



LOCAL CONSEQUENCES OF GLOBAL PRODUCTION PROCESSES*

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ABSTRACT. The financial crisis of 2008 not only started the Great Recession, but also set off fundamental changes in production processes, government fiscal practices, and housing. Technological progress has enabled firms to outsource and offshore parts of the production process, leading to a fragmentation of global value chains. We briefly discuss this “second unbundling,” global versus regional fragmentation and some of the consequences that became visible during the Great Recession’s trade collapse. We discuss the consequences for some local clusters, both from a theoretical and empirical perspective, and some consequences for government fiscal health and housing from an American perspective.

1. INTRODUCTION

The financial crisis of 2008 started what now has become known as the “Great Recession.” Large parts of the world, especially the higher income (Organization for Economic Co-operation and Development, OECD) countries, experienced low and sometimes even negative economic growth rates. There were many consequences of the Great Recession that include international trade, housing, fiscal health of governments.

One of the most visible aspects of the crisis is the international trade collapse commencing in October 2008. The reduction in trade flows was unprecedented in size since World War II and almost comparable to the decline during the Great Depression of the 1930s. The demand reductions that accompanied the recession quickly spread across the world, exacerbating the crisis. The reductions also highlighted the fundamental changes in the global production process, in particular what Richard Baldwin has called the “second unbundling.” This name distinguishes it from the “first unbundling” phase, which refers to the transport revolution of the 19th century. This revolution enabled the separation of production and consumption across space and started the first modern wave of globalization. The second unbundling, in contrast, is the fragmentation process or the slicing-up-of-the-value-chain that is made possible by the information and communication technology (ICT) revolution (see Baldwin and Evenett, 2015). New developments in ICT

*The articles in this special issue of the *Journal of Regional Science* were presented at the Nations and Regions after the Great Recession conference, co-organized by the *Journal of Regional Science* and the International Institute for Housing and Urban Development Studies in Rotterdam, December 2012.

enabled firms to separate the production process into different components or fragments that can be outsourced or offshored. The consequences of this process became especially visible during the Great Recession. A reduction in demand for a final product rapidly spreads globally as intermediate production is also affected, as described in Sections 2 and 3.

If the production process becomes increasingly fragmented into smaller parts spread across the globe, it raises questions like: (i) What countries are involved in this process? (ii) Where do the fragments relocate? (iii) What are the local consequences of this process? Some countries develop a comparative advantage in certain fragments of the production process rather than in complete sectors. Agglomeration economies may be enhanced in cities that specialize in certain tasks or functions, such as financial centers in London or New York, or an entertainment center in Los Angeles (see Grossman and Rossi-Hansberg, 2008, 2012). The implication is that comparative advantages of countries are to some extent determined by the comparative advantages of cities (Brakman and van Marrewijk, 2013a; Davis and Dingle, 2013). The Great Recession made the consequences of the fragmentation process more clearly visible, but the process itself has been going on for a much longer time.

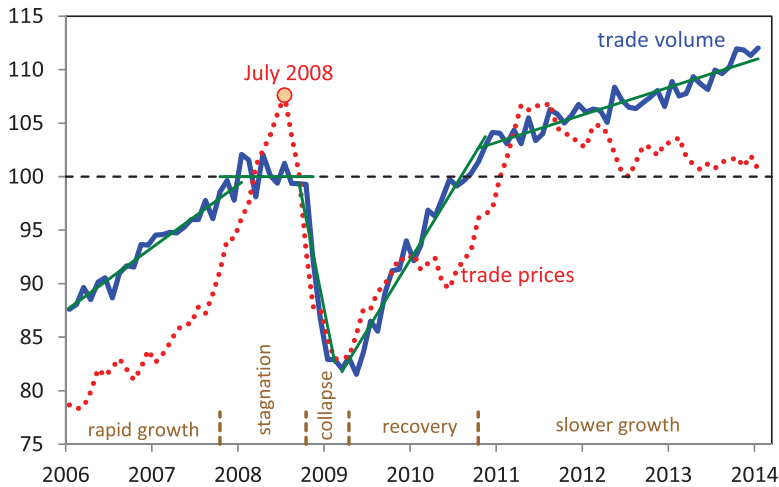
The Great Recession was primarily precipitated by the housing crash in the United States and elsewhere, which triggered the global financial crisis. The housing crash also set off adjustment waves in regional housing markets due to the concentration in certain Sunbelt locations that had been leading the United States pre-crisis growth. Similarly, the declining governmental revenues limited the ability of governments to deal with the pressures from the crisis and in providing for long-term needs such as education or infrastructure, which could limit long-term growth. It is now timely to assess how the Great Recession altered regional dynamics.

