



By force of demand: Explaining cyclical fluctuations of international trade and government spending

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ABSTRACT

This paper explores the role of demand shocks, as an alternative to productivity shocks, in driving both domestic and international business cycles within the international real business cycle (IRBC) framework. In addition to those well-documented domestic business cycle fluctuations (e.g., the volatility and cyclicity of output, consumption, investment, labor hours, and labor productivity) and international business cycle properties (e.g., the countercyclical net export and the comovement puzzle), this paper focuses on two additional stylized facts in the industrialized countries: the procyclical trade openness (the GDP fraction of trade volume) and the countercyclical government size (the GDP fraction of government spending). Using a parsimonious dynamic stochastic general equilibrium model, we show that the model's predictions under productivity shocks are not consistent with these facts. Instead, a demand-shock-driven model replicates the above facts while matching other domestic and international business cycle properties. An estimated version of the model confirms the quantitatively important impacts of demand shocks.

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1. Introduction

The purpose of this paper is to explore the role of demand shocks for both domestic and international business cycles.¹ As in this paper, some authors have shown that, as an alternative to productivity shocks, demand shocks have different yet important implications for international comovements.² However, the cyclical fluctuations of international trade and government spending and the comovement between these two variables have not been fully explored. In this paper, we investigate the potential of an international real business cycle (IRBC) model driven by demand shocks and show its ability to explain a large set of regularities observed in the data of industrialized countries.

The defining feature of this paper is to explore an important but largely ignored cyclical property of international trade: the procyclical trade openness, customarily calculated as the ratio of trade volume (imports plus exports) to output. Data from the industrialized countries show that both imports and exports are procyclical and trade openness decreases (increases) during economic recessions (expansions).³ This interesting finding implies that trade volume responds more than output to exogenous

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¹ The preference shock, modelled as a shift to the marginal utility of consumption, is introduced in this paper. According to Gali et al. (2005), preference shock can be interpreted “more broadly as a real demand shock”. We show that, with the model specification in Section 3, it is indeed the case.

² Important contributions on preference/demand shocks include Auernheimer and Trupkin (2014), Baxter and King (1991), Bencivenga (1992), Blankenau et al. (2001), Gali et al. (2005), Hall (1997), Heathcote and Perri (2013), Hirata (2014), Holland and Scott (1998), Stockman and Tesar (1995), and Wen (2007), among others.

³ See the statistics for G7 countries reported in Section 2 and Engel and Wang (2011).

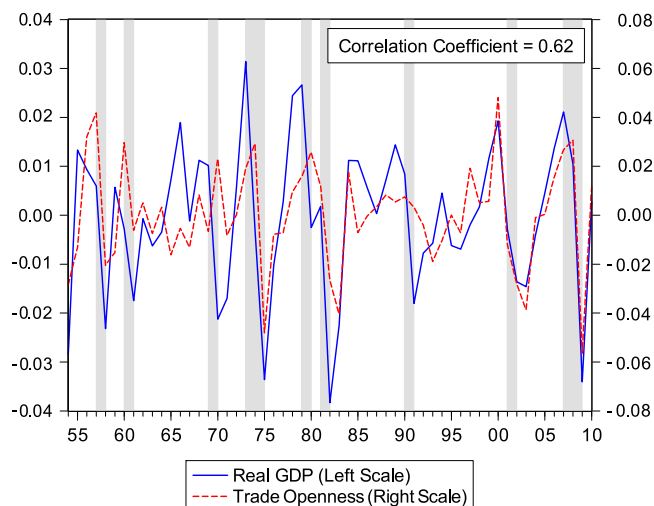


Fig. 1. Real GDP and trade openness over business cycles in the U.S.

Note: This figure plots the H-P filtered components of real GDP and trade openness (the ratio of trade volume to output) for the United States during the period 1954–2010. The shaded areas represent recessions dated by NBER. Data Source: PWT 7.1.

shocks over business cycles. For example, during the period of the Great Recession, the nominal GDP in the United States drops approximately by 2% from 2008 to 2009; in contrast, trade volume drops by approximately 20% during the same period, about 10 times the size of that change in the nominal GDP. The drop of trade volume is so prominent during this crisis that this phenomenon has been termed as the “Great Trade Collapse” (Alessandria et al., 2010). It turns out that this pattern of trade volume fluctuations is not specific to this period. Fig. 1 plots the cyclical fluctuations of real GDP and trade openness for the United States during the period 1954–2010, with both series detrended with the Hodrick-Prescott (1997) filter. We observe a significantly positive comovement relation between these two variables. This *procyclicality* of trade openness is not unique to the United States. When we calculate the correlation of trade openness and real output over business cycles for other G7 countries, we are informed of the average correlation coefficient of 0.51.⁴ Looking at this pattern from the eye of an IRBC model, we show that a conventional productivity-shock-driven model cannot generate the procyclical trade flows and trade openness. This is because the investment dynamics dominates the trade flows: imports increase but exports do not when the economy is hit by a positive productivity shock. Therefore trade volume does not increase sufficiently compared to output. On the contrary, a demand-shock-driven model predicts a larger demand-induced increase of imports and exports than output in the presence of exogenous demand shocks. The predicted procyclicality of imports, exports, and trade openness is consistent with the data. In an estimated version of the model in Section 6, we find that demand shocks account for 34–65% of the variations of the U.S. trade openness. Our analysis implies that the recent Great Trade Collapse may be largely demand-driven.

Another feature of our demand-shock-driven model is its ability to explain the cyclical properties of government consumption.⁵ Data from the industrialized countries show that government consumption is either acyclical or countercyclical while government size (the GDP fraction of the government consumption) is unambiguously countercyclical, consistent with the notion of countercyclical fiscal policy.⁶ Take the United States as an example. The contemporaneous correlation between real government consumption (government size) and real GDP is -0.23 (-0.74). Fig. 2 plots the real GDP, government size, and government consumption over business cycles for the United States during the period 1954–2010. All series are H-P filtered. From Fig. 2, we observe a negative comovement between output and government size. During all recessions (the shaded areas), there is a significant and almost instantaneous jump in government size. Fig. 2 also shows that this negative relationship is not driven by a flat government consumption; instead, a moderate countercyclical government consumption contributes to the significant countercyclicality of government size. This phenomenon does not uniquely apply to the United States. A calculation on the correlation of government size (government consumption) and output for G7 countries reveals that the average correlation coefficient is -0.77 (-0.16). When we evaluate the performance of a productivity-shock-driven IRBC model on government spending, its prediction is counterfactual. In the presence of a positive productivity shock, the large positive wealth effects induce more private and public consumption. Therefore government consumption under productivity shocks is predicted to be procyclical, which is counterfactual. On the contrary,

⁴ The data come from PWT 7.1. All series are from 1950 to 2010 but the time span of different countries varies due to its availability. Our calculations are based on the H-P filtered series.

⁵ Ambler and Paquet (1996) analyze the optimally determined public investment and government spending over business cycles within a closed economy RBC model. Ravn (1997) and Roche (1996) explore the cyclical performance of government spending in an open economy. However, government spending in both studies is specified as exogenous fiscal shocks, not endogenously determined. Roche (1996) shows that government spending could potentially facilitate a standard IRBC model to match the key stylized facts in the data.

⁶ See, for example, the discussions in Kaminsky et al. (2005).

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