Job Ladders and Labor Productivity Dynamics

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Motivation:

Our paper in a nutshell

- Cerra and Saxena [2008, 2017], Reinhart and Rogoff [2009]
- Multiple potential channels; we want to focus on a particular mechanism: destruction of valuable labor matches
- Severe recessions have **persistent** effects on output & productivity
  - Cerra and Saxena [2008, 2017], Reinhart and Rogoff [2009]
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  - Recessions and their aftermath change the composition of employment

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Specific question:

- Is average **match quality** relevant for aggregate labor productivity variations across the business cycle? Do job ladders play a role?
    - **Job ladder:** Workers share a ranking of jobs, they climb slowly through E-E transitions, and fall off (into unemployment) because of negative shocks (Moscarini and Postel-Vinay [2018]).

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  - Previous models focus on job creation (Barlevy [2002])...
  - ...but new empirical evidence suggests a role for **job destruction** (Mueller [2017]): in the US, during recessions the pool of the unemployed shifts toward workers with high wages. These shifts are driven by the high cyclicality of separations for high-wage workers.

Our paper in a nutshell

What we do:

- Augment the standard search model with a stylized job ladder, and analyze whether the cyclical behavior of job matches affects aggregate productivity. We find:
  - In this context, standard TFP shocks cannot account for significant changes in match quality: high quality matches are hard to break
  - But exogenous **across-the-board destruction** shocks can produce significant and persistent losses on labor productivity, through match quality.
  - (work in progress) Liquidity constraints, which limit the ability of productive matches to face temporary adverse shocks, can force separations in high quality jobs

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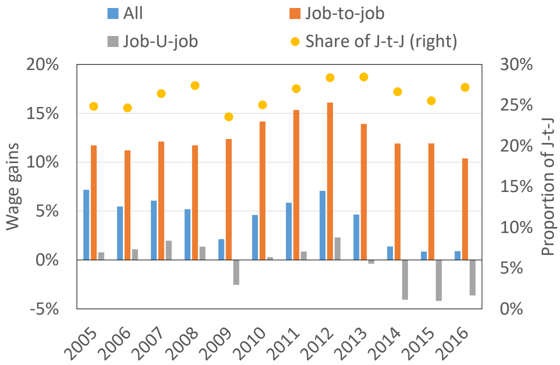
  - (work in progress) Liquidity constraints, which limit the ability of productive matches to face temporary adverse shocks, can force separations in high quality jobs
- Takeaway: Events which cause across-the-board job losses destroy matches far up in the ladder, which are relevant inputs and difficult to recover.
- Explanation: Good matches are valuable **intangible capital**, not destroyed by standard TFP shocks that reduce flows temporarily but have little effect on present value
- Potential mechanism: Financial frictions and wage rigidities that limit the ability of firms-worker matches to smooth out adverse shocks

Motivation: Micro

Significant presence of a job ladder in wages...

Figure: Wage gains (losses) of job transitions:



Source: Albagli et al. [2018] with data from the *Servicio de Impuestos Internos.* Wage gains are calculated from real wages, after controlling for year and age gains.

Motivation: Micro

... and in productivity gains as well

Figure: Productivity gains (losses) of job transitions:

Source: Albagli et al. [2018] with data from the *Servicio de Impuestos Internos.* They use mean labor productivity, calculated as sales over number of employed workers. Productivity gains are calculated as differentials between the firms of origin and destination, controlling for year and sector gains.

Literature

Creative Destruction and Cleansing Effect

How does resource allocation vary across the business cycle?

- Ever since Schumpeter [1939] the hypothesis of crisis-driven creative destruction has provided a potential silver lining to recessions.
- Caballero and Hammour [1994, 1996] coin the *cleansing effect:* inefficient arrangements are wiped out, higher productivity arrangements remain. Reallocation of factors to more productive uses increases because the opportunity cost to do so is low.
- Inefficient arrangements can survive temporarily due to frictions that prevent resources from moving to their most productive use.
    - Mortensen and Pissarides [1994]: Search frictions prevents instant formation of highly efficient firm-worker matches.

