

Surfing the business waves: An establishment level examination in Brazil

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Version: April 30, 2015

Abstract

The important debate about how economic fluctuations affect employment in large and small businesses is currently open in the literature. This paper contributes to this debate by providing direct empirical evidence on how unemployment relates to the cyclical nature of employment in businesses of different sizes measured by employment and wages in a developing country. The paper constructs a unique monthly matched employer-employee microdata for small and large establishments in Brazil from 2000 to 2013. The stylised evidence shows that small businesses are more sensitive to business cycle conditions. The VAR estimations suggest that credit constraints hit small establishments harder and contribute to the empirical regularity that small businesses are more cyclically sensitive than large businesses.

Keywords: Firm size, jobs flows, business cycles, market structure.
JEL Classification: J2, J4, J6, E3.

1. Introduction

A recent discussion in economics literature focuses on the cyclical nature of employment at small and large businesses. In an influential paper, Gertler and Gilchrist (1994) suggest that small enterprises (SEs) are more sensitive to cyclical conditions and monetary shocks. They show that SEs contract substantially more than large enterprises (LEs) after tight money events and account for a disproportionate amount of the decline in manufacturing due to financial constraints. In contrast, recent papers by Moscarini and Postel-Vinay (2009, 2010, 2012) present new empirical evidence for a series of countries, suggesting that LEs are more sensitive to business cycles. Their findings are in line with the predictions of the dynamic job-ladder model proposed by Moscarini and Postel-Vinay (2008), where SEs hire cheaply from unemployment in times of economic downturn proportionally more than LEs. As the reservoir of unemployment dries out more productive LEs increase wages and poach workers from less productive SEs, restricting the employment growth of SEs during economic expansions. Nevertheless, Haltiwanger et al. (2014) and Fort et al. (2013) find less conclusive results about the response of LEs and SEs to unemployment over business cycles.

This discussion on the extent to which businesses of different sizes are sensitive to business cycles is critical for the formulation of labour market policies, especially during recessions. If unemployment is translated into consumption fluctuations during recessions, it has significant welfare costs (e.g. De Santis, 2007; Beaudry and Pages, 2001; Krebs, 2007). Thus, a better understanding about which type of business and worker suffer more during recessions is very important to design better theoretical models and policies aimed at dampening employment fluctuations in order to reduce economic and social costs of job losses.

This paper contributes to this debate by using, for the first time, a unique monthly employment series constructed from matched employer-employee microdata for Brazil. The paper analyses the behaviour of the differential net job flow rates (DNF) between large and small businesses, defined by employment size and establishment wages, during business cycles. Furthermore, the paper uses Vector Autoregressions (VARs) to examine the response of small and large businesses to changes in unemployment, monetary policy, and credit constraint. Importantly, the use of microdata allows us to circumvent concerns of reclassification and regression bias by classifying enterprises by their initial size in the first year of the data. Also,

using records at the employee level and at the highest temporal frequency available circumvent the composition fallacy as discussed in Caballero (1992) and Hamermesh and Pfann (1996).

The remaining of the paper is organised as follows. The next section provides a detailed description of the data. Section 3 reports the stylised facts about the correlation of net job flows differential and business cycles. Section 4 analyses the response of SEs and LEs to shocks in unemployment and credit constraints in the VAR estimations. The final section concludes.

2. Data

The employment series and differential net job flow rates are constructed using RAIS (Annual Social Information Report), the administrative data for which is collected annually by the Ministry of Labour of Brazil. Every year, by law, all formal business should report information on their business and their employees to the Ministry of Labour. If an establishment fails to provide the annual RAIS declaration, it faces automatic fines proportional to the length of the delay and the number of declarations omitted. Importantly, severance payments are based on RAIS records and thus employers and workers have a strong incentive to submit the annual RAIS declaration. The Ministry of Labour estimates that the data covers about 97% of the formal sector—3.8 million establishments and 49 million workers—as of 31 December 2013.

