Unsettling Implications of Global Financial Integration

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Two critical questions

1. **Volatile capital flows have been destabilizing, but are capital controls harmful for the allocation of capital, inequality & welfare?**

   Beware the Side Effects: Capital Controls, Trade, Misallocation and Welfare, with E. Andreasen, S. Bauducco, E. Dardati, 2023 NBER WP 30963

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2. **Why did thirty years of financial globalization produce high liquidity and low interest rates but also increased financial instability?**

   Unstable Prosperity: How Globalization Made the World Economy More Volatile, with V. Quadrini, 2023 NBER WP 30832

Capital controls: Evolving views and new perspective

- **Evolving views:** Disliked since 1971 BW's collapse, gained favor after 1990s Sudden Stops & 2008 GFC ("capital flow management" or macroprudential CCs) ▸ CCsInflows

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  - Tradeoffs due to capital-tax-like distortions (e.g., Bianchi & Mendoza (20))

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- **New perspective**: Study CCs with heterogeneous firms to determine
  1. How important are the side effects of CCs on misallocation?
  2. What are their aggregate and social welfare implications?

What we do in the paper

1. Provide theoretical, quantitative and empirical answers
2. Analyze effects of CCs in dynamic SOE Melitz model with:
   - entrepreneurs heterogeneous in productivity, age, assets & trade
   - monopolistic competition
   - export entry choice
   - collateral constraints
3. Calibration: Chile 1990-91 (pre-CCs) + CCs (*encaje* on inflows)
   - Unremunerated reserve requirement (91-98): 20% to 30%, 6 to 12 mos.

   ▸ CCevolution
4. Quantify effects on misallocation, macro-aggregates, trade & welfare
5. Empirical analysis using Chilean manufacturing firm-level data

Main findings

- **Analytic**:
  1. MRPKs change via *static* ($\uparrow$), *dynamic* ($\downarrow$) & *GE* ($\uparrow$ / $\downarrow$) effects
  2. Effects are non-monotonic in net worth, tfp & trade
  3. LTV regulation distributes burden of credit adjustment more evenly

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  3. LTV regulation distributes burden of credit adjustment more evenly

- **Quantitative**:
  1. Misallocation worsens (0.5%) and social welfare falls (0.6%)
  2. Much worse for exporters (1.25%) & high-prod. firms (1.5%)
  3. Strong GE effects: Υ (-0.6%), w (-1.1%), p (-0.4%)
  4. Large drops in exports (-0.82%) & exporting firms (-5.7%)
  5. LTV regulation cuts credit by the same amount at a 1/3rd of the cost

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- **Empirical:**
  1. CCs worsened misallocation more for exporters, high-prod., & large OSG
  2. Non-linear interactions of productivity and trade in line with theory

Model

Model overview

- Builds on Buera & Moll (15), Brooks & Dovis (20), Midrigan & Xu (14), Gopinath et. al. (16), Andreasen et. al. (21)

1. **Heterogeneous entrepreneurs**: Produce inputs with C-D technology under monopolistic competition, die with prob. ρ (Blanchard-Yaari), draw TFP at birth (z), supply labor inelastically, make exporting choice ($e = 1$)
2. **Final goods producer**: CES technology with domestic and foreign inputs
3. **Rest of the world**: Credit market (r^*), foreign demand for home inputs (exports) driven by y^*, p^*
4. **Government**: CCs as a tax on *inflows* (i.e., debt). Initial capital $k_0(z) = \kappa \bar{k}(z)$ financed with lump-sum tax $T(z)$.

Trade costs & financial distortions

Trade costs

- Sunk cost wF at t for irreversible decision to become exporter at $t+1$
- Iceberg costs for fraction ζ of exports

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Capital Controls

$$r = \begin{cases} \hat{r} = r^* + \nu \quad (\hat{q} = 1/(1 + r^* + \nu)) & \text{if } d_t > 0 \\ r^* \quad (q^* = 1/(1 + r^*)) & \text{if } d_t \leq 0 \end{cases}$$

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Two regimes ***NCC:*** $\theta > 0, \nu = 0$ ***CC:*** $\theta > 0, \nu > 0$

Payoff & constraints for individual entrepreneur

- Utility function: $\sum_{t=0}^{\infty} \tilde{\beta}^t \frac{c_t^{1-\gamma}}{1-\gamma}, \quad \tilde{\beta} \equiv \beta(1-\rho)$
- Demand functions: $y_{h,t}(i) = \left(\frac{p_{h,t}(i)}{p_t}\right)^{-\sigma} y_t, \quad y_{f,t}(i) = \left(\frac{p_{f,t}(i)}{p^*}\right)^{-\sigma} y^*$
- Technological constraint: $y_{h,t} + e(\zeta y_{f,t}) = z k_t^{\alpha} n_t^{1-\alpha}.$
- Capital evolution: $(1-\rho)k_{t+1} = [(1-\delta)k_t + x_t]$
- Net worth: $a_{t+1} \equiv k_{t+1} - q_t d_{t+1}$

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- Net worth: $a_{t+1} \equiv k_{t+1} - q_t d_{t+1}$
- Cash on hand (single state variable):

$$p_t m_t \equiv w_t + \frac{p_{h,t}^{1-\sigma} y_t}{p_t^{-\sigma}} + e_t \frac{p_{f,t}^{1-\sigma} y^*}{p^{*-\sigma}} - w_t n_t + p_t(1-\delta)k_t - p_t d_t - T_t$$

- Budget constraint: $c_t = m_t - (1-\rho)a_{t+1}$

Recursive problem of an entrepreneur

- **Ex-ante payoff if not exporting**:

$$v(m,z) = \max_{e \in \{0,1\}} \left\{ (1-e)v^{NE}(m,z) + ev^{S}(m,z) \right\}$$