Literature

Empirical Findings of Cleansing Effect

However, evidence of the cleansing effect in the data is rather ambiguous:

- On the one hand, there is evidence of cleansing in manufacturing from late 1940s to 1990s, and for the entire private sector from 1990s to early 2000s
  - Davis and Haltiwanger [1992, 1990, 1999], Davis et al. [2012, 2006] respectively
- This effect apparently became weaker for the great financial crisis, and there are theoretical reasons to think it lessens with financial crises in general
  - Foster et al. [2016], Barlevy [2003], Eslava et al. [2010]
- But there are also many studies find no evidence of a cleansing effect!
  - No relationship between worker-firm match quality and the business cycle conditions when it ends: Mustre-del Río [2012]
  - No or little relationship between firm productivity and exit in Chile, Colombia, Japan and Indonesia: Liu and Tybout [1996], Nishimura et al. [2005], Hallward-Driemeier and Rijkers [2010]
  - Baily et al. [1992], Griliches and Regev [1995] do not find evidence of an increased contribution of reallocation to productivity growth

Literature

Scarring/Sullying Effects

On the other hand, many authors have taken an opposite view, positing that recessions have severe negative and long lasting effects:

- Permanent output losses in financial and political crises (Cerra and Saxena [2008]) or all crises (Cerra and Saxena [2017]). Further, the labor share decreases and recovers only slowly and partially, especially for financial crises: Diwan [2001]
- Recessions may actually wipe out highly productive arrangements, due to credit frictions or temporarily unobservable productivity: Barlevy [2003], Ouyang [2009]
- Jobs created during recessions are usually less productive, less well-paid, and less likely to last: Bowlus [1995], Davis et al. [1996]. Barlevy [2002] models this fact through an increase in labor market frictions in a model of on-the-job search.

Literature

Job Ladder Models

Job ladder models extend the Mortensen and Pissarides [1994] model to include on-the-job search in the spirit of Jovanovic [1979, 1984]. They are a natural starting point for this paper:

- Endogenous job destruction as in den Haan et al. [2000] allows for a cleansing effect, while decreases in average match quality allow for a scarring effect
- Most of these models link job-to-job transitions to productivity-enhancing reallocation: Krause and Lubik [2006], Menzio and Shi [2011]
- These models reconcile micro behavior with macro implications:
  - Krolikowski [2017], Jung and Kuhn [2018] study the persistent effects on earnings of displaced workers
  - Moscarini and Postel-Vinay [2016] claim the job ladder stopped in the Great Recession and has not fully resumed, while Moscarini and Postel-Vinay [2017] posit this as the cause of the missing inflation puzzle

Barlevy [2002] is the only one (that we are aware of) to study theoretically cleansing vs sullying in the labor market. Our contribution studies the role of job destruction in the scarring of the labor market, instead of a sullying effect through job creation.

Model Overview

Discrete time version of search & matching model of Mortensen and Pissarides [1994], with three tractable extensions:

1. Wage rigidity as in Hall [2005]
   - Realistic unemployment response to TFP shocks
2. Endogenous separations as in den Haan et al. [2000]
   - Allows for cleansing effect
3. A job ladder in the spirit of Moscarini and Postel-Vinay [2018], with two rungs
   - Drives our mechanisms

Model Setup

Agents

- Two types of risk-neutral, ex-ante homogeneous agents: workers and firms.
- Unemployed workers u_t receive utility b and search for a job with probability 1.
- Employed workers n_t receive wages, and with fixed probability s are allowed to search for a new job, without losing the current one. If one allows s>1, it can also can also be thought as a measure of the relative efficiency in the search process vis a vis unemployed workers.
- Firms hire workers and produce a final good. They can post vacancies v_t at a cost of ψ.
- Search is costless for workers, and matching is modeled in the DMP fashion:
  - Workers find jobs with probability $p_t = \Lambda\theta_t^{1-\kappa}$, market tightness θ_t.
  - Firms fill vacancies with probability $q_t = p_t/\theta_t$, decreasing in θ_t.
  - Matches formed in t start producing in $t+1$.

Model Setup

Production

- The output of a match is given by $A_t y^i + x$, three components:
  - A_t is aggregate TFP which follows an AR(1).
  - y^i is a match-specific permanent component, $i = \{h, l\}$.
  - x is a match-specific transitory component, i.i.d. across time.

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- The permanent component is drawn upon match contact. With probability λ it is equal to y^h and it is equal to y^l otherwise. Stays fixed for the duration of the match.

- The transitory component is drawn from a $N\left(0, \left(\sigma_x^i\right)^2\right)$. It is known every period before production takes place, and changes every period.

Model Setup

Wages and labor flows

- Knowing A_t, y and x, matches Nash-bargain over wages. Then, after wage rigidity like in Hall [1995], wages $w_t^h(x)$ and $w_t^l(x)$ are determined.
- Since x is $i.i.d.$ every period while y is permanent, workers in l matches (n_t^l) will search on the job but workers in h matches (n_t^h) will not.

