EM Cross Asset Navigator
Is the trade slowdown cyclical or structural?

Emerging Markets

Global

Bhanu Baweja, CFA
Strategist
bhanu.baweja@ubs.com
+44-20-7568 6833

Andrew Cates
Economist
andrew.cates@ubs.com
+44-20-7568 1401

Manik Narain
Strategist
manik.narain@ubs.com
+44-20-7567 3218

Patrick Lamaa
Associate Strategist
patrick.lamaa@ubs.com
+44-20-7567 4485

This issue is not going away

A Chinese slowdown, potentially higher US rates, rising EM leverage, the end of the commodities super-cycle; there is no dearth of issues that EM will have to grapple with over the medium term. In our mind, though, no issue looms quite as large on the horizon for EM as the loosening relationship between global growth and global trade. We have highlighted this as a key and underappreciated issue for EM for the last 18 months. We understand from our debates with investors that the market sees the weakness in global trade as primarily cyclical and centred on energy imports. We agree there are cyclical factors at work, but believe structural factors are playing a major role too. In this Navigator we present updated and new evidence. Charts begin on page 6.

The trade slowdown has cyclical elements, and here things may get better

Trade, along with fixed investment, is regarded as a high beta element of output, such that weak output typically begets disproportionately weak trade. The recovery in output has been particularly weak after the 2008-2009 recession. As fixed investment in DM improves, so will EM exports. However, the texture of the current recovery is different, and this will limit the magnitude of improvement. Developed world sectors that are improving today are not the ones that make big demands on EM exports. Sure, the recovery could broaden in the future, but it may be a while.

But we believe we are witnessing a structural shift too

For a long time technology and institutional change helped drive a trend toward globalization. Burgeoning global supply chains have also helped push up global trade more recently. There is increasing evidence, however, that the gains from these factors are now plateauing out. The changing nature of aggregate demand in China, a demographic-induced slowdown in housing construction in most major economies, and new manufacturing technologies constitute other important structural headwinds.

Unless EM manages costs, even the reduced EPS forecasts may be optimistic

With P/E ratios having risen closer to historic norms, earnings growth now needs to step up as a key driver of total returns for EM equities. Global trade values have been an important driver of earnings. A weak export impulse will be particularly noticeable at a time when the scope for counter-cyclical monetary policy is being compromised by rising leverage. Equity analysts have pulled down future EPS growth forecasts a long way to more realistic levels, but based on prospective export trends even these could be optimistic. We think EM needs to focus on cost control to improve earnings.

Most FX fair value models are wrong

Most fair value models in FX are based on some variant of PPP or real effective exchange rate concepts. These models assume a constant elasticity of trade to price and income. As world trade's multiplier to output falls, this assumption is no longer valid. It is no surprise that we are seeing a lower response from exports to currency moves than we did in the pre-crisis era. Larger currency moves will be needed to fix the same trade imbalances. We prefer FEER based fair value models.

Duration positive, but credit negative

More modest growth outcomes arguably present greater opportunities in EM fixed income than equities over the long haul. There are several caveats, however. Weak exports suggest that the lacklustre performance of EM currencies may be a persistent drag. Also, amidst weak domestic growth and limited export growth there may be greater emphasis on fiscal expansion which will contain compression of credit spreads. Investors will need to focus exposures on those emerging markets that are able to implement reforms to raise productivity, gain export share and preserve fiscal stability.

That world trade question again

Over the last two years we have argued consistently that the relationship between global growth and global trade has changed, and that this is having – and will continue to have – profound implications for EM assets. We have debated this issue more intensely with clients than any other. That global growth today isn't able to bring forth the same degree of global trade as before the crisis is fact **(Figure 1, Page 6**). What is more important however from a market perspective is to establish why. Are the reasons behind it structural or are they cyclical?

In this note we present a chart book with some updated and new evidence on both the near and long term aspects of global trade (see page 6). Since it is the structural aspect of this trade issue that is most hotly debated, we focus our attention on this both in our introductory remarks and in the charts that follow.

No denying the cyclical … but it may be a long cycle

The optimistic reading of the current situation ascribes purely cyclical reasons to the slowdown in trade. This school of thought sees trade as a high beta element of output. Given that output has been pulled lower for longer after the Great Recession, it is unsurprising that trade is weak. As balance sheets in the developed world slowly improve then trade as a percentage of output in developed countries ought to rebound quickly.

We too believe that trade growth will improve modestly from here. Firming lead indicators (e.g. orders to inventory ratios in PMI surveys) in most developed countries herald a slightly stronger growth rate for EM exports in the coming months. But we think investors will continue to be disappointed by the scale of any improvement. That's in part because any cyclical rebound in most developed countries but in particular in Europe and Japan is liable to be hampered by still-high levels of leverage. But there are other reasons too.

We believe investors should also focus on those sectors that are now recovering in the developed world and particularly in the US. Recent data suggest that sectors such as **heavy machinery, construction equipment and transportation equipment are doing pretty well in the US**. But these are not sectors that EM exporters specialise in. In contrast consumer non-durables, crude oil and energy products, computers and electronic products are seeing unusually weak demand. This is EM's area of expertise.

While cyclical factors have surely played a role in the weakness of global trade, we think the evidence is sufficiently strong now to suggest a structural downward shift in the multiplier between trade and output. In what follows we outline the key factors that we think have been responsible for this.

Structural force #1: Fading contribution from lower tariffs

It is useful to first address factors that led to an increase in global trade as a share of output in the first place. The trade literature has identified two factors as having driven the rise of global trade - technological change (more efficient and low cost shipping, the advent of containers etc.) and institutional change (a wider political acceptance of global trade, and lower trade barriers). Academic studies point to lower trade costs from technological change as being the main driver of increased

global trade before the second world-war, and institutional change being the dominant force in more recent decades[1].

With the collapse of the Berlin Wall in 1989, the formation of NAFTA in 1994, increased economic integration within Europe through the 1990s and early 2000s, and the accession of China to the WTO in 2001, the last two decades have witnessed an exceptional push to free up international trade not just in goods but also in services and intellectual property. These barriers had already been coming down under WTO's precursor, the GATT**. Based on data from UNCTAD and WTO we see that the big (easy) declines in tariffs may have already been seen (Figure 7, Page 8)**. Not only are tariffs already low now, there is greater resistance from developing countries to engage with developed countries on free trade due to their impact on employment heavy sectors such as agriculture. The 'incremental' gains from multilateral global trade agreements in other words may be more limited in the coming years.

Structural force #2: Ebbing globalization of capital and labour along with trade

A flattening out of the ratio of trade to output should not be seen in isolation, in our view. There is some evidence that the process of globalisation, which has defined markets, economics and society over the last 2-3 decades (though not for the first time in history) may now be losing momentum.

Globalisation is often used as a broad term but must specifically be thought of as the free movement across the globe not just of goods, but also of labour, capital and ideas. It's difficult to quantify free movement in ideas (our hunch is that this is not at risk) but along with slower movement of goods, there are signs that the movement of labour and of capital may also be slowing.

Based on data from the OECD and the UN we show that the stock of international migrants is growing at a slower pace (Figure 10, Page 9). International immigration and remittance flows are sensitive to the state of the global economy, but in our opinion a driver of immigration will also be the state of politics, which is more sensitive to employment than it is to output or productivity. To the extent that labour market participation rates in the developed world may be slow to recover, the slowdown in migration growth may persist for some time.

A similar slowing is evident in global financial flows (Figure 8, Page 8, and Figure 9, Page 8). Both bank lending flows and, to a lesser extent FDI, have slowed down since the crisis. In our view, heightened financial market regulation (e.g. around bank capital ratios) has strengthened the home bias for many institutions and accordingly restrained cross-border financial activity.

The world has certainly not reached the limits of globalization. The stock of migrants makes for only 3.2% of the world’s population according to UN and OECD data, for instance. Also, financial repression where local institutions stay captive at home to buy local paper needn’t be the norm. International flows could certainly pick up again. However, it does appear that the gains in globalization have hit a plateau. Another climb, if it is to come again, may take time.

[1] See D Jacks, C Meissner and D Novy "Trade Costs 1870-2000", American Economic Review Vol 98, No 2, 2008, and S Baier and J Bergstrand "The growth of world trade : tariffs, transport costs and income similarity", Journal of International Economics, Vol 53, No 1, 2001

It must be pointed out that over the last two decades trade openness has been strongly correlated with mobility in labour and capital**. We believe there may in fact be some causation between trade growth and labour/capital mobility.** If for example companies are able to move capital between borders, and there exist large migrant populations (and therefore business lobbies) in a specific country that may help boost trade with the home country.

Structural force #3: Early signs of on-shoring

We doubt that on-shoring has yet begun in earnest. But a few recent trends in the economic data suggest that something new could be afoot.

The first is the **relative trajectory of US industrial production and US imports (Figure 13, Page 10 and Figure 14, Page 10),** Compared to previous recessions since the 1980s, the recovery in US industrial production has been much stronger than in previous recessions. Apart from mining (shale gas and oil) the recovery is also strong in energy intense industries like chemicals, plastics and rubber. These are the industries that benefit most from cheaper energy, which arguably is one of the US economy's new competitive advantages. At the same time the recovery in US imports (both headline and also ex oil) is much weaker than has been seen in previous recessions.

Another development that points in the direction of on-shoring is the **relative increase in fixed investment in the US relative to direct investment abroad (Figure 12, Page 9).** One of the reasons for this could concern the sharp rise in labour costs in China (and other emerging economies) compared with the US (and other major developed economies) (see page 10).

A recent study by the ECB on changing global trade elasticities [2] also references work on shortening global supply chains wherein businesses are choosing to simplify their work processes and keep more production onshore. The ECB points out that as outsourcing progressed gross trade (which accounts for the value of a product) grew at a faster pace than value added trade. This spread between gross and value added trade has now been coming off suggesting outsourcing may not have quite the momentum behind it as it did between 1990 and 2007.

Structural force #4: Chinese re-balancing

We referred above to higher unit labour costs in China as one reason Western businesses may now be more inclined to invest at home. However, perhaps a more important way in which China is likely to impact the growth in global trade is via its role as an importer, particularly of commodities. Not only has China's overall growth rate been extraordinary over the past two decades, its commodity intensity has been considerably higher than the likes of Korea, Japan and Brazil at their similar stages of development. This likely reflects the scale of China's construction boom and increased capacity expansion in the traded goods sector.

One of the clearly stated objectives of the current 12th five year plan is to rebalance the economy away from investment towards consumption. Already construction, very likely amongst the most import thirsty parts of fixed asset investment, is slowing down. As our China economics team, led by Tao Wang, has explained in detail, demographics, leverage, and inventories are likely to result in a

---

[2] See "Understanding global trade elasticities: What has changed?" in ECB Monthly Bulletin, July 2014

new equilibrium for real estate investment being considerably weaker in the years ahead. Despite continued urbanisation potential, they highlight that the government is emphasising hukou urbanization over headline urbanization; this aims to integrate migrant workers into cities in which they are already living, rather than on more resource-intensive and investment-heavy activities (e.g. property construction and infrastructure). We find evidence to suggest that infrastructure investment in China tends to have a much weaker statistical relationship with commodity imports than does investment in real estate (Figure 36, Page 18).

