



Trend shocks and economic development[☆]

Claude Francis Naoussi^a, Fabien Tripier^{b,*}

^a University of Nantes (Lemna), France

^b University of Lille 1 (Clerisé) & CEPII, France

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ABSTRACT

This article explores the role of trend shocks in explaining the specificities of business cycles in developing countries using the methodology introduced by Aguiar and Gopinath (2007). We specify a small open economy model with transitory and trend shocks on productivity to replicate the differences in the business cycle behavior observed between developed, emerging, and Sub-Saharan Africa countries. Our results suggest a strong relationship between the weight of trend shocks in the source of fluctuations and the level of economic development. The weight of trend shocks is (i) higher in Sub-Saharan Africa countries than in emerging and developed countries, (ii) negatively correlated with the level of income, the quality of institutions, and the size of the credit market, and (iii) uncorrelated with the volatility of aid received by countries, the inflation rate, and the trend in trade-openness.

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1. Introduction

Developing countries, widely-known to be among the poorest of the world, are also among the most unstable economies, and these economies have the highest volatilities of output and consumption. This article explores the role of trend shocks in explaining specificities of business cycles in developing countries. Because developing countries are very heterogeneous, we draw distinction between a set of emerging countries, which are middle-income countries, and Sub-Saharan Africa (SSA) countries, which are low-income countries. To assess the relationship between trend shocks and economic development as a whole, we also consider a set of high-income developed countries.

The instability of developing economies, which has been documented by Ramey and Ramey (1995) and Rand and Tarp (2002), generates substantial costs that may be measured, directly, through the welfare costs of consumption fluctuations, as demonstrated by Pallage and

Robe (2003),¹ and indirectly through the consequences on growth, as discussed in Loayza et al. (2007). The recent literature attempts to rationalize this instability within the modern business cycle framework based on dynamic and stochastic general equilibrium models.² Many studies on this topic have examined emerging countries,³ but few have looked at SSA.⁴ The few studies that do exist have advanced possible explanations for the high output volatility that characterizes these economies, but none succeeds in explaining both the high volatility of consumption, which is higher than the volatility of output, and the acyclical behavior of net-exports, which are countercyclical in emerging countries.

Kose and Riezman (2001) propose a model in which trade shocks account for a large portion of output fluctuations. When these shocks are combined with transitory productivity shocks, however, the model

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* Corresponding author.

E-mail addresses: claudio.naoussi-defounkou@univ-nantes.fr (C.F. Naoussi), fabien.tripier@univ-lille1.fr (F. Tripier).

¹ The excess volatility of consumption explains the high welfare costs of fluctuations computed by Pallage and Robe (2003) for developing countries, which are at least 10 times greater than those in the United States.

² In their precursory contributions, Mendoza (1995) and Kydland and Zarazaga (1997) apply modern business cycle methodology to emerging countries. This approach has also been pursued by Neumeyer and Perri (2005) and Aguiar and Gopinath (2007).

³ Emerging countries are mainly in Latin America or Asia, but are also in North Africa. Among the SSA countries, only South Africa is generally considered an emerging country. Emerging countries experience both accelerating growth and crisis events.

⁴ Mendoza (1995) and Kose (2002) consider the average behavior of a group of developing countries that encompasses middle- and low-income countries, including several SSA countries. In this paper, we employ an alternative approach that differentiates SSA countries from other developing countries.

predicts a volatility of consumption that is half that of output and predicts a strongly countercyclical trade balance.⁵ Arellano et al. (2009) emphasize the role of shocks to the aid received by countries in explaining the fluctuations in one African country, Ivory Coast. However, this economy is not representative of African business cycles because consumption is as volatile as output in Ivory Coast. In addition, the authors do not discuss the model's implications for the cyclical behavior of net exports. In Özbilgin (2010), transitory productivity shocks are amplified in low-income countries by the limited participation of agents in financial markets. This financial friction increases the relative volatility of consumption compared to output, but it remains below unity. Moreover, this friction reinforces the countercyclical behavior of the trade balance, which is acyclic in low-income countries.⁶ The inability of these models to explain the high volatility of consumption should be interpreted with caution because of data limitations that render durable–nondurable decomposition impossible, whereas consumption is nondurable consumption in most business cycle models. To address this issue, Alvarez-Parra et al. (2011) study countries where data permit such decomposition. They show that the relative volatility of nondurable consumption to output varies among emerging countries (for example, it is 0.89 for Mexico and 1.20 for Chile), but on average nondurable consumption is not more volatile than output.⁷ Because data for SSA countries prohibit such decomposition, we use aggregate consumption as usually done in the literature but keeping in mind this limit. Ultimately, the existing literature fails to provide a convincing explanation of why net exports are acyclic in SSA countries. For emerging countries, Aguiar and Gopinath (2007) explain the excess volatility of consumption and the countercyclical behavior of net exports by substantial volatility in the trend growth of labor productivity in these countries. In this article, we assess the relevance of trend shocks to explain business cycle specificities of less developed countries, namely, the SSA countries.⁸

Aguiar and Gopinath (2007) consider a real business cycle model for small open economies in the spirit of Mendoza (1991) by examining the impact of two technological shocks on the technology used in the production of goods. The first is a purely transitory shock on the level of total factor productivity, whereas the second is a trend shock on the growth rate of labor productivity at the origin of the stochastic trend in the economy. Aguiar and Gopinath (2007) estimate the structural parameters necessary to reproduce key moments in the business cycles of two countries, Mexico and Canada, which exemplify emerging and developed countries, respectively. They subsequently explain the specificities of the emerging market business cycle by a higher relative weight of the trend shock (or the stochastic trend) when compared with the transitory shock, and they therefore conclude that “the cycle is the trend”.