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- Since x is $i.i.d.$ every period while y is permanent, workers in l matches (n_t^l) will search on the job but workers in h matches (n_t^h) will not.
- For $i = h, l$ matches there will be a cutoff value called κ_t^i, such that if $x < \kappa_t^i$ the match is destroyed. We assume efficient endogenous job separation: $S_t^i\left(\kappa_t^i\right) = 0$.
- We also model a standard exogenous job separation probability δ_t which follows an AR(1).
- Notice labor flows:
  - $u_t \leftrightarrows n_t^l$
  - $u_t \leftrightarrows n_t^h$
  - $n_t^l \rightarrow n_t^h$

Model Timing

1. New matches formed last period join previously active matches
2. Productivities A_t and x are revealed
3. A proportion δ of current matches are exogenously destroyed
4. Shares $F^i\left(\kappa_t^i\right)$ are destroyed for each type i
5. Unemployed workers receive b
6. Surviving matches bargain over wages and produce
7. Workers search for a job and firms post vacancies
8. New matches are formed

Model Details

Labor Market Dynamics

- Let ρ_t^i be the probability of remaining in a match of quality i:

$$\rho_t^i := (1-\delta)\left(1-F^i\left(\kappa_t^i\right)\right) \tag{1}$$

- Then the mass of workers in a high quality matches evolves according to:

$$n_t^h = \rho_t^h\left(n_{t-1}^h + \lambda p_{t-1}\left(u_{t-1} + s n_{t-1}^l\right)\right) \tag{2}$$

- And the mass of workers in a low quality matches according to:

$$n_t^l = \rho_t^l\left(\left(1-\lambda p_{t-1} s\right) n_{t-1}^l + \left(1-\lambda\right) p_{t-1} u_{t-1}\right) \tag{3}$$

- Also

$$u_t + n_t^h + n_t^l = 1 \tag{4}$$

Back

Value Functions

- For any variable $X_t(x)$, let $\widehat{X}_t^i := \int_{\kappa_t^i}^{\infty} \frac{X_t^i(x)}{1-F^i(\kappa_t^i)} dF^i(x)$ be its expected value across x.
- Then, the value of being employed in a match with permanent productivity h or l and transitory productivity x is:

$$W_t^h(x) = w_t^h(x) + \beta E_t \left\{ \rho_{t+1}^h \widehat{W}_{t+1}^h + \left(1 - \rho_{t+1}^h\right) U_{t+1} \right\} \tag{5}$$

$$W_t^l(x) = w_t^l(x) + \beta E_t \left\{ \begin{array}{c} \left(\lambda p_t s \rho_{t+1}^h \widehat{W}_{t+1}^h + (1 - \lambda p_t s) \rho_{t+1}^l \widehat{W}_{t+1}^l\right) \\ + \left(1 - \lambda p_t s \rho_{t+1}^h - (1 - \lambda p_t s) \rho_{t+1}^l\right) U_{t+1} \end{array} \right\} \tag{6}$$

- The value of being unemployed is:

$$U_t = b + \beta E_t \left\{ \begin{array}{c} p_t \left(\lambda \rho_{t+1}^h \widehat{W}_{t+1}^h + (1 - \lambda) \rho_{t+1}^l \widehat{W}_{t+1}^l\right) \\ + \left(1 - p_t \left(\lambda \rho_{t+1}^h + (1 - \lambda) \rho_{t+1}^l\right)\right) U_{t+1} \end{array} \right\} \tag{7}$$

Back

Value Functions

- The value of being an employer in a match with permanent productivity h or l and transitory productivity x is:

$$J_t^h(x) = A_t y^h + x - w_t^h(x) + \beta E_t \left\{ \rho_{t+1}^h \widehat{J}_{t+1}^h \right\} \tag{8}$$

$$J_t^l(x) = A_t y^l + x - w_t^l(x) + \beta E_t \left\{ \left(1 - \lambda p_t s\right) \rho_{t+1}^l \widehat{J}_{t+1}^l \right\} \tag{9}$$

- The value of an open vacancy is:

$$V_t = -\psi + q_t \beta E_t \left\{ \lambda \rho_{t+1}^h \widehat{J}_{t+1}^h + (1 - \lambda) \rho_{t+1}^l \widehat{J}_{t+1}^l \right\} \tag{10}$$

- With ψ vacancy posting cost. Free entry implies $V_t = 0$ for all t, leading to a standard job creation condition

Back

Wages

- Real wages are

$$w_t^i(x) = \rho_w w_{t-1}^i(x) + (1-\rho_w)\,\tilde{w}_t^i(x), \tag{11}$$

where $\tilde{w}_t^i(x)$ a notional wage coming from nash bargaining, and $\rho_w \in (0,1)$.