Many investors who regard the trade slowdown as cyclical suggest that weakness in domestic investment is exaggerated. It's not just in China, however, that housing construction is weakening. Building activity remains particularly lethargic in G7 countries as well (**Figure 17, Page 11**), and we believe this is exacting a toll on global trade. It is somewhat surprising that thus far we haven't seen a notable slowdown in Chinese imports in volume terms but we do expect that as consumption takes over from investment, the import propensity of the economy will fall, particularly with respect to commodity imports.

Structural force #5: New manufacturing and ICT technology

New disruptive technologies, such as additive manufacturing techniques, advanced robotics, more sophisticated mobile devices and the cloud could also weaken previous relationships between growth and trade. These technologies are still in their infancy; so this is more a potential threat, than an actively engaged process.

3D printers, for instance, are arguably hastening a dismantling of global supply chains because of the reduced cost of manufacturing products closer to the final consumer that the technology affords. The reduced cost of and future deployment of advanced robotics in manufacturing could be further reducing the incentives to source cheap labour from low-cost emerging countries, with ramifications for labour markets, for the globalization of labour and possibly for the globalization of goods trade as well. Information technologies could be further eroding trade multipliers via the increasing ease with which consumers can purchase and enjoy goods (and services) online (e.g. via I-devices) that they had previously purchased physically at a shopping mall. A close look at retail sales data in the developed world shows that an increasing amount of sales is being made outside stores, i.e. on the internet **(Figure 15, Page 10)**.

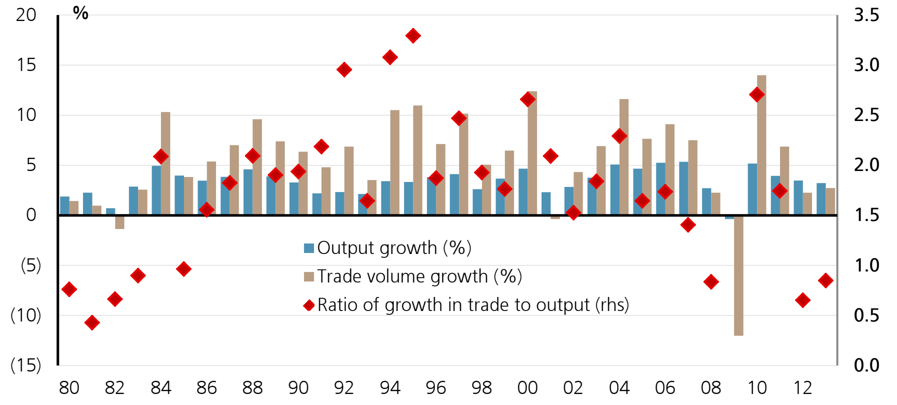
Many of these new technologies undeniably bring the promise of significant economic benefits as well which could, in turn, generate renewed vigour for global growth – and for global trade – in the period ahead.

As with any thesis, this one has risks too

The industrial development of those economies and the demands that they might make on the industrial fabric of other emerging economies offers a **stark reminder that the central thesis that we have laid out here is not without risks**. We think, nevertheless, that there are sufficient grounds for thinking that the nature of global trade is changing, possibly in profound ways.

World trade: changing elasticities

Figure 1: Global growth and global trade

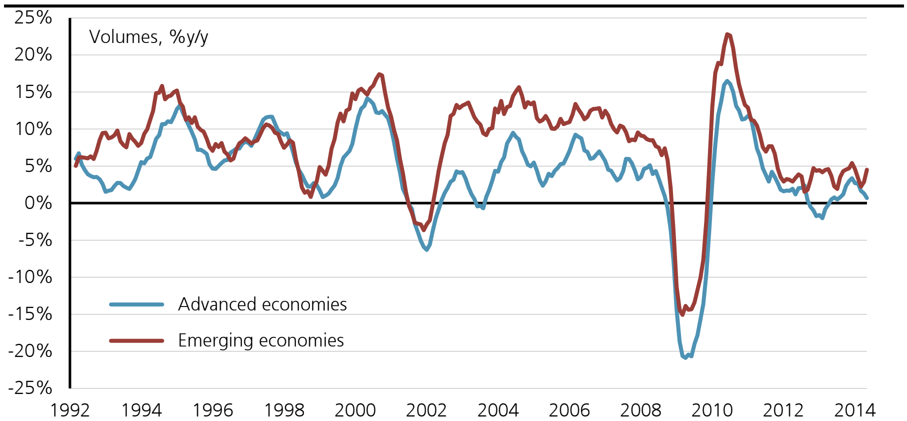


Source: Haver, UBS

The multiplier of trade to growth has fallen. Whereas 1 unit of global growth used to yield 2 to 2.5 units of trade volume growth between 1985 and 2005, that multiplier today is close to 1.

This multiplier had actually weakened well before the crisis.

Figure 2: World and EM export volume growth: EM gained share in the 2000s



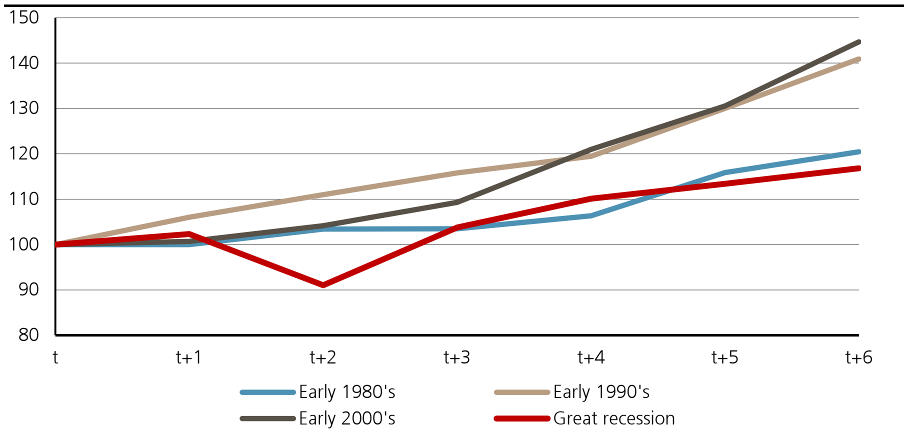
Source: CPB

There are two reasons this weakening multiple was not 'felt' before the crisis.

First, global commodity prices were rising so trade values remained high despite low volumes.

Second, EM was gaining market share in global markets. In addition to an even weaker multiplier of trade volumes to growth, both these forces have also weakened today.

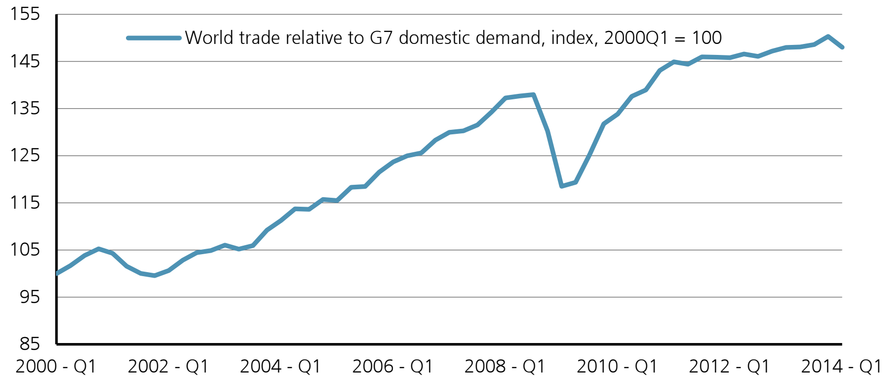
Figure 3: The evolution of world trade volume in previous recoveries



Source: OEF/national sources. . **The chart shows annual data for world trade volume after the trough in world GDP in each recession.**

The slow recovery in world trade is more pronounced relative to the recessions of the 1980s, 1990s and early 2000s

Figure 4: World trade relative to G7 domestic demand



Source: OEF/national sources

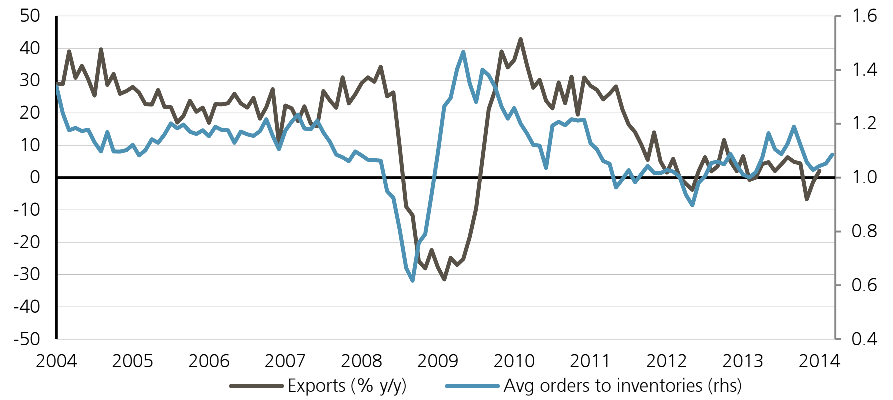
This is in part because domestic demand growth has been weaker than in previous recoveries. But even normalised for this, world trade growth is slow.

Figure 5: World trade share in goods and services

Source: OEF

This is evident not just in the trade flows of goods, but also in that of services.

Figure 6: A cyclical boost : EM exports vs US, China and Germany orders to inventories*

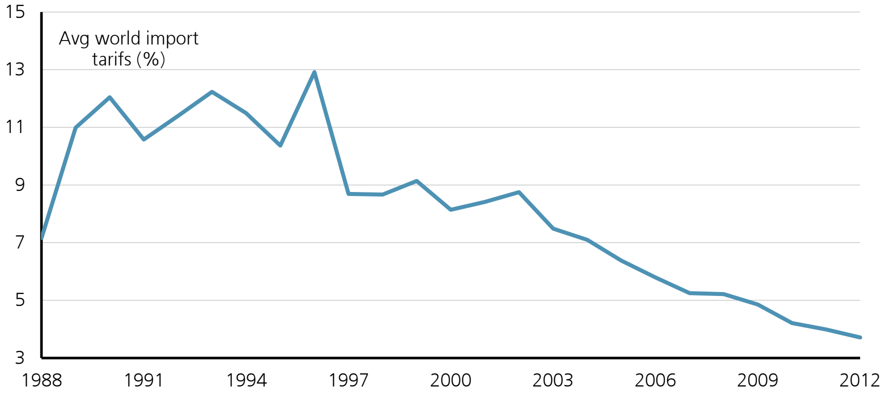


Source: Haver, UBS. *Simple average

Orders/inventory ratios in core markets remain below long term averages but only modestly so. In the near term we are likely to see slightly stronger EM export growth

Why is this change structural?