We extend the work of Aguiar and Gopinath (2007) to include SSA countries. Aguiar and Gopinath (2007) succeed in collecting quarterly data for 26 countries (13 emerging and 13 developed). Unfortunately, quarterly data are not available for a large sample of SSA economies over a long sample period.⁹ Therefore, we have used the annual data

for a relatively long sample period provided by the World Bank macroeconomic databases. We have collected output, consumption, investment, and net exports series for 22 developed countries, 28 emerging countries, and 32 SSA countries (starting in 1960 for most countries and continuing until 2006 in our sample), and we have taken a set of eleven moments to characterize business cycles (mainly standard deviations, correlation with output, and autocorrelation of variables). The following five structural parameters of the model are estimated with GMM methods to match the business cycle facts: the standard deviations of the two shocks, the persistence of trend shocks, the size of capital adjustment costs, and the average long-run growth rate. Because we produce one estimate for each country, we can study the relationship between economic development and business cycles by comparing a large number of heterogeneous countries.

First, we generalize the conclusion of Aguiar and Gopinath (2007) for emerging countries to low-income countries as follows: there is a strong relationship between economic development and the weight of trend shocks in the fluctuations of productivity measured by the size of the random walk. Aguiar and Gopinath (2007) conclude that the size of the random walk is greater for emerging countries than for developed countries. We show that this size is even greater for the SSA countries. When compared with developed countries, the key specificity of emerging countries is the higher standard deviation of trend shocks relative to transitory shocks, which makes consumption more volatile than output and makes net exports countercyclical. To make consumption as volatile as observed in SSA countries, we could again increase the relative standard deviation of trend shocks to transitory shocks. However, it would reinforce the countercyclical behavior of net exports whereas they are rather acyclical in the data for these countries. At this point, the persistence of trend shocks is crucial to make the model consistent with data. A slightly positive persistence of trend shocks in SSA countries, which are negatively autocorrelated in emerging and developed countries, results in the simultaneous occurrence of a high relative volatility of consumption and acyclical net exports.

We then relate our results to the literature on the sources of fluctuations in developing countries.¹⁰ To this end, we compare the cross-country variations in the size of the random walk with the cross-country variations in the usual determinants of fluctuations in developing countries. Seven variables are considered, and they are the following: the mean of real income per capita, the quality of institution, the growth rate of trade openness, the volatility of aid received by countries as a percent of income, the mean of the size of the domestic credit as a percent of GDP, the mean of the inflation rate, and the mean of the size of government spending as a percent of GDP. Each of these variables has been put forward in the literature as a potential determinant of macroeconomic volatility and is indeed significantly correlated with the volatility of output for our data. By studying the correlation between these variables and the size of the random walk, we seek to identify the potential origins of the trend shocks in developing countries. We find that the size of the random walk significantly decreases with the level of income, the quality of institutions, and the size of credit market. The results are ambiguous when correlated with government spending. Interestingly, some variables that are significantly correlated with the volatility of output, are not correlated with the size of the random walk. This is the case for the inflation rate, the trend in trade openness, and the volatility of aid received by countries.

⁵ More precisely, the relative volatility of consumption is 2.02 for the data against 1.01 for the model, and the correlation of the trade balance with output is -0.10 for the data against -0.72 for the model; see Table 5(a) of Kose and Riezman (2001).

⁶ Özbilgin (2010) matches the coefficient of correlation between net exports and output observed in average for all developing countries. It is negative (and equal to -0.20) and contrary to its value for the low-income developing countries (equal to 0.01) as indicated in Table 1 of Özbilgin (2010).

⁷ Alvarez-Parra et al. (2011) report a ratio of volatility equal to 0.90 for a set of five emerging countries and equal to 0.72 for a set of six small developed economies.

⁸ With the exception of Houssa et al. (2010), the applications of business cycle models to the SSA countries cited here do not consider permanent shocks. Houssa et al. (2010) estimate a medium-scale business cycle model for the Ghanaian economy with permanent technological shocks, which appears to be the most important source of fluctuations. However, Houssa et al. (2010) do not study the model's predictions for consumption.

⁹ Peiris and Saxegaard (2007) and Houssa et al. (2010) use quarterly data for Mozambique from 1996 to 2005 and for Ghana from 1983 to 1997, respectively.

¹⁰ Raddatz (2007) and Ahmed and Suardi (2009) provide empirical studies that are not based on business cycle models, that are on the sources of fluctuations in developing countries, and that focus on SSA. Raddatz (2007) considers external shocks in relation to the international economy and natural disasters, and Ahmed and Suardi (2009) examine the role of trade and financial liberalization in creating fluctuations.

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