- Therefore, defining the surplus of a match as

$$S_t^i(x) = J_t^i(x) + W_t^i(x) - U_t, \tag{12}$$

$\tilde{w}_t^i(x)$ solves

$$J_t^i(x) = (1-\eta)\,S_t^i(x) \qquad \text{and} \qquad W_t^i(x) - U_t = \eta S_t^i(x) \tag{13}$$

leading to

$$\widetilde{w}_t^h(x) = \eta\left[A_t y^h + x + \theta_t \psi\right] + (1-\eta)\,b \tag{14}$$

$$\widetilde{w}_t^l(x) = \eta\left[A_t y^l + x + \theta_t \psi\right] + (1-\eta)\,b - \eta(1-\eta)\,\beta E_t\left\{\lambda p_t s \rho_{t+1}^h \widehat{S}_{t+1}^h\right\} \tag{15}$$

Back

Model Productivity

- Let $\widehat{x}^i$ be average x across active i matches. Total output:

$$Y_t = n_t^h \left(A_t y^h + \widehat{x}_t^h \right) + n_t^l \left(A_t y^l + \widehat{x}_t^l \right) \tag{16}$$

- Let $\chi = n^h / n$. Average Labor Productivity is Y_t / n_t:

$$ALP_t = \chi_t \left(ALP_t^h \right) + (1 - \chi_t) \left(ALP_t^l \right) \tag{17}$$

- We can provide a useful decomposition:

$$\frac{dALP_t}{ALP_t} = \underbrace{\zeta_t^A \frac{dA_t}{A_t}}_{\text{TFP effect}} + \underbrace{\frac{ALP_t^h - ALP_t^l}{ALP_t} d\chi_t}_{\text{Extensive Margin}} + \underbrace{\zeta_t^{x^h} \frac{d\widehat{x}_t^h}{\widehat{x}_t^h} + \zeta_t^{x^l} \frac{d\widehat{x}_t^l}{\widehat{x}_t^l}}_{\text{Intensive Margin}} \tag{18}$$

Data

Apart from standard macro data, we use administrative micro data from the *SII* (the Chilean IRS):

- Matched employer-employee dataset for the Chilean economy 2005-2016.
- Firm and worker identifiers allow tracking over time.
- Includes all employment relationships with a wage contract (58% of active workers).
- Annual statement including various categories of labor income, and monthly employment status of individual workers.

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- Annual statement including various categories of labor income, and monthly employment status of individual workers.
    - Allows us to build monthly labor flows, including job to job transitions.
    - Characterize matches by low/high tenure
- We keep only a subset of employment relationships, as in Albagli et al. [2018].

Calibration

For a monthly frequency:

- Discount factor β, bargaining power η and matching function elasticity κ from the literature.
- Wage rigidity ρ_W, SS unemployment u and SS vacancy filling probability q from other studies, the latter two will help with b and ψ.
- We normalize $\bar{A}$ and y^l to 1.
- High quality matches in the model will have longer tenure than low quality matches. We exploit this fact to draw from IRS data moments:
  - We match proportion of high/low tenure matches, separation probabilities by tenure, low $\longrightarrow$ high tenure E-E transitions, and wage gains from such transitions. We also match cross-section wage volatility.
- Through steady state equations, we obtain λ, s, y^h, Λ, σ_x^l and σ_x^h. Still in need of a good calibration of $\bar{\delta}$

Calibration

Table: Calibrated Parameters and Matched Moments

Parameter	Symbol	Value	Source
Discount Factor	β	0.9959	5% real interest rate [Krolikowski, 2017]
Worker Bargaining Power	η	0.5	Mortensen and Pissarides [1994]
Matching Elasticity	κ	0.5	Hosios condition [Hosios, 1990]
Wage Rigidity	ρ_w	0.9435	Chilean Data (Garcia et al, 2018)
SS unemployment rate	u	7.3%	Chilean Data (NAIRU 2008-2018)
SS vacancy filling probability	q	41.5%	den Haan et al. [2000]
Steady state TFP	$\bar{A}$	1	Normalization
l Permanent Productivity	y^l	1	Normalization
Share of high tenure matches[1]		53.96%	DJ1887 form
Prob. keeping h tenure job		99.69%	DJ1887 form
Prob. keeping l tenure job		92.95%	DJ1887 form
Job to Job probability $l \longrightarrow h$		0.31%	DJ1887 form
Log wage volatility		0.9333	DJ1887 form
$l \longrightarrow h$ wage gains		36.28%	DJ1887 form

