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The international transmission channels of US supply and demand shocks: Evidence from a non-stationary dynamic factor model for the G7 countries

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ABSTRACT

We employ a multi-country non-stationary dynamic factor model to assess spillover effects and transmission channels of US supply and demand shocks on a variety of macroeconomic variables in individual non-US G7 countries. We find that trade, financial and confidence channels all play a significant role in the international transmission of US shocks. However, the results point to substantial heterogeneities of shock transmission across the individual G7 economies. In particular, we find negative transmission effects for Italy and Japan as the only two G7 countries not well integrated into global value chains. Moreover, the exchange rate responses of Germany, France and Italy turn out to be far less pronounced in comparison to the other G7 economies which we relate to their membership of the euro area and their coordinated monetary policies prior to the establishment of the euro. Whereas we document a close comovement of stock market dynamics across the G7 countries, we find credit and real estate markets to be less synchronized. We do not find the effects and transmission channels to be fundamentally affected by the post-2008 economic environment.

1. Introduction

Macroeconomic shocks originating in the US have proved to play a pivotal role in shaping international business cycles. The 2008 world financial crisis which followed a severe bust of the US housing market and triggered a strong worldwide economic recession is only the most recent example of economic turmoil stemming from the US and spreading through different transmission channels into the world economy. Similar evidence is provided by the simultaneous economic slowdowns observed in the group of the G7 countries in 2001 which are believed to have their roots in the US following the bursting of the New Economy bubble (Monfort, Renne, Rüffer, & Vitale, 2004). Such international transmission can also be observed for positive US supply shocks. For example, the late 1990s were characterized by technology-driven gains in US productivity which substantially contributed to international economic growth (Eickmeier, 2009). However, as Helbling et al. (2007) note, while the timing of US booms and recessions seems relatively well synchronized with worldwide economic conditions, different countries are affected in varying strength and duration. In this context, Georgiadis (2015) demonstrates that receiving-country characteristics such as trade openness, industry structure, financial market linkages

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or labor market rigidities are among the major driving forces of shock transmission. Proper responses to these shocks in individual countries render a detailed knowledge of the likely spillover effects essential.

To shed light on both such spillover effects and the transmission channels of changes in the US business cycle, we identify US supply and demand shocks from a multi-country non-stationary dynamic factor model and estimate the responses of a variety of macroeconomic variables in individual non-US G7 countries. Beside innovations in technology, supply shocks may comprise shocks to labor supply or cost-push shocks, as defined e.g. in Smets and Wouters (2003), whereas demand shocks include consumer preference shocks, changes in investment adjustment costs, or government spending shocks. While the literature on the spillover effects of US monetary policy effects is dense (see e.g. Bluedorn & Bowdler, 2011; Canova, 2005; Kim & Roubini, 2000; Kim, 1999), evidence regarding the global transmission of US supply and demand shocks is relatively sparse. Previous literature investigating this issue focuses on aggregates of country groups. Schneider and Fenz (2011) estimate a small-scale two-country vector-autoregression (VAR) model for the US and euro area aggregates, documenting significant positive spillover effects on output and prices to the euro area. In a large-scale global VAR, Feldkircher and Huber (2015) find US supply and demand shocks to positively affect output and prices in different regions of the world. Whereas interest rates and exchange rates are identified as the major transmission channels, significance levels turn out to be relatively low, which may be a possible indication of heterogeneous responses within these country groups.

In general, we are able to broadly confirm these results. We find a positive US demand shock to translate into immediate but short-lived growth in real output and sustained price inflation both in the US and individual non-US G7 countries. A positive US supply shock leads to a prolonged increase in output growth rates while depressing price developments in most countries. However, our results reveal distinct cross-country differences. These findings indicate that the aggregation of supposedly similar countries indeed neglects important country-specific responses to US shocks.

Furthermore, we analyze in detail the transmission mechanisms through which the US shocks feed into the world economy. Eickmeier (2007) studies the spillover effects and the international transmission channels of US supply and demand shocks on the basis of a bilateral two-country factor model for the US and Germany. She finds the US shocks to affect the US and German economies symmetrically, where both the trade channel and interest rates play a major role in the international shock transmission. However, by focusing exclusively on the US and Germany, her analysis is unable to capture the simultaneous responses of other major trading partners in the transmission process. We overcome this drawback by using a multi-country dynamic factor model to estimate the responses of a variety of macroeconomic variables in individual non-US G7 countries. This way we broaden the analysis of Eickmeier (2007) to a larger number of countries without having to resort to country aggregates. We thus avoid running into the curse of dimensionality of having to economize on the number of variable per country and hence the potential number of transmission channels. Furthermore, we utilize a procedure recently proposed by Barigozzi, Lippi, and Luciani (2016) in using the (potentially) non-stationary time series rather than their first differences to estimate the model. This procedure allows to keep and evaluate the long-run information of the data within the factor model. In contrast to stationary factor models we are thus able to directly interpret also the long-run impulse responses, a desirable feature especially in the context of supply shocks. Also it allows us to investigate the simultaneous dynamic interactions between those countries together making up half of world gross domestic product (GDP). The deepening of world real and financial market integration intensifies the interdependencies especially between those countries which are heavily engaged in cross-border trade. Any major macroeconomic shock will therefore cause economic repercussions that should be controlled for. A multi-country dynamic factor model allows us to account for such multilateral second- and higher-order spillover effects.

Our results confirm that both real and financial channels play a significant role in the international transmission of US shocks. Apart from output, interest and exchange rates, we also find stock, credit and housing markets as well as business and consumer sentiment indicators to be important contributors to the international dissemination of US shocks. However, the relative importance of all these channels shows substantial country heterogeneity, thereby revealing important country characteristics in the international transmission of US shocks. We also investigate the impact of the post-2008 economic environment that emerged in the aftermath of the global financial crisis. We do not detect systematic changes in the transmission of the shocks, neither in the US nor on the international level.

The remainder of the paper is structured as follow. Section 2 lays out the dynamic factor model, Section 3 describes the data and elaborates on the setup of the model, Section 4 presents the results, Section 5 reports on various robustness checks, and Section 6 concludes.

2. A multi-country non-stationary dynamic factor model

Based on Bernanke, Boivin, and Eliasz (2005), Giannone, Reichlin, and Sala (2005), Stock and Watson (2005) and Forni, Giannone, Lippi, and Reichlin (2009), factor models have become a frequently employed approach to analyse large-dimensional data sets. Applications to the effects of macroeconomic shocks include Forni and Gambetti (2010), Hanisch (2017) and Luciani (2015) on the national level and Eickmeier (2007) and Barigozzi, Conti, and Luciani (2014) for analyses of cross-country effects. Factor models assume each time series to be driven by few common shocks, consistent with the observation of international business cycle co-movements. Additionally, idiosyncratic shocks affect only sub-groups of variables and can be thought of as regional or sectoral shocks, specific to one or a certain group of countries or sectors. As such, factor models offer a realistic representation of the data, especially in the data-rich environment of a multi-country setting.