Globalization and Crisis: Lessons from the Past for a Post Pandemic World[1]

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Abstract

The global pandemic impels us to seek a better understanding of the globalization-crisis linkage. Taking a deeper look at the Great Recession, we uncover both new and nuanced relationships. Two aspects make our contribution unique. Its long-run focus and its counterfactual approach, enabling us to ask novel *what if* questions. Key to this is predicting counterfactual output as if crisis never occurred, so that observed-counterfactual differences can be attributed to the crisis. Most significantly, we find that trade and financial openness play widely divergent roles, with trade (not financial) openness, having a robust restorative effect in the long run.

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1. INTRODUCTION

The speed with which the Corona virus transmitted globally and the efficacy in the global distribution of the vaccines which has been taking shape at the time of this writing, demonstrate both the power of globalization for the good, and its ferocity for transmitting risk. Yet even before the post-COVID world arrives, the question engaging scholars and journalists alike is how globalization will impact the national economies and what will be its new form.[4] Will it be a force to ameliorate or accentuate the new international inequities driven by the pandemic? Will its ability to transmit risk and crisis remain its legacy for the foreseeable future? These questions have gained added urgency, an urgency driven in part by the ironically global anti-globalization movement.

To gain insights into the relation between globalization and crisis, it will be useful to understand how globalization entangled with the first crisis of the 21st, namely the financial crisis of 2008-2010, both in the transmission of that crisis and in the possible amelioration of the post-crisis recession that followed. This is what our paper is about. One of our key contributions over the existing studies of this type (detailed in section 2.1) is that we focus on the long run using data long after the crisis had passed[5]. This allows us to examine not just how exposure to globalization contributed to the impact of the financial crisis, but also whether it also contributed to the long, gradual and slow recovery of countries, post-crisis. If so, how? These questions could not have been asked with shorter period data. Our second contribution is to address some vexing endogeneity and identification issues that arise as a result of the long run examination. One example is the fact that the crisis itself may have caused countries to reduce their global exposure as a form of protection. Our approach to address this issue is to construct counterfactuals using

[4] On the latter, see for example F. Zakaria (2020)
[5] Our data is quarterly covering 1996 to 2018.

both forecasting techniques and (parts of) the synthetic control method. These and other methodological innovations, while not new in general, are new to this genre of work. Added to the long-run nature of our study, they produce a unique contribution to the existing literature.

To provide more detail about our specific contributions, we first need to present the differing perspectives that exist on globalization, as it relates to welfare gains and crisis transmission. On one hand, it is well known that globalization expands the economy's scale via trade (Frankel and Romer 1999; Dollar and Kraay, 2003) as well as mitigates a key component of idiosyncratic risk via finance (Kose et. al., 2009; Beckaert et. al., 2011)[6]. On the other hand, globalization allegedly facilitates the spread, extent, and duration of economic crises (Classens et al. 2010), though this latter view is not uniform. For example, Hamdi and Jlassi's (2014), Ranciere et al. (2006), Schmukler (2004), Cavallo and Frankel (2008), Classens et. al. (2010),[7] have each found results that contradict one another. Since our paper is about globalization and crisis, it is important to better understand these conflicting results. We take our cue from one study that attributes the conflicting results to the presence of "composite effects" in a macro framework that arises from different underlying causal factors. It offers a remedy to this problem by conducting a firm level microanalysis (Classens et al. 2012).[8] Our proposed methodology addresses the limitation of the "composite effects" problem differently while retaining a macro framework. In effect, it resurrects

[6] Frankel and Romer (1999) using an instrument for trade, show that trade has a large positive and moderately significant effect on income, while Dollar and Kraay (2003) show a greater positive role of trade openness over institutional strength in the short run. Kose et al. (2009) finds using the de-jure financial openness measure, that financial liberalization has a robust and positive effect on TFP growth while Beckaert et. al (2011) show that financial openness has a greater positive effect on productivity growth than capital growth.

[7] Hamdi and Jlassi's (2014) find no relationship between financial liberalization and banking crises, suggesting no negative effect of financial openness. Ranciere et al. (2006) and Schmukler (2004) suggest that the net effect of financial openness is likely positive in the long run suggesting that the negative impact during crises is offset by gains during periods of normalcy. Cavallo and Frankel (2008) show that trade openness reduced the impact of a crisis while Classens et al. (2010) find that an increase in trade openness leads to an increase in both the duration and the severity of the 2008 global recession.

[8] The study covers only publicly traded firms. As such, it does not the whole of the economy. Nonetheless, a micro framework does have some appeal over the *existing* macro studies for the reason pointed above.

the relevance of the macro framework for the study of globalization and crisis. The essence of this approach is in constructing country-specific counterfactuals to analyze country-specific impact of the crisis. Subsequently, by distinguishing between two groups of countries, "open" versus "closed", we can isolate openness from other macroeconomic factors.[9] We recognize that openness is a relative concept and that no country is completely closed or open. But to make the analysis tractable, we use the pre-crisis mean levels of trade and financial openness across countries as a cut-off between "open" and "closed" economies but then, for robustness, vary this threshold to allow for different levels of openness.

We also address another limitation of the existing studies: in making their case for or against openness, previous studies have focused exclusively on the *crisis period*, neglecting the role that globalization may have played *in the recovery period after the crisis*[10]. With the passage of time since the Great recession and the resulting availability of additional years of data, we address this gap. However, it is the counterfactual methodology that enables us to combine this long-run investigation with the disentangling of the composite effects discussed earlier.

We also contribute to the *measure* of the impact of the crisis. Previous measures of this impact fall in several categories, each with its own limitation for our purpose. Some studies focus on reduced growth rates which have a short-run focus; others examine changes in potential output as opposed to realized output; and yet others focus on changes in decomposed trends or cycles which yield

[9] We are also able to distinguish between effects from financial openness and those from trade openness in a way that addresses a second concern of the macro studies (ibid), namely that the separation between financial and trade openness is not "clean" as both measures are highly correlated. Our distinctly different results for the two effects support the fact that our approach addresses such a concern.

[10] One possible exception is Gamberoni et al. (2010) which studies the impact of globalization on unemployment during the crisis. The study finds that trade openness worsened the effects on employment but allowed for faster recovery. That study however did not examine the effect on output.

singular impact measures as opposed to measures that result in time series observations[11]. We propose an alternative method: to use pre-crisis output of each country to forecast what its output would have been in the absence of the crisis. This allows us to generate our own counterfactual output levels in the post-crisis period. By comparing this counterfactual with observed output after the crisis, we can estimate the impact of the crisis. This approach allows for the possibility of a change in the trend due to the crisis; captures the effect on actualized output (as opposed to potential output); and provides time series observations of the impact of the crisis through which we can undertake our long run study.

Once we construct the time series measure of the crisis per country, we examine the role of countries' pre-crisis state of openness on how they fared during and after the crisis[12]. Initially, we find that open countries via trade before the crisis suffered more severely, while financial openness played little to no role[13]. So far, this seems consistent with Clausen et. al.'s micro level findings. But because our study extends well beyond the crisis period and into the recovery period, a new pattern emerges when an inherent endogeneity in the measure of openness (see below) is corrected: Here, while our early results suggest that both trade and financial openness had a restorative effect as open countries grew faster, with the endogeneity correction, trade results survive but financial openness results turn *negative* throughout the period. As far as we know, this is the first paper to consider these and many other more nuanced and complex relationships between globalization and crisis.

[11] We extensively discuss these limitations in section 2.1.
[12] We classify countries by their trade and financial openness, using the mean value for all countries across time during the pre-crisis period. We provide robustness checks using a different cutoff point. The robustness results are presented in the appendix and discussed in footnotes throughout the paper.
[13] However, a more generous split of countries according by their financial openness which classifies only the bottom 20% as less financially open, shows a positive impact of being financially open during the crisis and a negative effect during the European debt crisis. See section 3 for more.

The inherent endogeneity mentioned above arises because countries may have either reduced their extent of international exposure during the crisis as a matter of policy, or the size of their trade or finance sector may have simply shrunk due to the crisis. Either way, the endogeneity complicates the analysis and biases the results as it is no longer clear whether levels of openness pre-crisis, were maintained post-crisis. To address this issue, we construct another set of counterfactuals that holds countries' openness ratio fixed at their pre-crisis levels and maintains this ratio at each point throughout the post-crisis period. This allows us to answer the question: what would have happened had the structure of openness not changed post crisis? We can answer this question for *each* country distinctly, owing to the use quarterly data that provides us with sufficient time series observations for the periods both during and after the crisis.

Addressing this source of endogeneity yields new results: we find that financial openness would have had a significant *negative* impact in *all* periods post-2007 (up to the end of our data point), had it stayed at the level just before the crisis. Our results suggest that previous findings, attributing little to no role to financial openness (or even a positive one) during the crisis, ignore the fact that financially open economies *retreated* from global financial markets. As for trade, using the same approach, we find that trade openness still retains its restorative effect during the recovery period with potentially quicker recovery times. This evolving role of trade openness from a negative conditioning factor during the crisis to a positive factor during the recovery, provides us with a glimpse of the unique, and more complex nature of the relationship between globalization and crises than has been understood thus far.

Finally, to provide some evidence of identification, we run a "Placebo" test: we do this by asking a third counterfactual question: What would be the difference in the crisis effect between two countries with similar levels of openness? Thus, we use the matching component of the synthetic

control methodology to create similarly open counterfactuals for each country in our sample to ascertain whether differences in openness was in fact responsible for the post-crisis patterns that we observe. By eliminating differences in the levels of openness between a country and its counterfactual, we eliminate differences in the exposure to globalization. If we are right and globalization is key to the post crisis state of the economy of different countries, removing this difference in exposure to globalization, would cause the post crisis output differentials to diminish significantly or vanish altogether.