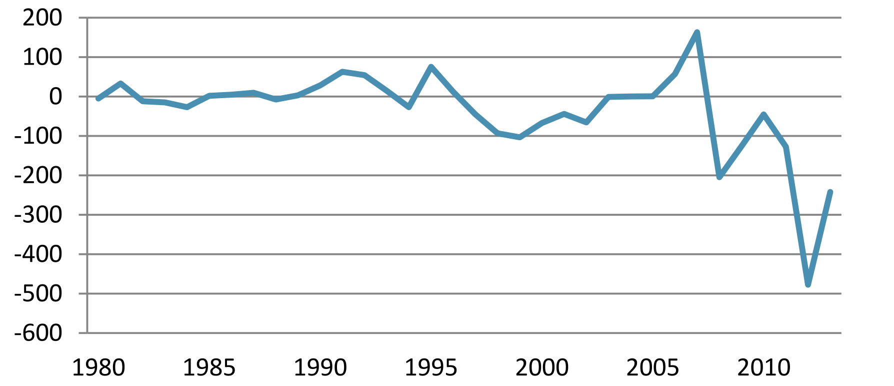
Figure 7: World import tariffs on goods (Weighted average of 21 categories)



Source: World Bank WITS database

Global import tariffs have been declining since the early 1990s as a series of positive 'shocks' have dismantled barriers to trade. It is difficult to see lower tariffs providing much 'incremental' benefit to world trade

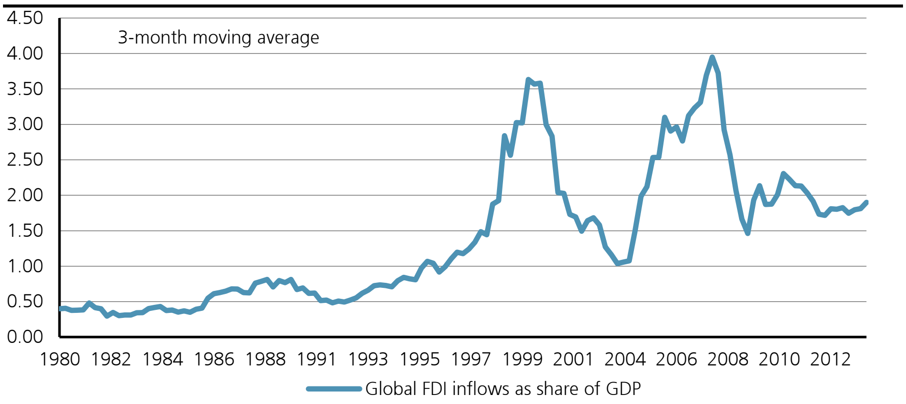
Figure 8: Emerging economies: other private financial flows (USD bln)



Source: IMF

Global capital flows are also not as strong as they used to be. This combined with the slowdown in services trade could be because banks are under pressure to pull back from cross-border activity.

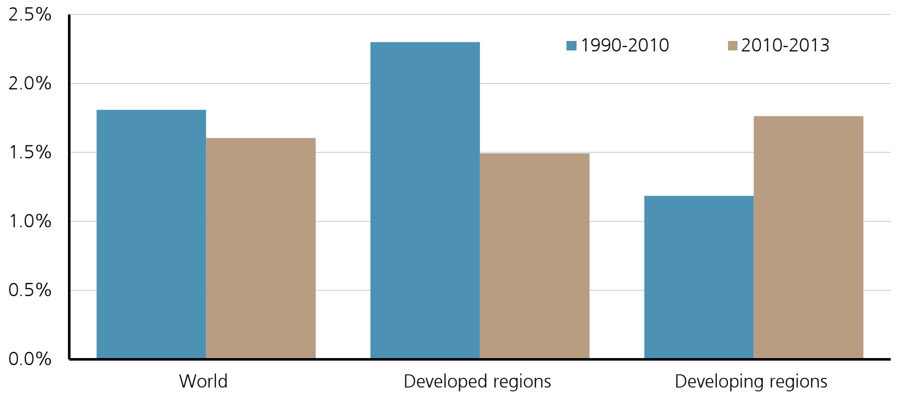
Figure 9: Global FDI inflows, % of GDP



Source: IMF/OEF

The slowdown in capital flows is also reflected in FDI

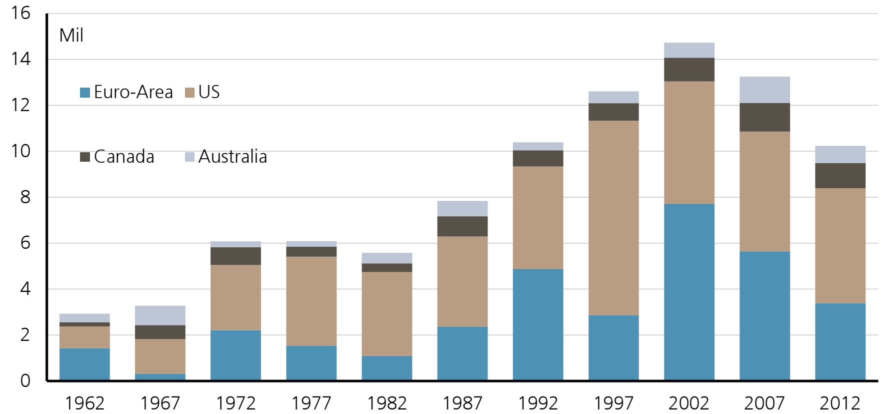
Figure 10: Growth rate (annualized) of migrant population by region



Source: United Nations (2013), *Trends in International Migrant Stock: The 2013 Revision.*

Growth rates of international labour migration are easing. There is some evidence to suggest that globalisation of capital flows, trade and labour have mutually beneficial linkages

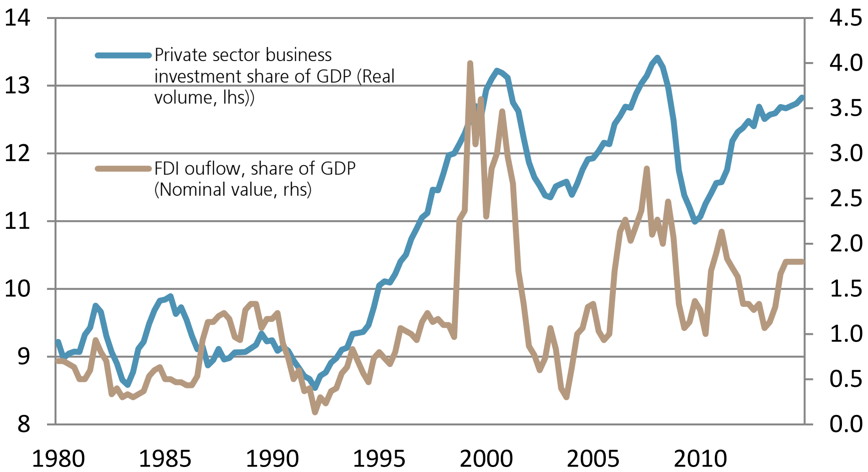
Figure 11: Net migrant flow to US & EA



Source:

The trend has been most pronounced in Europe

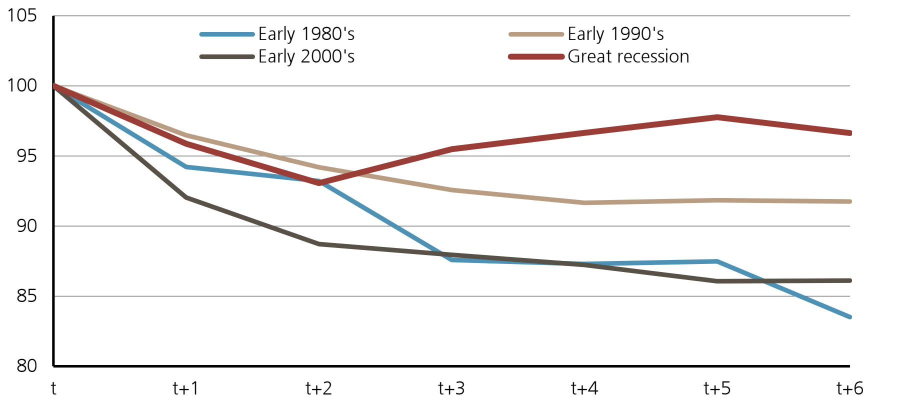
Figure 12: US FDI and domestic investment



Source: Haver, UBS

Like-for-like comparisons are difficult, but the recovery in US domestic investment (in real terms) has been much more impressive relative to the trend in US FDI outflows. The gap between the two series in other words has widened. That's a data point that gently suggests a trend toward on-shoring.

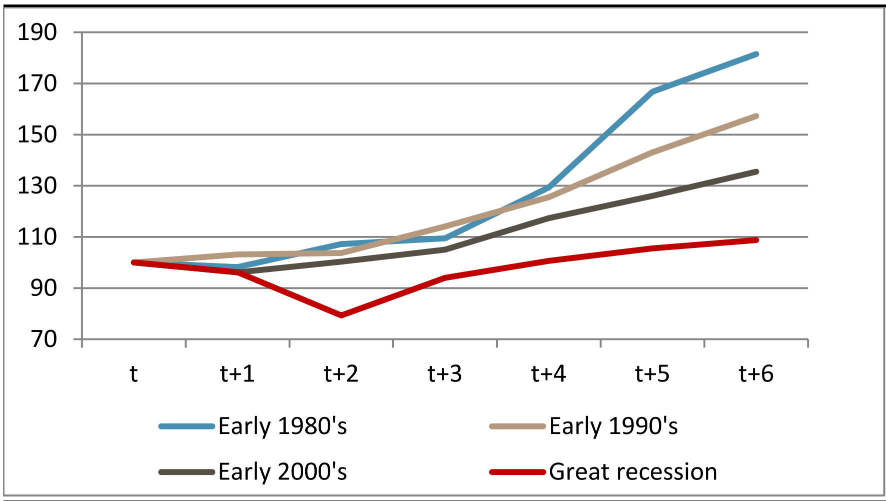
Figure 13: US manufacturing output during recovery phases, present and past



Source: BEA/FRB/IMF/UBS calculations. **The chart shows annual data for US manufacturing output after the trough in GDP in each recession.**

The recovery in US manufacturing output in this cycle has been impressive relative to previous cycles

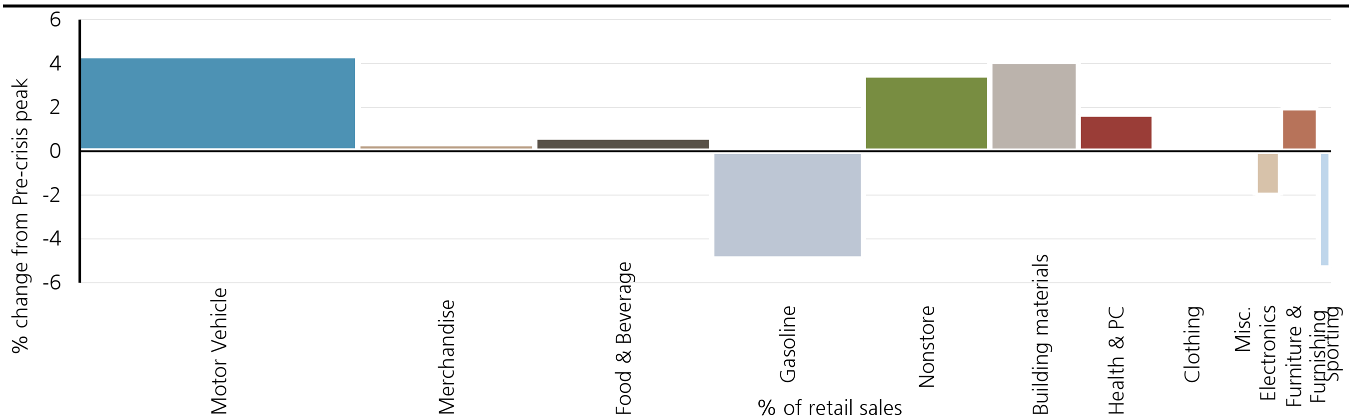
Figure 14: US imports (excluding oil) during recovery phases, present and past



Source: BEA/UBS. **The chart shows annual data for imports after the trough in GDP in each recession**.

