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INSTABILITY BEFORE THE 2008 FINANCIAL CRISIS

John Whalley  
Manmohan Agarwal  
Jing Wang  
Sean Walsh  
Chen Yan

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Linking External Sector Imbalances and Changing Financial Instability before the 2008  
Financial Crisis

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**ABSTRACT**

The G20 Framework for Strong, Sustainable and Balanced Growth builds on the claim that growing imbalances before the 2008 Financial Crisis were a major cause of the crisis, and the further claim that reducing imbalances post crisis must be a central part of any effort to prevent a further occurrence. Analytical literature in economics seemingly does not provide satisfactory measures of financial instability, either in individual national economies or in the combined global economy; nor ways of linking imbalance change to either worsening or improving financial (or real) instability and the onset of financial crises.

Here we focus on the external sector component of financial instability and link changes in country imbalances to individual economy growth rates in ways when summed across countries produce indices of expected worsening or improving financial instability at different points in time. We compute a variety of such indices for the years immediately before the 2008 Financial Crisis. We use the sum of the absolute value of external sector imbalances across countries (the trade imbalance, or the current account imbalance) as a proportion of the combined GDP of countries and link them in various ways to country growth rates. An increasing measure under an index is an indication of future widening excess demands and supplies over all countries as a group relative to gross world product. This, in turn, is an indication of increasing severity of adjustment problems ahead, and hence expected worsening financial instability. We compute such indices for all G20 countries, and various subsets of countries (G2, G8, G8+5) and examine their behavior over the period 2004-2007.

Our results suggest that depending upon the index used and the base date chosen for comparative purposes in determining changes, different implications emerge for the linkage between external sector imbalances, perceived future instability and hence the onset of a financial crisis. The implication we draw is that the links between imbalances and both the onset and best policy response to the 2008 Financial Crisis asserted by the G20 may be more tenuous than claimed. Indeed no such links were suggested earlier for the 1930s, the Asian Financial Crisis or any other crisis. In turn economies have functioned with larger imbalances relative to GDP than in 2008 for considerable periods of time and with no financial implosion (UK in the pre World War I period; Germany and Australia in the 1990s).

John Whalley  
Department of Economics  
University of Western Ontario  
London, Ontario  
Canada N6A 5C2  
and NBER  
jwhalley@uwo.ca

Manmohan Agarwal  
Center for International Governance  
Innovation (CIGI)  
57 Erb St. West  
Waterloo, Ontario  
Canada N2L 6C2  
magarwal@cigionline.org

Jing Wang  
Institute of Quantitative & Technical  
Economics  
Chinese Academy of Social Sciences  
(CASS).  
Beijing  
China 100732  
wj@cass.org.cn

Sean Walsh  
Centre for International Governance  
Innovation  
57 Erb Street West  
Waterloo, Ontario  
Canada N2L 6C2  
swalsh@cigionline.org

Chen Yan  
School of Economics  
Xiamen University  
Fujian Province  
China 361005  
chenyan@xmu.edu.cn

## 1. Introduction

The 2008 Financial Crisis saw large stock price, exchange rate, commodity price, and housing price oscillations and these prompted a global policy response through the G20 with the creation of a new Financial Stability Board (FSB), and the negotiation of a Framework for Strong, Sustainable, and Balanced Growth (FSSBG) to provide for a sustainable recovery. But central to these two initiatives are the twin presumptions that in some sense growing global imbalances were a key factor in precipitating the crisis, and that reduction in imbalances is the key to any future globally coordinated policy initiative to reestablish sustainable global growth. This stands in contrast to analytical literature in economics which provides no satisfactory measures either of the degree of either real or financial instability, either individual national economies or in the combined global economy<sup>1</sup>, nor whether financial instability is worsening or improving over time. Here we focus on the external sector components of global imbalances, link these to expected worsening instability, and through this linkage assess their potential contribution to the onset of the 2008 crisis.

Theoretical literature (such as Arrow and Hurwicz, 1958) of following Walras and his tâtonnement price adjustment scheme has characterized both stable and unstable adjustment processes, but remains silent on both the characterization and measurement of the degree of instability; either financial or real. The post-crisis literature which attempts to fill this gap like Dattels et al (2010) which provides detailed discussion on the Global Financial Stability Map developed by the IMF in Global Financial Stability Report (2007), and adopts an ad hoc approach of compiling composite indices of economic performance over time covering broad aggregates such as GDP change, inflation rates, employment change and other aggregates, with the claim that this provides proxies for measures of financial instability.

We focus here only on the external sector component of imbalances and produce measures of expected worsening or improving external sector instability both for

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<sup>1</sup> But see the discussion by Irving Fisher of corridor of stability in Fisher (1933). This concept is also discussed in Tobin (1975) and Dimand (2005).

individual economies and the global economy based on the sum of the absolute value of external sector imbalances (the trade imbalance, or the current account imbalance) across subsets of or all countries as a proportion of the combined GDP of countries. We develop two broad types of indices based on different ways of linking imbalances to growth rates. For each kind of index we also develop a number of variants which differ in whether we use the trade balance or the current account balance as the basis for the index; whether we use deviations for a country in its growth performance relative to a group or relative to its own historical experience; and whether we use simple averages to form group averages or weight the individual country index values by their GDP to form a group average.

We examine the behavior of such measures for all G20 countries, and various subsets (G2, G8, G12 and G8+5) after the 1980s, and especially over the period 2004-2007 before the 2008 financial crisis. We also examine the behavior of indices after the crisis. An increasing measure under such indices is an indication of widening future external sector excess demands over all countries as a group relative to gross world product; it is also taken as an indication of potentially increasing severity of adjustment problems ahead and hence an elevated probability of onset of financial crisis.

Our results reveal no clear pattern linking the perceiving changing severity of future imbalances captured in such indices through differential country growth performance to the onset of the 2008 financial crisis, either for individual economies or the global economy. We find significant differences in results from using deviations in country growth rates from group averages or from an individual country's own historical growth path in linking imbalances to growth when generating indicators of expected changing instability. Results also vary according to which measure of excess demand is used. In addition, the choices of the base date as a reference point for assessing whether financial instability is worsening or weakening also makes a substantial difference. Results do not differ that much if trade imbalances or current account imbalances is used, nor whether we weight individual country indices or use simple arithmetic averages.