The articles in this special issue of the *Journal of Regional Science* on the one hand describe the changes in the global and regional fragmentation process and on the other hand analyze the local consequences of these changes, both in theory and empirically. Section 2 provides some basic information on the global trade collapse during the Great Recession and for four main regions/countries. Section 3 discusses the global and regional fragmentation process. Section 4 analyzes the consequences for local clusters and regional economies. Section 5 focuses on the local consequences in the United States for housing in both for cities and for rural areas. Section 6 concludes with some future research directions.

2. THE GREAT RECESSION

The economic consequences of the Great Recession became most clearly visible with the collapsing international trade flows after October 2008. In the analysis below we therefore normalize the discussion by using index numbers with the one year leading up to the financial crisis (November 2007–October 2008) as our basis (index = 100). Three main forces precluding the trade collapse and underlying the Great Recession are generally identified in the literature (see Beugelsdijk et al., 2013, part III, for a discussion), namely (i) the housing bubble in the United States and various other countries; (ii) financial innovation, which made securitization of loans and mortgages possible; and (iii) global (current account) imbalances, which enabled the spread of inappropriately priced risky assets across the globe.

The CPB Netherlands Bureau of Economic Policy Analysis World Trade Monitor provides the most recent, statistically solid information on monthly developments of global trade and industrial production that we are aware of. The March 22, 2014 version



Source: Calculations based on CPB World Trade Monitor, March 2014 (www.cpb.nl/en); price index based on unit values in U.S. dollars.

FIGURE 1: World Trade Flows, Volume and Prices; Index Nov 2007–Oct 2008 = 100.

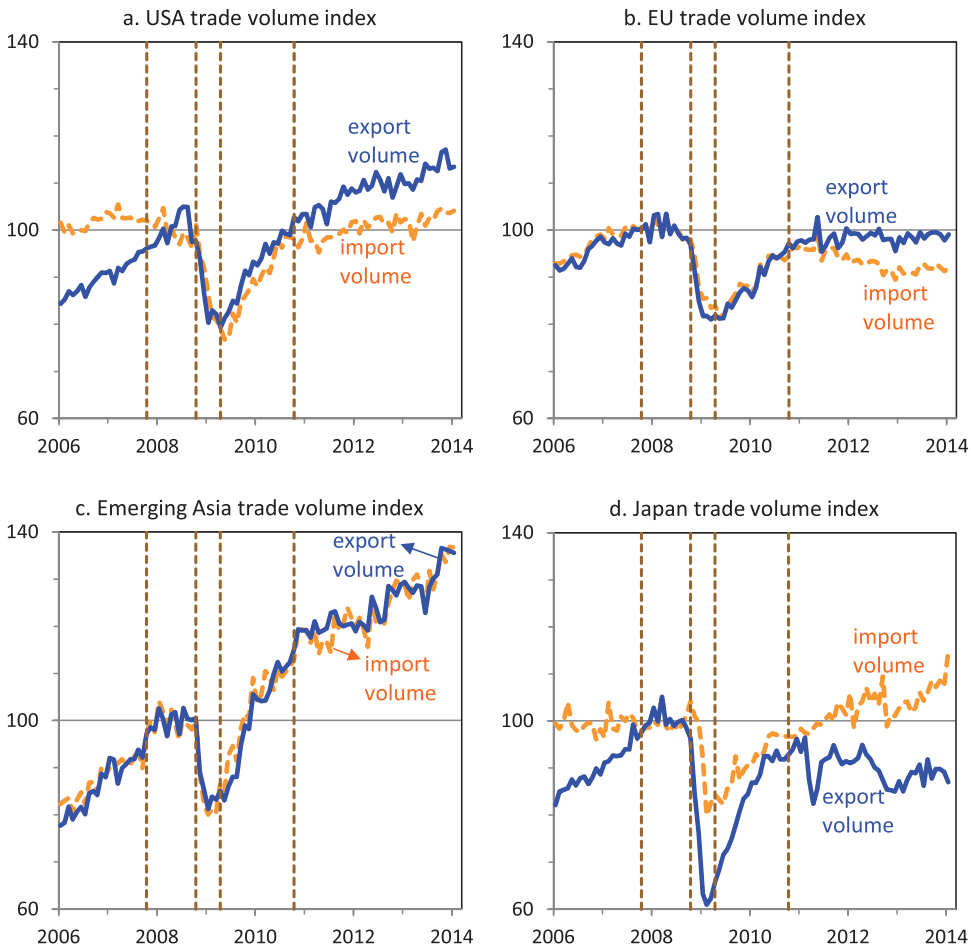
includes information up to and including January 2014. Using this information, global trade developments, both regarding the volume of trade and the price level based on unit values in U.S. dollars, are illustrated in Figure 1. We can identify five main phases since 2006, namely rapid growth–stagnation–collapse–recovery–slower growth, see the indicative straight lines around the trade flows in the figure. The trade collapse stands out. From October 2008 to March 2009, the steep 40 percent decline in trade on an annual basis. Altogether the volume of trade drops by about 18 percent. From May 2009 to October 2010, the volume of trade bounces back and grows at a high speed of almost 13 percent per year. The price level bounces back as well during this phase.

