshold of 1.

In the same period of time (2005–2010), the evolution of the comparative advantage according to the WIFO classification based on the extent of utilisation of tangible and intangible factor inputs in the manufacturing process showed the following characteristics (see Figure 6):
- Labour-intensive industries scored the highest RCA index with a stable, but modest upward trend.
- The development of the RCA index of mainstream industries almost matched the former trend at a lower level with an average difference of around –1.4.
- In 1995 technology-driven industries exhibited almost the same RCA index as basic industries but developed with a lower growth rate resulting in a gap of –0.44 in 2010.
- As expected the RCA index of capital industries scored lowest with the largest differences to the RCA index of technology-driven industries in 2000 (–0.54) and 2009 (–0.53).
- The development of the RCA index of marketing-driven industries did not match the trends of other industries. It showed a sinus curve run between 1995 and 2007 with peaks in 2000 (0.88) and 2007 (1.08) and a slightly increasing trend afterwards. Except for 2005 and 2006, marketing-driven industries' RCA scored higher than basic industries but over the whole period of time fairly lower than labour-intensive industries.

The third method to explore China's comparative advantage in international trade is based on the WIFO classification of industries according to their share of different skill levels of labour (see Figure 7):
- It does not surprise that industries with a high share of low-skilled labour exhibited the highest RCA scores. The development between 1995 and 2010 did not take a stable course. The steep rise in 2006/2007 was preceded by a gradual decline from 2000 on and an almost stable RCA index from 2008 to 2010.

– A quite similar trend at a lower level could be observed for the industries with a high share of medium-skilled, blue-collar labour.
– The pattern of the industries with high share of medium-skilled, white-collar labour showed a relatively stable, slightly upward trend.
– The strongest upward trend occurred in the industries with a high share of high--skilled labour with a short minor decline in 2005/2006. Since the beginning of the last decade the RCA indices of these industries have surpassed those of the medium-skilled, white-collar industries and since 2005 also those of the medium--skilled, blue-collar industries.
– Only the industries with a high share of low-skilled labour achieved RCA indices higher than 1. If the trend in the industries with a high share of high-skilled labour continues, the RCA index should reach 1.00 in 2012.

The main message of the different levels and structures of the product- and industry- based analysis of China's comparative advantage is the confirmed knowledge that low-skill labour is still its most important source. Despite improving comparative advantages in technology-intensive, high-skill products and industries, China will be able to further rely on its labour-based comparative advantage with a gradually increasing skill level. In contrast to theoretical predictions and examples in other emerging countries, the rise of comparative advantage in high-tech, high-skilled labour industries does not correspond to the decline in the comparative advantage of low-tech, labour-intensive industries. China might preserve this pattern for the near future if the government succeeds in transforming the labour market toward an efficiency-guided functioning.[13] It should be pointed out that the aforementioned results do not hold for any break-down of bilateral country and/or product level.[14]

The evolution of China's RCA indices in any industry classification does not mirror the 2009 global recession by a decrease in China's trade competitiveness, even when taking into account the fact that in the booming time of the world economy (2006–2007) China's trade competitiveness increased in all industries.

3. Trade and the crisis

There are different indicators suitable for measuring the exposure of country's trade to external shocks. It is argued that countries with trade openness (all WTO members) cannot fully separate themselves from global or main trading partners' cyclical fluctuations. It is to be expected that China as the leading exporter (see Figure 2) is hit by the demand shock in the USA and Europe in 2009. Therefore, indicators should

[13] D.T. Yang, J. Zhang, S. Zhou, *Why Are Saving Rates So High In China?*, NBER Working Paper 16771, Cambridge, Mass. 2011.

[14] J. Ju, Q. Liu, H. Ma, Y. Qian, Z. Wei, *Anti-Comparative Advantage: A Puzzle in US–China Bilateral Trade*, 2010, http://www.hkimr.org/cms/upload/seminar_app/sem_paper_0_408_Paper_2011-06-03.pdf.

compare the timing and sequencing of the crisis' evolution (including the pre- and after-crisis situation), which requires in the present case data from 2006–2011.[15] The comparison should indicate relative time lags, strengths of crisis peaks, relative changes in structures of production, trade, GDP. The proof of causality needs the revelation of transmission mechanisms.