The implication we draw from our calculations is that links between external sector instability and the onset of the 2008 Financial Crisis may be more tenuous than the G20 has seemingly asserted in developing their policy responses to the crisis. Indeed, no such claims

of linkage of this form emerged either in the 1930's in response to the Great Depression or following the Asian Financial Crisis in the 1990s. And economies such as Germany and Australia in the 1990s operated with external sector imbalances of 2.6% and 3.2% of GDP respectively and the UK pre World War I operated with a surplus around 8% of GDP, which is in excess of what was observed globally in 2008, and seemingly with no financial instability repercussions. These cautions regarding the G20 assertions of linkage seem borne out by our calculations.

Our argument is against with many recent literatures. For instance, Bini Smaghi assessed in 2008 that external imbalances are often a reflection, and even a prediction, of internal imbalances, Obstfeld and Rogoff (2009) argues that global imbalances and the financial crisis were "intimately connected" by discussing the macroeconomic indicators of the US and country groups such as current account balance, prices, international reserves, and etc.

There are assessments in other literatures seem exactly right to us, though none of them reach this position by employing index approach. For instance, Whelan (2010) examines the US current account deficit by distinguishing gross and net external assets of the US and also argues that the net flows associated with current account deficits played a minor role in determining the 2008 financial crisis and reducing global imbalances should be of secondary importance in preventing the crises.

## 2. Indices of Worsening or Improving External Sector Financial Instability

A substantial recent literature now discusses linkage between global imbalances and instability, but none provides explicit measures for assessing either the degree of or changes in sign of linkage, nor provides clear measures of instability. Nelson and Perli (2005) discuss a number of financial indicators that the Federal Reserve Board's staff uses as aids in the interpretation of the condition of a financial system. Berger et al. (2009) assess "competition-fragility" and "competition-stability" by regressing measures of loan risk, bank risk, and bank equity capital on measures of market power. Adrian and Shin (2010) describe the changing nature of financial intermediation in the market-based financial system. Brown et al. (2010) use a data set that allows high-frequency monitoring of household liabilities, and find that the level of household debt, after a sustained period of increase, began to decline in 2008.

There is also a literature that discusses the potential impacts of the financial crisis on trade. Amiti and Weinstein (2009) examine whether deterioration in bank health can help explain the large drops in exports relative to output in the 2008 crisis. Eaton et al. (2010) use detailed international trade data and a general-equilibrium trade model to show that a shift in spending away from manufactures, particularly durables, may have accounted for more than 80 percent of the drop in trade/GDP.

Here we differ from this literature by using measures of external sector imbalances both for individual economies and groups of economies which we link to country or group growth rates to yield indices of expected impacts on global (or country sub group) financial instability. We focus initially on trade imbalances (exports - imports) and then also discuss current account balances. We do not discuss other imbalances, such as differences in national saving rates, deficits as a % of GDP or debt/GDP ratios across countries.

For a country experiencing imbalanced international trade, either presenting surplus or deficit, we first assume that the ratio of the absolute value of its trade balance to its GDP indicates the state of its external position. We define  $R_i^T$  for country  $i$ ,

$$R_i^T = \frac{|Trade\ Balance_i|}{GDP_i} \quad (i = 1, \dots, N) \quad (i)$$

We then combine the individual country  $R_i^T$  across countries to form a group indicator, eg. for the G20, or for some other group of countries such as G8. We calculate the ratio  $R_w^T$  for the global economy (or a sub group of countries) as the summed absolute value of trade imbalances of all group members and its GDP as summed GDP of all members. The ratio for the G2 (China and the United States) in a given year is, for instance, the sum of absolute values of trade imbalances of China and the US divided by the sum of China and the US GDP in the corresponding year. The ratio for the G20 for a period is the summed absolute values of G20's trade balances in this period divided by sum of G20's GDP in the same period.

Similarly, the current account imbalance for any country can be related to GDP as:

$$R_i^C = \frac{|Current\ Account\ Balance_i|}{GDP_i} \quad (i = 1, \dots, N) \quad (ii)$$

A number of measurement issues arise with trade and current account imbalance data. Importantly, we use data on trade imbalances and current account imbalances from national Balance of Payment (BOP) sources without reconciling statistical differences in global trade data. Thus, present available data on international trade, both in goods and service, show significant deviation between reporters and partner's statistics (so called mirror trade statistics). The deviations in data on bilateral trade in goods are especially significant between both developed country pairs and developed and developing country pairs, and paired trade statistics between China and US show large differences both on the export and import sides.

Also, because of the differing forms that international agreements on trade in goods and trade in services take in the GATT (1994) and the GATS there is an incompatibility between measures of world trade in goods and services. Measures of goods trade reflecting GATT (1994) are restricted to trade that crosses borders. However, service trade under GATS mode 3 (commercial presence) includes both cross border delivery and foreign affiliate sales within borders. Li and Whalley (2010) argue that foreign affiliate sales (FAS) should either be



partially included in goods trade to achieve consistency across the separate sets of goods and services trade data or alternatively removed from services trade data. Kregel (2008) also argues that international imbalances recorded using traditional balance of payments accounting presumes national vertically integrated production of exports. However, this may not be the most appropriate method to measure imbalances when multinational corporations operate global production chains that are geographically distributed across a number of national boundaries and financed by global financial institutions.

We then relate the  $R_i^T$  and  $R_i^C$  to country's GDP growth rates and develop indices of expected worsening or improving external sector instability at a point in time by linking imbalances to growth rates both for individual countries or groups of countries. Two sets of indices are developed based on different views of what may or may not affect the external sector imbalance for an economy in the future. Our first simple approach taken imbalances as fixed in relative to GDP, so that only differentials in growth rates will change imbalances in the future. Our second approach incorporates an assumed endogenous adjustment process for external imbalances given exogenous expected country growth rates.