Figure 2 provides more detailed information on the evolution of the volume of exports and imports for countries or groups of countries, namely the United States, EU, Japan, and Emerging Asia, in four separate panels. The figure identifies the five phases discussed above using four vertical lines. All four countries/regions experience a trade collapse and experience the same five phases, albeit with different dynamics and growth rates. The deviations between export and import growth rates for the United States and Japan in the fifth phase lead to a reduction in global trade imbalances, thus mitigating one of the root forces driving the severity of the Great Recession.

3. FRAGMENTATION

One of the explanations for the large trade decline that has been brought forward in the literature is fragmentation of the production process, which magnifies a trade shock and sends the effects of a trade shock through the whole system (see Behrens, Corcos, and Mion, 2013, for a review).¹ The trade collapse is interesting by itself, but

¹Behrens et al. (2013) conclude that fragmentation only explains part of the trade collapse. Note, however, that they do not fully follow a supply chain through all countries involved in a chain, but restrain themselves to country import-to-intermediate production ratios, or import-to-production ratios.



Source: Calculations based on CPB World Trade Monitor, March 2014 (www.cpb.nl/en); index, Nov 2007–Oct 2008 = 100; the vertical lines indicate the demarcation between rapid growth–stagnation–collapse–recovery–slower growth as identified in Figure 1.

FIGURE 2: Evolution of Trade Volume; United States, EU, Emerging Asia, and Japan, 2006–2014 index, Nov 2007–Oct 2008 = 100.

more importantly it highlights, as discussed later, fundamental changes in the production process. This process is described in detail in Baldwin and Evenett (2015), who also stress the agglomeration of fragmentation. If components of the production process become more and more footloose, the location decision becomes more important. Forward and backward linkages are not responsible for agglomeration at the sector level, but at the level of fragments. This implies that countries or regions become more specialized in the production of particular *stages* of the production process, which are much harder compared to sectors to identify clearly in empirical research.

An important and related question is how global the production networks really are and the extent to which these value chains are changing over time. Are they regionally concentrated or truly global? As Los, Timmer, and de Vries (2015) argue, if value chains are regionally concentrated, trade policy could be more regionally oriented as well, which it is

in practice in view of the surge in regional trade agreements (see van Marrewijk, 2012, Ch. 13). If supply chains are global, however, trade policies should be more globally oriented. Based on a comprehensive and new input–output model of the world economy Los et al. (2015) find, using the Feenstra-Hanson (1999) methodology, that: “in almost all product chains the share of value added outside the country-of-completion has increased since 1995.” In this sense, *global* fragmentation has thus increased more rapidly than *regional* fragmentation. This suggests a transition from more regional production systems to a more global “World Factory” system.

