



# Shadow economies at times of banking crises: Empirics and theory<sup>☆</sup>



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## ABSTRACT

This paper investigates the response of the shadow economy to banking crises. Our empirical analysis, based on a large sample of countries, suggests that the informal sector is a powerful buffer, which expands at times of banking crises and absorbs a large proportion of the fall in official output. To rationalise our evidence, we build a dynamic stochastic general equilibrium model which accounts for financial and labour market frictions and for nominal rigidities. In line with the empirical literature on the shadow economy, we assume that in the informal sector access to external finance is limited, and the production technology is relatively more labour intensive. Following a banking shock in the official sector, the model predicts a large negative transmission to the unofficial economy that substantially dampens the overall effect of the shock.

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## 1. Introduction

Banking crises are typically associated with a prolonged decline in output and employment (Rajan and Zingales, 1998; Kroszner et al., 2007; Cerra and Saxena, 2008; Dell'Ariccia et al., 2008; Reinhart and Rogoff, 2009b). One less investigated issue is the behaviour of the informal economy during such episodes. Recently some contributions suggesting that the relative size of the shadow economy might be on the rise in the aftermath of the 2007 crisis (Schneider and Buehn, 2012; Elgin and Oztunali, 2012), have found considerable echo in the press.<sup>1</sup>

Understanding the shadow economy adjustment to banking crises is important for several reasons. First it makes it possible to provide a better estimate of output and employment losses.

Second, it has relevant policy implications. On the one hand, the existence of an informal sector may add resilience to the economy when times are hard. On the other hand, the erosion of the tax base greatly complicates the task of fiscal policy makers at a time of ballooning public deficits. In fact, revenue losses seem to be the main cause of the dramatic increase in debt-to-GDP ratios that typically follows the explosion of a banking crisis (Reinhart and Rogoff, 2009a).

This is the first paper where the shadow economy response to banking crises is analysed both empirically and theoretically. There are several macroeconomic methods for measuring the relative size of the shadow economy, all of which have shortcomings. For our purposes the widely used Multiple Indicator–Multiple Cause (MIMIC) approach would be inappropriate because shadow economy data sets based on the MIMIC method, such as Schneider et al. (2010), are too limited in the time series dimension of the sample. The so called Currency Demand Method (Feige, 1990; Tanzi, 1983), may cover a large sample of countries only if M1 monetary aggregates are used as a proxy for currency holdings. Unfortunately M1 is typically determined by central bank attempts to preserve liquidity in spite of the crisis. We therefore take an alternative route, based on the assumption that the rate of change in electricity consumption is a proxy for the growth rate of total economic activity (henceforth TEAg) (Schneider and Enste, 2000). We thus take the differential responses of TEAg and official output growth rates to banking crises as a broad indicator of shadow econ-

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<sup>1</sup> "A Lengthening Shadow" The Economist, August 2010 ; "Europe: Hidden Economy", The Financial Times 8th June 2011; "Shadow economies all around the world: Model-based estimates", Vox, available at <http://www.voxeu.org>.

omy dynamics. As a robustness check of our results we also consider the method that simply proxies the shadow economy share with the ratio of self-employed to the total labour force (Loayza and Rigolini, 2011).

For a large sample of countries and over a relatively long time span we find that following banking crises the *TEA* fall is very small relative to what we observe for the official output. Further, the *TEA* drop is never statistically significant if the electricity consumption growth series is filtered to control for variations in the relative price of electricity and for long-run sectoral output composition in the official economy. By contrast banking crises are followed by a deep contraction of gross capital formation in the official economy. This implies an increase in the electricity-consumption-to-GDP ratio which is particularly striking in light of the huge literature on the procyclical pattern of electricity consumption. In fact electricity consumption is used as a proxy for capacity utilisation in business cycle models, and as a leading indicator for business cycle conditions. In our view, this evidence indicates a potentially large shadow economy increase in response to banking crises. When we focus on labour market data we find that the share of self-employed workers strongly increases in response to the banking crisis. Even though the cyclical pattern of the unofficial economy cannot be directly observed, this evidence indicates a potentially large shadow economy increase in response to financial crises.

To rationalise our empirical results, we build a two-sector DSGE model that accounts for price stickiness, search frictions in the labor market, and for credit market frictions. Our characterisation of the shadow economy is consistent with two “stylised facts”. The first is that firms operating in the shadow economy have access to a relatively more labour intensive production technology (Amaral and Quintin, 2006; Koreshkova, 2006). The second is that formal and informal financial sectors coexist but are typically characterised by different degrees of efficiency in channeling funds from households to firms: it is well known that the access of informal firms to outside finance is typically limited (Banerjee and Duflo, 2007; Madestam, 2008).