It is worth noting that we do *not* investigate *contagion* whose presence during the global recession is well known and understood. [14] Rather, we try to understand the degree of exposure to the crisis in different economies and the aggregate effect of that exposure on each economy. To examine exposure rather than contagion, variations in contagion across countries and over time need to be controlled. With respect to cross-country variations, using the pre-crisis time series data per country to construct counterfactual output levels (for estimating the impact of the crisis) preserves the existence of the contagion factors in each country. This way, our resulting estimate of the impact of the crisis does not arise from cross country differences in contagion factors. With respect to time series variations in contagion (if any), addressing the potential contraction of country level openness due to crisis in our investigation of endogeneity effects (section 5.1) in effect "neutralizes" any possible changes in contagion factors over time. Finally, the placebo experiment described above, hones in on openness and addresses any potential identification issues,

[14] This strand of the literature examines the necessary conditions for a crisis to transmit from one country to another, whether due to herd behavior, trade linkages, or financial linkages. For example, Calvo and Mendoza (2000) highlight the effect of high fixed costs of gathering country specific information, which causes firms to react to an event based solely on the observation of other firms' reaction. Kaminsky et al. (2003) discuss the unholy trinity of financial contagion which include an abrupt reversal of capital inflows, surprised announcements and a leveraged common investor as the conditions necessary for transmission to occur. (See Kaminsky et al. (2003) for a thorough discussion on contagion).

concluding that the results we find can only be driven by variations in global exposure, not global contagion[15].

In what follows, section 2 discusses the existing methodologies for generating measures of the impact of crisis as well as the approach we take; section 3 addresses the effect of pre-crisis openness on the impact of the crisis; section 4 discusses the role of openness after the recession; section 5 discusses robustness checks for endogeneity and addresses identification issues and section 6 concludes.

2. MEASURING THE IMPACT OF THE CRISIS

2.1 Existing Measures of the impact of the crisis

Finding an appropriate measure that captures the impact of the financial crisis is a complex task. There are several distinct approaches in the literature that address this task, each with its own limitations specific to our purpose. The first approach uses the fall in growth rate as a measure of the impact on the crisis (Berkmen et al. 2009) and its subsequent rise as an indicator of the end of the crisis. One limitation of this approach is that a return to pre-crisis growth rates may be a consequence of the depressed level of output due to crisis, rather than indicating that the impact of a crisis has dissipated. Another limitation is that a decline in growth might be a natural part of the economy's business cycle that would have occurred anyway. Thus, attributing this decline to the crisis can potentially overestimate the impact of the crisis or underestimate its duration. A second approach adopts an event study methodology (Schularick and Taylor2012). While this approach captures the initial impact of the crisis by examining the pre and post crisis trends, it does not provide the requisite individual time series observations for the full post-crisis period. A third approach examines the effect of crises on *potential* output (Furceri and Mourougane 2012,

[15] See section 5 for more on this.

Reifschneider et al. 2013, Ball 2014). While this method does address the potential for a long-term impact of the crisis, it does not address the impact of the crisis on *actual* output which is our outcome of interest. A fourth approach has been the standard trend-cycle decomposition, with deviations from the trend during the crisis attributed to the effect of the crisis (Gupta et al. 2007, Cerra and Saxena 2008, Blanchard et al. 2015, Martin et al. 2015). However, this approach does not account for the possibility that the crisis alters the *evolution* of output--perhaps as a result of significant long-term policy changes--as only a single trend is estimated for both the pre and post crisis. Finally, a fifth approach uses the standard definition of a real business cycle to measure the impact of the crisis starting from the peak of output and ending at its trough (Claessens et. al. (2009), Jorda et. al. (2013)). While this approach is subject to the same assumptions on trends as the method above, it also provides only one observation per country for the impact of the crisis.

In addition to the individual issues highlighted above, one more issue common these approaches still remains. This common issue is that these measures are based on observed outcomes only; omitting the additional unobserved levels of output that would have been realized, had the crisis not occurred. As such, they do not capture the full extent of the impact of the crisis. Typically, to recover this unobserved component, counterfactuals would be created, for example using the synthetic control methodology (Abadie and Gardeazabal 2003, Abadie et. al. 2010, Cavallo, 2013). In this method, for each treated country, a synthetic counterfactual is generated from a control group that is unaffected by the treatment via an optimizing vector methodology. The outcome difference between the synthetic control and the treated country then approximates the treatment effect, which should theoretically include the unobserved component. The difficulty in adopting this approach in measuring output effects during the recession is that the global crisis of 2007-2009 affected nearly all countries so that finding an unaffected control group with which to create

a counterfactual is not feasible. In the next section however, we discuss our approach, which highlights how the issues described are addressed.

2.2 Generating Counterfactual output

Our solution to the issues discussed above is to generate a forecast for a country's output using pre-crisis variables in order to establish a "pattern of normalcy" which is then projected beyond the crisis to serve as a counterfactual to the observed data, post crisis. Using this general approach would imply that whatever forecasting method is used, two criteria must be satisfied: first the fit of the pre- crisis forecast must be "good" (with "good" defined as the forecasting method with the least in sample forecast errors) and second, projections made beyond the crisis should *not* depend on realized observations in the post crisis period for the projections to be considered a true counterfactual. In generating this proposed counterfactual, we consider the following forecasting tools: Vector Autoregression (VAR), Generalized Autoregressive conditional heteroskedasticity models (GARCH), the Auto regressive model (AR), the moving average model (MA), and the exponentially weighted moving average model (EWMA). We discuss each approach in the next sub section in the context of the two criteria for an ideal counterfactual.

2.2.1 Determining an Appropriate Forecasting Method

In considering the VAR approach, we use output, financial openness, and trade openness as our system of variables. However, given the two criteria for an ideal counterfactual discussed above, we find that the VAR approach fails in the second criteria as the VAR estimates post-crisis, would depend on observed outcomes, making for a poor counterfactual. Next, we turn our attention to the GARCH approach. For this method to work, a high degree of volatility as well as a large sample are needed to generate GARCH forecasts. The latter is noticeably absent in our analysis as for each country, we only have forty-seven observations with which to create the forecasts. As for former,

the volatility differentiation upon which the GARCH models thrive is absent from most of our growth measures. Thus, it is not surprising that we could not fit GARCH models for most countries in our sample[16]. For those where a fit was possible, the contributions of the GARCH components are negligible. This is because it is the presence of the autoregressive components that generate the quarter-on-quarter distinction, hence the GARCH model fails in the first criteria. The MA model, when it is compared to the AR approach fails in the first criteria as the AR model generates better fits in all but 3 countries. The EWMA, however, outperforms the AR model in all but four countries, but does *not* pass the second criteria. Because the EWMA uses observed and forecasted data in its prediction (the very characteristic that makes it more accurate than the AR approach), its out-of- sample predictions are flat. This implies that it predicts the same value, for every out of sample entry, since there are no more observed data to use in its prediction. It is quite clear that this does not make for a good counterfactual[17].

Finally, we select the AR model for its simplicity and its satisfaction of both criteria[18]. Specifically, we exploit the autoregressive properties of output create counterfactuals for the post-crisis era (2008 to 2018), using each country's own pre-2008 historical output. The projection of the pre-2008 output to post-2008, serves as a counterfactual as if a country's performance was

[16] One option to overcome this limitation was to pool all country observations and treat them as time series observations, but this will imply that there are no inherent differences across countries, which is too extreme an assumption. It would also yield less accurate results when compared to generating country specific counterfactuals.

[17] In fact, the projected counterfactual is lower than the observed output in the post crisis period, which does not show detrimental effects of the crisis and actually suggests that countries were better off. In general, this flat line out of sample prediction is suitable for variables with no trends. We therefore carried out the same analysis for growth instead of output. This generated a flat line even in the pre-crisis period. This is similar to an AR(0) process on growth which creates a simple straight line as the counterfactual. In this sense, the AR benchmark, especially for the countries that yield non-AR(0) results is richer.

[18] To provide some idea as to the fit of the AR, we compared pre crisis in sample fits from the VAR approach for 21 out of 30 countries (due to missing observations) to the AR approach and found no significant difference between the in sample forecasts on average. Even on a per country basis, only one country showed significant difference between the two models and this only at the 10% level.

unaffected by the crisis. The impact of the crisis for each country is then measured by the difference between the predicted counterfactual and the observed output in the post crisis period. This approach while simple, allows for the possibility of a change in the trend, is able to capture the effect on *actual* output (as opposed to potential output), entails both observed and unobserved effects, largely avoids overestimating the impact of the crisis, and allows for a *long-run* examination of the impact of the crisis by generating time series observations. These features allow us to be able to address most of the limitations on the existing measures that were highlighted in section 2.1

2.2.2 Estimating the impact of the crisis

Following the discussion above, we fit an Auto regressive (AR) model to output growth using pre crisis data, and then forecast output levels for all periods. Data generated after 2007:Q4 using this method produce our counterfactual output levels. Akaike information criterion (AIC) is used to select the appropriate AR model, extracting maximum information from past observations in determining optimal AR specification. By contrast, the Schwartz information criteria (SIC) adds extra penalties for specifications with more terms, so that selection based on the SIC will have less information from past periods than selections made with the AIC. To generate an AR model, we find the optimal specification of the first differenced output levels from the following regression for each country i.

$$\Delta Y_t = c + \sum_{s=0}^{p} \beta_s \Delta Y_{t-s} + \varepsilon_t \qquad (1)$$

For $p = 0,1,2, and\ 3$ and t from Q2-1996 to Q4-2007[19] and Y_t is the natural log of output[20].