The first and very preliminary insight into China's exposure to the external demand shock is offered by the comparison of the shares of value added in manufacturing industries among the USA, the EU and Japan. China's share increased in low-tech, medium-low-tech and medium-high-tech industries between 2004 and 2010, whereas the shares of the other countries/region decreased (see Figure 8a, b, c). China experienced the highest increase in medium-high-tech industries. The comparison of the shares in exports of high-technology goods in 2006-2010 shows that China and the USA, contrary to Germany and Japan, did not lose in 2009. China experienced the highest increase in high-tech exports in 2010 (see Figure 9).

A detailed analysis of China's export performance in 2008–2010 confirms the dominance of external demand shocks over financial constraints as causal for its decreasing exports.[16] The earlier and stronger drop of processing exports fits this crisis sequence.

4. Preliminary conclusion

The review of the analysed data suggests evidence that in absolute terms China's high-tech exports are stronger exposed to external demand shocks in 2009 than low--tech exports but recover faster after the crisis year. Compared to other countries' high-tech exports, the negative exposure in 2009 is weaker and the recovery effect is stronger. The latter may be explained by long-term shifts in innovative competitiveness in trade from the USA, Japan and European countries to China. An in-depth analysis of the circular relations between China's IFDI, imports, OFDI, exports in high-tech industries as well as the impact of these relations on the growth of the GDP should deliver causal evidence for the very cursory observations.

[15] At the current stage data for 2011 are not available.

[16] R. Jing, The Collapse Speed of China's Exports in the 2008–2009 Financial Crisis, *CESifo Economic Studies*, 2012, doi:10.1093/cesifo/ifs00.

APPENDIX

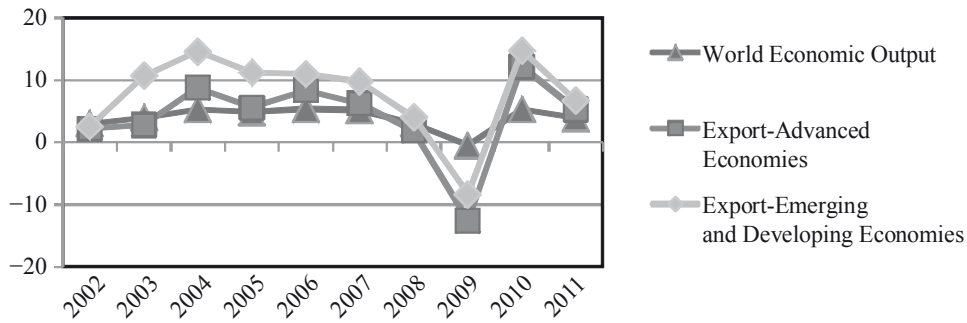

Figure 1. World economic output, exports of advanced and emerging/developing countries, 2002––2011 (annual change)

Source: author's own calculation based on IMF data.

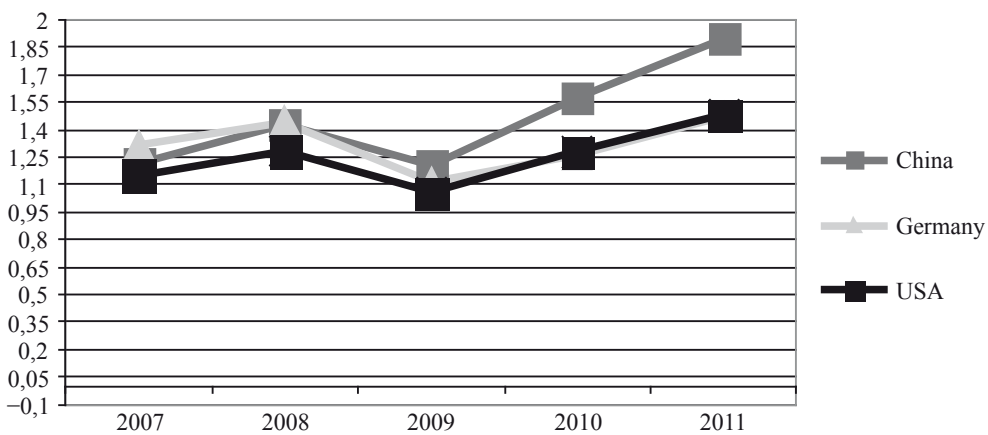

Figure 2. Total merchandise exports of China, Germany, and the USA, 2007–2011 (billion USD)

Source: author's own calculations based on WTO, Time Series on International Trade.