We develop our simple index approach by assuming that the imbalances ratios ( $R_i^T$  or  $R_i^C$ ) are fixed, i.e., an economy's external position relative to GDP is given. Thus for an economy having a large imbalance ratio and high GDP growth rate, its trade or current account balances would increase relative to the global imbalance situation as its growth continues. This would cause the enlargement of external sector balances of its bilateral partners, and it would contribute to worsen the future global imbalances, and hence also worsen for the global external sector financial instability. But for an economy having a large imbalance ratio and a low GDP growth rate, its external sector balance would proportionally fall over time as its relatively low GDP growth continued, and this would improve global external financial instability. Accordingly, an economy with small imbalance ratios would improve global external instability if it experienced a high GDP growth rate and worsen global external instability if it experienced a low GDP growth rate.

Under this approach, for a given country in a given year, we assess country impacts on future global external sector financial stability by assessing whether it has relative larger or smaller trade imbalances than average across countries and relatively faster or slower GDP growth rate. This allows us to construct an index of expected future change in financial instability for individual countries as outlined in Table 1.

**Table 1: Simple Approach to Construction of Country Indices for Worsening or Improving Expected Financial Instability—Type I Index**

For a country in a given Year, its index is:

	Above Average Imbalance Ratio	Below Average Imbalance Ratio
Above Average GDP Growth Rate	+1	-1
Below Average GDP Growth Rate	-1	+1

Note: Group index is summed +1, -1 over members; Index for a period is summed +1, -1 indices over time

Under this simple +1/-1 index approach, the +1 indices represent an imbalance expected to increase proportionally in value and hence increase potential for added global instability, while -1 indices represent countries experiencing decreasing relative imbalances and hence expected to contribute to improving global financial instability.

In assigning +1/-1 indices to G20 countries, we use two alternative ways of calculating average benchmarks for comparison. One is an average indicator (trade imbalances and GDP growth rates) across all G20 members in each year; Another is average country indicators over the period 1980 to 2009. For any country in any given year, we compare country trade imbalance and GDP growth rates with relevant average values in the same year respectively, decide which quadrant of Table 1 this fits into, and assign corresponding +1/-1 indices for the country in the year. This use of average values across G20 members as a benchmark we denote this as “Across Countries”. The other method uses the average value for each country over the period 1980 to 2009, and we denote this as “Through Time”.

We then develop a second index approach by assuming that there is an endogenous adjustment mechanism in economies imbalances given exogenous future expected growth rates both domestically and in other economies. For this we assume that any economy with a higher than average GDP growth rate would import proportionally more than its exports would grow, and any economy with a lower GDP growth rate would import proportionally less. Thus for an economy with a high GDP growth rate and a trade surplus, it would import more to meet its growing domestic demands and reduce its trade surplus over time. For country with a low GDP growth rate and a deficit, its domestic market would demand relatively less imports, and it would achieve more balanced trade over time. Under such assumptions a country is improving global external financial instability by self-adjustment and we assign -1 index for such country for the year.

An economy experiencing high GDP growth and a deficit in trade would import more to support its strong domestic market demand, thus would worsen its trade imbalances more over time. For country with low GDP growth and surplus, its sluggish domestic demand (and low productivity) would cause relatively less imports and worsen its external imbalance further. We assign a +1 index to countries in these situations in a given year. This in turn, indicates that they are likely to worsen future global external instability through a deterioration in their own situation.

**Table 2: Endogenous Approach to Construction of Country Indices for Worsening or Improving instability --- Type II Index**

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For a country in a given year, its index is:

	Surplus	Deficit
Above Average Growth Rate	-1	+1
Below Average Growth Rate	+1	-1

Note: Group index is summed +1, -1 over members; Index for a period is summed +1, -1 indices over time

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For any given country in a given year, we can thus also differentiate its effect on global stability by whether it has a surplus or deficit in its external sector accounts, and

relatively faster or slower GDP growth rate. Table 2 outlines how we have constructed this index for individual countries. Positive indices represent expected future worsening instability and negative indices represent expected improving instability. Again we calculate two set of indices by using alternative benchmarks of average growth rates “Across Countries” and “Through Time”.

Though a country’s various +1/-1 indices can be used to represent changes in a country’s qualitative contribution to global external financial instability and hence the direction of its contribution to global instability, they are not comparable across different countries due to differences in country size. Weighting +1/-1 indices by country GDP relative to G20 total GDP, gives weighted indices which indicate both the direction and the size of combined country contributions to global external financial instability. Either the +1/-1 country indices or weighted indices can be aggregated over time to form aggregated global or sub group indices for periods. The aggregation of indices across group members forms the indices for a group.

We can also compute the +1/-1 index linking country’s current account imbalance to its GDP growth rates using current account imbalances instead of trade imbalances. Following the same procedure, we can compute the +1/-1 indices using either the first or second approach; also using either the “Across Countries” or “Through Time” method; either for individual countries or an aggregation of country groups; and either for a single year or aggregation for time periods.

These procedures thus yield a number of closely related indices of expected worsening or weakening external financial instability each linking imbalances measures to country’s GDP growth performance. We can also develop further indices using piecewise benchmarks for comparison or using trade balance to trade as measure of imbalance. We do not report these in this paper as they merely multiply further the range of potential indices. We argue later that for the indices we use that the pattern of linkage between imbalances and the onset of the 2008 financial crisis is highly varied. Using additional indices would only strengthen this position.

### 3. The Behavior of Country and Group Trade and Current Account Imbalances

We have calculated the imbalance ratios,  $R_i^T$  and  $R_i^C$ , discussed in the section above based on both trade imbalances and on current account imbalances. These have also been aggregated for all G20 members (plus Netherlands), for groups of G2, G8, G8+5, G12<sup>1</sup> (country with over 1 trillion GDP in 2007), for developed countries and for developing countries in the G20. For reference, we have also calculated the imbalance measures for all OECD countries.