From these optimal specifications, values of ΔY_t are predicted for both in-sample (Q2-1996 to Q4-2007) and out-of-sample (Q1-2008 and Q4-2018) time periods. These predictions are then used to generate output levels for the same time period starting with the very first observation (Q2-1996), i.e.

$$Y_{Q3-1996,pred} = Y_{Q2-1996} + \Delta Y_{Q3-1996,pred} \qquad (2a)$$

$$Y_{t,pred} = Y_{t-1,pred} + \Delta Y_{t,pred} \quad \text{t = Q4-1996, …, Q4-2018} \qquad (2b)$$

Here, $Y_{t,pred}$ is the predicted counterfactual of output level at time t, and $\Delta Y_{t,pred}$ is the predicted value of the first difference of Y obtained from the optimal AR specification. Since the out-of-sample predictions are generated using the same pre-crisis AR specifications as those for the in-sample period, the measures of output obtained follow the same evolution and are by design, unaffected by the crisis. The difference between this counterfactual and the observed post crisis output is attributed to the impact of the crisis. Verifying this claim however rests on the accuracy of our counterfactual output in the pre-crisis period. To this end, we compensate for forecasting errors by adding the average pre-crisis errors over time for each country to each counterfactual estimate in both the pre and post crisis periods. This improves the accuracy of the AR forecasts and to provide a sense of this accuracy, table A.1 in the appendix shows the sum of squares of errors (SSE) for 29 of the 30 countries in our sample in the pre-crisis periods, while the online

[19] We cap P at 3 given the need for a simpler optimal specification and the fact that for values of p higher than 3, the AIC and SIC are typically higher even when coefficients are significant. This also aids in streamlining the presentation of the results of this process given that we have 30 countries in the sample.

[20] Results are reported in table A.1 of the online appendix, with the chosen optimal specifications (the columns with the lowest corresponding AIC values) in bold. For example, the chosen specification for Australia and Brazil are AR (0), Austria and Canada are AR (1), Chile and Estonia are AR (2), and Belgium and Spain are AR (3).

appendix shows the individual plots of each country, visually highlighting the degree of fit. Both show reasonably large degree of accuracy[21].

Finally, to highlight the degree to which the above measure captures the effect of the crisis across countries, we plot the difference between the predicted counterfactual and the observed output for all countries in our study. For further confirmation of our measure, the plots for the pre-crisis period should bunch up around the zero line, while the post crisis period should show movements away from the zero-line specifically into the negative, since we expect the effect of the crisis to be negative. Figure 1, measuring observed output minus predicted counterfactual against time, confirms this expectation and vindicates the approach. Henceforth we call this the "*output effect.*"

[Insert figure 1 here]

3 OPENNESS EFFECT DURING AND AFTER CRISIS: A BIRD'S EYE VIEW

Besides new methodology, our new extended data allows us to examine, not just the role of economic openness in how countries fared *during* the crises, but how they fared in its *aftermath*. This is especially important since most of our sample includes the European economies that experienced a second crisis, the European debt crisis, from 2010:Q1 to 2013:Q3, which due to our approach, we can examine separately (see section 4). First, we determine the role of pre-crisis levels of openness on "output effect." To do this, we stratify the countries into two groups, using the *pre-crisis mean financial and trade openness across time and countries* as a cutoff point. For our measure of financial openness, we use the well-known de-facto measure of financial capital

[21] From the table, the three countries marked with a star (Iceland, Slovak Republic and Turkey), are those whose pre-crisis SSE values are further than one standard deviation away from the mean of all countries. In the online appendix, we find that the exclusion of these countries from our analysis, produce results that further strengthen our argument. We however opt for their inclusion in our main results owing to the fact that we lose too much information about openness by excluding these countries. See section 3 of the online appendix.

flows across countries per Lane-Milesi-Ferretti's (2001) and given the quarterly nature of this study, we extend it from annual (available on their website) to quarterly. The de-facto measure is generated by aggregating countries' total international investment position, i.e., sum of external assets and liabilities as a fraction of GDP. Quarterly data on assets and liabilities are from the International financial statistics (IFS) database. Our measure of trade openness follows the established standard of the sum of exports and imports as a fraction of GDP[22]. While de-jure measures of openness promise greater independence from output measures, they are also more static and unchanging, making it difficult to infer a meaningful role in relation to the financial crisis which contrasts our chosen measures as shown in figures 2 and 3.[23] Further, the use of the de-facto measures is more prevalent, allowing us to benchmark our results against those in the literature.

[Insert figures 2 and 3 here]

Next, we obtain the average output effect (i.e., the average of the observed – counterfactual outputs for each quarter for the pre and post crisis periods) associated with the "closed" and "open" groups, as prescribed by the above cutoff point. Comparing the differences in the output effects over time will tell us what role *ex-anti* (i.e., before crisis) economic openness played in either accentuating or mitigating the impact of the crisis. This amounts to carrying out, in effect, a difference-in-difference-in-difference analysis.

Figures 4 and 5 report the results, depicting the differences in the output effects, with respect to differences in the level of financial and trade openness, respectively. For the moment, we will consider only the effects during the financial crisis and the long-run post crisis effects without the

[22] See tables A.2 and A.3 in the appendix for the list of countries belonging to each group.

[23] For example, the well-known Chinn-Ito de-jure measure of financial openness remained largely constant for all countries in our sample during and after the financial crisis.

consideration of European debt crisis and the subsequent recovery period within the post-2009 period. We call this a bird's eye view. We will later take a closer and deeper look at this latter issue.

[Insert figures 4 and 5 here]

While the figures confirm, not surprisingly, that both groups experienced a dramatic downturn at the outset of the crisis, there are important distinctions. On one hand, *before* the crisis, there is no discernable pattern in the performance of open versus closed economies, either in finance (figure 4) or in trade (figure 5) as we see the plotted effects cross, but both remain close to the zero line as should be the case before the treatment. During the crisis, there are no discernable distinctions between the two groups in figure 4, but we see some separation towards the tail end of the crisis in figure 5, with closed countries via trade outperforming their open counterparts. One the other hand, *after* the crisis was over, financially open economies did better (figure 4) while trade-wise open economies consistently did worse (figure 5). In the absence of any potential endogeneity considerations of openness, due to crisis itself, to which we will return, these results tentatively suggest that trade and financial openness played a different role and are consistent with the firm-level findings of Classens et al. (2012) discussed earlier. But when we go further and ask a deeper question of "how these results would change if countries' global exposure *declined"* (either as a matter of policy response to the crisis, or contraction of the trade and financial sector due to the crisis), our results take a dramatic turn, signifying a departure of our paper from similar studies. We will see this in subsection 5.1. For now however, we further examine the sensitivity of these

results to a different definition of open versus closed economies by varying the cut-off points. Results are reported in the appendix.[24].

Next we examine more closely the effect of openness after the end of the crisis (i.e., 2009:Q4) and determine the role of openness during the periods that followed.

4 OPENNESS EFFECT DURING AND AFTER CRISIS: A DETAILED VIEW

Before examining the possible endogeneity effects discussed above, we explore the evolution of the role of openness over the longer run. To do this we do two things. First, we start off from Q4-2007. The shortened period allows greater magnification of what happens afterwards. Second, we split the post Q4-2007 period into three periods of interest: the global recession (2008:Q1 to 2009:Q4), the European debt crisis (2010:Q1 to 2013:Q3) and the recovery period (2013:Q4 to 2018:Q4). We select the end of the European debt crisis as 2013:Q3 because reports show that the Eurozone experienced its first positive growth in the second quarter of 2013 and the European commission reported "tangible positive" outcomes in the same period.[25]. To better depict the nuances in the post crisis period, the *difference between the output effects* for the two groups (

[24] Using 20th percentile openness cutoffs, which restricts the classification of "closed" only to the most closed countries (those in the bottom 20%), we obtain similar results for trade openness but no gains post-crisis from financial openness. This suggests that for financial openness to improve things, economies have to be much more financially open than defined by a 20% cut-off. One reason may be that more financially closed off countries lacked access to the same international resources with which to share the burden of the negative effects of the crisis compared to their more open counterparts, leading to less significant negative effects during and after the crisis. With respect to trade openness however, we find consistency in the results. We find an even greater difference than was picked up in the mean split showing that the really closed countries insulated against greater levels of trade openness in the pre-crisis period suffered much less than their more open counterparts during the crisis. These findings are re-examined in subsection 5.1 which correct for the endogeneity of openness. For example, more open countries may have decided to withdraw from international capital markets to avoid the negative effects of the crisis (or even as a precautionary measure) and thus, were insulated from the full effects of the crisis. We will examine these possibilities.

[25] See 2013 BBC business articles:
https://www.bbc.com/news/business-24851483
https://www.bbc.com/news/business-24817818
https://www.bbc.com/news/world-europe-23695877

open versus closed) is plotted such that an upward slope implies that over that period, the open countries are doing better than closed countries, implying a positive effect of openness[26].

[Insert figures 6 and 7 here]

Figure 6 shows the difference in the output effects with respect to financial openness under the mean split approach and figure 7 does the same with respect to trade openness. Figure 6 reaffirms the finding of figure 4 that (a) there is little to no effect of financial openness during the crisis (i.e., that the difference in the output effects of the two groups hovers around zero) and (b) that after the financial crisis, financially open economies continue to perform better than their closed counterparts, a behavior that persists both during the European debt crisis as defined earlier *and* the subsequent recovery period. Thus, there is little surprise here when compared to figure 4. The difference comes with respect to trade openness, when comparing figure 7 with figure 5, due to the greater magnification of figure 5 and also the use of "difference" representation. Here, we find that while both the Great Recession period *and* the subsequent debt crisis period (2010.Q1 to 2013.Q3) show evidence of a negative impact of trade openness, the *recovery period indicates open economies catching up*, a result that is difficult to discern from figure 5. Note that this effect while still in the upward trajectory it is still below zero implying the open countries are not yet at parity with their closed counterparts, as of our last data point (2018.Q4).