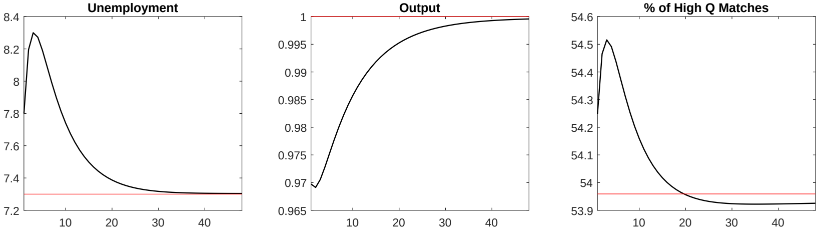
More Parameters

[1] High tenure = at least 5 years

Results

- Negative productivity shocks induce higher endogenous separation.
- Low quality matches are destroyed easily, but high quality matches have high continuation values and are largely unaffected.
- Match quality composition improves.

Figure: Aggregate Productivity Shock

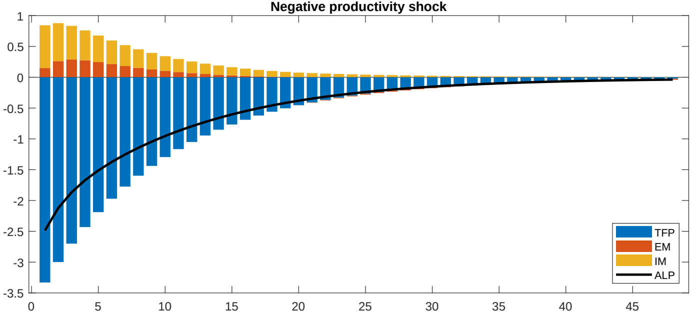


More IRFs

Results

- Both the extensive and intensive margin work to attenuate the TFP impact in measured productivity: a cleansing effect

Figure: Aggregate Productivity Shock: ALP decomposition



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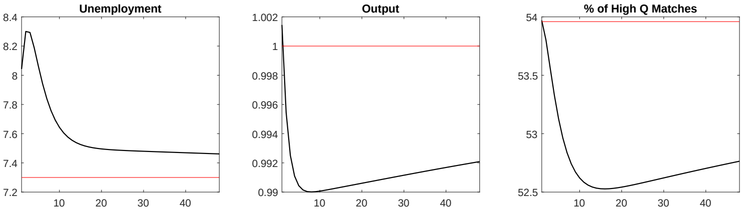
Results

- Job destruction shocks cause across the board job losses.
- Low quality jobs are recovered easily, but their high quality counterparts are not
- Persistent deterioration in composition of match quality and output, while unemployment mostly recovers.

Figure: Job Destruction Shock



More IRFs

Results

- As a result, measured productivity shows persistent deterioration

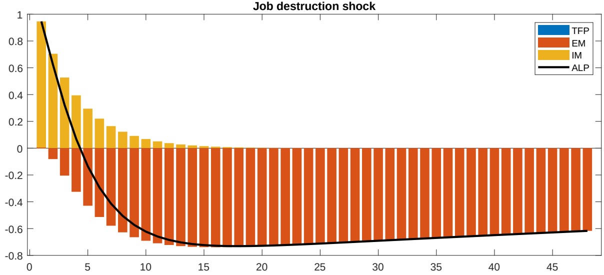


Figure: Job Destruction Shock: ALP decomposition

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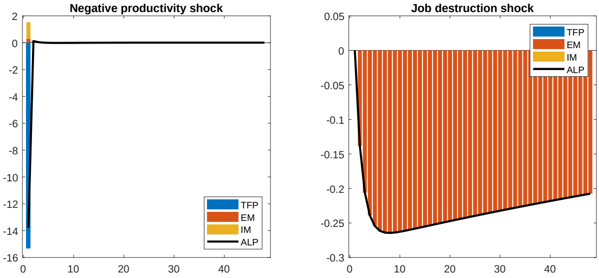
Results

- As opposed to productivity shocks, with job destruction shocks the ALP deterioration is persistent even if the underlying shock is not!