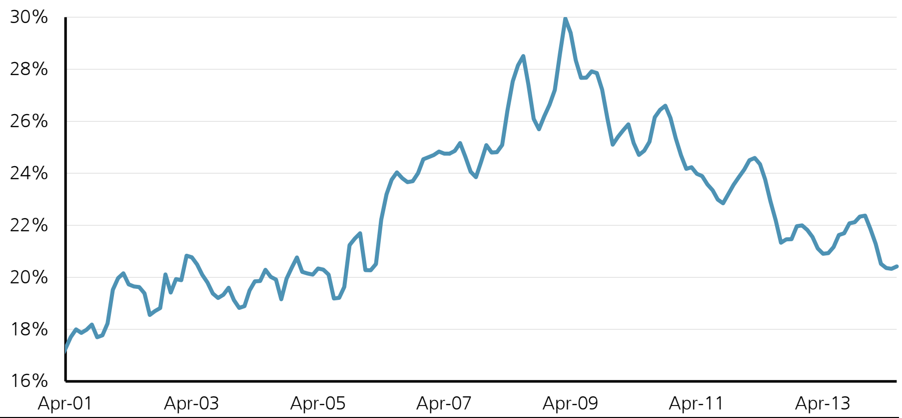
US imports have – at the same time as this – been unusually weak in the current cycle. This too provides tentative evidence that US manufacturers are on-shoring some of their production

Figure 15: Structure of US retail sales: (Width of bar indicates weight in retail sales): Motor vehicles and non-store sales are parts of retail sales that have done well since the crisis



Source: Haver, UBS.

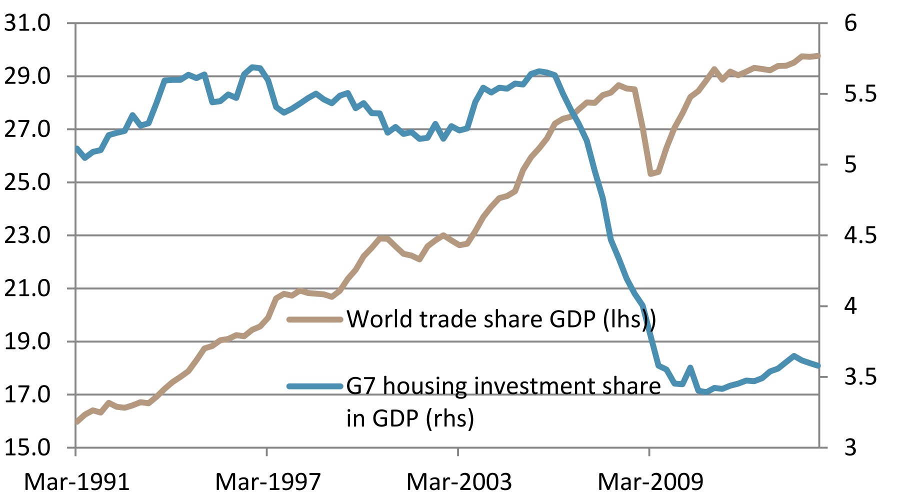
Figure 16: Imports of vehicles as proportion of total sales



Source: Haver

A greater proportion of US vehicle sales since the crisis is being supplied domestically

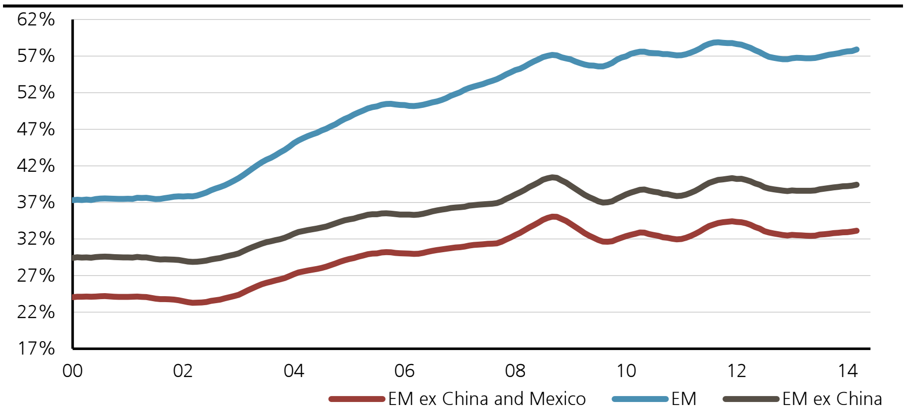
Figure 17: World trade and G7 housing investment share of GDP



Source: OEF

The fragility of housing investment may also have been an issue with structural demographic restraints likely to pose even bigger challenges in the period ahead

Figure 18: EM's* market share in US, Euro area and Japan's imports

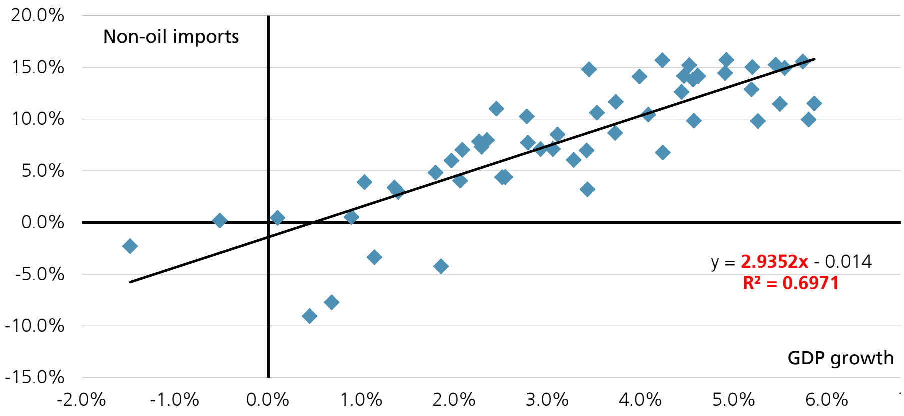


Source: IMF DOTS, Haver, UBS estimates. EM here refers to the main 30 EM countries.

One reason that declining trade intensity of global output didn't seem to hurt EM before the crisis was that EM was still gaining market share in DM imports. Since 2011 this trend has stagnated.

United States

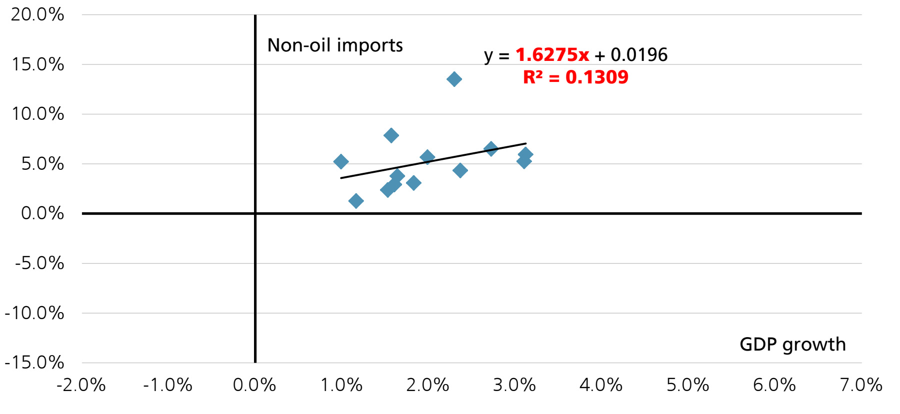
Figure 19: US non-oil imports to domestic demand pre-crisis (Q1-95 to Q3-08)



Source: Haver, UBS

The US shale revolution has reduced the nation's energy import bill. But even in US non-oil imports…

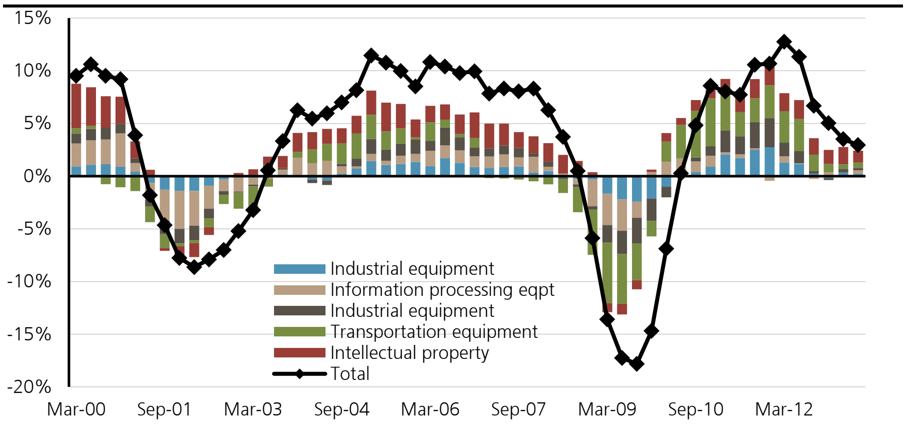
Figure 20: US non-oil imports to domestic demand over the last 3 years (Q1-11 to Q1-14)



Source: Haver, UBS

…there has been a loosening of the relationship with domestic demand relative to the pre-crisis years

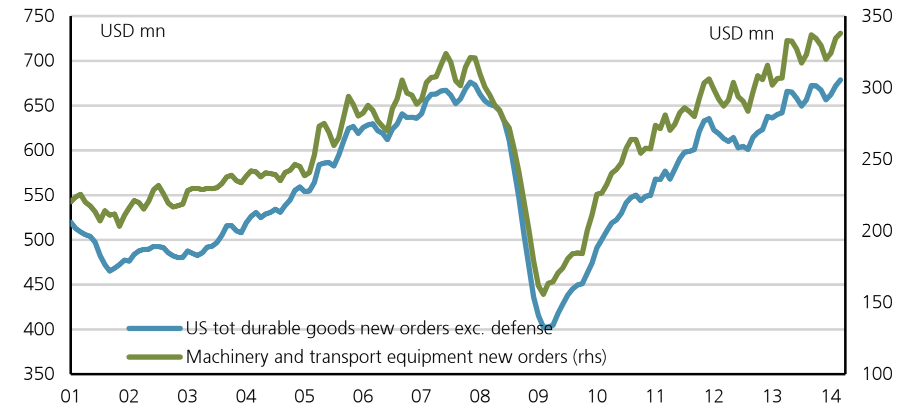
Figure 21: The US is investing again, but in which sectors?: Breakdown of US non-residential fixed capital formation growth, % y/y



Source: Haver, UBS

Today sectoral growth within US gross fixed capital formation isn't EM friendly. Software investment is doing better than computers and information processing equipment. This can change though.