We back up the results in these figures by comparing the average differenced output effect in one period to the average differenced output effect in another period[27]. Since the differenced output effect is just the output effect in the open countries minus that in the closed countries, the higher is the differenced output effect, the better is the performance of the open countries compared to

[26] Difference in output effect = average output effect for open countries – average output effect for closed countries
[27] The differenced output effect between open and closed countries is what has been plotted in figures 6 and 7

their closed counterparts. As such, a positive (negative) realization of the difference between the two periods (more recent period minus the preceding period), in this differenced output effect, suggests that on average, open countries performed better (worse) in the more recent period than their closed counterparts. These results are reported in panel A of table 1 in which each cell is the change in differenced output effects between the period represented by the ith row and the jth column. For example, Cell (1, 1) is the difference in the output effect during the recession minus the difference in the output effect during the pre-crisis period. Bootstrapped standard errors are reported in parenthesis[28]. Panel B reports the magnitude and significance of the slope of the change in the output effect in each period. A positive and significant coefficient here suggests that on average, open countries outperform their closed counterparts in that period. A combination of the results in these two panels: A and B, provide evidence in support of the observations in the figures.

Insert Table 1

Grid 1 provides results with respect to the financial openness splits, and we see that there is no difference in differenced output effects between the pre-crisis period and the recession, with performance in the more financially open countries outstripping their closed counterparts in subsequent periods as evidenced by the positive and statistically significant cell entries. This is further corroborated in panel B where we see a negative slope during the recession and positive slopes during the EU debt crisis and the recovery period[29]. The story in grid 2 (Panel A) also mirrors the observations in figure 7 with trade openness splits showing a worsening effect in the

[28] We opt for bootstrapped standard errors as each period has a small sample size that could lead to large standard errors. Bootstrapping is especially necessary as the underlying distribution from which our sample is drawn is unknown and as such, we cannot assume normality in generating standard errors.

[29] Even though we see a significantly negative coefficient in panel B during the recession, which captures a worsening performance of the more open countries, the difference in performances during the recession as shown in panel A, is statistically no different than it was during the pre-crisis period.

open countries compared to their closed counterparts across all periods except in the recovery period. In examining the difference between the recovery period and the preceding EU debt crisis period (cell (3,3) in grid 2: Panel A), we now find a positive, although statistically insignificant, difference between the two periods, where all other comparison had showed a worsening effect. This supports the uptick that we identify in figure 7, especially when we see confirmation of this uptick characterized by the positive slope during the recovery period in panel B, showing the better performance in the more open countries via trade during the recovery period. As in the previous case, we also examine varying the different definitions of open versus closed economies and report the results in the appendix.[30]

5 ROBUSTNESS CHECKS: ADDRESSING ENDOGENEITY AND IDENTIFICATION

5.1 Endogeneity

It is possible that the observed "uptick" in the performance of the financially more open economies since 2009.Q4, i.e., post Great Recession (figure 6), is due—at least in part--to countries either reducing their exposure to financial openness as a matter of policy, or their financial sector naturally contracting as a consequence of the financial crisis itself. If this is true, it would imply that the benefit of financial openness in delivering superior performance post-crises is overstated.

[30] Using the same 20th percentile openness cutoff as before now tells a much more nuanced story. From figure 6a in the appendix, we find that more financially open economies do worse during the tail end of the crisis and the entirety of the European debt crisis. Interestingly, the negative effect seems to dissipate during the recovery period, i.e., post 2014, with open countries not only catching up, but exceeding their closed counterparts (i.e. converging towards 0 and then exceeding it). Figure 7a which captures the differences in output effect for the 20th percentile split with respect to trade openness is consistent with mean split results (figure 7) as well as with the 20th percentile results for financial openness (figure 6a). We find that in all three cases, the recession and the debt crisis show evidence of a negative impact of trade openness, while the *recovery period shows the open countries catching up to their closed counterparts*. (One difference with financial openness, i.e., with figure 6a, is that unlike the latter, this upward trajectory has not yet reached the point where open economies would outperform their more closed counterparts. The corresponding table A.4 in the appendix also support these observations.

A similar argument can be made for trade openness, though here the uptick is observed after 2013.Q3, marking the start of the European financial recovery (figure 7).

A second possibility that could also contribute to overstating the positive effect of financial openness to recovery post-crisis, is that the upward tick may have been due to stimulus packages infused into the economy by governments. For this to be the case however, we must either assume that only open countries receive stimulus packages (which is not the case), or that open countries somehow benefitted more from such a package. This latter point would actually reinforce the positive role of financial openness.

If countries' openness ratio falls *because* of the crisis (so that it is an endogenous response to the crisis), we would expect that the financial and/or trade sectors contract by *more* than the general level of economic activity. To address this challenge, we construct another counterfactual output after the onset of the crisis in which the openness ratio is fixed and held to the ratio prevailing at the onset of the Great Recession, i.e., the average quarterly level of openness in 2007. (See below for details). If the restorative performance of financial openness since 2009.Q4 (figure 6) or trade openness since 2013.Q3 (figure 7) were *not* because open countries become less open, we should continue to observe a difference in the output effects between open and closed economies similar to what we saw in figures 4 and 5, implying that endogeneity is *not* the reason for the "uptick". But if endogeneity *is* the cause, the recovery period uptick would vanish. [31].

[31] In carrying out this exercise, we note the fact that this approach preserves the 2007 relationship between openness and GDP throughout the post crisis period, and as such, we are assuming a symmetric relationship between openness and GDP with respect to the degree of openness, when this may not be the case. If indeed lower levels of openness have a different impact on output than higher levels, then this counterfactual may be under or overstated, depending on the degree and direction of the asymmetry. We have no way of adjusting for such an asymmetry in this setting but present this observation as a potential caution with which these results should be viewed.

5.1.1 Creating the "constant openness" output counterfactual.

With the above background, we use the average openness measures in 2007 to create output levels that correspond to observed trade levels post 2007:Q4. i.e.

$$O_{2007}^{j} = \frac{j_{2007}}{GDP_{2007}} \qquad (3a)$$

$$CGDP_t = \frac{j_t}{O_{2007}^{j}} \qquad (3b)$$

Where j is total trade flows or financial flows in level terms (as in figures 2 and 3), *O* is the measure of openness (trade or finance to GDP in 2007) and CGDP is the counterfactual output level from 2008: Q1 to 2018: Q4. In doing this, the post 2007: Q4 openness ratio (i.e. $\frac{j_t}{CGDP_t}$) corresponds to the average 2007 openness ratio ($O_{2007}^{j} = \frac{j_{2007}}{GDP_{2007}}$), resulting in a constant openness measure for the entire period. The difference between our initial AR-generated counterfactual output and the present constant openness-generated counterfactual output (CGDP), yields the "output effect" if countries had maintained the same level of openness after the onset of the crisis. This implies that the counterfactual GDP generated in this exercise, is different from observed output and the projected output created by the AR process as it is solely driven by the trade (finance) levels post crisis, i.e., if trade (finance) levels go up, CGDP goes up and vice versa, thus maintaining the openness ratios.

5.1.2. Endogeneity Results

[Insert figures 8 and 9]

Figure 8, which incorporates the endogeneity effect for financial openness, indicates a stark contrast to figure 6: the previously upward sloping curve now turns downward. Thus, countries' *reduction* of exposure to global finance appears to be the sole reason why financial openness has first a somewhat positive and then a strongly positive effect, during and after the financial crisis, respectively. Figure 8, indicates that had financially open countries remained equally exposed during and after the crisis, they would have suffered more than their closed counterparts in both cases. We are able to confirm these results in Grid 1 of Table 2. When compared to Grid 1 of Table 1, we see financially open countries consistently underperform compared to their more closed counterparts in every subsequent period, as evidenced by the negative and statistically significant entries in each cell both in level (Panel A) and in slope (Panel B), whereas the reverse was the case for the corresponding cells in Table 1. The stark contrast between figures 6 and 8 is particularly intriguing and highlights the importance of properly addressing endogeneity in macroeconomic studies of this nature. Now we turn our attention to trade openness.

Insert Table 2

Figure 9 repeats our approach for the case of trade openness. Here, a comparison with figure 7 shows that during the recovery (post 2013) the "uptick" present in figure 7, is still present in this endogeneity corrected result. The *slope* coefficients in tables 1 and 2 for grid 2 (the corner right cell in both tables) are both positive and significant, confirming this result.[32] Similarly, for the

[32] The fact that the slope coefficient in the endogeneity-corrected result in table 2 is larger than its counterpart in table 1 while visually, the appearance of the slopes is *reverse* (figure 7 looks steeper than figure 8) is simply a consequence of scale differences between the two figures.

previous two periods, the Great Recession period and the end of Great Recession to EU Debt Crisis period (2010-2013), a comparison of Grid 2 in Tables 1 and 2 as well as figures 7 and 9 are all consistent indicating that trade-wise open economies continued to underperform compared to their closed counterpart. In summary, these results indicate that, unlike finance, withdrawal from trade did not confer any benefits to the economies of our sample. If anything, we see an earlier turn around, suggesting that more trade-wise open economies would have caught up with their closed counterparts even before the European debt crisis was officially over, had they not withdrawn. For robustness check, we also examine the effect of choosing a different cut-off for open versus closed[33].

5.2. Identification strategy: Developing A Placebo Counterfactual

A counterargument to our findings is that some other unobserved or as at yet, unidentified characteristic is responsible for these findings ranging from contagion to other idiosyncratic characteristics. We propose a placebo test in the next subsection that addresses these concerns. But since *size* may be a particularly prominent potential underlying factor to explain the degree of openness (with larger countries being less open, using the de-facto measures of openness), we preface our placebo test with an examination of this specific question. Table 3 provides summary statistics that compare the difference in the average size of countries to the difference in degree of openness.