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- **Two-stage problem if not exporting**:

$$v^{NE}(m,z) = \max_{a'} \left[u\left(m - (1-\rho)a'\right) + \tilde{\beta} v\left(\tilde{m}'(a',z),z\right) \right]$$

$$\tilde{m}'(a',z) = \max_{k',d',{p'}_h,n'} \left[\frac{w' + \frac{{p'}_h^{1-\sigma}}{p'^{-\sigma}} y' - w'n' + p'(1-\delta)k' - p'd' - T}{p'} \right]$$

$$\text{s.t.} \quad \left(\frac{p'_h}{p'}\right)^{-\sigma} y' = z{k'}^{\alpha}{n'}^{1-\alpha}$$

$$a' = k' - qd'$$

$$qd' \leq \theta k' \quad \& \quad q^* d' \leq 0$$

Recursive problem of an entrepreneur (contn'd)

- **Two-stage problem if exporting**:

$$v^E(m,z) = \max_{a'} \left[u\left(m - (1-\rho)a'\right) + \tilde{\beta} v^E\left(\tilde{m}'(a',z),z\right) \right]$$

$$\tilde{m}'(a',z) =$$

$$\max_{k',d',p'_h,p'_f,n'} \left[\frac{w' + \frac{p'^{1-\sigma}_h}{p'^{-\sigma}} y' + \frac{p'^{1-\sigma}_f}{p^{*-\sigma}} y^* - w'n' + p'(1-\delta)k' - p'd' - T}{p'} \right]$$

$$\text{s.t.} \quad \left(\frac{p'_h}{p'}\right)^{-\sigma} y' + \zeta \left(\frac{p'_f}{p^*}\right)^{-\sigma} y^* = z k'^{\alpha} n'^{1-\alpha}$$

$$a' = k' - qd'$$

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Recursive problem of an entrepreneur (contn'd)

- **Two-stage problem if switching**:

$$v^S(m,z) = \max_{a'} \left[u\left(m - (1-\rho)a' - wF\right) + \tilde{\beta} v^E\left(\tilde{m}'(a',z),z\right) \right]$$

$$\tilde{m}'(a',z) =$$

$$\max_{k',d',p'_h,p'_f,n'} \left[\frac{w' + \frac{p'^{1-\sigma}_h}{p'^{-\sigma}} y' + \frac{p'^{1-\sigma}_f}{p^{*-\sigma}} y^* - w'n' + p'(1-\delta)k' - p'd' - T}{p'} \right]$$

$$\text{s.t.} \quad \left(\frac{p'_h}{p'}\right)^{-\sigma} y' + \zeta \left(\frac{p'_f}{p^*}\right)^{-\sigma} y^* = z k'^{\alpha} n'^{1-\alpha}$$

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Final goods producer & stationary equilibrium

- Final goods producer:

$$\max_{y_h(i),y_m} p\left[\int_0^1 y_h(i)^{\frac{\sigma-1}{\sigma}}di + y_m^{\frac{\sigma-1}{\sigma}}\right]^{\frac{\sigma}{\sigma-1}} - \int_0^1 p_h(i)y_h(i)di - p_m y_m,$$

where $p = [\int_0^1 p_h(i)^{1-\sigma}di + p_m^{1-\sigma}]^{1/(1-\sigma)}$

- Recursive stationary equilibrium:
  1. Entrepreneurs make optimal plans given w, p, y, r
  2. Final goods producer makes optimal plans given $p_h(i)$'s
  3. Labor market clears: $\int [n'(m,z) + F\mathbb{I}_{\tilde{m}'(m,z)=\hat{m}(z)}]d\phi(m,z) = 1$
  4. Final goods market clears: $\int [c'(m,z) + x'(m,z)]d\phi(m,z) + \rho\underline{k} = y$
  5. Government budget constraint holds: $p\rho\underline{k} = T$
  6. Distribution of firms over m,z is stationary:

$$\phi(m',z') = \int\int [(1-\rho)I^S(m',m,z) + \rho I^D(m',m,z)]\phi(m,z)dmdz$$

How do Capital Controls Affect Misallocation?

Static effects (2nd-stage optimality conditions)

1. MRPK (financial distortions cause capital misallocation)

$$MRPK_i \equiv \frac{p'_{h,i}}{\varsigma}\alpha z_i (k'_i)^{\alpha-1}(n'_i)^{1-\alpha} = \qquad \left(\varsigma \equiv \frac{\sigma}{\sigma-1}\right)$$

$$\mathbb{I}_{d'\leq 0}\left[p'(r^*+\delta)+\mu_i\right] + \mathbb{I}_{d'>0}\left[p'(\hat{r}+\delta)+\eta_i(1-\theta)\right]$$

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2. MRPL (no labor misallocation)

$$MRPL_i \equiv \frac{p'_{h,i}}{\varsigma}(1-\alpha) z_i (k'_i)^{\alpha}(n'_i)^{-\alpha} = w'$$