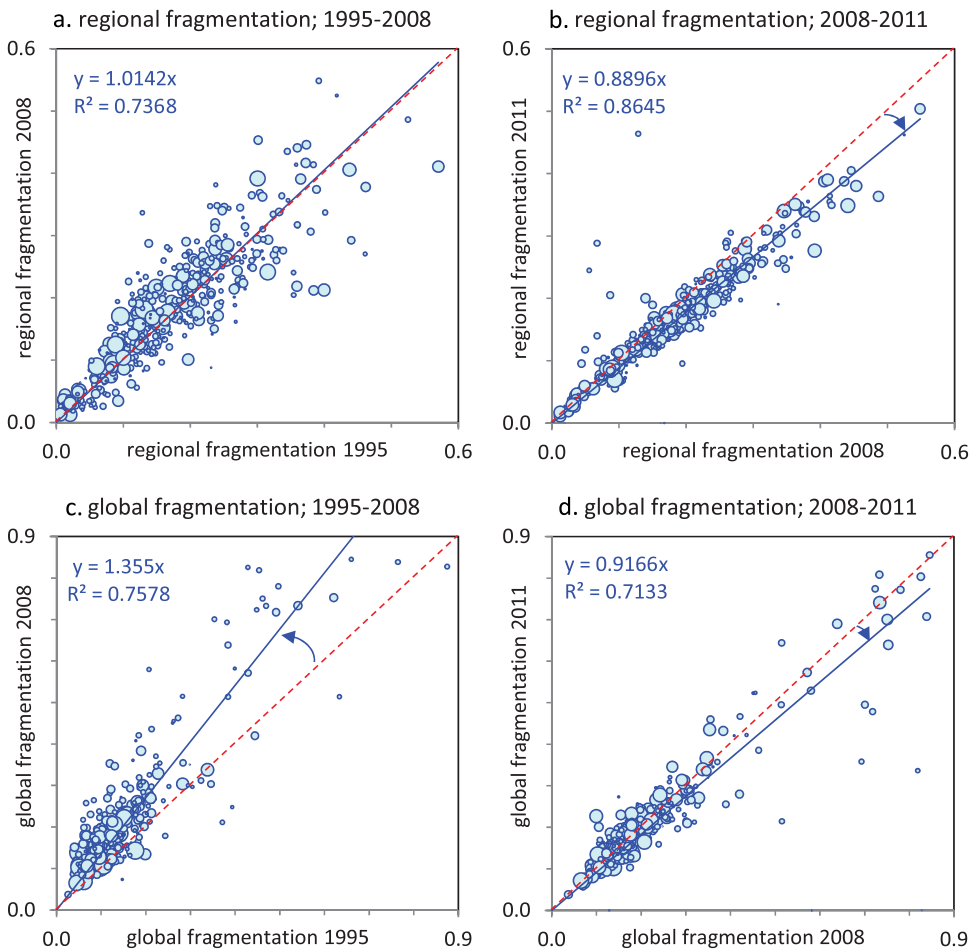
The important work of Los et al. (2015) in this issue is illustrated in Figure 3 (panels a and c) using a bubble diagram, where the size of the bubbles is proportional to the sector’s share in total value added of the country in the initial year. The figure depicts developments in 34 countries and 14 sectors for three global regions, namely Europe, NAFTA, and East Asia.² For each sector and country of completion, the foreign share of value added is calculated both *within* the region of the country (regional fragmentation, say within Europe for Germany) and *outside* the region of the country (global fragmentation, outside of Europe in the case of Germany). Figure 3a shows that from 1995 to 2008 regional fragmentation has not changed (the slope of the regression line is not significantly different from one). Figure 3c, however, shows that far-away global fragmentation has significantly increased in this period, as has, of course, total fragmentation (not shown in the figure).