Table 3 reports trade imbalance measures both for individual G20 countries and for the country groups listed above between the 1960s and 2000s and also before and after the 2008 Financial Crisis. These data indicate that trade imbalances kept growing between the 1960s and 2000s, and there is an especially large rise in imbalances for all groups after 2000. Also, generally countries and groups have larger imbalances in 2008 - 2009 than before the 2000s. Their trade imbalances measures then fell after the 2008 crisis.

Imbalances for the G20 and for the OECD show the same trends over time and there are no significant differences between them. However, Saudi Arabia, Russia, Indonesia, Turkey, Spain, Netherlands, Germany, the United States all have large trade imbalance of over 5.5% of GDP in 2007. Ratios for about two thirds of the G20 countries show a sharp rise in the early 2000s, with the ratio for Argentina in the 2000s being 4.7 fold higher than in the 1990s. Also, ratios for Germany, the United Kingdom, the United States, Australia, Russia, and Brazil doubled in the 2000s compared to the 1990s. Imbalances fall in 2007 and 2008 after sharp increases in the early 2000s. Trade imbalances decreased in 2009, but all groups were still operating with larger imbalances post crisis at around twice those of the 1980s and 1990s.

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<sup>1</sup> The G12 is a group of 12 countries with over 1 trillion GDP in 2007. It includes United States, Japan, China, Germany, United Kingdom, France, Italy, Spain, Canada, Brazil, Russia and India. Mexico and Australia joined this "1 trillion club" in 2008 and dropped out in 2009.

**Table 3: Trade Imbalance Measures for G20 Countries and Groups between 1960s and 2000s and before and after the 2008 Financial Crisis (Absolute Value of Trade Balance / GDP, %)**

G20 Countries	1960s	1970s	1980s	1990s	2000s	2000-07	2008-09
<b>A. Larger Developed</b>							
Canada	1.1	1.6	2.7	2.8	3.8	4.5	1.7
France	NA	0.4	1.2	1.0	1.4	1.0	2.7
Germany	NA	2.7	4.1	2.6	6.4	6.3	6.5
Italy	NA	1.0	1.0	2.2	0.5	0.6	0.1
Japan	NA	0.8	3.0	2.7	2.0	2.3	0.8
United Kingdom	NA	2.2	2.4	2.1	5.3	5.1	6.2
United States	NA	0.8	2.3	2.4	5.2	5.4	4.7
<b>B. Smaller Developed</b>							
Australia	1.7	1.7	0.7	0.9	1.4	1.9	0.3
Netherlands	0.6	1.2	3.6	4.8	6.5	6.4	6.8
Spain	NA	3.0	4.6	3.9	6.8	7.0	6.2
<b>C. Middle Income</b>							
Korea Rep.	NA	2.7	3.6	2.7	3.4	3.3	3.5
Mexico	NA	0.3	3.7	2.3	1.1	1.0	1.1
Russia	NA	NA	NA	3.2	12.4	13.8	10.0
Saudi Arabia	NA	36.7	20.6	16.4	34.9	33.7	37.9
Turkey	NA	3.4	4.2	5.8	6.1	6.2	5.8
Argentina	NA	1.5	3.3	1.3	5.9	6.1	5.3
Brazil	NA	0.8	3.3	1.4	2.7	3.3	1.6
<b>D. Lower Income</b>							
China	NA	NA	1.6	3.1	5.9	5.6	6.6
India	NA	0.5	2.3	1.8	4.3	3.1	6.9
Indonesia	NA	NA	4.7	5.9	8.1	9.4	5.5
South Africa	3.6	4.4	5.3	3.3	1.6	1.9	0.9
<b>E. Groups</b>							
G2 (China/ US)	NA	0.7	2.3	2.4	5.4	5.4	5.2
G8	0.1	1.1	2.5	2.4	4.4	4.5	4.1
G8+5	0.1	1.1	2.5	2.4	4.4	4.4	4.2
G12	0.0	1.1	2.5	2.4	4.5	4.6	4.4
Developed of G20	0.1	1.2	2.5	2.4	4.2	4.3	3.9
Developing of G20	0.2	3.4	4.4	3.2	6.3	6.2	6.5
G20	0.1	1.5	2.8	2.5	4.7	4.7	4.6
OECD	0.1	1.4	2.6	2.7	4.4	4.5	4.1

Source: Authors' calculations based on World Development Indicators (World Bank).

Note: N/A indicates data on imbalance is unavailable. Russia, for example, only has data from 1994. Its ratio between 1990 and 1999 is calculated using available data for years after 1994.

Among all groups, the imbalance ratios of the G2 (China and the US) show the largest increase before 2007, from 0.9 in 1980 to 6.7 in 2006. The G2 had the smallest imbalance measure among all groups in 1980 and became the second largest after 2000

(next to the developing country group). This continued until 2009 with the largest drop in imbalance ratio in 2009. The continuing growth in imbalance ratios for all groups before the early 2000s results in an accumulation in global imbalances before the financial crisis, especially for the G2. The pattern for current account imbalance ratios is the same as that for trade imbalance ratios.

Trade and current account imbalance ratios between the 1980s and 2000 as well as yearly before and after the 2008 Financial Crisis are reported in Table 4. Though in general current account imbalance ratios are smaller, they show similar behavior to trade imbalance ratios. Group wise imbalance ratios measured by the current account imbalance ratios increased sharply after the early 2000s, decreased in 2007 and 2008, and dropped sharply in 2009. The major difference between these two imbalance ratios is that the current account imbalance ratios for the G2 became the largest among all groups, outranking those of developing countries. Also, the G2 shows the smallest difference between ratios for current account imbalances and trade imbalances. Results for indices linked to growth rates using the two different measures as the base for the construction of indices thus do not vary significantly.