Following a banking shock in the official sector, our model predicts a disruption of capital formation in the official economy. This, in turn, is associated with a fall in official output and employment. The ensuing real wage fall in the official sector favours an increase in output and employment in the unofficial economy. The sectoral reallocation of employment causes a persistent increase in the marginal productivity of capital in the unofficial sector, and triggers a surge in unofficial investment. We obtain a large negative transmission effect: when the share of the shadow economy is low (12%) 20% of the official sector contraction is absorbed by the growth of the shadow sector, when the share of the shadow economy is high (40%) the figure raises to 68%.

Previous empirical evidence on the cyclical pattern of the shadow economy is mixed. Bajada (2003) and Giles (1997) find a procyclical relationship in Australia and New Zealand, respectively. A number of studies based on the MIMIC approach support the view that the shadow economy acts as a buffer, increasing its size in periods of recession (Bajada and Schneider, 2005; Schneider and Enste, 2000; Feld and Schneider, 2010). Our theoretical results do not fully confirm this view. In fact we find that technology shocks induce a positive correlation between sectoral outputs. Thus our model does not merely predict a countercyclical behaviour of the underground economy; on the contrary, it highlights a propagation pattern which is specific to banking shocks. Our theoretical contribution adds to a small but rapidly expanding literature. Business cycle models of the informal economy basically fall into two categories. In the first there are real business cycle models that incorporate an informal sector (Conesa et al., 2001; Busato and Chiarini, 2004; Granda-Carvajal, 2010). In the second there are models that focus on the labour market, assuming either search frictions (Bosch

and Esteban-Pretel, 2012) or the dual labour market hypothesis (Fliess et al., 2010; Castillo and Montoro, 2010). None of these contributions incorporates financial frictions as important elements of business cycle fluctuations and the inter-sectoral transmission of shocks as we do in this paper. The only exception is Batini et al. (2011). Our paper differs from theirs in two key aspects: the first is the modeling strategy of financial frictions that here deliver an endogenous risk premium, while they assume exogenous risk premium shocks; the second is the focus on banking shocks, which are neglected in their contribution.

The remainder of the paper is structured as follows. Section 2 describes the data and methodology used in the empirical analysis. Section 3 presents the empirical results. Section 4 describes the theoretical model and illustrates the findings. Section 5 concludes.

## 2. Data and methodology

### 2.1. Measuring banking crises and total economic activity

We adopt the well known classification by Laeven and Valencia (2010), who focus on systemic banking crises excluding distress events that affected isolated banks.<sup>2</sup> Defining banking crises is often controversial, due to the lack of a consensual definition and the need of a certain degree of discretionary judgement. Our choice is justified by the widespread use of the classification in the empirical literature.

### 2.2. Measuring total economic activity

There are several indirect approaches for measuring the shadow economy. All of them have shortcomings since the shadow economy is by definition unobservable.

- The Multiple Indicator–Multiple Cause (MIMIC) approach pioneered by Schneider is essentially a structural model where the shadow economy is estimated from a system of equations composed of economic and institutional variables. This approach is most appropriate in identifying the structural long-run relation between the official and the shadow economy. For our purpose it has two weaknesses. First it is very demanding in terms of data, and therefore it seems unsuitable for large cross country panel data. Second, being based on a structural model, it is less suitable in identifying the response of the shadow economy to shocks such as financial crises.
- The currency demand approach (CDA) is based on the assumption that the shadow economy is cash intensive and infers the behaviour of the informal economy from the demand for currency. Unfortunately, since central banks typically modify monetary aggregates to preserve liquidity in the aftermath of financial crises, using money supply growth as a proxy for shadow economy dynamics would cause serious identification problems.
- The percentage of the active labour force that is self-employed is sometimes used as a proxy for the relative size of the shadow economy (Loayza and Rigolini, 2011). As pointed out in La Porta and Shleifer (2008) the definition of self-employment does not include unpaid family workers whose contribution to informal production is probably high. Further, it is quite obvious that self-employment can be high for structural reasons which are

<sup>2</sup> More precisely the starting year of the crises is identified by (a) deposit runs, defined as a monthly percentage decline in deposits in excess of 5%, (b) the introduction of deposit freezes or blanket guarantees, and (c) liquidity support or central bank interventions, defined as the ratio of monetary authorities' claims on banks as a fraction of total deposits of “at least 5% and at least double the ratio compared to the previous year”.

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