RAIS matched employer-employee microdata allows the construction of monthly data, as it reports the stock of employment at the end of each year and indicates the month each individual worker is hired or dismissed within each year. For instance, if a worker had two different jobs in a given year, it will appear twice in the RAIS records with the respective dismissal and admission month related to each job. Employment stock is based on the values of 31 of December 2013, and by calculating the monthly net job flows we are able to construct a monthly employment series backwards for the period from January 2000 to December 2013. Furthermore, RAIS provides the establishment identifier and allows us to classify establishments by their initial size, either by employment or wage distribution, and isolate the effects of the creation and destruction of businesses. The continuous longitudinal employment series used in

this paper encompasses 542,360 establishments and 11,442,246 workers as of December 2013.¹ To the best of our knowledge, this is the first time such longitudinal monthly data has been constructed based on matched employer-employee microdata in Brazil.²

Unemployment rate from DIEESE (Inter-Union Department of Statistics and Socio-Economic Studies) is the business cycle measure used, as it is linked to the theoretical arguments that determine the cyclicity of employment in small and large businesses in the dynamic job-ladder model.³ Also, alternative business cycle measures available at monthly frequency were collected to further explore the relationship between business size and business cycles. The seasonally-adjusted real wholesale revenue index and the manufacturing index were obtained from IBGE (Brazilian Institute for Geography and Statistics).

3. Stylised Facts: Business Size and Cycles in Brazil

The DNF rates between LEs and SEs are used as a measure of the establishment's relative performance as follows:

$$DNF_t^j = \left[\frac{NET\ JOB\ FLOW_{t,LE}^j}{L_{t-1}} \right] - \left[\frac{NET\ JOB\ FLOW_{t,SE}^j}{S_{t-1}} \right]$$

where L and S are the employment level in LEs and SEs, t denotes time and j whether employment or wage criterion was used as the establishment size definition. We use the cut-offs of < 50 and > 500 employees to classify SEs and LEs by employment size as in Haltiwanger et al. (2013) and Moscarini and Postel-Vinay (2009). Alternatively, we also define establishment size using the wage distribution. Establishments are defined as high wage if they are in the top

¹ Data from the public administration, construction, and agriculture sectors were excluded from the calculation, as the Ministry of Labour warns about problems with these sectors related to omission of declarations (technical note MTE 079/2009).

² Annual longitudinal employer-employee series were constructed before for Brazil. Nevertheless, constructing monthly longitudinal data is much more complicated and requires a substantial extra amount of effort. This paper takes on this challenge and, to our knowledge, constructs for the first time a monthly longitudinal job flow series for Brazil.

³ Unemployment rate is calculated in the main metropolitan areas: São Paulo, Belo Horizonte, Porto Alegre, Recife, and Salvador.

quintile and as low wage if they are in the bottom quintile.⁴ The classification of establishments using the wage distribution has an advantage as wage is what drives the poaching mechanism. Also, as noted by Syverson (2011), wage captures marginal products of labor units. Thus, wage is more likely to be related to the productivity of an establishment than size.

The aim is to observe how the deviation from the trend of DNF correlates with a business cycle measure. We use the band-pass filter as in Christiano and Fitzgerald (2003) to extract the cyclical component of the series considering the standard cycle fluctuations between 6 and 32 quarters.

Figure 1 presents the stylised fact about the sensitivity of establishments of different employment sizes to unemployment. It presents the unconditional relationship of small and large businesses during the business cycles. The shaded areas identify Brazil's economic recessions.⁵ The cyclical component of the relative business size performance presents a decline around recessions and sharp increase after the episodes of recessions. This is also observed as the establishment size performance measure is positively correlated to the business cycle as measured by the cyclical component of unemployment. The DNF series seem to be counter-cyclical: SEs destroy proportionally more jobs than LEs later in recessions and create proportionally more jobs during expansions.