Figure 3 also illustrates in panels b and d how the trade collapse has, temporarily at least, reversed the process of fragmentation, essentially because trade flows declined relative to income. Note that both regional fragmentation (panel b) and global fragmentation (panel d) are significantly lower in 2011 than in 2008. More importantly, however, the general tendency identified by Los et al. (2015) is *not* interrupted. There is a continued change in production structure from regional fragmentation toward global fragmentation. In particular, the decline in regional fragmentation was significantly stronger than the decline in global fragmentation from 2008 to 2011. The trade collapse has therefore made the changes in the world production structure more clearly visible, but it has not interrupted the main forces underlying these changes as such. Yet, there are clear gaps in our knowledge on fragmentation. For example, although we know quite a bit about the interaction between agglomeration and human capital (e.g., Brown and Scott, 2012), we know less about how fragmentation is related to agglomeration and the location of human capital. Finally, will these fragmentation forces affect the resilience of regions to withstand future economic shocks (Fingleton, Garretsen, and Martin, 2012), or will they facilitate the spread of economic shocks.

4. LOCAL CLUSTERS

The “factories of the world” discussed in the previous section increasingly consist of China and India. Desmet et al. (2015) highlight what happens within India as a consequence of the ongoing fragmentation process identified by Baldwin and Evenett (2015). They analyze the density of spatial growth patterns in India, not only for manufacturing activities but also for services. They argue that the high-density areas in India are its engines of growth and that high-density clusters are more important in India than in, for example, the United States or Europe. Since they contend that the costs of congestion in India are smaller than in the United States or Europe, the density levels are higher. An exception in this respect is Bangalore, which is often referred to as the Silicon Valley of India; density there is comparable to that of similar clusters in the United States. Note,

²The total input-output data set consists of 40 countries and 15 sectors.



Notes: Figure based on data from Los, Timmer, and de Vries (2015); each dot represents the share of foreign value added in the final output of a product in 1995, 2008, and 2011, subdivided into the share from within the region (regional fragmentation) and the share from outside the region (global fragmentation); the size of the bubble is proportional to the sector's share in total value added of the country in the initial year; observations have been included for 14 manufacturing industries of completion in 34 countries in the regions "Europe," "NAFTA," and "East Asia." The dashed line is the 45 degree line. The solid line results from OLS regression through the origin; arrows indicate coefficients that are significantly different from one.

FIGURE 3: Foreign Value Added Shares in Output of Final Manufactures; from within the Region (Regional Fragmentation) and from Outside the Region (Global Fragmentation), Selected Years.

however, that the simple fact that Bangalore exists as an ICT cluster also illustrates some of the characteristics of fragmentation.

The existence of clusters like Silicon Valley or Bangalore that are home to parts of the information technology supply chain are key to local growth; a fact that has not gone unnoticed by policymakers. Cluster formation is high on the policy agenda of many policymakers who like to create their own local "valley." Often this results in policy competition between regional policy makers that could diminish welfare of a region or country, for example if the total level of investment is fixed or if a location lacks any comparative

advantage in the particular product.³ Bruelhart and Schmidheiny (2015) explicitly address this topic. Analyzing inward foreign direct investment (FDI) for the U.S. using conditional logit, Poisson, and nested logit models, they find “that state-level corporate taxes affect the distribution of FDI across U.S. states, but possibly not the total amount of FDI into the country as a whole. Inward FDI appears to be a rival resource.” This conclusion is interesting and should warn governments not to engage too easily in tax competition as it might result in a negative-sum game between local governments.

The findings of Bruelhart and Schmidheiny (2015) point toward the importance of the location decisions of firms in a world characterized by supply chains. In a theoretical contribution, they analyze this aspect more explicitly by introducing scale economies in transportation in a model with heterogeneous firms. There is little doubt that scale economies are important in transportation in practice. Such findings are consistent with the notion that innovations in transportation technologies can greatly shape where economic investments will take place (Pires et al., 2013). It also turns out that this changes the standard results of these types of models quite drastically. In particular, Forslid and Okubo (2015) find that the most productive firms no longer tend to agglomerate, and move to more peripheral areas because transportation costs become less important and local costs more important. Yet, a relatively understudied area is the role of transportation costs in affecting colocation, which may work to cause productive firms to coagglomerate (Gallagher, 2013). Note that the forces discussed in these models might also be relevant for Desmet et al. (2015) or Desmet and Rossi-Hansberg (2009).