Insert table 3

[33]The 20th percentile split, with endogeneity in finance accounted for, confirms the mean split results of figure 8: any previously positive effect of financial openness, post financial crisis, or European recession now vanishes. Similarly, when endogeneity is accounted for, the 20th percentile results for trade also confirm the mean split results

Not surprisingly, we find that differences in the degree of openness between "open" and "closed" economies far exceeds differences in the size between "open" and "closed" economies. Specifically, from table 3, based on the financial openness split, there is at most a 1.12% difference in average log GDP between open and closed countries, which drops to only a 0.37% difference if US is excluded. By contrast, we see an enormous 431.59% difference between these groups when considering the difference in the average openness levels. Table 3 indicates similar patterns when the split is done according to trade openness. While this table illustrates that size variations cannot account for variations in the level of openness, it does not rule out other unobserved factors. Ruling out *all* such factors is only possible with the aid of our placebo test which we describe below.

Specifically, to formally address such identification issues, we rely on proof by contradiction and create a placebo counterfactual: We will show that once the difference in trade openness is eliminated, we will no longer observe the familiar patterns previously observed throughout the trade openness results, i.e., the downturn during the crisis and "uptick" during the recovery[34]. Ideally, we would study the performance of two countries with identical levels of openness for each time period in our sample and determine whether there is a difference in economic performance between these two similarly open countries. However, there is no guarantee that we can find such a pair in our sample, and on the off chance we do, it would significantly reduce the sample size and create a bias when comparing results in this exercise to those previously obtained. This is where the matching component of the synthetic control method (SCM) comes to the rescue. Since our identification strategy involves matching countries with similar levels of openness, we employ the matching process from SCM to construct counterfactuals that match the degree of

[34] In light of the endogeneity results above, the identification test is more pressing for the trade openness split since the results still hold and less so for finance. Hence, we focus solely on trade.

openness for each country in our dataset. This process generates a much closer match per country than using any other method (e.g., propensity score matching) and allows us to carry out this analysis for *all* the countries in our earlier results, eliminating any sample bias when comparing placebo results to the original ones.

5.2.1 Constructing the "similar openness" counterfactuals

SCM produces the closest synthetic match for *every* country in the sample closely mirroring its level trade openness for the entire period of investigation. This is possible because every country from the dataset is a "treated" country, with all other countries serving as the control set. With the objective of matching levels of openness, weights are obtained to minimize the difference between openness levels of the treated country and the potential counterfactual. This is detailed below.

For a treated country i and a set of J control countries, let $\boldsymbol{W} = (w_1, w_2, \dots, w_j)$ be a $(J \times 1)$ vector of non-negative weights, where w_j is the weight applied to control country j in the resulting counterfactual corresponding to a given treatment country i. The optimal matrix $\boldsymbol{W}$ is obtained by minimizing the expression,

$$(\boldsymbol{X_1} - \boldsymbol{X_0}\boldsymbol{W})'\boldsymbol{V}(\boldsymbol{X_1} - \boldsymbol{X_0}\boldsymbol{W}) \qquad (4)$$

subject to $w_j \geq 0 \; for \; all \; j$ and $w_1 + w_2 + \cdots + w_j = 1$, where $\boldsymbol{X_1}$ is a $(K \times 1)$ vector of openness predictors for the treated country; $\boldsymbol{X_0}$ is a $(K \times J)$ matrix of the same K predictors for the J possible control countries, $\boldsymbol{V}$ is a diagonal matrix of non-negative components reflecting the importance of different openness predictors[35]. The optimal choice of $\boldsymbol{V}$ is one where the resulting synthetic control best matches the openness of the treated country.

[35] The predictors used in this case are financial openness, total assets, total liabilities, exports, imports and GDP. Results of the synthetic control matching process are available in sections 4, 5 and 6 of the online appendix.

The optimal weight vector $\boldsymbol{W}^*$ is applied to the openness levels of the control countries to obtain the resulting synthetic control. i.e. if we define $\boldsymbol{Y_1}$ as a $(T \times 1)$ vector of openness levels for the treated country and $\boldsymbol{Y_0}$ as a $(T \times J)$ matrix of openness levels for the control countries, the synthetic control for the treated country will be the $(T \times 1)$ vector $\boldsymbol{Y_1}^*$, such that

$$\boldsymbol{Y_1^*} = \boldsymbol{Y_0}\boldsymbol{W}^* \qquad (\mathbf{5})$$

Unlike the traditional synthetic control method, we assume the entire period in our study (1996:Q2 to 2018:Q4) is the "pre-treatment" period which enables us to generate openness matches for all periods. We are able to do this because we are not concerned with the effect of the crisis on the levels of openness and so have no need for a traditional pre and post treatment period[36].

To obtain counterfactual output effects, we apply the same weights obtained from the openness matching process to the output effects of the set of control countries for each "treated' country. As a result, we have counterfactual output effects for each country in our sample with the assumption of similar openness levels.

5.2.2 Placebo Results

Figure 10 replicates figure 5 by plotting the average output effect for both the treated countries and their (matched) counterfactuals. The figure provides strong evidence that matching levels of openness does not yield significant differences in output effects. The strength of this result is further appreciated when we note that the output effect was *not* included in the construction of the "similar openness" counterfactual.

[Insert figure 10 here]

[36] See Abadie and Gardeazabaal (2003) or Abadie et. al (2010) for more on the matching process of the synthetic control method.

We also carried out one additional placebo exploration by asking what happens when we separate out the countries based on levels of openness as we have done in the past. First, we split countries into "open" and "closed" based on their pre-crisis level of openness relative to overall mean openness. We then matched each open and each closed economy with its synthetic control counterpart. Results showed again that once the trade openness differential is removed for each group, the pattern of evolution of trade openness effects established in figures 7 and 9 no longer holds.[37]

6 CONCLUSION

In this paper, we develop a new approach to study the complex interrelationship between globalization and crisis. Using the Great Recession as the study's focus, we examine how this event may have adversely affected economies *more* exposed to it, and how it may (or may not) have later ameliorated the lingering consequences of those same effects on those same economies. Further, having the European economies as the study's principal group to investigate, our findings also yield insights on the role of openness during a Euro-specific crisis, the European Debt crisis. Besides methodology, our approach is distinct in its long run perspective examining *how* and *why* economies converged (or not) to their new equilibria long after the crisis.

Our approach has required us to ask some basic questions such as, "how the crisis or its impact should be measured?" or "what would have happened had countries not turned inwards, as they did, while the crisis unfolded?" Both these questions, and others, have forced us to construct a variety of counterfactuals, each tailored to answer a different question.

[37] Results for this exercise as well as that for the 20th percentile cutoff are available on request from the authors but are not included for the sake of brevity.

To do all this, we use data on 30 countries over 44 quarters (Q1-2008 to Q4-2018) as part of our larger dataset that begins at Q2-1996 (total of 91 quarters). Our *initial* results seem to echo what some others had found; that economies more open to trade suffered more during the crisis, while financial openness did little during the crisis. By taking a long run approach, given the subsequent availability of data, we are able to add to these findings and show that openness in the long run, whether via finance or trade, does prove restorative as open economies catch up quicker to their closed counterparts. But when we ask a deeper question of "how these results would change when we take into consideration the fact that countries' global exposure *declined"* (either as a matter of policy response to the crisis, or contraction of the trade and financial sector due to the crisis), our results take a dramatic turn, signifying a departure of our paper from similar studies. When such endogeneity is accounted for, using a counterfactual in which exposure is held at pre-crisis levels, we find that the inconsequential role of financial openness found before the endogeneity correction, occurred *because countries international financial exposure actually declined.* Had this not happened, the Great Recession would have adversely affected the financially open economies *more* severely both during afterwards. By contrast, the earlier findings on the restorative role of trade openness remained robust to this endogeneity test as well as to a further robustness placebo test, designed to address identification issues.

One potential policy implication arises based on the positive effects of trade openness and applies in our post pandemic world as economies seek to rebuild. Our findings indicate that free trade agreements going forward (both bilateral and multilateral) should include clauses that incentivize sustained trade relationships during times of financial turmoil, due to its stabilizing effect on the economy.

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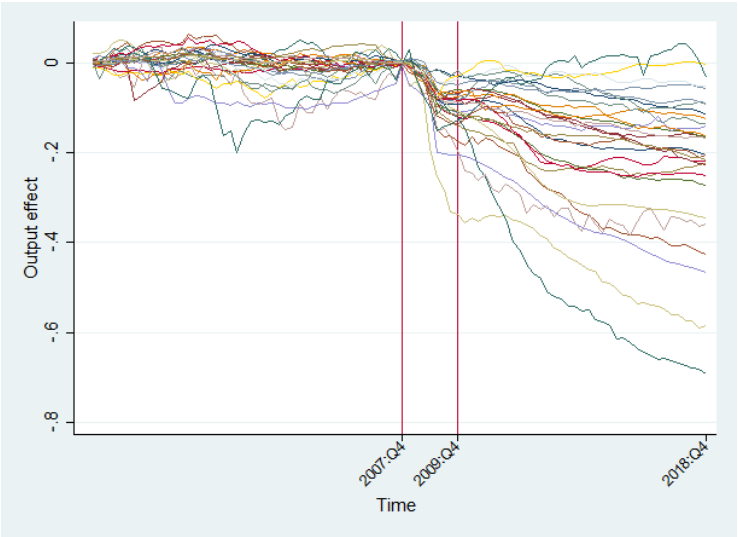
FIGURES

Figure 1: Estimated crisis impact on output for the pre and post crisis periods



The figure displays the output effect of the 2008 crisis on the countries in our sample. The effect is the difference between forecasted output using a country's own history pre 2008 and observed output (see section 2.2 for more detail). As a result, post 2008 forecasts are counterfactuals where the recession never took place and as such, the difference post 2008 is thus attributed to the impact of the crisis. Pre 2008, the effects are expected to bunch up around zero to show no impact of the crisis with any deviations attributed to unavoidable prediction error.