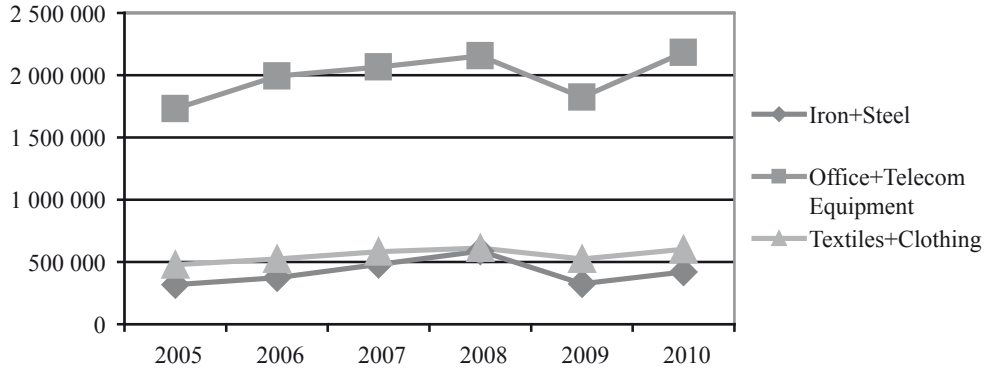

Figure 3. World merchandise exports by selected commodities, 2005–2010 (million USD)

Source: author's own calculation based on WTO, International Trade Statistics.

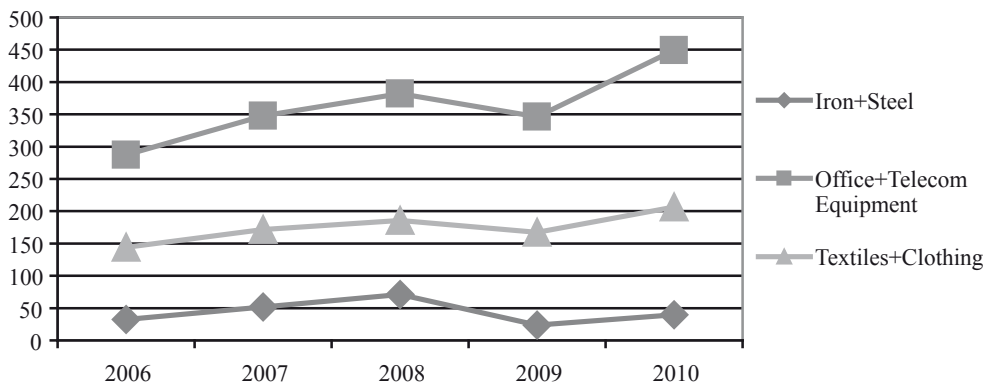

Figure 4. China's exports by selected commodities, 2006–2010 (billion USD)

Source: author's own calculations based on WTO, Time Series in International Trade.

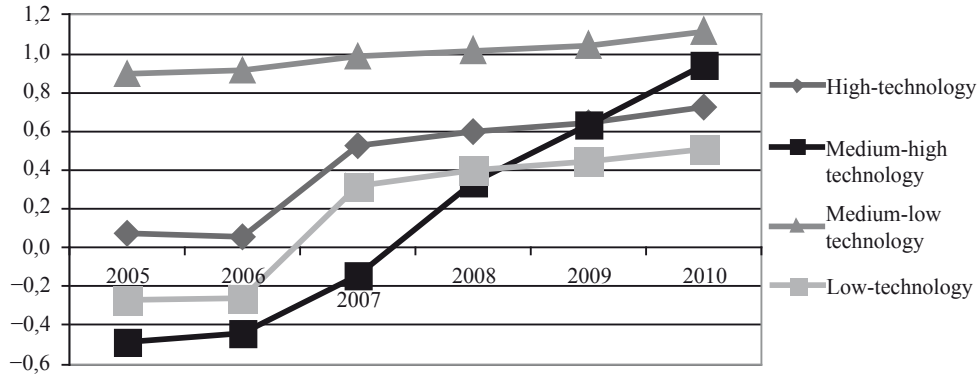

Figure 5. China's RCA indices of industries based on the technology level, 1995–2010

Source: author's own calculations based on UN COMTRADE database.