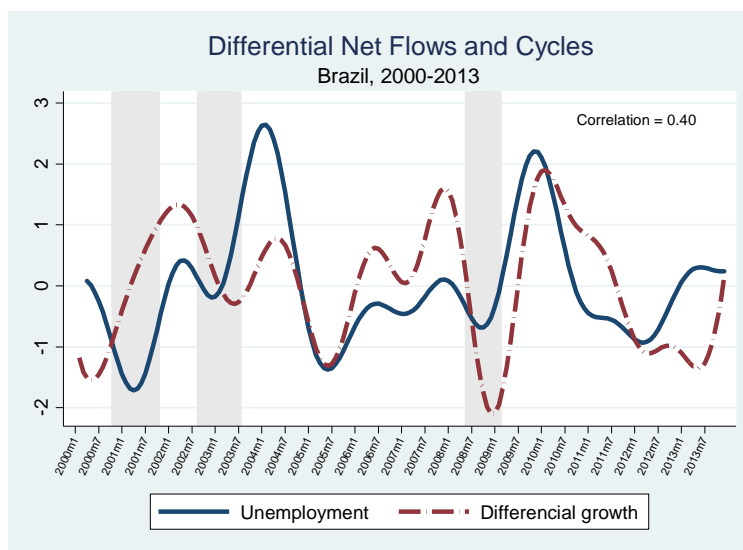


Figure 1: Differential net flows and cycles

⁴ The payment of a minimum wage is mandatory for full time employees in Brazil. To avoid distortions in the calculation of the average establishment wage and in the definition of the quantiles of the wage distribution, only full time employees that received at least one minimum wage were considered.

⁵ As dated by the Economic Cycle Dating Committee (CODACE).

Figure 2 presents a similar pattern for establishments classified by wage. The differential net job flows when establishments are classified by wage continues to be positively correlated to the cyclical component of unemployment, indicating that small business shed more jobs in times of high unemployment and hire proportionally more than larger businesses when the economy expands and unemployment rate declines. The correlations are in line with Cravo (2011) whose study for Brazil is based on aggregated data, the stylised facts presented in this paper represent a major improvement, as it is constructed based on microdata controlling for reclassification bias.

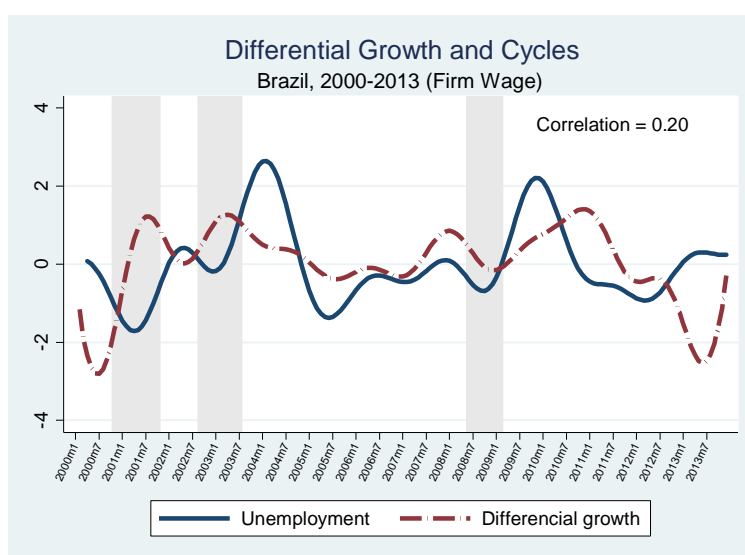


Figure 2: Differential net flows and cycles (Wage)

The correlations between DNF measures and the alternative detrended *proxies* for business cycles (Table 1) confirm the pattern observed in Figures 1 and 2.⁶ The DNF based on employment is negatively correlated with the business cycle measured by unemployment, indicating that small business hire proportionally more during times of low unemployment and shed proportionally more jobs in periods of higher unemployment. The negative correlation with wholesale and manufacturing indexes confirm the pattern that the DFN based on employment is countercyclical to business cycles and small enterprises suffer proportionately more in times of

⁶ The paper uses unemployment lagged one quarter. This is based on Attuy (2012) who follows Shimer (2012) to analyse the unemployment rate cycles in Brazil and suggests that fluctuations in the employment-to-unemployment transition affects unemployment rates with a delay of one quarter. The use of contemporaneous unemployment rate provide similar qualitative results.

decline in economic activity. The use of the alternative DFN based on the wage distribution provides similar qualitative results and also suggests that small business are more sensitive to business cycles.