Figure: iid shocks: ALP decomposition

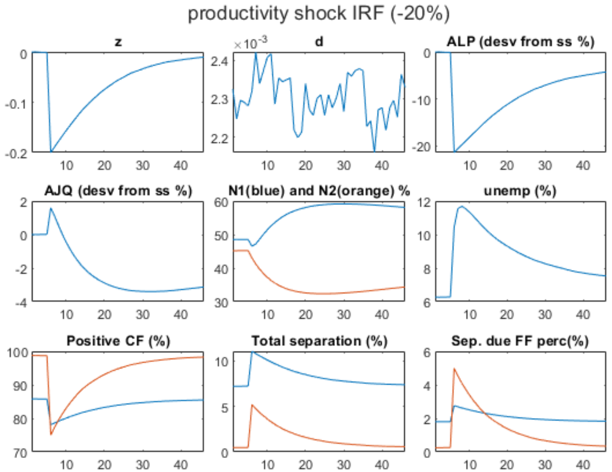


Financial frictions (preliminary)

- Liquidity constraints plus wage rigidity can break up valuable matches
- In the standard model, firm-worker matches have perfect access to financial markets and therefore only care about present values, not about per period flows
- Introduce reduced-form financial friction: exogenous probability ω that a match with positive continuation value but a negative cash value in the current period is forced to separate.
- This is, a liquidity constraint becomes active for some matches that have a positive value but are forced to separate if they cannot cover wages - which are not fully flexible- with their period output.

Results (very preliminary)

- Negative productivity shocks can now generate persistent effects on average job quality (AJQ)



Conclusions

- We set up a job ladder model with endogenous and exogenous separations calibrated with Chilean micro data.
- Preliminary results:
    - Good matches are valuable, difficult to obtain, hard to break endogenously.
    - Standard TFP shocks are dampened by a cleansing effect.
    - Separation shocks that affect high quality matches have long lasting impact that is not predicted in standard search and matching models.
- The following suggests that events which cause across the board job destruction will have long lasting consequences for productivity, due to a persistent deterioration in match quality.

November, 2021

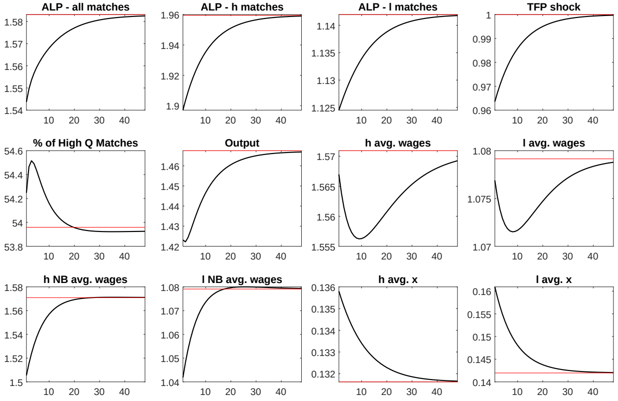
Appendix

All Calibrated Parameters

Parameter	Symbol	Value	Source
Discount Factor	β	0.9959	5% real interest rate
Worker Bargaining Power	η	0.5	Literature Standard
Matching Elasticity	κ	0.5	Hosios (1990)
Wage Rigidity	ρ_w	0.9398	Chilean Data
Steady state TFP	$\bar{A}$	1	Normalization
Low-Quality Persistent Productivity	y^l	1	Normalization
Idiosyncratic Productivity Mean	μ_x	0	Normalization
Employed Search Ability	s	0.9417	Matches labor flows data
Prob. of High-Quality Match	λ	0.0071	Matches labor flows data
High-Quality Persistent Productivity	y^h	1.828	Obtained Endogenously
Matching Efficiency	Λ	0.3964	Obtained Endogenously
Vacancy Posting Cost	ψ	0.3812	Obtained Endogenously
Unemployment Benefit	b	0.6583	Obtained Endogenously
SS Exogenous Destruction Rate	$\bar{\delta}$	0.002	Matches Relevant Statistics
High-Quality x Volatility	σ_x^h	35.25	Matches Relevant Statistics
Low-Quality x Volatility	σ_x^l	1	Matches Relevant Statistics