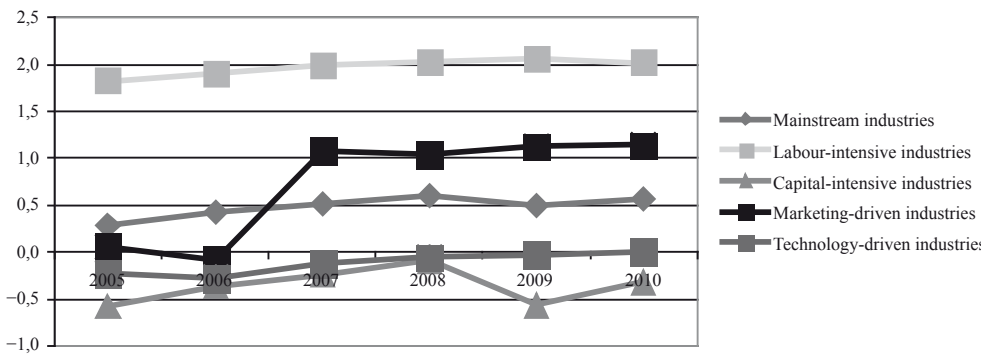

Figure 6. China's RCA indices of industries based on their factor input, 1995–2010

Source: author's own calculations based on UN COMTRADE database.

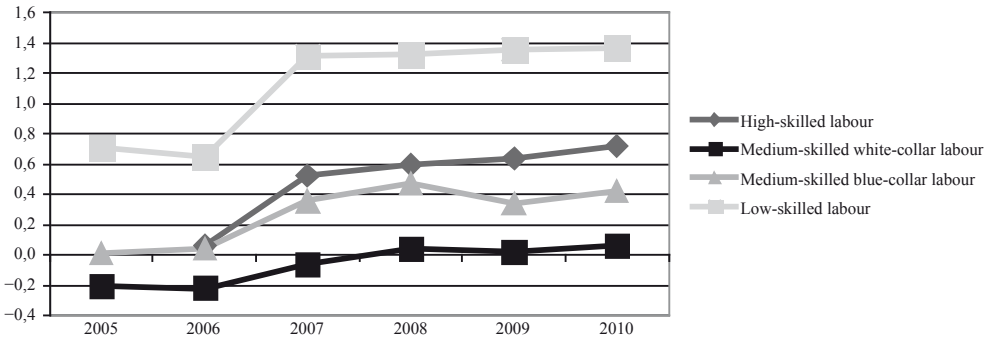

Figure 7. China's RCA indices of industries based on their skill level of labour, 1995–2010

Source: author's own calculations based on UN COMTRADE database.

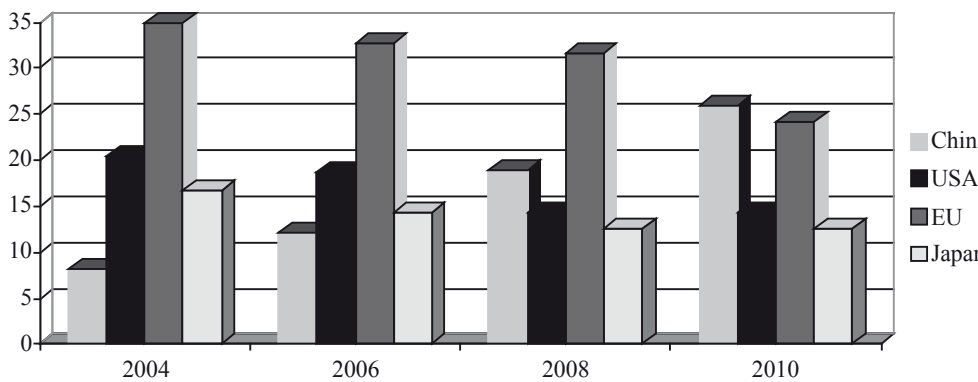

Figure 8a. Value added for medium-high-technology manufacturing industries by selected countries and selected years (% of global value added)

Source: author's own calculation based on National Science Foundation, Science and Engineering Indicators 2012, http://www.nfs.gov/statistics/seind 12/.