3. Pricing arbitrage

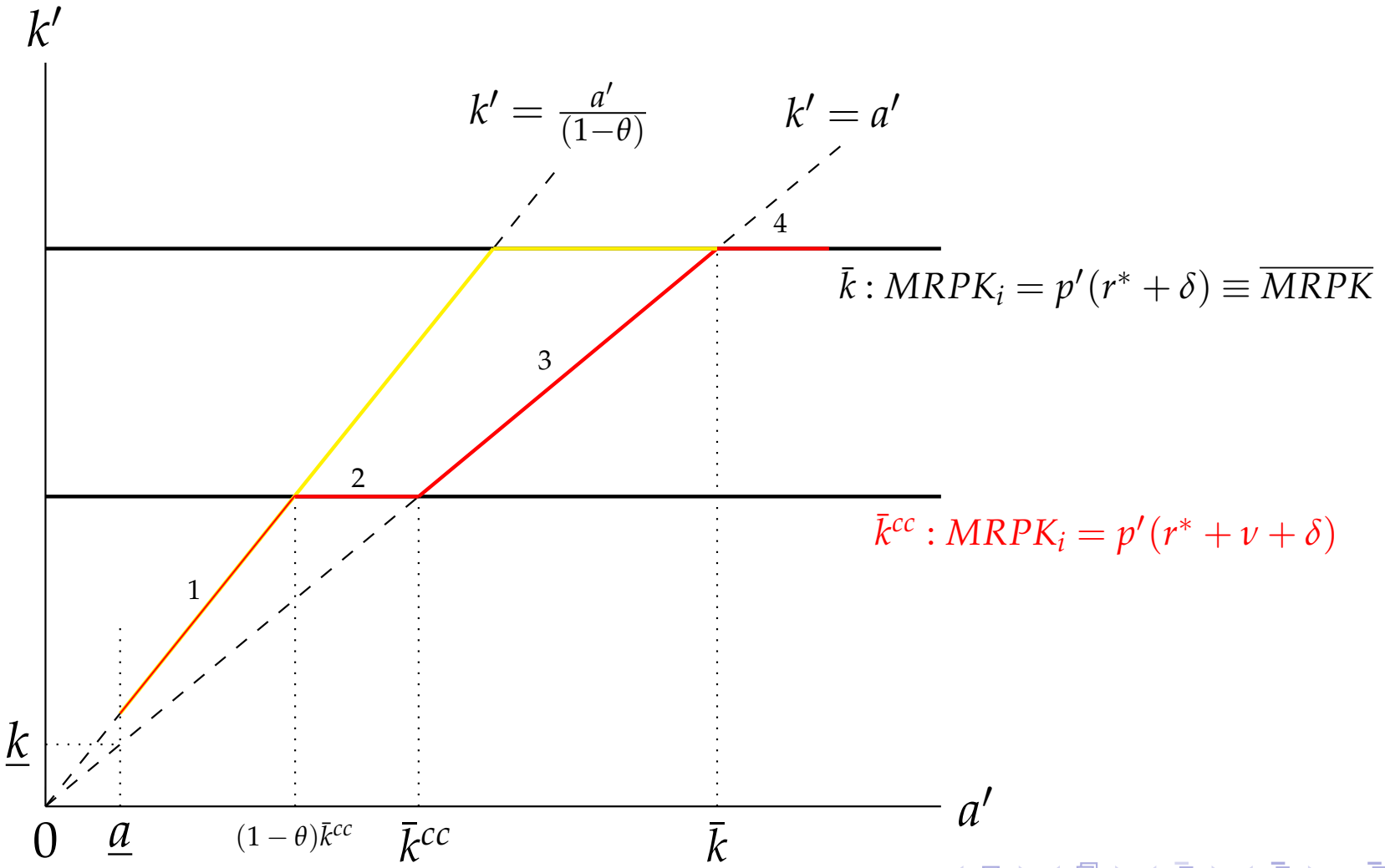
$$p'_{f,i} = \zeta p'_{h,i}$$

4. Technological constraint

$$\left(\frac{p'_{h,i}}{p'}\right)^{-\sigma} y + \zeta \left(\frac{p'_{f,i}}{p^*}\right)^{-\sigma} y^* = z_i {k'_i}^{\alpha} {n'_i}^{1-\alpha}$$

Static effects: Comparing NCC v. CC regime

$$MRPK_i = \mathbb{I}_{d' \leq 0} \left[p'(r^* + \delta) + \mu_i \right] + \mathbb{I}_{d' > 0} \left[p'(\hat{r} + \delta) + \eta_i (1 - \theta) \right]$$



Dynamic and GE effects of CCs

- **Dynamic (1st-stage) effects**: financial distortions increase marginal benefit of saving

$$\frac{u'(c)}{\beta u'(c')} = \mathbb{I}_{d'>0}\left[\hat{R} + \frac{\eta}{p'}\right] + \mathbb{I}_{d'\leq 0}\left[R^* + \frac{\mu}{p'}\right]$$

  - Firms grow net worth *faster*, spend less time at lower k, higher MRPK
  - In R. 2, firms pay debt down to zero and R. 3 mimics financial autarky
  - $\beta R^* = 1 \Rightarrow \bar{k}$ and steady state c are the same with CCs and in autarky

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- **General eq. effects**: w, p, y change with misallocation and $\phi(\cdot)$. If they fall, p_h falls (less for exporters) but effects on $\frac{k}{n}$, $MRPK$ are ambiguous (depend on $\frac{w}{ph}$, relative size of exports v. domestic sales, size of p drop)
  - Quantitatively, $\uparrow$ ($\downarrow$) optimal scales & MRPK diffs. for Es (NEs)

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  - Quantitatively, $\uparrow$ ($\downarrow$) optimal scales & MRPK diffs. for Es (NEs)

- Overall effects are ambiguous

Quantitative Analysis

Calibration strategy

- $\theta^E > \theta^{NE}$, with $\theta^E = (\theta_f + 1)\theta^{NE}$, so that exporters have better credit access (e.g., Muuls (2015))
- Set $\{\gamma, \beta, \sigma, \delta, \rho, r^*\}$ to common values in the misallocation literature
- Set $\{\zeta, \omega_z, F, \theta_f, \theta^{NE}, \kappa, \alpha\}$ to match seven data targets by SMM

Baseline NCC calibration

Predetermined parameters				Targeted parameters		
β	Discount factor	0.96	Standard	ζ	Iceberg trade cost	3.7134
γ	Risk aversion	2	Standard	ω_z	Productivity dispersion	0.4289
σ	Substitution elasticity	4	Leibovici (21)	F	Sunk export entry cost	1.5564
δ	Depreciation rate	0.06	Midrigan & Xu (14)	θ^{NE}	NEs collateral coef.	0.0610
ρ	Death probability	0.08	Chilean data	θ_f	Es collateral factor	1.6977
				α	Capital intensity	0.4673
				κ	Fraction of std. st. capital as initial capital	0.3002