**Table 4: Trade and Current Account Imbalance Ratios for Country Groups Pre and Post 2008 Financial Crisis (Absolute Value of Trade Balance / GDP, Absolute Value of Current Account Balance / GDP, %)**

		1980s	1990s	2000s	2005	2006	2007	2008	2009
G2 (China and United States)	Trade	2.3	2.4	5.4	6.3	6.7	6.6	6.5	3.9
	CA	2.0	1.7	5.1	6.2	6.7	6.4	6.0	3.5
G8	Trade	2.5	2.4	4.4	5.0	5.1	5.1	4.8	3.3
	CA	2.0	1.8	3.8	4.5	4.9	4.5	4.0	2.9
G8+5	Trade	2.5	2.4	4.4	4.9	5.2	5.2	5.0	3.4
	CA	2.0	1.8	3.9	4.4	4.9	4.7	4.5	3.1
G12 (GDP > 1 Trillion)	Trade	2.5	2.4	4.5	5.1	5.4	5.5	5.3	3.5
	CA	2.0	1.8	4.0	4.7	5.1	5.0	4.7	3.3
Developed of G20	Trade	2.5	2.4	4.2	4.8	4.9	5.0	4.6	3.1
	CA	2.1	1.9	3.9	4.6	5.0	4.8	4.2	2.9
Developing of G20	Trade	4.4	3.2	6.3	7.1	7.7	7.4	7.6	5.5
	CA	3.3	2.5	4.7	5.3	5.9	5.7	6.3	4.0
G20	Trade	2.8	2.5	4.7	5.3	5.6	5.6	5.4	3.7
	CA	2.3	2.0	4.1	4.7	5.2	5.0	4.8	3.2
OECD	Trade	2.6	2.7	4.4	4.9	5.0	5.0	4.7	3.4
	CA	2.2	2.0	4.0	4.5	4.9	4.8	4.4	3.1

Key: Trade – Trade imbalance ratio; CA – Current Account imbalance ratio.

Source: Authors' calculations based on World Development Indicators (World Bank).

#### 4. Is Instability Worsening or Improving?

We next relate external sector imbalances to country's GDP growth by constructing the indices described above which to assess linkage between expected changes in financial instability and the onset of financial crisis. We construct indices for individual countries and groups of G20 countries using the two index approaches. Under each approach we also separately calculate indices based both on trade imbalances and current account imbalances. We also use the two Across Countries or Through Time treatments respectively. For each variant of each index, we also calculate relevant weighted indices by GDP share. For each group, we calculate arithmetic average indices by aggregating group members' unweighted indices and weighted indices by aggregating along group members using GDP weights.

Table 5 reports indices for the G20 of worsening or improving instability based on these different approaches and methods, and averaged growth rates and imbalance measures for the G20 before and after the 2008 Financial Crisis. The averaged GDP growth rates of the G20 increased before 2007 and decreased in 2008, and showed a significant drop in 2009, behavior similar to that of the imbalances .

For the G20, for the 16 kinds of indices listed in Table 5, the different indices behave differently and there is no consistent pattern among them. In every year there are opposite algebraic signs. Also there is no similar behavior in indices in recent years, except for the trade imbalances based indices under the first approach and using the Through Time treatment. Irrespective of whether we use arithmetic average indices or weighted average indices, they both are positive over 2004 and 2007 and negative in 2008. This suggests the choice of index determines whether the analysis showing increasing potential of worsening instability over 2004 and 2007 and improving instability in 2008. In 2009 the arithmetic average one is positive while weighted one is negative. Under same index approach and the same method of Through Time, indices based on current account imbalances also do not show same behavior.

In general, the behavior of indices for G20 varies according to index approach, imbalance measures, index methods, and even the way of aggregation. And no form of



indices among the 16 forms of indice shows clear superiority in predicting the 2008 financial crisis. Thus, we conclude that either it is misleading to use simple indices to predict financial crises and the linkage between imbalances and the onset of financial crisis asserted by G20 maybe more tenuous than the G20 claim.

**Table 5: Indices for G20 of Worsening or Improving instability and Growth Performance of the G20 Before and After 2008 Financial Crisis under Different Index Approaches**

Index Approach	1990	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
<b>Growth Performance</b>												
<b>GDP Growth Rate</b>	3.3	3.1	4.8	1.8	2.2	3.7	4.8	4.4	4.8	4.8	2.7	-1.5
<b> Trade balance /GDP</b>	3.7	3.4	5.7	4.9	5.6	5.8	6.2	6.6	6.8	6.6	6.5	4.9
<b> Current Account Balance /GDP</b>	2.5	2.0	3.6	2.6	2.9	3.5	4.3	5.0	5.6	5.3	5.1	3.2
<b>Trade Imbalance based indices using different index approach - arithmetic average</b>												
<b>Type I-Across Countries</b>	4	-1	15	-1	-3	11	5	7	5	1	1	9
<b>Type I-Through Time</b>	-6	-1	1	13	5	-5	1	5	11	11	-7	3
<b>Type II-Across Countries</b>	-1	11	-3	-3	1	1	-3	-1	-1	-5	-5	-5
<b>Type II-Through Time</b>	3	3	1	7	5	5	5	3	-1	1	-5	7
<b>Current Account Imbalance based indices using different index approach - arithmetic average</b>												
<b>Type I-Across Countries</b>	6	3	7	-5	1	5	-3	1	-3	-1	5	1
<b>Type I-Through Time</b>	-4	3	3	5	-1	5	3	-5	9	3	-7	1
<b>Type II-Across Countries</b>	1	1	-9	-3	-1	-5	-5	-3	-1	-7	-5	-7
<b>Type II-Through Time</b>	5	5	3	7	3	3	3	1	-1	-1	-5	1
<b>Trade Imbalance based indices using different index approach - weighted average</b>												
<b>Type I-Across Countries</b>	0.45	0.55	0.83	0.40	0.46	0.65	0.53	0.57	0.72	0.52	0.46	0.57
<b>Type I-Through Time</b>	-0.09	0.29	0.16	0.04	-0.11	-0.52	0.33	0.54	0.60	0.07	-0.53	-0.26
<b>Type II-Across Countries</b>	-0.64	0.20	-0.27	-0.24	-0.20	-0.13	-0.27	-0.25	-0.34	-0.38	-0.42	-0.36
<b>Type II-Through Time</b>	-0.38	-0.18	0.24	0.03	-0.08	0.05	0.38	0.53	0.22	-0.32	-0.28	0.01
<b>Current Account Imbalance based indices using different index approach - weighted average</b>												
<b>Type I-Across Countries</b>	0.37	0.28	-0.03	-0.39	-0.07	-0.01	-0.21	-0.05	-0.13	0.48	0.56	0.50
<b>Type I-Through Time</b>	0.03	0.36	0.30	-0.10	-0.35	-0.29	0.42	-0.01	0.64	-0.08	-0.68	0.03
<b>Type II-Across Countries</b>	-0.69	-0.11	-0.43	-0.21	-0.29	-0.27	-0.30	-0.34	-0.34	-0.48	-0.39	-0.39
<b>Type II-Through Time</b>	-0.43	0.05	0.35	0.07	-0.17	-0.07	0.32	0.44	0.22	-0.41	-0.25	-0.16