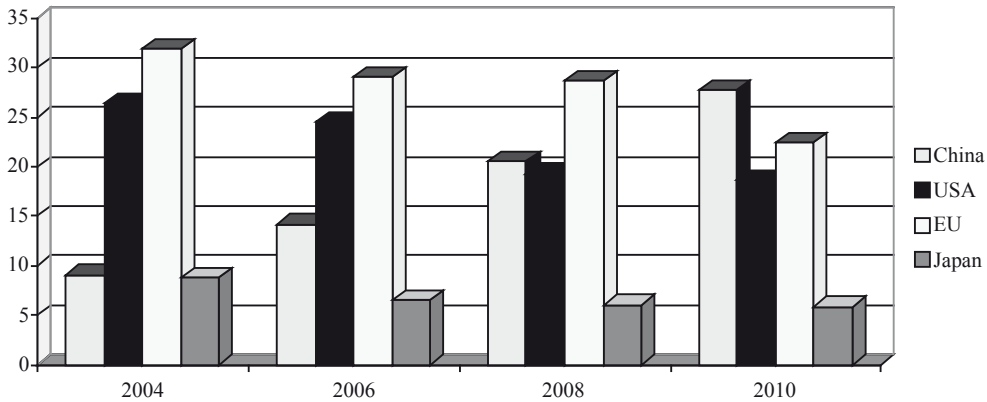

Figure 8b. Value added for medium-low-technology manufacturing industries by selected countries and selected years (% of global value added)

Source: author's own calculation based on National Science Foundation, Science and Engineering Indicators 2012, http://www.nfs.gov/statistics/seind 12/.

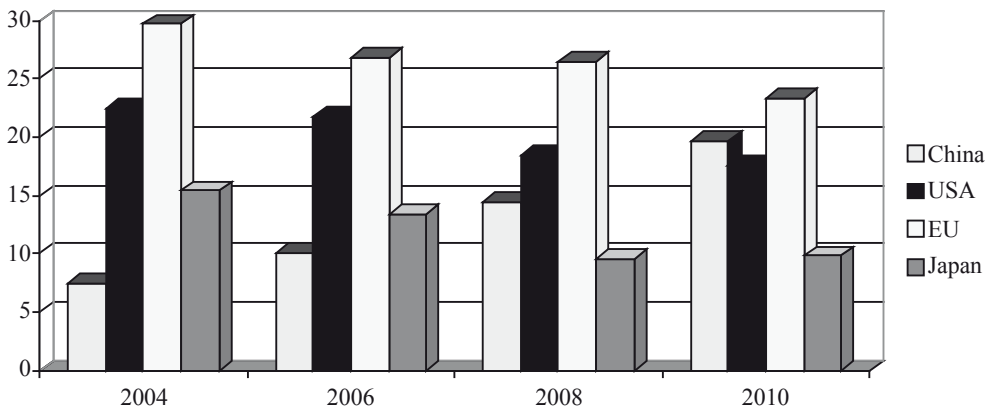

Figure 8c. Value added for low-technology manufacturing industries by selected countries and selected years (% of global value added)

Source: author's own calculation based on National Science Foundation, Science and Engineering Indicators 2012. http://www.nfs.gov/statistics/seind 12/.

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CZY KONKURENCYJNOŚĆ W HANDLU OPARTA NA INNOWACJACH JEST ODPORNA NA KRYZYS? PRZYKŁAD CHIN

Streszczenie: W czasach wzrostu światowej produkcji handel wschodzących i rozwijających się gospodarek spisuje się lepiej niż handel gospodarek rozwiniętych – jest tak przynajmniej od początku tego wieku. Przeczucie, że w czasie globalnej recesji zdywersyfikowany handel tych ostatnich jest bardziej odporny na załamania koniunktury niż poprzednich, wydaje się nie sprawdzać, przynajmniej w przypadku kryzysu lat 2008/2009. Analiza handlu Chin pokazuje nieproporcjonalnie wysokie wartości w czasach wzrostu i nieproporcjonalnie wysoką odporność w czasach kryzysu. Istnieją dowody na to, że zmiana struktury handlu kraju z opartego na eksporcie pracochłonnych, niskich technologii, bazujących na przewagach komparatywnych do opartego na eksporcie wysoko zaawansowanych technologii opartych na innowacjach miała miejsce właśnie w czasie kryzysu. Siły napędowe stojące za zachodzącą zmianą właśnie w takiej chwili powinny być poddane przyszłej, dogłębnej analizie.

Słowa kluczowe: Chiny, konkurencyjność, handel, kryzys ekonomiczny i finansowy.