5. LOCAL CONSEQUENCES IN THE UNITED STATES

We conclude this special issue with two studies on the local consequences for the United States of the global developments discussed in Sections 2 and 3. The paper by Ross, Yan, and Johnson (2015) analyzes the consequences of the shocks generated by the Great Recession for the public finance system of the 35 largest American cities. They show that the impact on parts of the financial system can be substantial. This holds in particular for the revenue generated by property taxes, which declined significantly as a result of falling housing prices. Nonetheless, the volatility in *total* revenue and expenditure was considerably less dramatic, partially as a result of adaptability and financial resilience and partially as a result of central-government-like deficit financing. The authors conclude that the cities are generally returning to the same pattern of fiscal sustainability in 2011 that they had in 2006. Indeed, given the severity of the Great Recession, Ross et al.’s findings are somewhat optimistic for the ability of local governments to positively provide long-term services that support economic growth.

In view of the rising share of cities and agglomerations in economic output all over the world, the emphasis in the media and in academic analysis is increasingly shifting toward metropolitan areas. We should be careful, however, not to think there is only empty space in between cities as nonmetropolitan shares of national populations has been remarkably stable in many developed countries (OECD, 2010).

The paper by Rickman and Guettabi (2015) is a refreshing counterexample to this general trend (and complementary to the Ross et al., 2015 paper) as it explicitly tries to get a better understanding of developments in the *nonmetropolitan* housing market before, during, and after the Great Recession. The authors find, for example, that natural amenity attractiveness was strongly associated with employment and population growth during the expansion phase (2002–2007), but not during the recession phase (2007–2009).

³See Brakman and van Marrewijk (2013b) for a recent discussion.

Although natural amenities re-emerged as a contributing factor during the recovery phase (2009–2011), their influence was much smaller than before the Great Recession. Yet, as the U.S. economy continues to recover, there is evidence in migration patterns that growth patterns are increasingly looking like those of the pre-Great Recession, suggesting that the Great Recession's long-term impacts may not be permanent in affecting long-standing regional trends. The Rickman and Guettabi's paper raises interesting questions about the relative roles of amenities and proximity to urban areas for determining nonmetropolitan growth during this period of upheaval (e.g., see Ganning et al., 2013, for discussion of urban spread effects). Similarly, we know little about how the Great Recession and the associated trends in fragmentation have altered migration patterns of the most skilled in the United States and elsewhere (e.g., see Haapanen and Tervo, 2012, for a discussion of the migration of the most educated).

6. CONCLUSION

The “second unbundling” has enabled the process of both regional and global fragmentation. As a consequence, global value chains emerged, which are now becoming a dominant force in the world economy. The Great Recession has revealed the wide-spread nature of this process as it has, to some extent, contributed to the recent trade collapse. The consequences of this process are equally widespread and research into this phenomenon has only just started. Limitations in the availability of relevant data are rapidly being reduced, revealing which countries are most heavily involved in the fragmentation process. Also within countries the effects of global value chains are being felt in a range of questions. Where do fragments relocate? What do policymakers do if they are confronted with specialized firms looking for a location? How will cities change and adapt to the new circumstances? Will they become more specialized as certain fragments of the production process try to benefit from agglomeration economies? Similarly, are governments really able to respond to long-term needs and have housing markets fully recovered? Finally, have the trends associated with the Great Recession altered the ability of for governments to conduct place-based regional development policy (Barca, McCann, and Rodríguez-Pose, 2012)?

This special issue describes the broad tendencies and provides some more detailed answers to some questions. In view of the scope of this topic, we have only started the discussion and not yet answered both the deeper, broader, or more detailed questions. Nonetheless, we made a start and we look forward to the answers that will be provided as these economic trends further unfold in the near future.

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