Key: Type I – The simple index approach; Type II – The endogenous index approach.

Source: Authors' calculations based on World Development Indicators (World Bank).

Next we investigate changes in indices for the G20 compared to 1 year before, 5 years before and 10 years before. Results are reported in Table 6. Changes in indices compared to previous year no matter for unweighted or weighted indices, show large rises

and falls, alternating with signs every year or two. For four kinds of indices based on different methods, only the unweighted indices show consistently worsening in external instability in 1995 and in 2009 compared to 1 year ago. Weighted indices all show worsening in instability in 2005 and 2009 and improvement in 2007 compared to the previous year. Further more, only indices based on the Type I approach and Through Time method show continue worsening expected external instability year by year between 2004 and 2006 and improving in 2008 than in 2007.

Comparing over 5 years changes in unweighted and weighted indices for the G20 based on four methods show different signs each year, except for all negative changes in 2008 and all positive changes in 1995 for unweighted indices and negative changes in 2008 for all weighted indices. These indices show expected external instability to be less in 2008 than in 2003. Weighted indices for G20 based on type I approach and Through Time method show worse in external financial instability between 2001 and 2007 than 5 years earlier and improvement in 2008 and 2009, while weighted indices based on our Type II approach and Across Countries method show continue improved instability between 2000 and 2004 compared to 5 years ago.

Even comparing with 10 years earlier, indices do not reveal stronger evidence that there is worse external financial instability in recent decades compared to earlier. No matter whether unweighted or weighted indices for the G20 are used, changes compared to 10 years ago differ in sign for each year for four kinds of indices under different index approaches and methods. The only exception with all positive changes is weighted indices in 2000 compared to 1990. Weighted indices based on our Type I approach and our Across Country method show continued worsening in instability after 1995 compared to 10 years ago. Also, for indices based on Type I approach and Through Time method, weighted and unweighted indices all show worsened instability between 2004 and 2007 and improved instability in 2009 compared to one decade ago.

Overall, therefore, changes in indices for the G20 based on different methods vary sharply according to the base date used for comparison. The linkage between instability and onset of financial crisis revealed by our indices is unclear.

**Table 6: Change in Indices for the G20 Comparing over 1 Year, 5 Years and 10 Years under Different Index Approaches (Trade Imbalance Ratio as Measure of Imbalances)**

Index Approach	1990	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
<b>Compare with 1 Year Before - arithmetic average indices</b>												
Type I-Across Countries	14	4	16	-16	-2	14	-6	2	-2	-4	0	8
Type I-Through Time	-6	6	-4	12	-8	-10	6	4	6	0	-18	10
Type II-Across Countries	-6	2	-6	0	4	0	-4	2	0	-4	0	0
Type II-Through Time	4	4	-2	6	-2	0	0	-2	-4	2	-6	12
<b>Compare with 1 Year Before – weighted average indices</b>												
Type I-Across Countries	1.10	0.62	1.05	-0.43	0.06	0.18	-0.12	0.04	0.16	-0.20	-0.07	0.11
Type I-Through Time	0.02	1.03	-0.06	-0.12	-0.15	-0.41	0.85	0.21	0.05	-0.53	-0.60	0.27
Type II-Across Countries	-0.90	-0.59	-0.86	0.03	0.04	0.07	-0.15	0.03	-0.09	-0.05	-0.03	0.06
Type II-Through Time	-0.55	-0.51	-0.27	-0.21	-0.11	0.13	0.33	0.16	-0.31	-0.54	0.04	0.29
<b>Compare with 5 Years Before –arithmetic average indices</b>												
Type I-Across Countries	8	-5	16	4	-10	16	6	-8	6	4	-10	4
Type I-Through Time	-6	5	2	16	10	0	-4	4	-2	6	-2	2
Type II-Across Countries	-8	12	-14	-6	-2	-6	-6	2	2	-6	-6	-2
Type II-Through Time	-2	0	-2	6	8	-2	2	2	-8	-4	-10	2
<b>Compare with 5 Years Before – weighted average indices</b>												
Type I-Across Countries	0.81	0.10	0.28	-0.12	0.31	1.02	0.75	-0.26	0.32	0.06	-0.19	0.05
Type I-Through Time	0.20	0.38	-0.13	0.48	0.21	0.15	0.11	0.38	0.56	0.18	-0.01	-0.59
Type II-Across Countries	-1.00	0.83	-0.47	-0.27	-0.74	-0.60	-0.86	0.03	-0.10	-0.18	-0.29	-0.08
Type II-Through Time	-0.62	0.20	0.41	-0.30	-0.43	-0.48	-0.13	0.29	0.19	-0.23	-0.33	-0.37
<b>Compare with 10 Years Before –arithmetic average indices</b>												
Type I-Across Countries	-2	3	11	-1	-3	11	10	8	10	-6	6	10
Type I-Through Time	-8	-1	7	15	7	-1	8	6	14	16	-2	-2
Type II-Across Countries	-4	4	-2	2	-8	-8	-12	-12	-4	-8	-12	-8
Type II-Through Time	0	-2	-2	10	2	-4	6	0	-2	4	-12	4
<b>Compare with 10 Years Before – weighted average indices</b>												
Type I-Across Countries	-0.33	0.91	0.38	0.21	0.72	0.54	0.59	0.02	0.20	0.37	0.83	0.79
Type I-Through Time	-0.45	0.58	0.25	-0.38	0.30	-0.05	1.07	0.25	1.04	0.39	0.13	-0.48
Type II-Across Countries	-0.55	-0.17	0.37	0.46	-0.85	-0.86	-1.05	-0.44	-0.37	-0.92	-0.88	-0.95
Type II-Through Time	-0.14	-0.42	0.62	0.60	-0.47	-0.75	0.04	0.71	-0.10	-0.66	-0.81	-0.50

Key: Type I – Simple index approach; Type II – Endogenous imbalance index approach.