Finance and Trade Levels

Fig 2: Finance levels

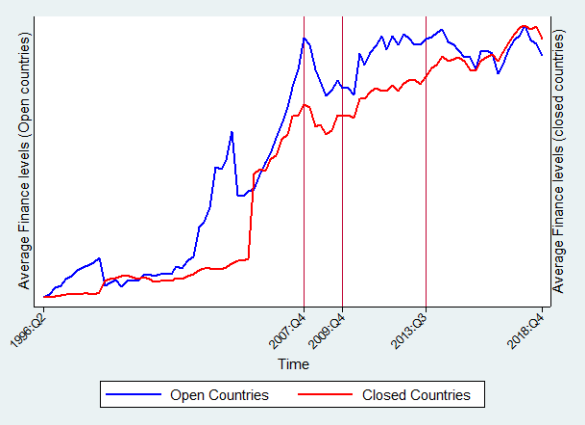
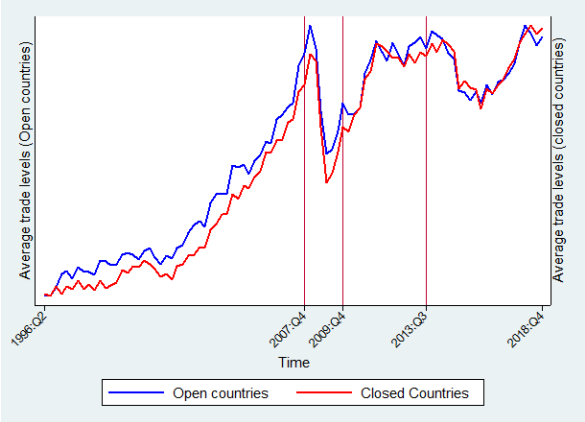


Fig 3: Trade levels



The figures above show the average levels of financial exposure (Assets plus liabilities) and trade exposure (Exports plus imports) in the two groups of countries in our sample (open and closed according to the cutoffs in each openness type). There are two key takeaways: 1. It is clear that both groups withdrew from international markets during the crisis (became less open) and 2. Post crisis, there are continuous fluctuations in levels of exposure. These points show a clear need to address the endogeneity that results from countries adapting openness levels as a result of the detrimental effects of crises.

Mean splits.

Figure 4: Low vs. high levels of financial openness (FO)

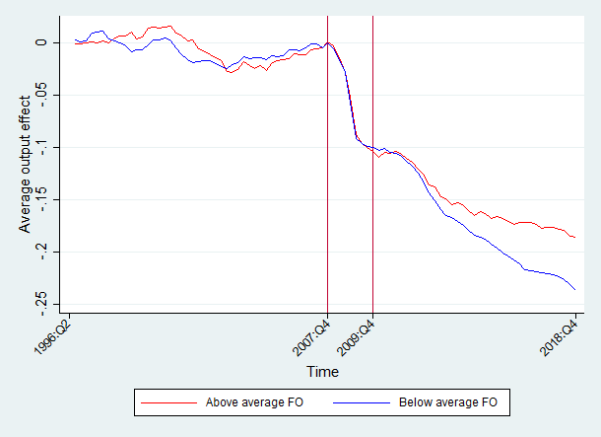
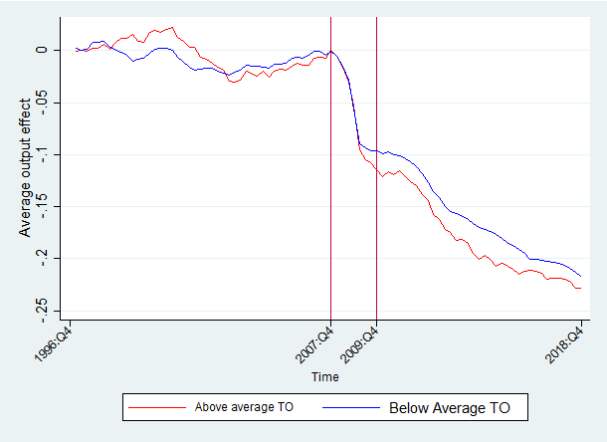


Figure 5: Low vs. high levels of trade openness (TO)



The figures above show the average output effect for each group of countries stratified according to their level of openness. Figure 4 shows the stratification using the financial openness measure while figure 5 shows the trade openness stratification. Groups are split using the average level of pre-crisis openness levels. (See figures 4a and 5a in the appendix for robust splits at the twentieth percentile cutoffs). With these splits, we see differing effects of financial openness and trade openness with more open countries via trade suffering more as a result of the crisis while those more open via finance seemingly better off (see figure 8 for more on the effect of financial openness).

Effect of openness during and after the crisis

Fig 6: Difference in output effect (Finance mean split)

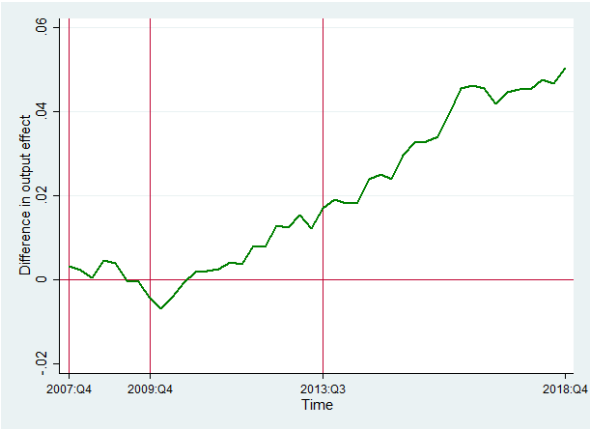
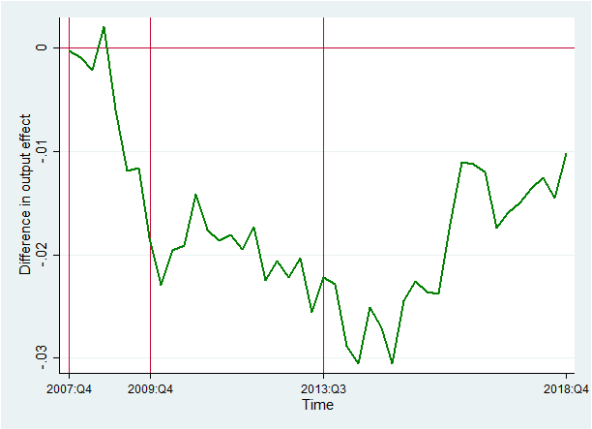


Fig 7: Difference in output effect (Trade mean split)



Figures 6 and 7 above capture the difference between the output effects of the open and closed countries from figures 4 and 5 respectively. This is done in order to take a more in depth look at evolving behavior post crisis, as such; the pre-crisis period is not introduced. These figures corroborate the findings in the literature, which suggest that financial openness had no effect during the crisis and move beyond to show that it seemed to have a positive effect on countries that were more financially open before the crisis in its aftermath. The trade split also corroborates the literature, which suggests that trade openness was detrimental, but we extend this and show that these more open countries pre crisis are catching up faster to their closed counterparts. See table 1 for the statistical analysis associated with these figures.

Effect of openness during and after the crisis (corrected for endogeneity)

Fig 8: Difference in output effect (finance mean split)

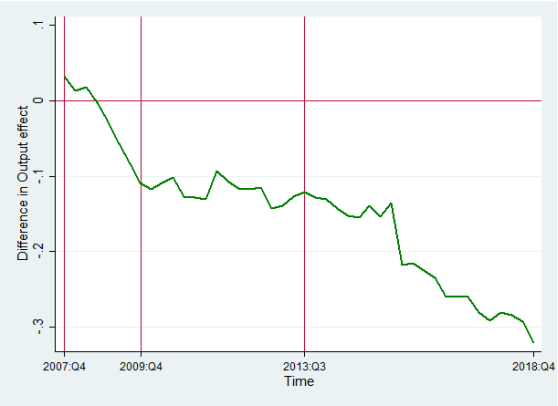
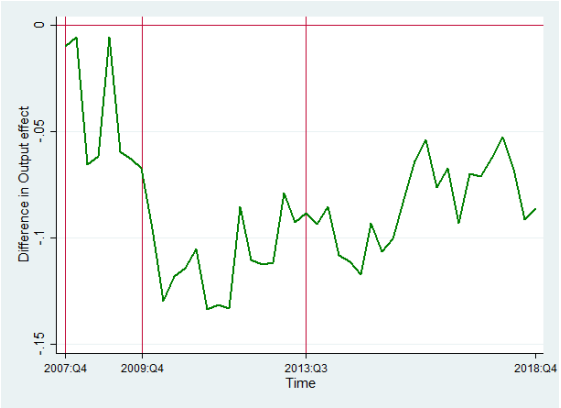
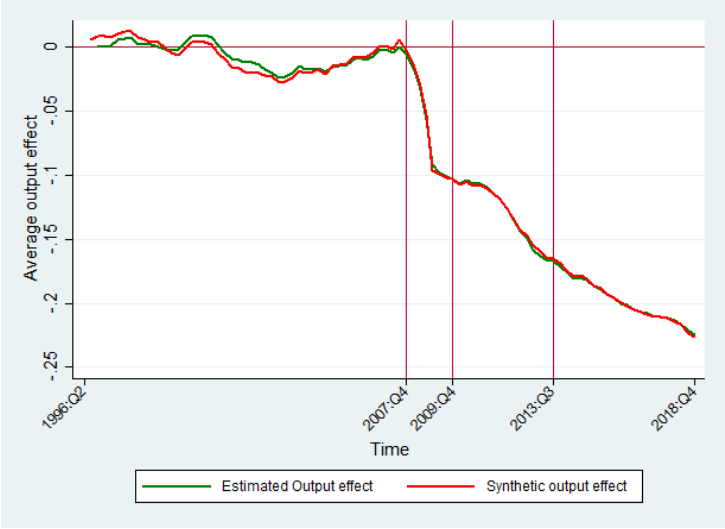


Fig 9: Difference in output effect (trade mean split)



Figures 8 and 9 above capture the difference between the output effects of the open and closed countries after correcting for the endogeneity, which stems from countries adapting their openness levels to the crisis (which took the form of withdrawal during the crisis as shown in figures 6 and 7). We corrected for endogeneity by holding the openness constant at their 2007 levels and projecting this constancy to create a secondary output counterfactual. This also implies that we assume the openness-output relationship established in 2007 continues to hold (See section 5.11). Here we see that the benign effect of financial openness during the crisis and its subsequent positive effect have now been eliminated suggesting that had countries not withdrawn, the effects would have been much worse. With respect to trade however, we still observe the same pattern of restoration, suggesting that the effects of trade openness is robust to this endogeneity concern See table 2 for the statistical analysis associated with these figures.