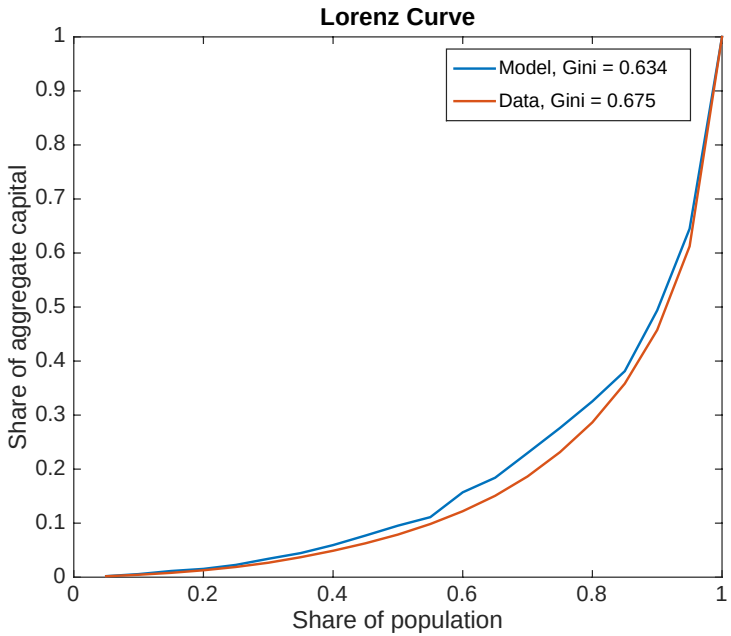
- For CC regime, ν =1.98% (average tax-equivalent of Chilean *encaje*)

▸ Tax

Calibration data targets and model results

Target Moment	Data (1990-1991) (1)	Model (NCC regime) (2)
Share of exporters	0.18	0.18
Average sales (exporters/non-exporters)	8.55	8.55
Average sales (age 5 / age 1)	1.26	1.27
Aggregate exports / sales	0.21	0.21
Aggregate credit / Value added	0.33	0.33
Aggregate capital stock / wage bill	6.60	6.61
(Investment /VA)$_{exporters}$ / (Investment/VA)$_{non-exporters}$	1.84	1.85

Firm size distribution: Lorenz curves in data & model



Quintile	Data (1990) (1)	Model (NCC regime) (2)
0.2	0.0128	0.0154
0.4	0.0361	0.0441
0.6	0.0732	0.0977
0.8	0.1645	0.1684
1	0.7134	0.6745

Aggregate effects of capital controls

	$(\Delta\%)$
Exports	-0.82%
Share of exporters	-5.74%
Domestic Sales	-0.94%
Investment	-1.46%
Consumption	-0.73%
Final goods output	-0.85%
Real GDP	-0.56%
Real wage	-0.70%
Wage	-1.06%
Price level (Real ex. rate)	-0.36%
Agg. credit/Value Added	-12.87%

Measures of misallocation & welfare

- **Firm misallocation:**

$$mis_i = |ln(MRPK_i) - ln(\overline{MRPK})|, \qquad \overline{MRPK} \equiv p(r^* + \delta)$$

- **Aggregate misallocation** (mean deviation in mis_i):

$$MIS = \sum_{\tau}\sum_{z} mis(\tau,z)\phi(\tau,z), \qquad \phi(\tau,z) = \rho(1-\rho)^{\tau} f(z)$$

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- **Welfare:** Compensating consumption variation in utilitarian SWF

$$G = \left[\frac{\sum_{\tau}\sum_{z} V^{CC}(\tau,z)\phi(\tau,z)}{\sum_{\tau}\sum_{z} V^{NCC}(\tau,z)\phi(\tau,z)} \right]^{\frac{1}{1-\gamma}} - 1,$$