Source: Authors' calculations based on World Development Indicators (World Bank).

As indices for the G20 based on our Type I approach and using the Through Time method show little evidence of worsening instability before the onset of 2008 financial crisis,

we investigate if there is similar evidence for indices for sub groups and individual countries under the same index approach. Table 7 reports the unweighted indices for the G8, US, Japan and China based on trade imbalances using the Type I index approach and the Through Time method, as well as the changes in indices compared to 1 year, 5 years and 10 years ago. The reason for using the G8 and these three additional countries for these calculations lies in their considerable GDP weights in the G20.

The Arithmetic Average +1/-1 indices for G8 are all positive between 2000 and 2007 (except for zeros in 2000 and 2003) and this indicates that there are always more (at least equal) numbers showing +1 indices than -1 indices in these years. The indices for G8 increase between 2003 and 2006, and decrease between 2007 and 2008. There are 4 out of 8 members of G8 with +1 indices in 2003, 5 out of 8 in 2004 and 2007, 6 out of 8 members in 2005 and 2006, while only 3 members with +1 indices in 2008. This suggests potential worsening external instability 2007 and improving afterwards. The US has four +1 indices and six -1 indices during the 1990s, and continues +1 indices between 2004 and 2006 and -1 indices afterwards, which indicate an accumulating potential worsening instability before the 2008 financial crisis. Japan shows three +1 indices in the 1990s and all +1 indices in the 2000s. In most years during the past two decades, Japan and China have opposite yearly indices, indicating an offset of expected instability among countries.

Changes in indices comparing with previous year also show no coincidence pattern among these four economies. There are seven years in the 2000s that the indices for the US show no difference from previous years; No obvious evidence also appears that there is sharp worsening in expected external financial instability for the for G8, the US, Japan and China year by year before the 2008 financial crisis.

Comparing indices with 5 years before, the G8 worsens in instability between 2001 and 2006 compared to 5 years ago, the US shows no change during 2000-2005 and 2007-2008, and China shows no change after 2003. Changes in indices for Japan move up and down every a few years. According to these indices, the US has the same expected financial instability in 2007 and 2008 as 5 years ago and smaller instability in 2009 compared to 5 years ago.

If we compared indices for these economies to 10 years earlier, then the indices for the G8 between 2002 and 2008 are larger than 10 years ago, and the gap increases in the early 2000s and decreases after 2006. There is smaller expected financial instability for the G8 in 2009 compared to 10 years ago. For the US, there is the same or larger expected financial instability between 2002 and 2008 than 10 years ago, and smaller instability in 2009 than in 1999.

**Table 7: Arithmetic Average Indices for G8, US, Japan and China Before and After 2008 Financial Crisis (Type I Index Approach, Through Time; Based on Trade Imbalances)**

	1990	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
<b>Indices</b>												
<b>G8</b>	-3	2	0	2	2	0	2	4	4	2	-2	0
<b>US</b>	1	1	1	-1	-1	-1	1	1	1	-1	-1	-1
<b>Japan</b>	-1	1	-1	1	1	-1	1	1	-1	-1	1	1
<b>China</b>	1	-1	1	1	1	-1	-1	1	1	1	-1	-1
<b>Compare with 1 Year before</b>												
<b>G8</b>	-2	6	-2	2	0	-2	2	2	0	-2	-4	2
<b>US</b>	2	2	0	-2	0	0	2	0	0	-2	0	0
<b>Japan</b>	-2	2	0	2	0	-2	2	0	-2	0	2	0
<b>China</b>	0	0	2	0	0	-2	0	2	0	0	-2	0
<b>Compare with 5 Years before</b>												
<b>G8</b>	-2	5	-2	4	4	4	0	4	2	0	-2	-2
<b>US</b>	2	0	0	0	0	0	0	0	2	0	0	-2
<b>Japan</b>	-2	2	-2	2	0	0	2	2	-2	-2	2	0
<b>China</b>	0	-2	2	2	2	0	0	0	0	0	0	0
<b>Compare with 10 Years before</b>												
<b>G8</b>	-6	3	3	-1	1	1	6	2	6	4	2	-2
<b>US</b>	0	2	0	-2	0	0	2	0	2	0	0	-2
<b>Japan</b>	0	0	0	0	2	0	2	0	0	-2	2	2
<b>China</b>	1	-2	0	0	2	0	0	2	2	2	0	0

Source: Authors' calculations based on World Development Indicators (World Bank).

Table 8 reports weighted indices as well as changes in indices compared to the previous year, 5 years ago and 10 years ago for the G8, the US, Japan and China based on trade imbalances using our Type I index approach and the Through Time method. Indices for the G8 and the US show similar signs in each year after 1980, except for in 1990. Also,

indices for G8 and the US are closer in values in recent years, because of the domination of the US in the G8 and there is only a small trade-off between the US and other G8 members. In another words, the external instability of the US dominants others' in the G8. There is improved expected external instability for the G8 and the US in the early 2000s and worsened instability between 2004 and 2006. Instability improves again afterwards. During 1980 to 2009, the minimum value of indices for US is -0.42 in 1985 and maximum value of indices is 0.37 in 1986. The absolute values of weighted indices for the US fluctuate between [0.3, 0.38] after the mid 1980s and decreases slowly in recent decade. Also despite the signs of indices, the absolute values of weighted indices for China increases over time, while indices for Japan decreases over time. These show a changing pattern among countries in influencing global instability.