Back

IRFs: TFP shock



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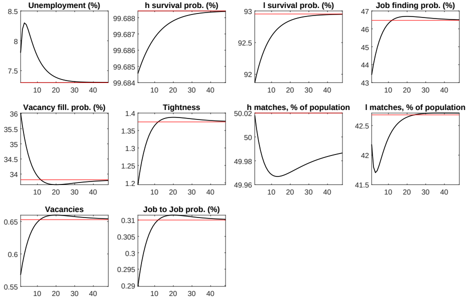
IRFs: TFP shock



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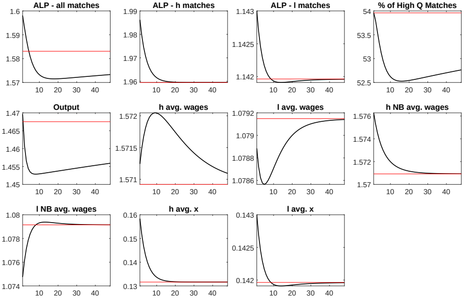
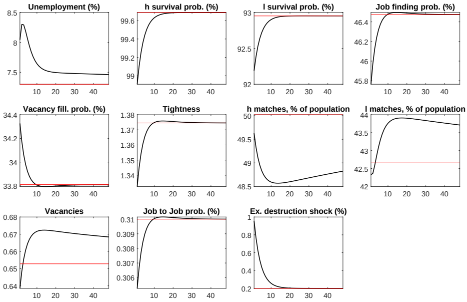
IRFs: Job destruction shock



Back

IRFs: Job destruction shock



Back

Elías Albagli, Mario Canales, Chad Syverson, Matías Tapia, and Juan Wlasiuk. Firm Productivity and Job Transitions: The Reallocation Puzzle. *Mimeo, Banco Central de Chile*, 2018.

Martin Baily, Charles Hulten, and David Campbell. The Distribution of Productivity in Manufacturing Plants. *Brookings Papers: Microeconomics*, 4:187–226, 1992.

Gadi Barlevy. The Sullying Effect of Recessions. *Review of Economic Studies*, 69(1):65–96, January 2002.

Gadi Barlevy. Credit Market Frictions and the Allocation of Resources Over the Business Cycle. *Journal of Monetary Economics*, 50(8): 1795–1818, November 2003.

Audra Bowlus. Matching Workers and Jobs: Cyclical Fluctuations in Match Quality. *Journal of Labor Economics*, 13(2):335–350, April 1995.

Ricardo Caballero and Mohamad Hammour. The Cleansing Effect of Recessions. *American Economic Review*, 84(5):1350–1368, December 1994.

Ricardo Caballero and Mohamad Hammour. On the Timing and Efficiency of Creative Destruction. *The Quarterly Journal of Economics*, 11 (3):805–852, August 1996.

Valerie Cerra and Sweta Saxena. Growth Dynamics: The Myth of Economic Recovery. *American Economic Review*, 98(1):439–457, March 2008.

Valerie Cerra and Sweta Saxena. Booms, Crises, and Recoveries: A New Paradigm of the Business Cycle and Its Policy Implications. *IMF Working Paper No. 17/250*, 2017.

Steven Davis and John Haltiwanger. Gross Job Creation and Destruction: Microeconomic Evidence and Macroeconomic Implications. *NBER Macroeconomics Annual*, 5:123–186, 1990.

Steven Davis and John Haltiwanger. Gross Job Creation, Gross Job Destruction, and Employment Reallocation. *Quarterly Journal of Economics*, 107(3):819–863, August 1992.

Steven Davis and John Haltiwanger. On the Driving Forces behind Cyclical Movements in Employment and Job Reallocation. *American Economic Review*, 89(5):1234–1258, December 1999.

Steven Davis, John Haltiwanger, and Scott Schuh. Job Creation and Destruction. *Cambridge, MA: MIT Press.*, 1996.

Steven Davis, Jason Faberman, and John Haltiwanger. The Flow Approach to Labor Markets: New Data Sources and Micro-Macro Links. *Journal of Economic Perspectives*, 20(3):3–26, 2006.

Steven Davis, Jason Faberman, and John Haltiwanger. Labor Market Flows in the Cross Section and Over Time. *Journal of Monetary Economics*, 59(1):1–18, January 2012.

Wouter J. den Haan, Garey Ramey, and Joel Watson. Job Destruction and Propagation of Shocks. *American Economic Review*, 90(3): 482–498, June 2000. URL https://ideas.repec.org/a/aea/aecrev/v90y2000i3p482-498.html.

Ishac Diwan. Debt as Sweat: Labor, Financial Crises, and the Globalization of Capital. *Processed, World Bank*, 2001.