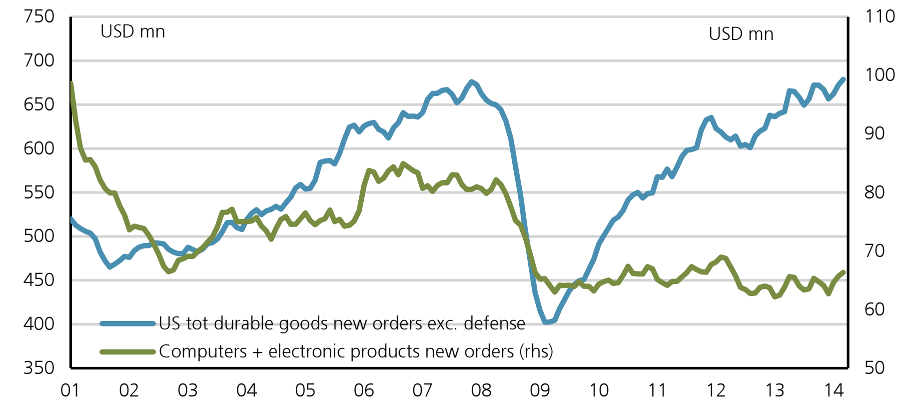
Figure 22: Which are the 'in demand' sectors? US durable goods orders – total vs. machinery/transport subcomponent



Source: Haver, UBS

Machinery and transport equipment has propelled the capex recovery. DM markets such as Germany and Switzerland excel in catering to these demands

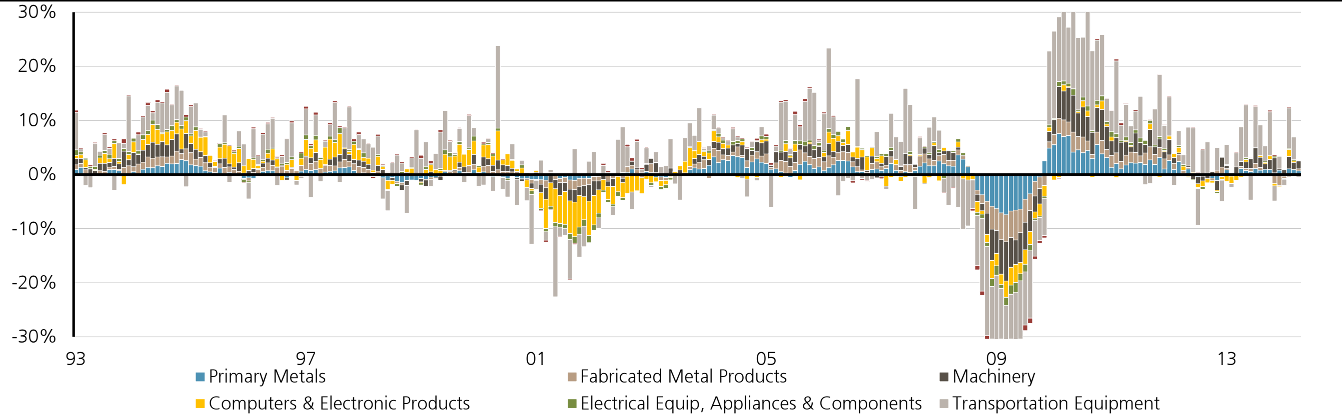
Figure 23: Which are 'not in demand' sectors? US durable goods orders – total vs. computing and electronics subcomponent. This is partly due to terms of trade shifting against computers and electronics products.



Source: Haver, UBS

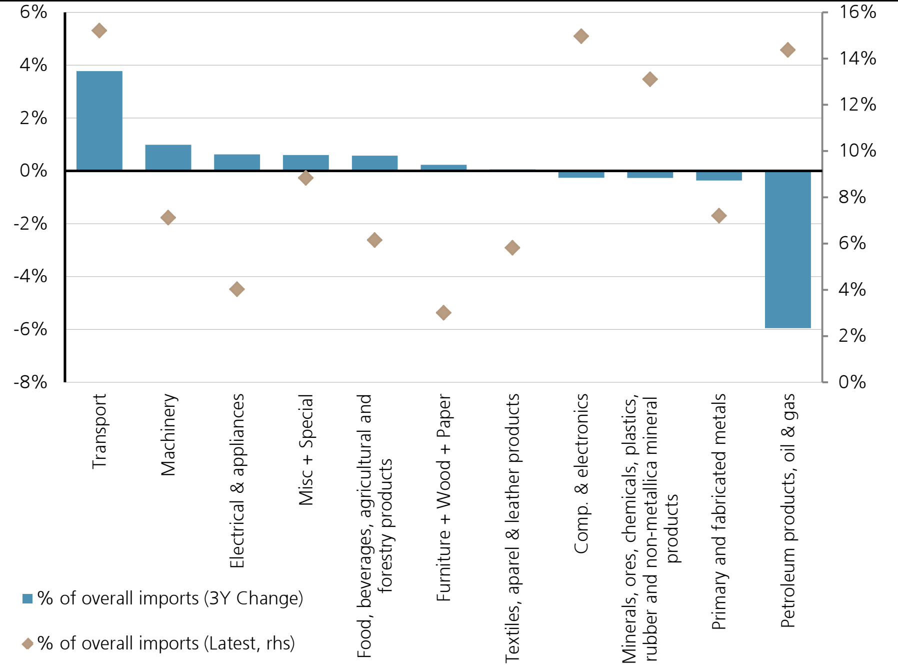
By contrast electronics and computing equipment – sectors that EM exports in size – have considerably lagged. This lag is visible in value measures more than volume measures.

Figure 24: Contribution to US durable goods orders, % y/y. In terms of relative contribution to growth, the 1990s was about computers and electronics products, the 2000s was about metals ; today it's about machinery and transport



Source: Haver, UBS

Figure 25: How are US imports changing? 3y change in the weight of individual categories in overall US imports

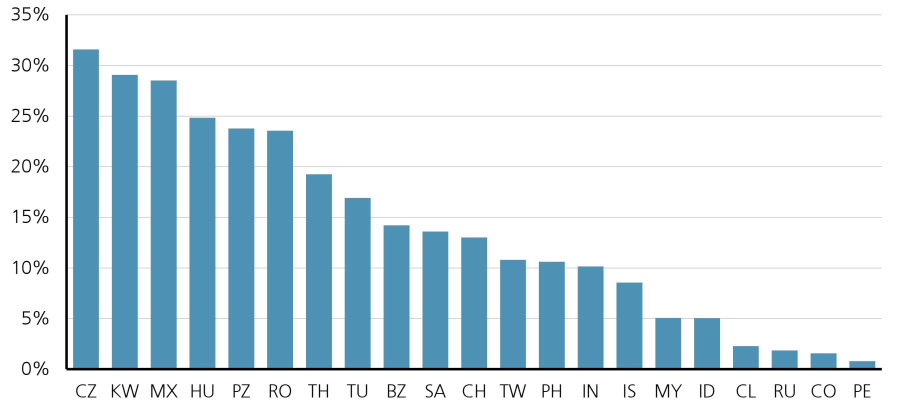


Source: Haver, UBS

Big gainers: Transport, machinery (EM doesn't specialise in these)

Losers: Oil, metals & minerals, computers and electronics products (largely EM products)

Figure 26: Heavy machinery and transport equipment as a % of total goods exports (2012)

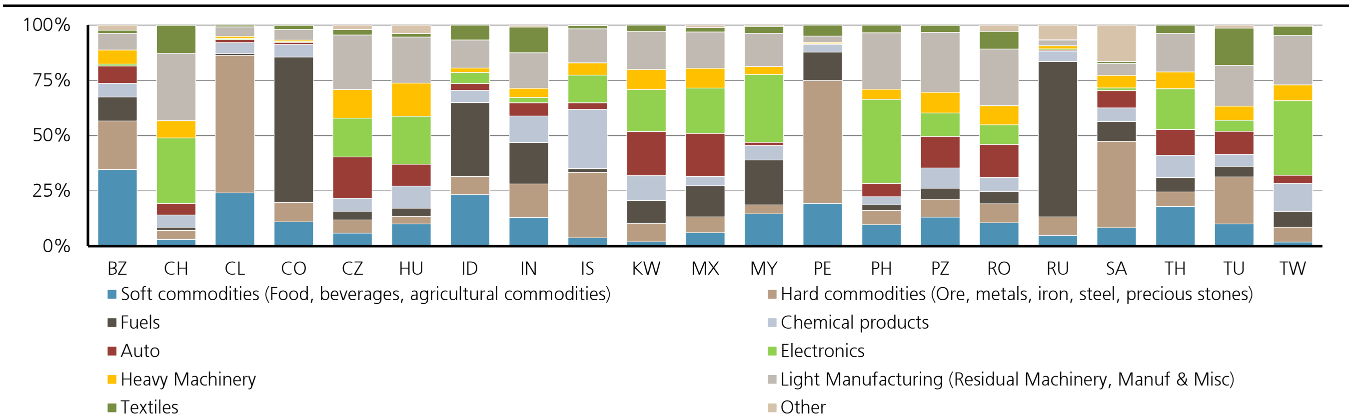


Source: UNCTAD, UBS. Note: reclassified from SITC methodology

Differentiation is key. Machinery and transport equipment account for a very low share of total exports in Russia, Indonesia, the Andeans. Korea, Mexico, and CEE are gainers, by contrast.