Table 1. Correlations between detrended DNF and cycle measures

	DNF (employment)	DNF (wage)	Unemployment	Wholesale index	Manufacturing index
DNF (employment)	1.00	0.68*	0.40*	-0.18**	-0.36**
DNF (wage)	0.68*	1.00	0.20*	-0.56*	-0.80*
Unemployment	0.40*	0.20*	1.00	-0.41*	-0.36**
Wholesale index	-0.18**	-0.56*	-0.41*	1.00	0.70*
Manufacturing index	-0.36**	-0.80*	-0.36**	0.70*	1.00

Note: *, ** and *** denote significance at the 1%, 5% and 10% levels.

This evidence on the unconditional correlation of both DNF measures and business cycle indicators contradicts results presented by Moscarini and Postel-Vinay (2009, 2012) for the US, Denmark, France, Canada, UK, and Brazil.⁷ Other recent studies based on microdata such as Haltiwanger et al. (2014) and Fort et al. (2013) also do not lend support for the idea that SEs are less sensitive to business cycles. Hence, the claim that LEs are more sensitive to business cycles deserves better scrutiny, particularly in developing countries in which SEs are more likely to be affected by financial constraints as argued in Beck et al. (2005).

The discussion about which type of business suffers more during recessions is important as it might have social welfare implications. Theoretical and empirical research suggest that there is significant welfare costs due to consumption fluctuations during recessions (e.g. De Santis, 2007; Beaudry and Pages, 2001). Cunha e Ferreira (2004) suggest there is also a significant welfare cost of business cycle fluctuation in Brazil. If small businesses shed proportionally more employment during business cycles, understanding better this section of the economy is paramount to reduce economic and social costs of recessions. The analysis of the behavior of DNF conditional to exogenous shocks might contribute to further the understanding on the aspects that generate the unconditional relationship between DNF and unemployment presented above. Thus, the next section analyses the behavior of DNF conditional to shocks in business cycle measures.

⁷ Moscarini and Postel-Vinay (2009) use annual data for Brazil over a shorter period and allow for mortality of firms.

4. The Response of Small and Large Businesses to Shocks

To examine in more detail the relationship between DNF and cycles we follow Gertler and Gilchrist (1994) and Moscarini and Postel-Vinay (2010) and analyze the behavior of DNF conditional to shocks to business cycle related measures. By estimating VARs, the paper provides evidence and discusses how shocks to unemployment and credit constraint affect businesses of different sizes.

The VAR is estimated using unemployment (UNP), inflation rate (IPCA), DNF employment, and SELIC rate.⁸ The VAR is run with the variables in their stationary levels, and Figure 3 reports a set of impulse responses with their confidence band.⁹