Marcela Eslava, Arturo Galindo, Marc Hofstetter, and Alejandro Izquierdo. Scarring Recessions and Credit Constraints: Evidence from Colombian Plant Dynamics. *CEDE Working Paper*, 2010.

Lucia Foster, Cheryl Grim, and John Haltiwanger. Reallocation in the Great Recession: Cleansing or Not? *Journal of Labor Economics*, 34 (1):S293–S331, January 2016.

Zvi Griliches and Haim Regev. Firm Productivity in Israeli Industry: 1979 - 1988. *Journal of Econometrics*, 65(1):175–203, January 1995.

Robert E. Hall. Lost Jobs. *Brookings Papers on Economic Activity*, 26(1):221–274, 1995. URL https://ideas.repec.org/a/bin/bpeajo/v26y1995i1995-1p221-274.html.

Robert E. Hall. Employment Fluctuations with Equilibrium Wage Stickiness. *American Economic Review*, 95(1):50–65, March 2005. URL https://ideas.repec.org/a/aea/aecrev/v95y2005i1p50-65.html.

Mary Hallward-Driemeier and Bob Rijkers. Do Crises Catalyze Creative Destruction? Firm- Level Evidence from Indonesia. *Processed, World Bank*, 2010.

Arthur Hosios. On the Efficiency of Matching and Related Models of Search and Unemployment. *The Review of Economic Studies*, 57(2): 279–298, April 1990.

Boyan Jovanovic. Job Matching and the Theory of Turnover. *Journal of Political Economy*, 87(5):972–990, October 1979.

Boyan Jovanovic. Matching, Turnover, and Unemployment. *Journal of Political Economy*, 92(1):108–122, February 1984.

Philip Jung and Moritz Kuhn. Earnings Losses and Labor Mobility Over the Life Cycle. *Journal of the European Economic Association*, May 2018.

Michael Krause and Thomas Lubik. The Cyclical Upgrading of Labor and On-the-Job Search. *Labour Economics*, 13:459–477, 2006.

Pavel Krolikowski. Job Ladders and Earnings of Displaced Workers. *American Economic Journal: Macroeconomics*, 9(2):1–31, April 2017.

Lili Liu and James Tybout. Productivity Growth in Chile and Colombia: The Role of Entry, Exit, and Learning. *M. Roberts, and J. Tybout, eds., Industrial Evolution in Developing Countries. Oxford: Oxford University Press*, pages 73–103, 1996.

Guido Menzio and Shouyong Shi. Efficient Search on the Job and the Business Cycle. *Journal of Political Economy*, 119(3):468–510, June 2011.

Dale T Mortensen and Christopher A Pissarides. Job Creation and Job Destruction in the Theory of Unemployment. *Review of Economic Studies*, 61(3):397–415, July 1994. URL https://ideas.repec.org/a/bla/restud/v61y1994i3p397-415.html.

Giuseppe Moscarini and Fabien Postel-Vinay. Did the Job Ladder Fail after the Great Recession. *Journal of Labor Economics*, 34(1): S55–S93, January 2016.

Giuseppe Moscarini and Fabien Postel-Vinay. The Job Ladder: Inflation vs. Reallocation. *Mimeo*, 2017.

Giuseppe Moscarini and Fabien Postel-Vinay. The Cyclical Job Ladder. *Annual Review of Economics*, 10(1):165–188, August 2018.

Andreas Mueller. Separations, Sorting, and Cyclical Unemployment. *American Economic Review*, 107(7):2081–2107, July 2017.

José Mustre-del Río. Job Duration and the Cleansing and Sullying Effects of Recessions. *Research Working Paper RWP 12-08, Federal Reserve Bank of Kansas City*, 2012.

Kiyohiko Nishimura, Takanobu Nakajima, and Kozo Kiyota. Does the Natural Selection Mechanism still Work in Severe Recessions? Examination of the Japanese Economy in the 1990. *Journal of Economic Behavior and Organization*, 58(1):53–78, September 2005.

Min Ouyang. The Scarring Effect of Recessions. *Journal of Monetary Economics*, 56(2):184–199, March 2009.

Carmen Reinhart and Kenneth Rogoff. The Aftermath of Financial Crises. *The American Economic Review*, 99(2):466–472, May 2009.

Joseph Schumpeter. Business Cycles: A Theoretical, Historical and Statistical Analysis of the Capitalist Process. *New York: McGraw-Hill*, 1939.