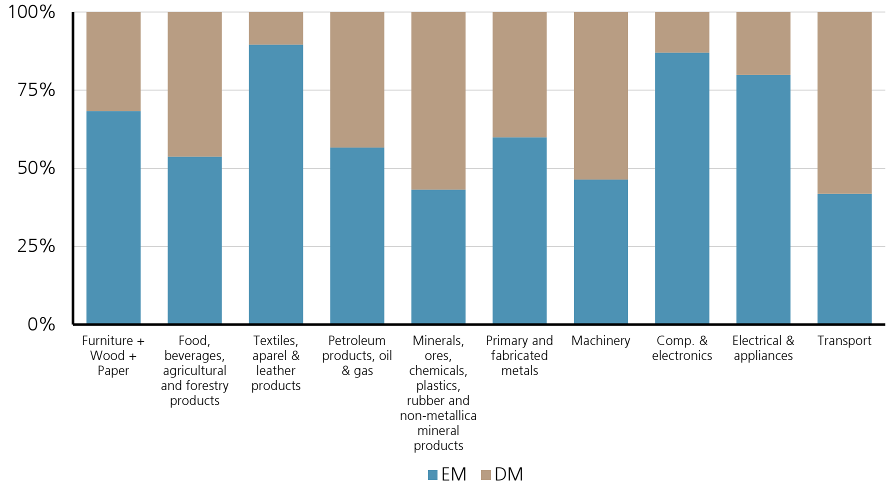
Overall transport and heavy machinery (red and yellow in the chart below) are not a big part of EM exports

Figure 27: EM export decomposition by product (2012)



Source: UNCTAD, UBS. Note: reclassified from SITC methodology

Figure 28: US goods imports by product and origin, % of total, latest 12m

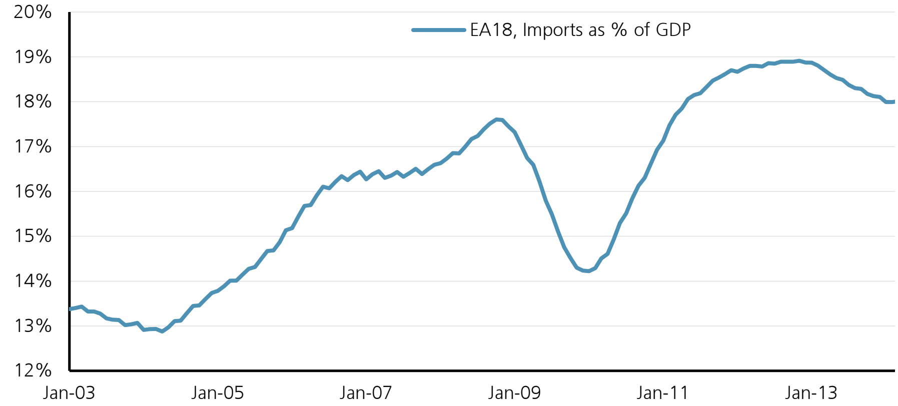


Source: Haver, UBS. Note: categories are based on NAICS classifications. We define DM here as EA18, Japan, Australia, NZ, Sweden, Norway, Denmark and Canada, while EM is constituted of 36 economies. We have this data available country by country.

The US sources the bulk of its machinery and transport imports from the developed world, rather than EM. EM is more dominant in sectors such as computing and electronics, petroleum, and textiles

Euro Zone

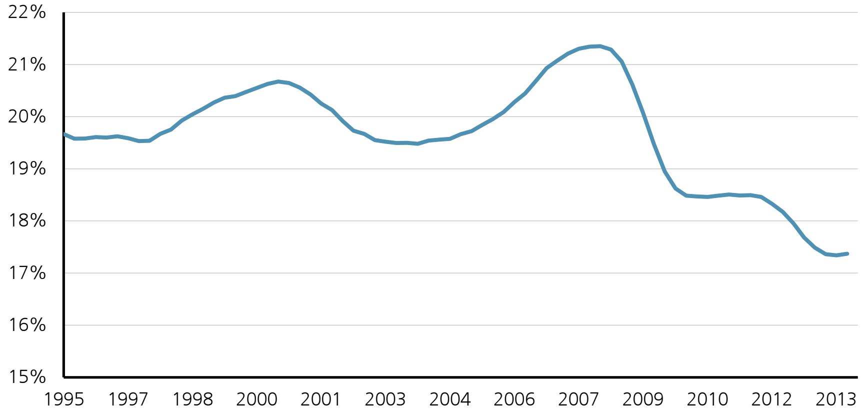
Figure 29: Euro area goods imports (from non-Euro area countries) as % of GDP



Source: Haver, UBS

There has been a flattening out in the Euro area's import propensity since the global financial crisis

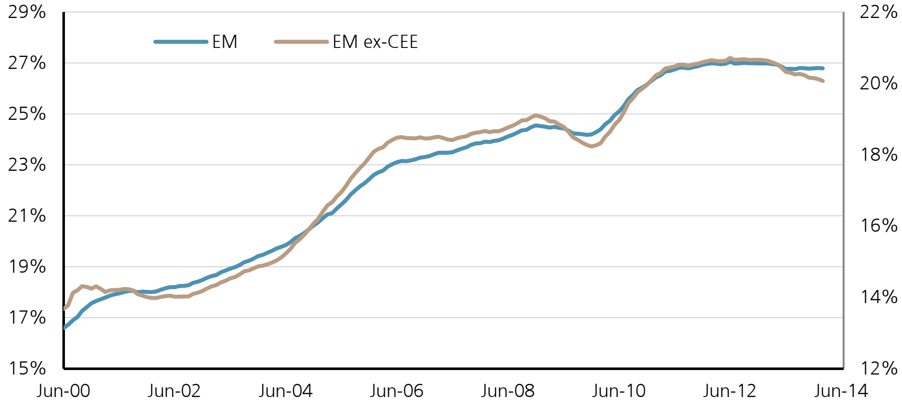
Figure 30: Eurozone gross fixed capital formation (%/GDP)



Source: Haver, UBS

To be fair, because there hasn't been a big recovery in Europe, it is difficult to make the point of a structural break in imports to GDP in this region. We assume for now that the import slowdown is cyclical, driven by the very weak fixed investment. It is a different matter that fixed investment may itself take a while to recover.

Figure 31: EM* share in EU imports



Source: Haver, UBS. EM includes CH. HK, IN, ID, KR, MA, PH, SG, TH, BG, CR, CZ, HU, IS, KZ, LT, LV, PD, RO, RU, SA, TU, AR, BZ, CL, CO, MX, PE

Similar to the US, EM's share in European imports appears to have peaked around 2011. This is particularly true outside of the CEE. CEE can benefit as European companies move to shorten supply chains.

China

Figure 32: World exports to China

Source: IMF

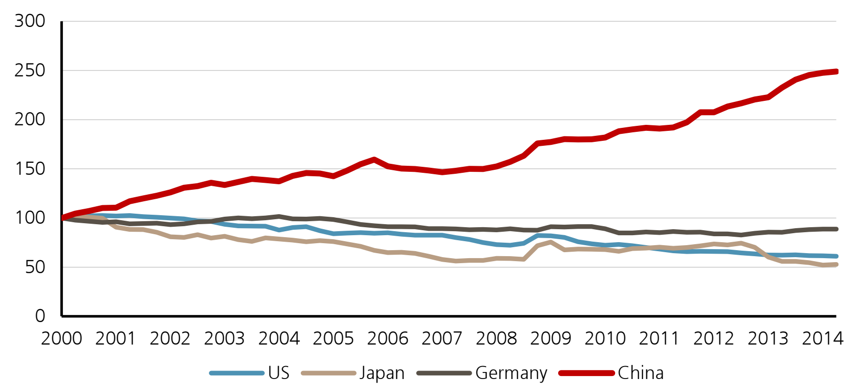
China's modest shift away from an investment and trade-led growth model has also reduced global export growth and will continue to do so

Figure 33: China nominal import to GDP ratio

Source: Haver, OEF, UBS.

This can be seen in the recent decline in China's import to GDP ratios

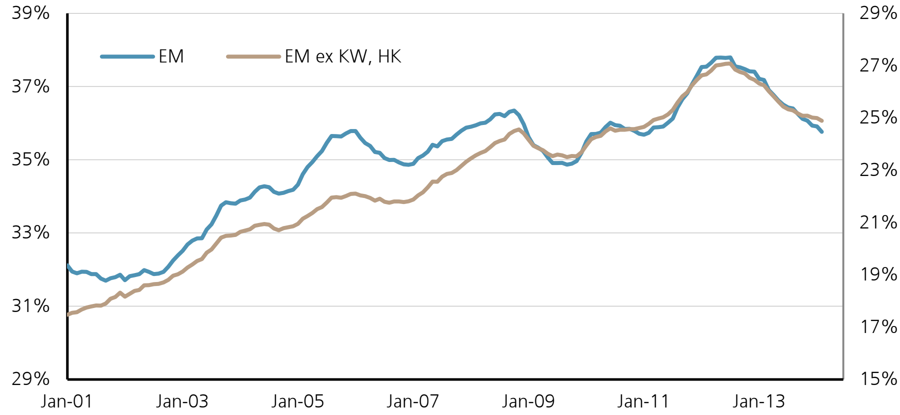
Figure 34: Relative unit labour costs



Source: OEF

There has been little let up in the relative cost inflation in China this has incentivized a trend toward on-shoring in the US (and elsewhere)

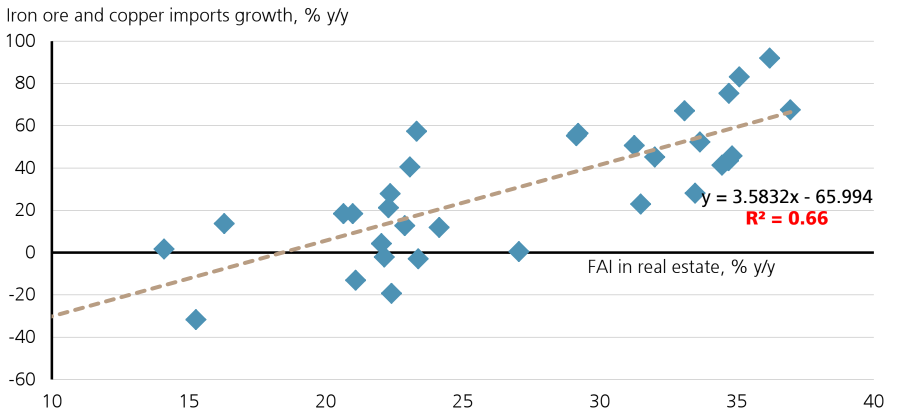
Figure 35: EM's share of Chinese imports



Source: Haver, UBS. *HK, IN, ID, KR, MA, PH, SG, TH, BG, CR, CZ, HU, IS, KZ, LT, LV, PD, RO, RU, SA, TU, AR, BZ, CL, CO, MX, PE

EM's share of Chinese imports has been easing modestly in recent years.