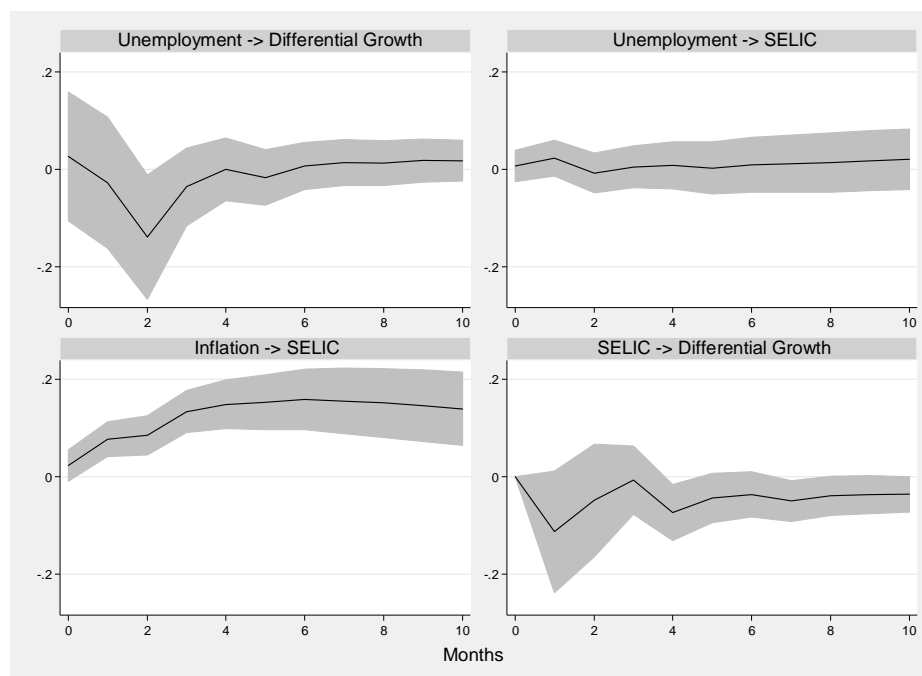


Figure 3: Impulse response functions

An interesting result is that a shock to unemployment leads to a significant decline in DNF measured by employment, a result in line with Moscarini and Postel-Vinay (2010). Nevertheless, the results do not lend support to the argument that interest rate increases during periods of expansion tend to constrain SE growth. Figure 3 shows that DNF does not tend to

⁸ SELIC is the Brazilian Central Bank's reference interest rate. The variables are ordered as in the text and the reference interest rate is placed last, as in Gertler and Gilchrist (1994), to capture the idea that monetary policy adjusts to current events but its effects operate only in the following month. Data about official inflation (IPCA) is retrieved from IBGE.

⁹ The VAR of lag order 3 is selected according to the standard AIC criteria.

increase when the SELIC increases, and a higher interest rate does not prevent SE growth. The monetary policy responds to inflation in the expected direction, a shock to inflation leads to an increase in interest rates, suggesting that the Central Bank follows the Taylor rule and is concerned with the inflation target via monetary policy response.

Figure 4 provides the same VAR impulse response functions by using DNF based on the first and last quintile of the per worker wage distribution to classify small and large business. Figure 4 suggests that DNF measured by wages does not respond to shocks in unemployment. Establishments that are at the bottom of wage per worker distribution do not hire proportionally more than high paying businesses as a result of a shock to unemployment. The poaching mechanism suggested by Moscarini and Postel-Vinay (2008, 2009, 2010, 2012) does not seem to work when establishment size is defined based on wage per worker distribution. This result is consistent with the evidence presented by Fort et al. (2013) that used a panel VAR approach and do not find support for the poaching mechanism.

As in Figure 3, the results do not lend support to the argument that interest rate increases during periods of expansion tend to constrain SE growth. Figure 4 shows that DNF declines when the SELIC increases, which suggests that a higher interest rate does not prevent SE growth. Also, the results presented in Figure 4 confirm that interest rate responds to shocks in inflation.

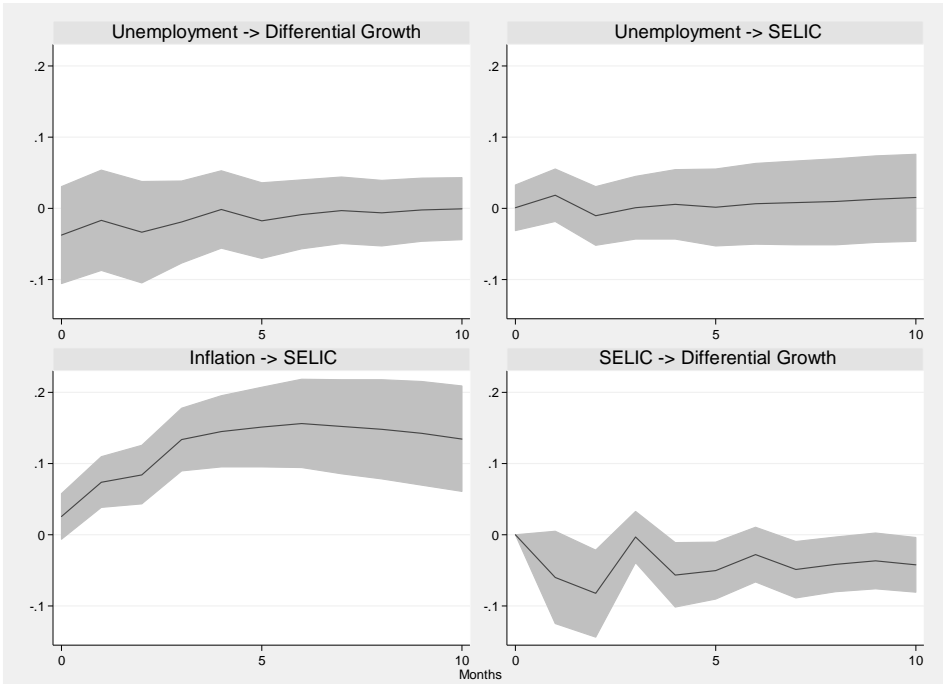


Figure 4: Impulse response functions (Wage)