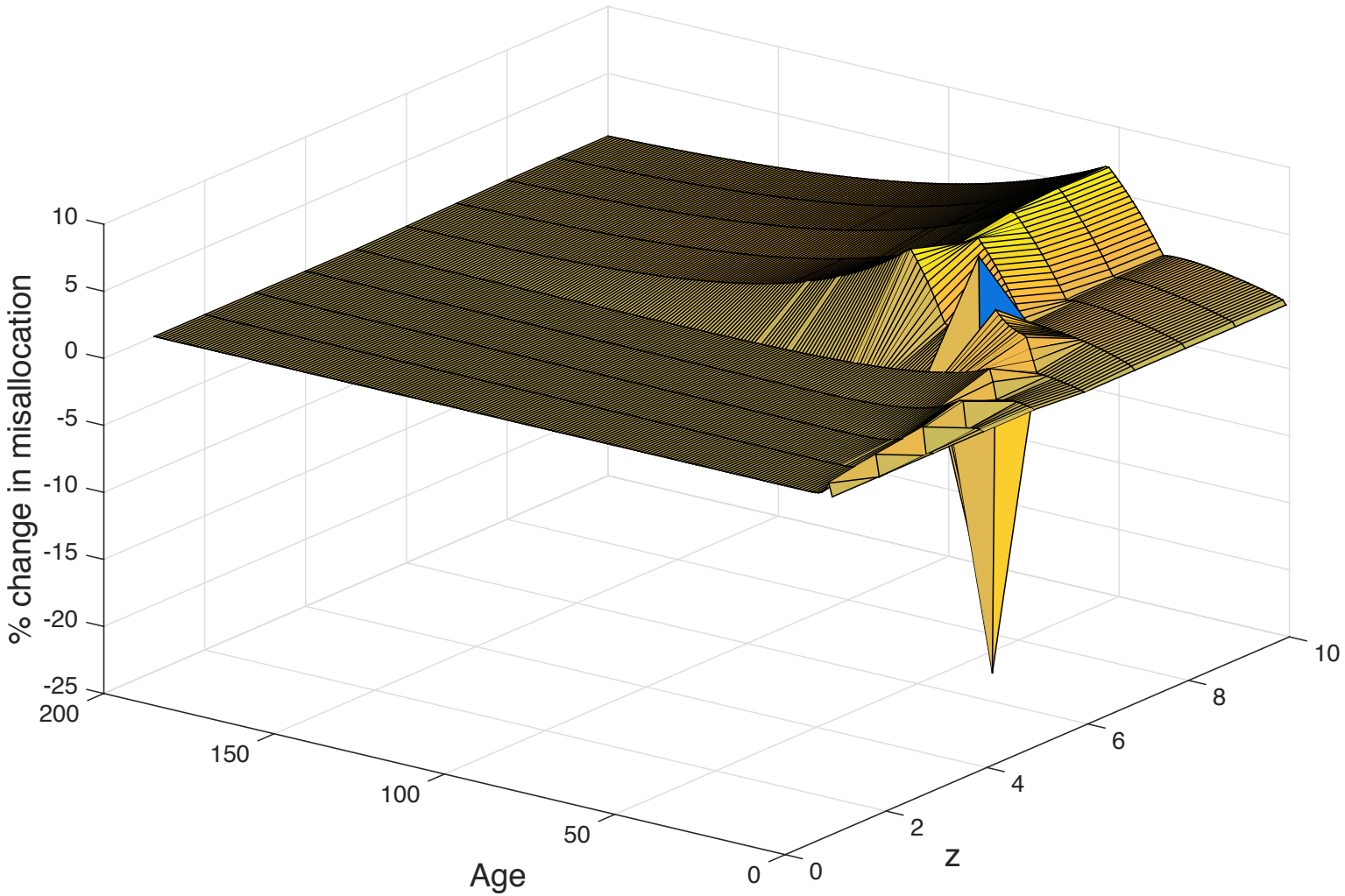
where, for $i = CC, NCC$, the payoff of each entrepreneur is:

$$V^i(\tau,z) = \begin{cases} v(\tau,z) & \text{for } \tau \leq \hat{\tau}^i(z) : v^{NE}(\hat{\tau}^i(z),z) = v^S(\hat{\tau}^i(z),z) \\ v^E(\tau,z) & \text{for } \tau > \hat{\tau}^i(z) \end{cases}$$

Effects of CCs on misallocation and welfare

	% change Misallocation	% change Welfare
All firms	0.50%	−0.61%
Exporters	1.25%	−1.82%
Non-exporters	0.34%	−0.56%
Large OSG	0.51%	—
Small OSG	0.23%	—

Effect of capital controls on misallocation across firms



Effecs of CCs on misallocation & welfare by productivity

Productivity	% change Misallocation	% change Welfare
1	0.11%	−0.82%
2	0.22%	−0.81%
3	0.43%	−0.76%
4	0.61%	−0.70%
5	0.64%	−0.76%
6	0.24%	−1.32%
7	0.67%	−1.59%
8	0.60%	−1.62%
9	0.58%	−1.54%
10	0.57%	−1.40%

Heterogeneous income effects of capital controls

- **Labor income:** Fall in w/p matters more for those earning less from capital (low-z and/or young)
- Firm's relative price falls with fall in w/p, rises with misallocation:

$$\frac{p^h(\tau,z)}{p} = \frac{\varsigma(r+\delta)^\alpha}{(1-\alpha)^{1-\alpha}\alpha^\alpha z}\left(\frac{w}{p}\right)^{1-\alpha}\left(\frac{MRPK(\tau,z)}{p(r+\delta)}\right)^\alpha$$

- **Capital income:** π/p rises (falls) if p^h/p falls (rises):

$$\frac{\pi(\tau,z)}{p} = \frac{y + \frac{1}{\tau^{\sigma-1}}\left(\frac{p^*}{p}\right)^\sigma y^*}{\left(\frac{p^h(\tau,z)}{p}\right)^{\sigma-1}}\left[1 - \frac{(1-\alpha)}{\varsigma}\right]$$

  - It also rises with y, and falls with p for exporters (real appreciation)