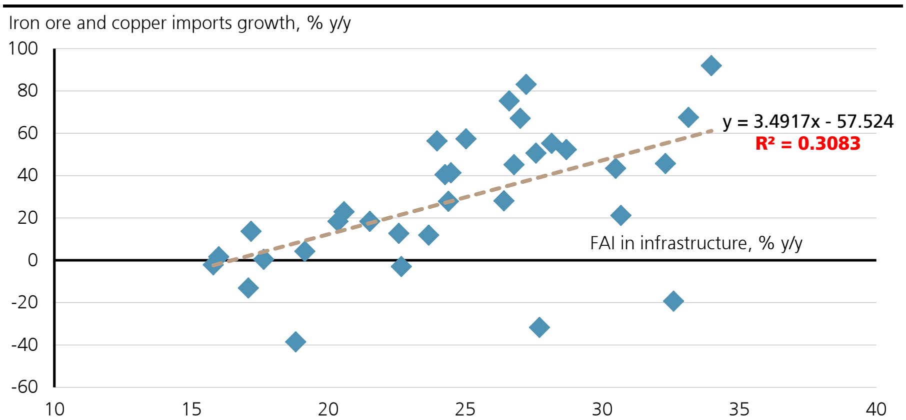
Figure 36: Regression of Chinese iron ore and copper imports vs. fixed asset investment in real estate, % y/y



Source: Haver, UBS.

Real estate investment in China may decline in the future. China's commodity imports are statistically more correlated with its investment in real estate…

Figure 37: Regression of Chinese iron ore and copper imports vs. fixed asset investment in infrastructure, % y/y

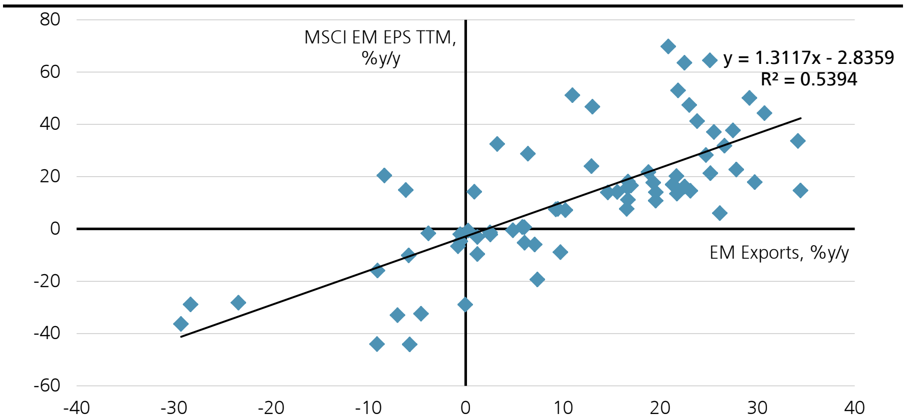


Source: Haver, UBS. Note: Infrastructure investment defined as investment in transport, storage and posts investment and water conservancy, environment and public utilities management

…than its investment in infrastructure. The latter is likely to become an increasingly important driver of FAI in the future.

So what? : Asset implications

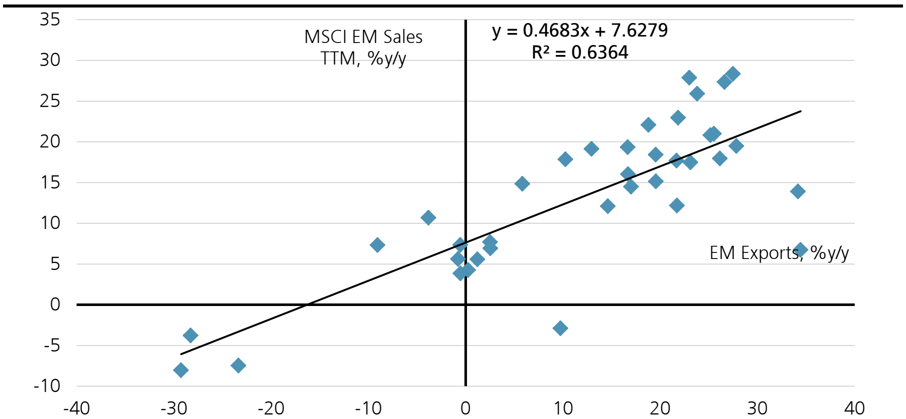
Figure 38: MSCI EM earnings growth and EM* exports growth



Source: Datastream, Haver, UBS. *Simple average of 12 EMs. Data analysed is Q3 1996 - Q1 2014

EM exports exhibit a clear relationship with EM EPS

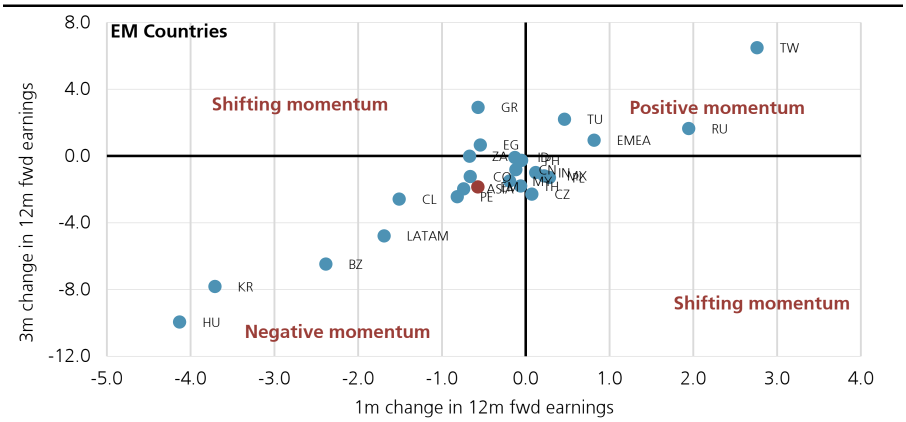
Figure 39: MSCI EM revenue and EM* exports growth



Source: Datastream, Haver, UBS. *Simple average of 12 EMs. Data analysed is Q1 2005 - Q1 2014

Exports' relationship with the top line is even stronger.

Figure 40: Forward EPS change over last 1m and 3m

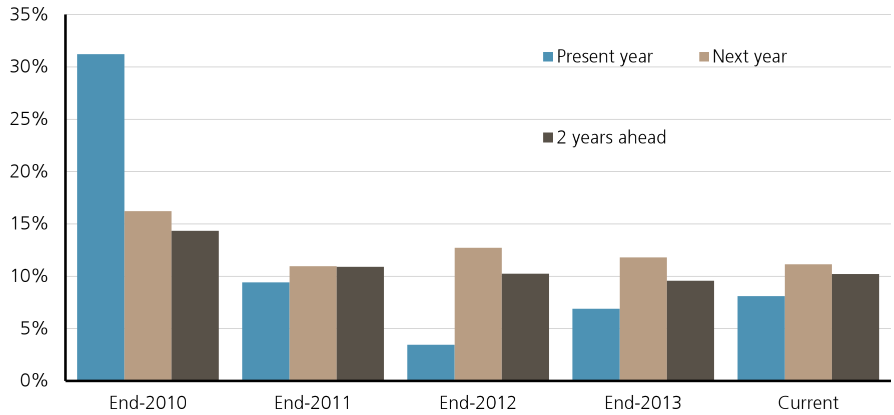


Source: Datastream, Haver, UBS

Are EPS expectations implying too optimistic an outcome on trade?

To be fair, expectations are being toned down across EM (watch the 3rd quadrant).

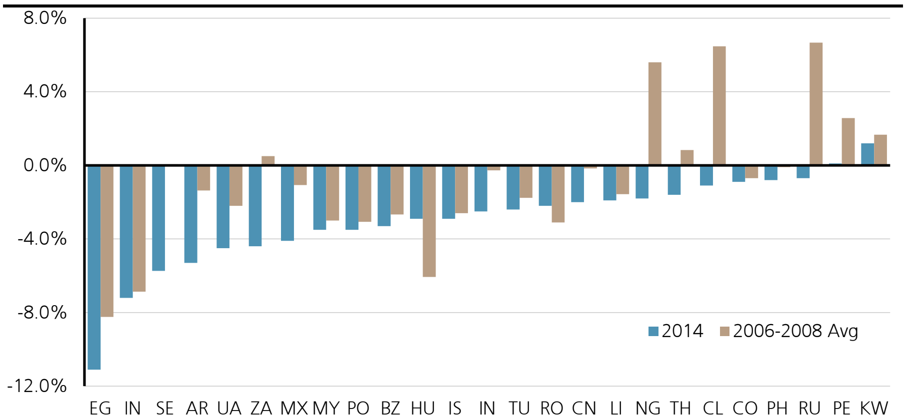
Figure 41: MSCI EM EPS growth: 12m, 24m and 36m fwd estimates



Source: Datastream, UBS

EM earnings expectations have been trimmed and now look more realistic. However it will be hard to surpass these expectations with a muted export performance. The onus now falls on domestic cost control and competitiveness.

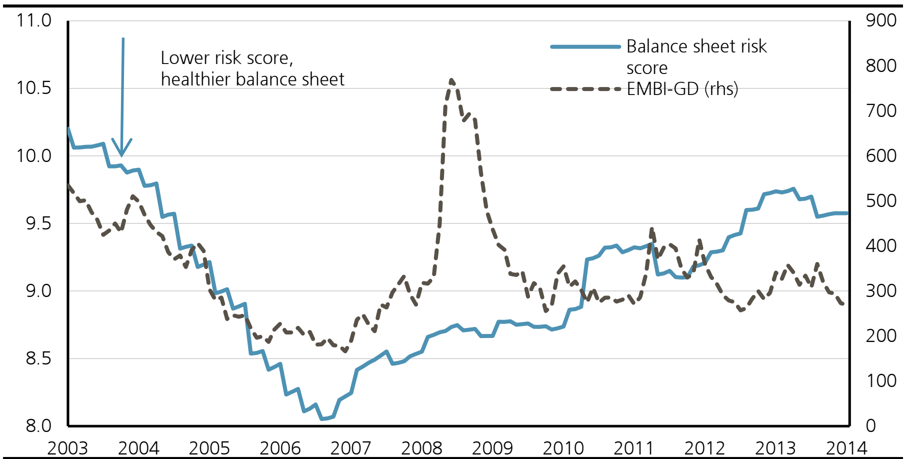
Figure 42: EM fiscal balances (%/GDP), 2014 vs. 2006-8 avg



Source: IMF Fiscal Monitor

Fiscal policy is likely to have to shoulder the burden of weak external demand and high domestic leverage. Fiscal balances have already worsened compared to pre-crisis levels, but they were admittedly very strong then.