Figure 10: Actual vs. "similar openness" counterfactual Average output effects



The figure above much like figures 2 and 3 show the average output effect for each group of countries stratified according to their level of openness. The difference is that the "other group" has similar levels of openness. We generate effects for this group by creating counterfactuals for each country in our sample such that their levels of trade openness for each quarter is as close as possible. We do this using the matching component of the synthetic control method. (See section 5.2). The figure shows how well the synthetic control group on average matches the average effect of all countries and acts as the first indicator, which suggests that similar openness levels yield similar output effects.

TABLES

Table 1: Mean Splits (corresponding to figures 6 and 7)

Panel A: Difference in the Mean difference effects between defined periods						
	Grid 1: Financial openness			Grid 2: Trade Openness		
	Recession	EU debt	Recovery	Recession	EU debt	Recovery
Pre-crisis:	-0.0006	0.004*	0.034***	-0.01***	-0.023***	-0.023***
1996:Q2 – 2007:Q4	(0.0018)	(0.002)	(0.003)	(0.002)	(0.002)	(0.002)
Recession:		0.005**	0.035***		-0.014***	-0.013***
2008:Q1 – 2009:Q4		(0.002)	(0.003)		(0.003)	(0.003)
EU debt:			0.030***			0.0005
2010:Q1 – 2013:Q3			(0.003)			(0.002)

Panel B: Slope of difference effects in each defined period							
Pre-crisis	**Recession**	**EU debt**	**Recovery**	**Pre-crisis**	**Recession**	**EU debt**	**Recovery**
-0.0002**	-0.0008**	0.002***	0.002***	-0.0004***	-0.003***	-0.0003	0.0009***
(0.0001)	(0.0003)	(0.0001)	(0.0001)	(0.0001)	(0.0005)	(0.0002)	(0.0001)

Each ijth cell in **panel A** is the difference in differenced output effects between the period represented by the ith row and the jth column (where differenced output effect itself is defined as average effect of open countries minus average effect of closed countries) with bootstrapped standard errors are in parentheses. For example, Cell (1, 1) is the difference in the output effect during the recession minus the difference in the output effect during the pre-crisis period. A positive entry implies that on average, the differenced output effect in the more recent period is larger than in the older period, which indicates a better performance in the open countries when compared to their closed counterparts in the more recent period. The key variable to note here is cell (3, 1) in each grid, which shows the difference in the output effect during the recovery period minus the difference in the output effect during the European debt crisis. We can thus confirm the restorative effects of trade openness or at the very least given the non-significance, we can say that trade openness halted the deteriorating effects observed as we moved from the recession to the EU debt crisis. **Panel B** provides additional evidence by reporting the magnitude and significance of slopes of the differenced output effect in each period. Here, a positive and significant slope suggests that on average, open countries outperform their closed counterparts in that period. This is certainly the case for both recovery periods.

Table 2: Addressing endogeneity: Mean Splits (corresponding to figures 8 and 9)

Panel A: Difference in the Mean difference effects between defined periods					
	Grid 1: Financial openness			Grid 2: Trade Openness	
		EU debt	Recovery	EU debt	Recovery
Recession:		-0.09***	-0.19***	-0.07***	-0.04***
2008:Q1 – 2009:Q4		(0.018)	(0.02)	(0.01)	(0.01)
EU debt:			-0.1***		0.026***
2010:Q1 – 2013:Q3			(0.01)		(0. 006)

Panel B: Slope of difference effects in each defined period					
Recession	**EU debt**	**Recovery**	**Recession**	**EU debt**	**Recovery**
-0.02***	-0.001*	-0.01***	-0.007**	0.002*	0.002***
(0.002)	(0.0006)	(0.0005)	(0.002)	(0.0009)	(0.0006)

Each ijth cell in **panel A** is the difference in differenced output effects between the period represented by the ith row and the jth column (where differenced output effect itself is defined as average effect of open countries minus average effect of closed countries) with bootstrapped standard errors are in parentheses. For example, Cell (1, 1) is the difference in the output effect during the recession minus the difference in the output effect during the pre-crisis period. A positive entry implies that on average, the differenced output effect in the more recent period is larger than in the older period, which indicates a better performance in the open countries when compared to their closed counterparts in the more recent period. The key variable to note here is cell (3, 1) in each grid, which shows the difference in the output effect during the recovery period minus the difference in the output effect during the European debt crisis. We now see that correcting for endogeneity eliminates the positive effects of financial openness as each period now shows a worse performance than the preceding period for more financially open countries. Trade openness however appears robust to the endogeneity correction and in fact now shows larger and more significant restorative effects. **Panel B** provides additional evidence by reporting the magnitude and significance of slopes of the differenced output effect in each period. Here, a positive and significant slope suggests that on average, open countries outperform their closed counterparts in that period. This is certainly the case for the recovery period with the trade openness split but not in the case of financial openness. This provides further evidence that preventing countries from withdrawing from the international financial markets would have had significant negative effects.

Table 3: Summary statistics contrasting the difference between country size and openness levels between open and closed countries

Financial openness split				
	Natural log of GDP			
	Average	minimum	maximum	% difference in averages
Open	26.6	22.8	28.8	
Closed	26.9	23.5	30.3	-1.12%
Closed(w/o USA)	26.7	23.5	29.1	-0.37%
	Financial openness			
	Average	minimum	maximum	
Open	6.49	3.48	13.86	
Closed	1.22	0.14	2.89	431.97%
Closed(w/o USA)	1.16	0.14	2.89	459.48%
Trade openness split				
	Natural log of GDP			
	Average	minimum	maximum	% difference in averages
Open	26.1	22.8	27.4	
Closed	27.1	23.5	30.3	-3.69%
Closed (w/o USA)	26.9	23.5	29.1	-2.97%
	Trade openness			
	Average	minimum	maximum	
Open	0.17	0.13	0.32	
Closed	0.08	0.01	0.12	112.5%
Closed (w/o USA)	0.08	0.01	0.12	112.5%

APPENDIX

Table A.1: Pre-crisis degree of fit between AR generated counterfactual and observed output

Country	SSPE	Country	SSPE	Country	SSPE	Country	SSPE
Australia	0.009	Estonia	0.024	Israel	0.034	Slovak Republic*	0.255
Austria	0.004	Finland	0.045	Italy	0.011	Spain	0.002
Belgium	0.003	Germany	0.017	Korea	0.025	Sweden	0.007
Brazil	0.072	Greece	0.017	Netherlands	0.007	Switzerland	0.007
Canada	0.016	Hungary	0.018	New Zealand	0.012	Turkey*	0.307
Chile	0.047	Iceland*	0.200	Poland	0.062	United Kingdom	0.005
Czech Republic	0.009	India	0.066	Portugal	0.033	United States	0.010
Denmark	0.009						

* The three countries marked with a star, are those whose pre-crisis SSE values are further than one standard deviation away from the mean of all countries. In the online appendix, we produce robust results to show that these findings are not driven by those countries with larger than average SSE.

Table A.2: Country groups split by financial openness.

Mean Split		**20th percentile split**	
More open	**Less open**	**More open**	**Less open**
Austria	Australia	Australia	Brazil
Belgium	Brazil	Austria	Czech Republic
Denmark	Canada	Belgium	Estonia
Germany	Chile	Canada	Hungary
Iceland	Czech Republic	Chile	India
Netherlands	Estonia	Denmark	Korea
Sweden	Finland	Finland	Poland
Switzerland	Greece	Germany	Slovak Republic
United Kingdom	Hungary	Greece	Turkey
	India	Iceland	
	Israel	Israel	
	Italy	Italy	
	Korea	Netherlands	
	New Zealand	New Zealand	
	Poland	Portugal	
	Portugal	Spain	
	Slovak Republic	Sweden	
	Spain	Switzerland	
	Turkey	United Kingdom	
	United States	United States	

Table A.3: Country groups split by Trade openness

Mean Split		**20th percentile split**	
More open	Less open	More open	Less open
Austria	Australia	Austria	Australia
Belgium	Brazil	Belgium	Brazil
Denmark	Canada	Canada	Chile
Finland	Chile	Czech Republic	Greece
Iceland	Czech Republic	Denmark	India
Netherlands	Estonia	Estonia	Poland
Sweden	Germany	Finland	Turkey
Switzerland	Greece	Germany	United States
	Hungary	Hungary	
	India	Iceland	
	Israel	Israel	
	Italy	Italy	
	Korea	Korea	
	New Zealand	Netherlands	
	Poland	New Zealand	
	Portugal	Portugal	
	Slovak Republic	Slovak Republic	
	Spain	Spain	
	Turkey	Sweden	
	United Kingdom	Switzerland	
	United States	United Kingdom	

Table A.4: Twentieth percentile splits (corresponding to figures 6a and 7a)