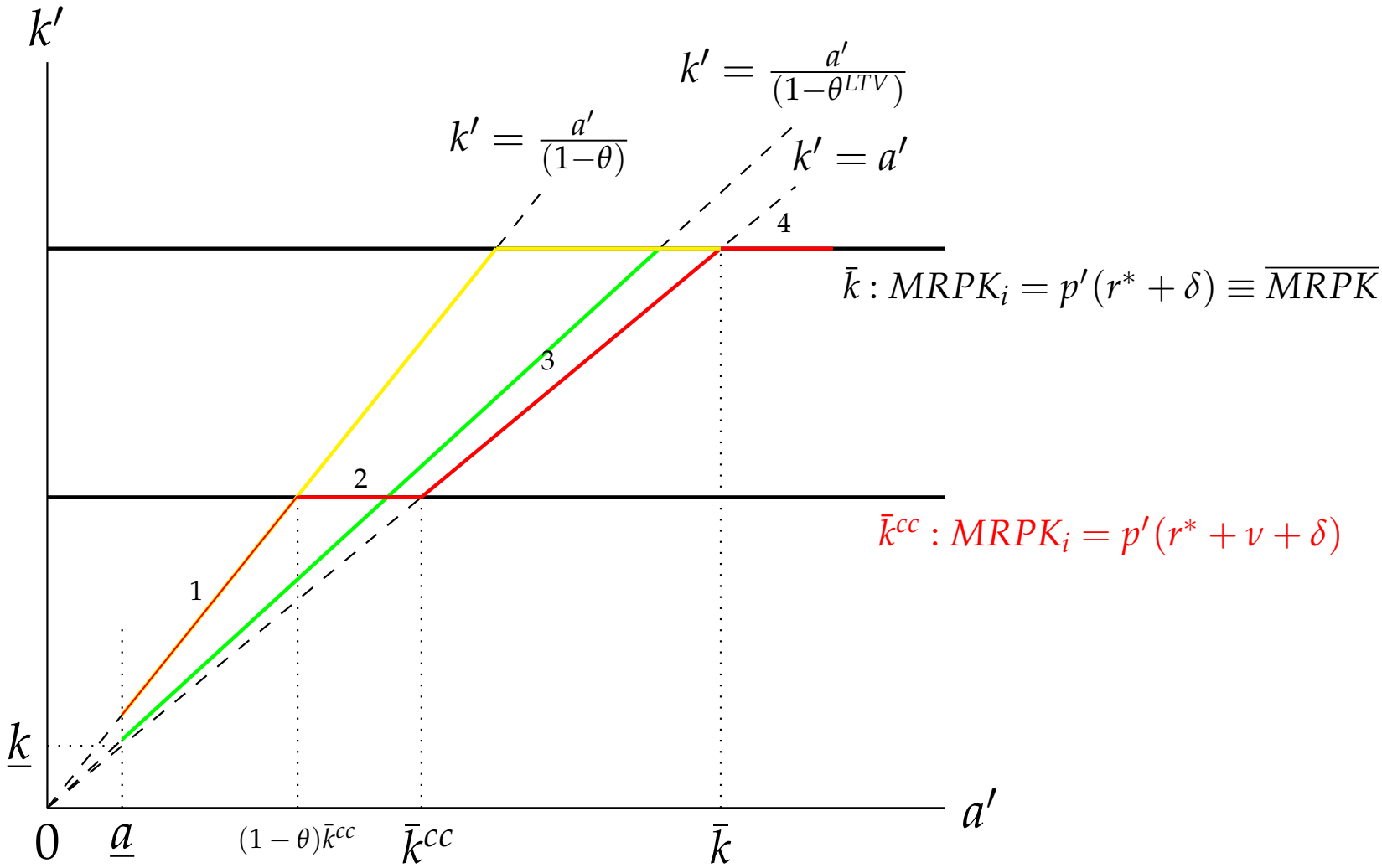
Counterfactuals & robustness

1. **LTV regulation**: Set $\nu = 0$, reduce θ to θ^{LTV} to match agg. credit drop
2. **Tighter capital controls**: Higher ν in CC regime
3. **Tax rebates**: Rebate debt tax paid by each entrepreneur
4. **Earnings-based constraint**: Profits instead of k as pledgeable collateral
5. **Domestic credit market**: Allow firms to choose investing v. lending to others (analytic results)

LTV regulation is better than capital controls

- The burden of the credit cut is distributed more evenly across firms
- Region 1: Firms with low net worth unaffected by CCs now borrow less, have less capital, higher MRPKs
- Regions 2 and 3: Firms more severely affected by CCs borrow more, have more capital, lower MPRKs (nonmonotonic effect)
- w, y, p fall less, misallocation still rises but better aggregate outcomes reduce welfare costs (higher real wage, less dispersion in real profits)

Comparing LTV regulation with capital controls



LTV v. CCs: Aggregate Effects

	CC regime $\nu = 0.0198$ $\theta^{NE} = 0.0610$	LTV regulation $\nu = 0$ $\theta^{NE} = 0.0538$
Exports	-0.82%	-0.94%
Share of exporters	-5.74%	-1.62%
Domestic Sales	-0.94%	-0.21%
Investment	-1.46%	-0.91%
Consumption	-0.73%	-0.08%
Final goods output	-0.85%	-0.21%
Real GDP	-0.56%	-0.38%
Real wage	-0.70%	-0.42%
Wage	-1.06%	-0.40%
Price level (Real ex. rate)	-0.36%	0.02%
Agg. credit/Value Added	-12.87%	-12.87%

LTV v. CCs: Effects on misallocation & welfare

	Baseline w. CCs		LTV regulation	
	Misallocation	Welfare	Misallocation	Welfare
All firms	0.50%	−0.61%	0.29%	−0.20%
Exp. status				
Exporters	1.25%	−1.82%	0.91%	−0.15%
Non-exporters	0.34%	−0.56%	0.16%	−0.20%
OSG				
Large	0.51%	—	0.31%	—
Small	0.23%	—	0.04%	—

Tighter CCs: Aggregate Effects

	NCC regime ($\nu = 1.75\%$)	$\nu = 2.75\%$	$\nu = 5\%$
Exports	-0.82%	-1.76%	-4.04%
Share of exporters	-5.74%	-7.97%	-6.90%
Domestic Sales	-0.94%	-1.29%	-1.68%
Investment	-1.46%	-2.66%	-5.42%
Consumption	-0.73%	-0.92%	-0.99%
Final goods output	-0.85%	-1.20%	-1.70%
Real wage	-0.70%	-1.22%	-2.43%
Wage	-1.06%	-1.58%	-2.34%
Price level (Real ex. rate)	-0.36%	-0.36%	0.09%
Agg. credit/Value Added	-12.87%	-30.38%	-72.73%

Tighter CCs: Effects on misallocation & welfare

	CC regime ($\nu = 1.75\%$)		$\nu = 5.0\%$	
	Misallocation	Welfare	Misallocation	Welfare
All firms	0.50%	-0.61%	1.9%	-1.23%
Exp. status				
Exporters	1.25%	-1.82%	4.10%	-0.21%
Non-exporters	0.34%	-0.56%	1.50%	-1.25%
OSG				
Large	0.51%	—	2.0%	—
Small	0.23%	—	0.3%	—

Conclusions

- CCs affect misallocation via static, dynamic and GE effects that work in different directions and are non-monotonic in net worth, tfp & trade status
- The model calibrated to Chilean *encaje* predicts that:
  1. Misallocation worsened and more so for Es, high-prod. & large OSG firms
  2. Strong GE effects reduced real wages, consumption and output
  3. Sizable social welfare loss and larger for exporters & high-prod. firms
  4. Substantial heterogeneity in MRPKs and income effects
- LTV regulation is far superior (same credit cut at 1/3rd of the cost)
- Empirical evidence consistent w. larger effects for exporters and high prod. firms, and non-monotonic effects
- Relevant for fin. repression, fin. integration & size-dependent policies

Empirical Analysis

Objective & data

Objective

- Evaluate empirical relevance of firms' productivity, exporting status and OSG in shaping the effect of CCs on misallocation.