Yet, SELIC is not an ideal credit constraint *proxy* due to its asymmetrical behaviour (more potent in downturns) as argued in Gertler and Gilchrist (1994). Therefore, we introduce in the VARs a more explicit credit constraint variable given by the percentage of credit operations with non-earmarked funds in arrears in financial institutions in Brazil.¹⁰ This credit constraint *proxy* is suggested in Aghion et al. (2012).

The new set of impulse responses is reported in Figure 5. The DNF constructed based on employment size continues to respond negatively to shocks to unemployment as in Figure 3. SEs classified by the number of employees hire proportionately more from unemployment than LEs. Also, the SELIC reference interest rate continues respond to inflation as in Figure 3.

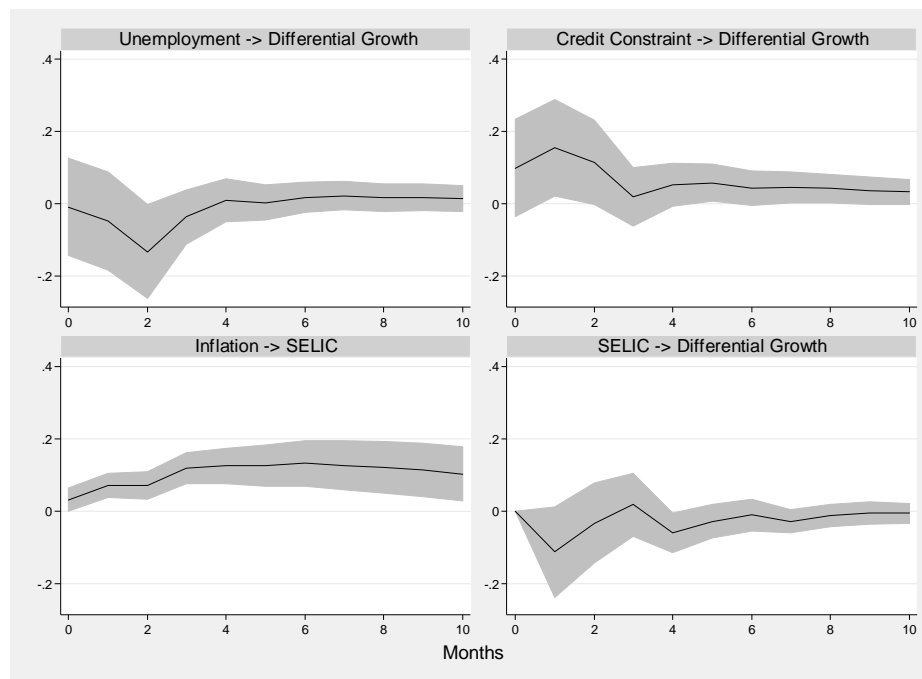


Figure 5: Impulse response functions with credit constraint

An interesting result of the VAR estimated with the introduction of a more explicit measure of credit constraint is that shocks to this variable increase DNF based on employment, suggesting that credit constraint hits SEs harder. The results provided by Figure 3 and 5 using employment cut-off to define establishment size suggest that SEs hire from unemployment proportionately more than LEs. If this effect dominates, it would lead to SEs being less sensitive to business cycles. However, Figures 1 and 2 show that the stylised fact indicates the opposite,

¹⁰ The Brazilian Central Bank provided the credit constraint series, which is available from July 2000 onwards.

SEs are more sensitive to business cycles. The results that credit constraint hits SEs harder are in line with Gertler and Gilchrist (1994) and suggest that the empirical regularity might be influenced by credit constraint.