Difference in the Mean difference effects between defined periods							
	Financial openness			Trade Openness			
	Recession	EU debt	Recovery	Recession	EU debt	Recovery	
Pre-crisis:	-0.0006	0.004*	0.03***	-0.04***	-0.08***	-0.08***	
1996:Q2 – 2007:Q4	(0.002)	(0.002)	(0.003)	(0.007)	(0.002)	(0.003)	
Recession:		0.005**	0.03***		-0.04***	-0.04***	
2008:Q1 – 2009:Q4		(0.002)	(0.003)		(0.007)	(0.007)	
EU debt:			0.03***			-0.003	
2010:Q1 – 2013:Q3			(0.003)			(0.003)	
Slope of difference effects in each defined period							
Pre-crisis	**Recession**	**EU debt**	**Recovery**	**Pre-crisis**	**Recession**	**EU debt**	**Recovery**
-0.0001	0.004**	-0.002***	0.001***	0.0001	-0.007***	-0.002***	0.001***
(0.0002)	(0.001)	(0.0002)	(0.0000)	(0.0001)	(0.001)	(0.0002)	(0.0001)

Each ijth entry in **panel A** is the difference in differenced output effects between the period represented by the ith row and the jth column (where differenced output effect itself is defined as average effect of open countries minus average effect of closed countries) with bootstrapped standard errors are in parentheses. For example, Cell (1, 1) is the difference in the output effect during the recession minus the difference in the output effect during the pre-crisis period. A positive entry implies that on average, the differenced output effect in the more recent period is larger than in the older period, which indicates a better performance in the open countries when compared to their closed counterparts in the more recent period. The key variable to note here is cell (3, 1) in each grid, which shows the difference in the output effect during the recovery period minus the difference in the output effect during the European debt crisis. We can thus confirm the restorative effects of trade openness or at the very least given the non-significance, we can say that trade openness halted the deteriorating effects observed as we moved from the recession to the EU debt crisis. **Panel B** provides additional evidence by reporting the magnitude and significance of slopes of the differenced output effect in each period. Here, a positive and significant slope suggests that on average, open countries outperform their closed counterparts in that period. This is certainly the case for both recovery periods.

Table A.5: Addressing endogeneity: Twentieth percentile Splits (corresponding to figures 6a and 7a)

Difference in the Mean difference effects between defined periods						
	Financial openness			Trade Openness		
		EU debt	Recovery	EU debt	Recovery	
Recession:		-0.03***	-0.07***	-0.08***	-0.01***	
2008:Q1 – 2009:Q4		(0.01)	(0.01)	(0.02)	(0.02)	
EU debt:			-0.04***		0.07***	
2010:Q1 – 2013:Q3			(0.01)		(0.01)	
Slope of difference effects in each defined period						
	Recession	**EU debt**	**Recovery**	**Recession**	**EU debt**	**Recovery**
	-0.006**	-0.001	-0.006***	-0.01*	-0.002	0.002**
	(0.002)	(0.001)	(0.001)	(0.005)	(0.001)	(0.001)

Each ijth entry in **panel A** is the difference in differenced output effects between the period represented by the ith row and the jth column (where differenced output effect itself is defined as average effect of open countries minus average effect of closed countries) with bootstrapped standard errors are in parentheses. For example, Cell (1, 1) is the difference in the output effect during the recession minus the difference in the output effect during the pre-crisis period. A positive entry implies that on average, the differenced output effect in the more recent period is larger than in the older period, which indicates a better performance in the open countries when compared to their closed counterparts in the more recent period. The key variable to note here is cell (3, 1) in each grid, which shows the difference in the output effect during the recovery period minus the difference in the output effect during the European debt crisis. We now see that correcting for endogeneity eliminates the positive effects of financial openness as each period now shows a worse performance than the preceding period for more financially open countries. Trade openness however appears robust to the endogeneity correction and in fact now shows larger and more significant restorative effects. **Panel B** provides additional evidence by reporting the magnitude and significance of slopes of the differenced output effect in each period. Here, a positive and significant slope suggests that on average, open countries outperform their closed counterparts in that period. This is certainly the case for the recovery period with the trade openness split but not in the case of financial openness. This provides further evidence that preventing countries from withdrawing from the international financial markets would have had significant negative effects.

FIGURES

Low vs high levels of openness: 20th percentile splits

Figure 4a: Low vs. high levels of financial openness (FO)

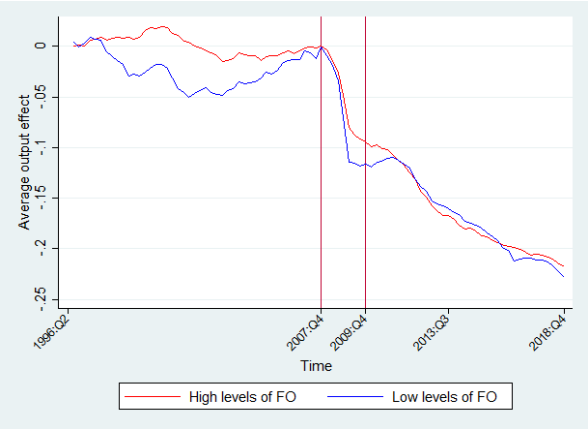


Figure 5a: Low vs. high levels of trade openness (TO)

The figures above show the average output effect for each group of countries stratified according to their level of openness. Figure 4a shows the stratification using the financial openness measure while figure 5a shows the trade openness stratification. Groups are split using the average level of pre-crisis openness levels. (See figures 4 and 5 in the main paper for splits at the mean cutoffs). With these splits, we see differing effects of financial openness and trade openness with more open countries via trade suffering more as a result of the crisis while those more open via finance seemingly better off (see figure 8a for more on the effect of financial openness).

Effect of openness during the crisis (20th percentile split)

Fig 6a: Difference in output effect (FO)

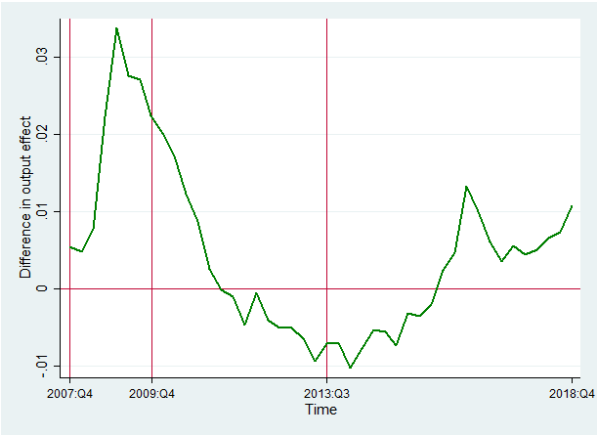
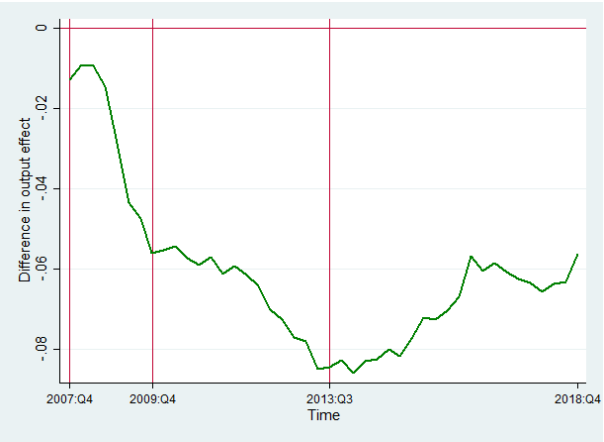


Fig 7a: Difference in output effect (TO)



Figures 6a and 7a above capture the difference between the output effects of the open and closed countries from figures 4a and 5a respectively. This is done in order to take a more in depth look at evolving behavior post crisis, as such; the pre-crisis period is not introduced. In contrast to the mean split, we see that the positive effects of financial openness during the recession becomes negative during the debt crisis and shows signs pf a restorative effect during the recovery period. We also see similar patterns with respect to trade openness splits. See table 4a in the appendix for the statistical analysis associated with these figures.

Effect of openness during the crisis corrected for endogeneity (20th percentile split)

Fig 8a: Difference in output effect (FO)

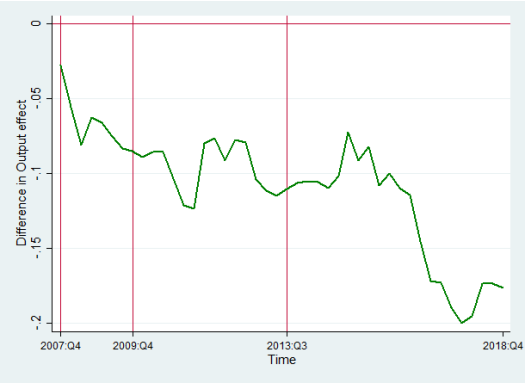
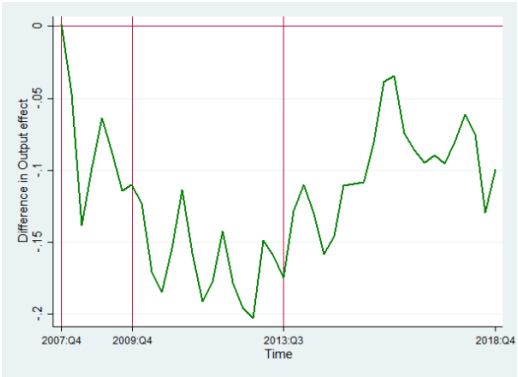


Fig 9a: Difference in output effect (TO)



Figures 8a and 9a above capture the difference between the output effects of the open and closed countries after correcting for the endogeneity, which stems from countries adapting their openness levels to the crisis (which took the form of withdrawal during the crisis as shown in figures 6 and 7). We corrected for endogeneity by holding the openness constant at their 2007 levels and projecting this constancy to create a secondary output counterfactual. This also implies that we assume the openness-output relationship established in 2007 continues to hold (See section 5.11). Here we see that the restorative effect of financial openness has now been eliminated suggesting that had countries not withdrawn, the effects would have been much worse. With respect to trade however, we still observe the same pattern of restoration, suggesting that the effects of trade openness are robust to this endogeneity concern. See table 5 for the statistical analysis associated with these figures.