Figure 43: EM spreads vs EM macro balance sheet scores[3]

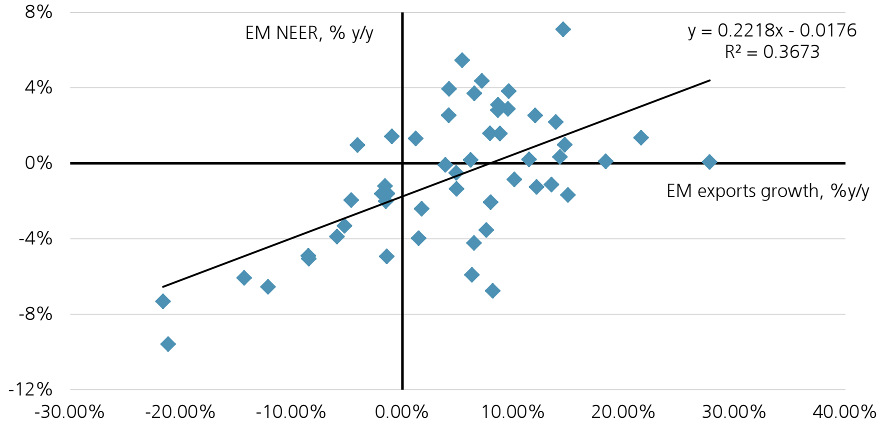


Source: Bloomberg, Datastream, Haver, UBS

Fundamentals have already stopped contributing to tighter credit spreads for a while. Fiscal loosening would add further pressure on EM balance sheet health & spreads

[3] Click **here** for report detailing methodology

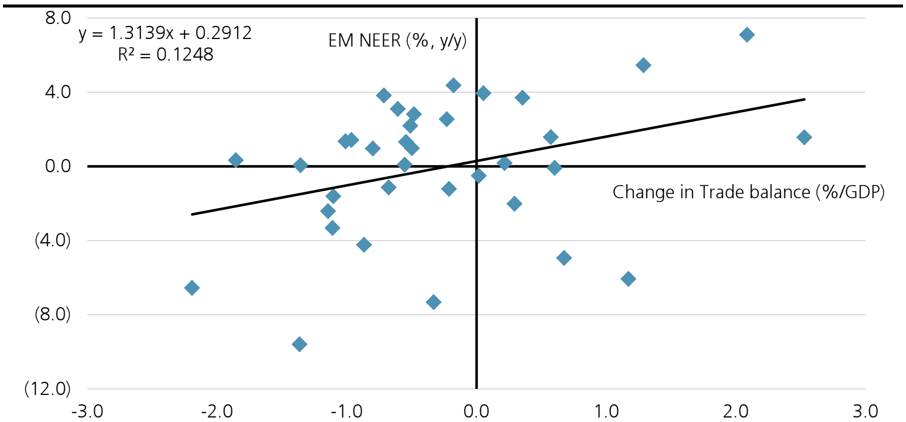
Figure 44: Growth in EM Nominal effective exchange rates (NEER)* and exports



Source: CPB World Trade Monitor Haver, UBS. *Simple average of 23 GEM economies. Data analysed is Q3 1996 - Q1 2014

EM currencies are typically well correlated with export growth.

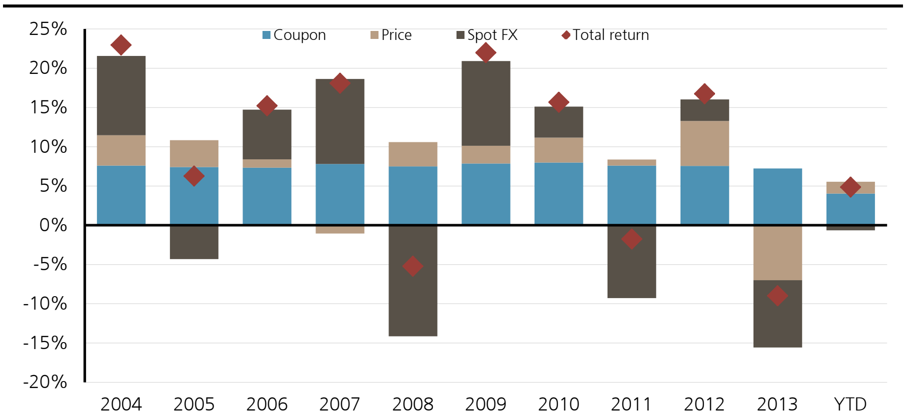
Figure 45: EM NEER* relationship with EM trade balances*



Source: CPB World Trade Monitor Haver, UBS. *Simple average of 23 GEM economies. Data analysed is Q1 2004 - Q1 2014

Changes in trade balances do not have a statistically strong relationship with NEERs over time. Exports are likely to matter more for EM FX over the long haul than an import compression led trade adjustment

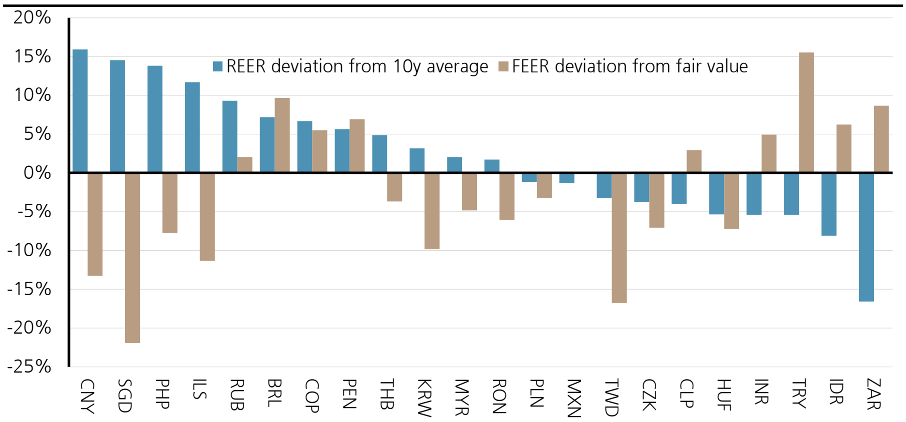
Figure 46: Breakdown of GBI-EM Global Diversified annual returns



Source: Datastream

Currency movement has been a key swing factor in the performance of EM local debt in recent years.

Figure 47: UBS fundamental equilibrium exchange rate (FEER) model



Source: Haver, UBS estimates. Note: in the chart above, deviations above zero signify the real effective exchange rate is trading above its long term average/fair value equilibrium, and is thus expensive
Click here for report detailing FEER methodology

FX fair value models often assume a constant elasticity of trade to price and income, an assumption that is increasingly invalid in the current environment. We prefer FEER based valuation models

Required Disclosures

This report has been prepared by UBS Limited, an affiliate of UBS AG. UBS AG, its subsidiaries, branches and affiliates are referred to herein as UBS.

For information on the ways in which UBS manages conflicts and maintains independence of its research product; historical performance information; and certain additional disclosures concerning UBS research recommendations, please visit www.ubs.com/disclosures. The figures contained in performance charts refer to the past; past performance is not a reliable indicator of future results. Additional information will be made available upon request. UBS Securities Co. Limited is licensed to conduct securities investment consultancy businesses by the China Securities Regulatory Commission.

Analyst Certification: Each research analyst primarily responsible for the content of this research report, in whole or in part, certifies that with respect to each security or issuer that the analyst covered in this report: (1) all of the views expressed accurately reflect his or her personal views about those securities or issuers and were prepared in an independent manner, including with respect to UBS, and (2) no part of his or her compensation was, is, or will be, directly or indirectly, related to the specific recommendations or views expressed by that research analyst in the research report.

Global Disclaimer

This document has been prepared by UBS Limited, an affiliate of UBS AG. UBS AG, its subsidiaries, branches and affiliates are referred to herein as UBS.

This document is for distribution only as may be permitted by law. It is not directed to, or intended for distribution to or use by, any person or entity who is a citizen or resident of or located in any locality, state, country or other jurisdiction where such distribution, publication, availability or use would be contrary to law or regulation or would subject UBS to any registration or licensing requirement within such jurisdiction. It is published solely for information purposes; it is not an advertisement nor is it a solicitation or an offer to buy or sell any financial instruments or to participate in any particular trading strategy. No representation or warranty, either express or implied, is provided in relation to the accuracy, completeness or reliability of the information contained in this document ('the Information'), except with respect to Information concerning UBS. The Information is not intended to be a complete statement or summary of the securities, markets or developments referred to in the document. UBS does not undertake to update or keep current the Information. Any opinions expressed in this document may change without notice and may differ or be contrary to opinions expressed by other business areas or groups of UBS. Any statements contained in this report attributed to a third party represent UBS's interpretation of the data, information and/or opinions provided by that third party either publicly or through a subscription service, and such use and interpretation have not been reviewed by the third party.

Nothing in this document constitutes a representation that any investment strategy or recommendation is suitable or appropriate to an investor's individual circumstances or otherwise constitutes a personal recommendation. Investments involve risks, and investors should exercise prudence and their own judgement in making their investment decisions. The financial instruments described in the document may not be eligible for sale in all jurisdictions or to certain categories of investors. Options, derivative products and futures are not suitable for all investors, and trading in these instruments is considered risky. Mortgage and asset-backed securities may involve a high degree of risk and may be highly volatile in response to fluctuations in interest rates or other market conditions. Foreign currency rates of exchange may adversely affect the value, price or income of any security or related instrument referred to in the document. For investment advice, trade execution or other enquiries, clients should contact their local sales representative.

The value of any investment or income may go down as well as up, and investors may not get back the full amount invested. Past performance is not necessarily a guide to future performance. Neither UBS nor any of its directors, employees or agents accepts any liability for any loss (including investment loss) or damage arising out of the use of all or any of the Information.

Any prices stated in this document are for information purposes only and do not represent valuations for individual securities or other financial instruments. There is no representation that any transaction can or could have been effected at those prices, and any prices do not necessarily reflect UBS's internal books and records or theoretical model-based valuations and may be based on certain assumptions. Different assumptions by UBS or any other source may yield substantially different results.

Research will initiate, update and cease coverage solely at the discretion of UBS Investment Bank Research Management. The analysis contained in this document is based on numerous assumptions. Different assumptions could result in materially different results. The analyst(s) responsible for the preparation of this document may interact with trading desk personnel, sales personnel and other parties for the purpose of gathering, applying and interpreting market information. UBS relies on information barriers to control the flow of information contained in one or more areas within UBS into other areas, units, groups or affiliates of UBS. The compensation of the analyst who prepared this document is determined exclusively by research management and senior management (not including investment banking). Analyst compensation is not based on investment banking revenues; however, compensation may relate to the revenues of UBS Investment Bank as a whole, of which investment banking, sales and trading are a part.

For financial instruments admitted to trading on an EU regulated market: UBS AG, its affiliates or subsidiaries (excluding UBS Securities LLC) acts as a market maker or liquidity provider (in accordance with the interpretation of these terms in the UK) in the financial instruments of the issuer save that where the activity of liquidity provider is carried out in accordance with the definition given to it by the laws and regulations of any other EU jurisdictions, such information is separately disclosed in this document. For financial instruments admitted to trading on a non-EU regulated market: UBS may act as a market maker save that where this activity is carried out in the US in accordance with the definition given to it by the relevant laws and regulations, such activity will be specifically disclosed in this document. UBS may have issued a warrant the value of which is based on one or more of the financial instruments referred to in the document. UBS and its affiliates and employees may have long or short positions, trade as principal and buy and sell in instruments or derivatives identified herein; such transactions or positions may be inconsistent with the opinions expressed in this document.

UBS