Similar to unweighed indices, change in indices for these four economies shows no consistent pattern compared to previous year. During the 2000s indices for the G8 and the US change signs in 2001, 2004 and 2007, which causes significant changes in indices for these years compared to previous years and small changes in other years. Compared to one year earlier, China shows worsened expected external instability between 2005 and 2007 and improvement afterwards.

The G8 has continued worsened expected external instability between 2001 and 2008 and improvement in 2009 compared to 5 years ago. The peak in differences in indices for the G8 appears in 2006, and a trough appears in 2009. In recent decade, indices for US show a sharp rise in 2006 and a sharp down turn in 2009 compared to 5 years earlier, while no significant changes in others years. Indices for Japan show big differences compared to 5 years earlier for most years, reflecting changes in signs and fluctuations in values.

Comparing indices for these four economies over 10 years earlier, a common characteristic is that they all show worsened external instability in most years in the 2000s. For the G8, its external position worsens between 2002 and 2008 and improves in 2009 compared to a decade earlier. The story for the US is similar to that for the G8. Compared to 10 years earlier, the expected external instability of China worsens between 2000 and 2003, improves slightly in 2004 and 2005, and worsens before improving again after 2008.

**Table 8: Weighted Average Indices for G8, US, Japan and China Before and After the 2008 Financial Crisis (Type I Index Approach, Though Time; Based on Trade Imbalance Ratios)**

	1990	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
<b>Indices</b>												
<b>G8</b>	-0.10	0.38	0.12	-0.17	-0.23	-0.42	0.39	0.47	0.42	-0.17	-0.34	-0.27
<b>US</b>	0.31	0.29	0.36	-0.38	-0.38	-0.35	0.34	0.33	0.33	-0.31	-0.29	-0.30
<b>Japan</b>	-0.17	0.21	-0.17	0.15	0.14	-0.14	0.13	0.12	-0.11	-0.10	0.10	0.11
<b>China</b>	0.02	-0.03	0.04	0.05	0.05	-0.05	-0.06	0.06	0.07	0.08	-0.09	-0.11
<b>Compare with 1 Year before</b>												
<b>G8</b>	0.06	1.06	-0.08	-0.29	-0.07	-0.18	0.81	0.09	-0.05	-0.59	-0.17	0.07
<b>US</b>	0.64	0.60	0.01	-0.74	+0.00	0.02	0.69	-0.00	-0.00	-0.64	0.02	-0.01
<b>Japan</b>	-0.35	0.42	-0.01	0.32	-0.01	-0.28	0.27	-0.01	-0.23	0.01	0.20	0.01
<b>China</b>	-0.00	-0.00	0.09	0.01	+0.00	-0.10	-0.00	0.11	0.01	0.01	-0.17	-0.01
<b>Compare with 5 Years before</b>												
<b>G8</b>	0.25	0.48	-0.26	0.27	+0.00	0.23	0.18	0.35	0.59	0.07	0.08	-0.66
<b>US</b>	0.73	-0.02	0.07	-0.07	-0.05	-0.01	-0.02	-0.03	0.71	0.07	0.06	-0.64
<b>Japan</b>	-0.30	0.38	-0.38	0.34	-0.03	0.02	0.30	0.29	-0.26	-0.24	0.23	-0.02
<b>China</b>	-0.01	-0.05	0.07	0.08	0.09	-0.01	-0.01	0.02	0.02	0.03	-0.04	-0.05
<b>Compare with 10 Years before</b>												
<b>G8</b>	-0.47	0.73	0.22	-0.65	0.14	0.01	1.07	0.09	0.86	0.07	0.31	-0.47
<b>US</b>	-0.01	0.71	0.05	-0.69	-0.08	-0.04	0.65	0.04	0.64	0.02	0.05	-0.66
<b>Japan</b>	-0.04	0.07	-0.01	-0.03	0.32	0.07	0.34	-0.09	0.08	-0.27	0.25	0.27
<b>China</b>	0.02	-0.06	0.02	0.03	0.07	-0.03	-0.03	0.09	0.10	0.11	-0.05	-0.07

Source: Authors' calculations based on World Development Indicators (World Bank).

## 5. Concluding Remarks

The Pittsburgh G20 meeting in September 2009 resulted in agreement on a framework for strong, sustainable and balanced growth and this, in turn, has provided the impetus for major effects to reduce global imbalances as a key element to a G20 strategy of preventing future global financial crisis. But the analytical underpinnings both of what financial instability (as opposed to economic instability in general) actually is, and how it is linked to both imbalances and the onset of financial crisis are remaining opaque in research literature.

A recent G20 finance ministers meeting has resulted in a commitment by G20 countries to produce five indicators of financial instability, one of which is based on trade imbalances. Our discussion sets out how country measures of imbalance ratios can be combined both across time and across countries to provide aggregate measures of one key element in imbalances, namely external sector imbalances. The hope is that aggregate measures of financial instability can then give some guide to global policy coordination responses in advance of potential crises after the 2008 event.

What we do not do here is pass definitive judgment on the strength of the link between imbalance and the onset of crisis but we do suggest that from our calculations that the basis for such a link maybe more tenuous than the G20 seem to believe. If the 2008 crisis is viewed as largely a confluence of bubbles in housing markets, oil prices, commodity prices, and speculative mortgage and other lending, then the construction of measures of global or national financial instability and linking them to changes in imbalances may help to give insights on the relative contribution of imbalances. In the 1930s there was no serious suggestion at the time that imbalances were a key cause of the depression. Nor in the Asian financial crisis of 1997/1998 were imbalances thought to be the key. Equally imbalances larger than those experienced in 2008 prevailed without the onset of financial instability in earlier periods such as the pre World War I global economy. Whether this was, however, the case in 2008 remains as the issue.



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