Figure 6 shows the set of impulse responses for the VAR estimations using the wage distribution to define establishment size. The results are in line with Figure 4. DNF using wage per worker does not respond to a shock in unemployment and again as in Fort et al. (2013) the results do not find support for the poaching mechanism. This provides further evidence that SEs do not hire proportionately more than LEs in times of economic contraction and that the poaching mechanism does not work when the bottom and top quintile of the wage distribution are used to define establishment size. Furthermore, a shock to credit constraint increases DNF, reinforcing the view that SEs are more sensitive than LEs due to credit availability.

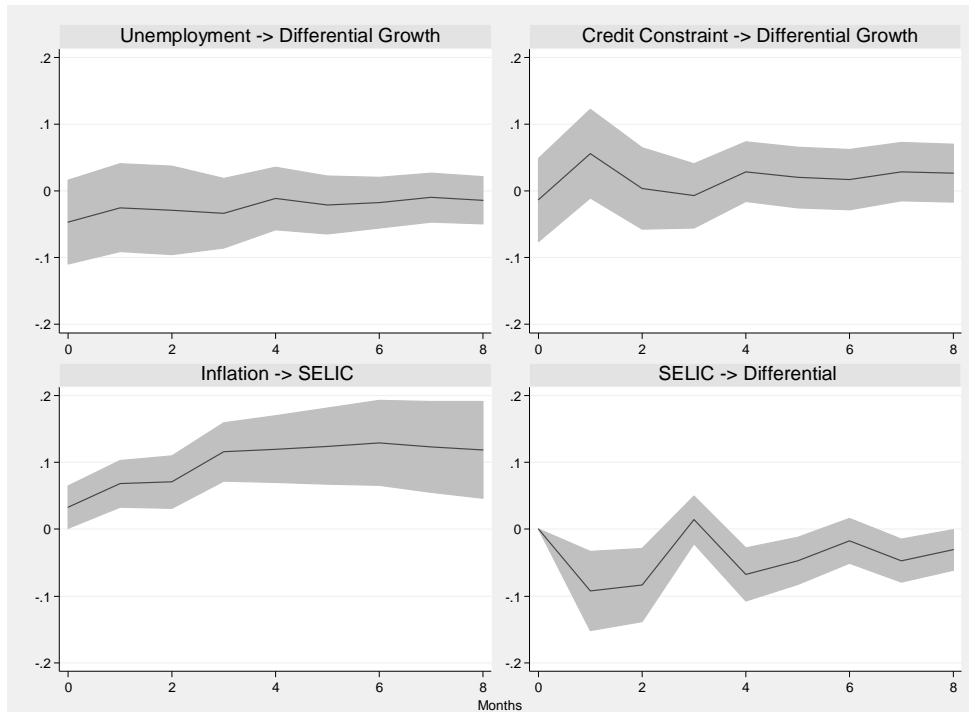


Figure 6: Impulse response functions with credit constraint (Wage)

Therefore, DNF based on employment and wage size are countercyclical to economic activity, suggesting that in developing countries SEs are more sensitive to business cycles. This pattern seems to be determined by credit constraint, regardless of whether SEs are measured by employment or wages. The effect of SEs hiring cheaply from a shock to unemployment

proportionately more than LEs, as suggested by the poaching mechanism in Moscarini and Postel-Vinay (2010), is supported only when businesses are classified by their employment size. Nevertheless, this poaching mechanism does not necessarily lead to larger businesses being more cyclically sensitive. There is no indication of the poaching mechanism when establishment size is defined by the wage per worker distribution that is likely to be more linked to the productivity of the establishments.

Concluding remarks

This paper constructs a unique longitudinal dataset and shows that smaller employers are more cyclically sensitive than larger employers in Brazil. The stylised facts show that smaller establishments classified by employment or wages have a stronger unconditional correlation with business cycle measures. The impulse response analysis suggests that small businesses hire cheaply in times of high unemployment proportionally more than large businesses only when establishment size is defined by employment, in line with the prediction of dynamic job-ladder models. There is no indication that the dynamic job-ladder models and the poaching mechanism work when wages are used to define establishment size. However, regardless on whether the establishment size is defined by employment or wages, innovations to credit constraint hit small establishments harder and support the view that small businesses are more sensitive to business cycles. Thus, credit constraints seem to be an important aspect determining the cyclicity of small business in the context of a developing country.

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