Data

- Chilean manufacturing establishments data (ENIA), 1990-2007.
  ▸ Sum. Statistics
  - All manufacturing firms with more than 10 workers (around 5,000 firms per year, 90,000 observations aprox.).
  - Data on capital stock, investment, workers, sales, exports, income taxes (proxy for profits).
- Tax-equivalent of the CC by year. ▸ more

Measure of misallocation

- As in Gopinath et al. (2017), Hsieh & Klenow (2009):

$$MRPK = \frac{\sigma - 1}{\sigma}(p_h y_h + p_f y_f)\frac{\alpha}{k}.$$

where: $p_h y_h + p_f y_f$ = value added or total sales; $k_{i,t}$= fixed capital; σ and α take calibrated values.

- Firm misallocation as defined earlier:

$$mis_{ijt} = \mid Ln(MRPK_{ijt}) - Ln(\overline{MRPK_{jt}}) \mid$$

using yearly industry mean (4-digit ISIC) of MRPK to proxy for $\overline{MRPK_{jt}}$

Econometric model

$$mis_{ijt} = \omega_1 CC_{t-1} * TFP_{ijt} + \omega_2 CC_{t-1} * Exp_{ijt} + \omega_3 CC_{t-1} * OSG_{ijt} + \omega_4 X_{ijt} + A_i + B_t + \epsilon_{ijt}$$

- CC_{t-1}: tax-equivalent *encaje* lagged one period
- $Exp_{ijt} = 1$ for firms that export in current period
- OSG_{ijt} is the % diff. between date-t firm's capital and industry-year mean for firms older than 10 years
- X_{ijt}: time varying firm characteristics, including TFP_{ijt}, Exp_{ijt}, OSG_{ijt}
- A_i: firm fixed effects
- B_t: time fixed effects (includes direct effect of CCs)

CCs effects on misallocation by TFP, OSG & export status

	(1)	(2)	(3)	(4)	(5)	(6)
		$mis_{ijt}(VA)$			$mis_{ijt}(total\_sales)$	
VARIABLES	All firms	Balanced Panel	W/o crisis cohort	All firms	Balanced Panel	W/o crisis cohort
CC*TFP	0.876***		0.883***	0.713***		0.728***
	(0.122)		(0.126)	(0.078)		(0.080)
CC*Exp	0.224***		0.208***	0.317***		0.299***
	(0.030)		(0.030)	(0.031)		(0.032)
CC*OSG	0.248***		0.244***	0.255***		0.250***
	(0.031)		(0.031)	(0.032)		(0.032)
CC*TFP_BP		1.363***			1.108***	
		(0.190)			(0.189)	
CC*Exp_BP		0.296***			0.410***	
		(0.060)			(0.064)	
CC*OSG_BP		0.309***			0.380***	
		(0.056)			(0.059)	
Observations	91,374	22,204	90,359	87,469	21,935	86,524
R-squared	0.624	0.579	0.625	0.600	0.573	0.601
Controls	YES	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES	YES
Time FE	YES	YES	YES	YES	YES	YES

Additional exercises and robustness checks

- Heterogeneity of effects by exporting status ▸ More
- Forward-looking definition of exporters (next 2 years) ▸ More
- Interaction of firms' characteristics with macroeconomic controls ▸ More
- Using sales instead of value added for MRPKs ▸ More
- Winsorization for outliers ▸ More

Heterogeneous effects by exporting status

Back

VARIABLES	(1) All firms	(2) All firms	(3) All firms	(4) Non-Exporters	(5) Exporters
CC*TFP	1.005***	0.965***	1.020***	1.030***	0.195
	(0.157)	(0.136)	(0.157)	(0.155)	(0.175)
CC*OSG	0.004**	0.506***	0.012***	0.019***	0.003*
	(0.002)	(0.050)	(0.004)	(0.007)	(0.001)
CC*Exp	1.189***	0.293***	1.246***		
	(0.426)	(0.080)	(0.428)		
CC*TFP*EXP	-0.495**		-0.521***		
	(0.199)		(0.199)		
CC*OSG*EXP		-0.215**	-0.009**		
		(0.094)	(0.004)		
Observations	92,690	78,810	92,690	61,725	30,965
R-squared	0.226	0.232	0.226	0.240	0.211
Number of id	12,155	11,489	12,155	9,257	9,147
Controls	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES
Time FE	YES	YES	YES	YES	YES

Exporters' behavior

Periods as Exporter	Exporter (t+1)	Non-exp. (t+1)
1	71%	29%
2	79%	21%
3	93%	7%
4	94%	6%

Fixed Capital Interval	Share of Exporters
$x < p(25)$	3.03%
$p(25) < x < p(50)$	2.89%
$p(50) < x < p(75)$	12.65%
$p(75) < x$	30.21%
$p(95) < x$	53.97%

Effects on misallocation: Relative Size and Export Status by prod.

VARIABLES	(1) Misallocation All firms High z	(2) Misallocation All firms Low z	(3) Taxes All firms High z	(4) Taxes All firms Low z
CC*Rel_Size	-0.002*	-0.022***	0.014***	-0.002
	(0.001)	(0.008)	(0.005)	(0.007)
CC*Exp	0.190***	0.061**	-0.085**	-0.117***
	(0.030)	(0.028)	(0.043)	(0.043)
Observations	46,340	46,350	46,337	46,350
R-squared	0.177	0.259	0.093	0.173
Number of id	7,959	8,734	7,959	8,734
Controls	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES
Time FE	YES	YES	YES	YES

Forward looking definition of exporters

Back

VARIABLES	(1) All firms	(2) Balanced panel	(3) W/o crisis cohort
CC*TFP	0.812***	1.531***	0.805***
	(0.125)	(0.212)	(0.130)
CC*OSG	0.004**		0.004**
	(0.002)		(0.002)
CC*F_Exp	0.091***	0.127***	0.078***
	(0.028)	(0.046)	(0.029)
CC_OSG_BP		0.009**	
		(0.005)	
Observations	92,690	22,203	91,659
R-squared	0.225	0.196	0.225
Number of id	12,155	1,586	12,039
Firm FE	YES	YES	YES
Time FE	YES	YES	YES

Interaction with macroeconomic controls: Misallocation

Back

VARIABLES	(1) Misallocation Libor	(2) Misallocation Inflation	(3) Misallocation Growth	(4) Misallocation RER	(5) Misallocation PrivCreditGDP	(6) Misallocation WorldGrowth
CC*TFP	0.011***	0.010***	0.011***	0.007***	0.013***	0.010***
CC*Rel_Size	-0.004**	-0.006***	-0.006***	-0.000	-0.007***	-0.004***
CC*Exp	0.101***	0.104***	0.065***	0.090***	0.124***	0.116***
Exp*Libor	0.011					
TFP*Libor	-0.002***					
Rel_size*Libor	-0.001					
Exp*Inflation		-0.001				
TFP*Inflation		-0.001***				
Rel_sizeInflation		0.002***				
Exp*Growth			0.035***			
TFP*Growth			-0.001***			
Rel_size*Growth			0.001*			
Exp*TCR				-0.003		
TFP*TCR				-0.001***		
Rel_size*TCR				0.001***		
Exp*PrivCreditGDP					0.659**	
TFP*PrivCreditGDP					0.096***	
Rel_size*PrivCreditGDP					-0.094***	
Exp*WorldGrowth						0.214***
TFP*WorldGrowth						0.005***
Rel_size*WorldGrowth						-0.007**
Observations	92,690	92,690	92,690	92,690	92,690	92,690
R-squared	0.219	0.220	0.219	0.219	0.220	0.221
Number of id	12,155	12,155	12,155	12,155	12,155	12,155
Controls	YES	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES	YES
Time FE	YES	YES	YES	YES	YES	YES

Interaction with macroeconomic controls: Taxes

Back

VARIABLES	(1) Taxes Libor	(2) Taxes Inflation	(3) Taxes Growth	(4) Taxes RER	(5) Taxes PrivCreditGDP	(6) Taxes WorldGrowth
CC*TFP	-0.003***	-0.003***	-0.002	-0.005***	-0.002*	-0.002**
CC*Rel_Size	0.010***	0.008**	0.014***	0.011***	0.002	0.012***
CC*Exp	-0.097***	-0.090***	-0.087**	-0.053	-0.131***	-0.099***
Exp*Libor	0.016					
TFP*Libor	0.000					
Rel_size*Libor	0.008***					
Exp*Inflation		0.015***				
TFP*Inflation		-0.001***				
Rel_sizeInflation		0.003**				
Exp*Growth			-0.002			
TFP*Growth			-0.001***			
Rel_size*Growth			-0.001			
Exp*TCR				0.008**		
TFP*TCR				-0.001***		
Rel_size*TCR				-0.000		
Exp*PrivCreditGDP					-1.302***	
TFP*PrivCreditGDP					0.042***	
Rel_size*PrivCreditGDP					-0.320***	
Exp*WorldGrowth						-0.123***
TFP*WorldGrowth						0.004***
Rel_size*WorldGrowth						-0.004
Observations	92,687	92,687	92,687	92,687	92,687	92,687
R-squared	0.136	0.136	0.136	0.136	0.137	0.136
Number of id	12,155	12,155	12,155	12,155	12,155	12,155
Controls	YES	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES	YES
Time FE	YES	YES	YES	YES	YES	YES

Sub-samples

Back

VARIABLES	(1) Misallocation W/o crisis cohort	(2) Taxes W/o crisis cohort	(3) Taxes Since 1992
CC*TFP	0.010***	-0.003***	-0.003***
	(0.001)	(0.001)	(0.001)
CC*Rel_Size	-0.004**	0.012***	0.012***
	(0.002)	(0.004)	(0.004)
CC*Exp	0.097***	-0.095***	-0.078**
	(0.021)	(0.031)	(0.033)
Constant	1.235*	-10.246***	-2.670***
	(0.734)	(1.180)	(0.476)
Observations	91,659	91,656	83,475
R-squared	0.218	0.137	0.132
Number of id	12,039	12,039	11,780
Controls	YES	YES	YES
Firm FE	YES	YES	YES
Time FE	YES	YES	YES

Winsorization

Back

VARIABLES	(1) Wins. MRPK	(2) Wins. Controls	(3) Wins. Sectors
CC*TFP	0.845***	1.233***	1.001***
	(0.089)	(0.093)	(0.117)
CC*Exp	0.115***	0.148***	0.119***
	(0.021)	(0.022)	(0.021)
CC*OSG	0.006***	0.072***	0.004**
	(0.002)	(0.009)	(0.002)
Observations	90,841	83,632	91,764
R-squared	0.223	0.232	0.235
Number of id	11,887	11,003	12,030
Controls	YES	YES	YES
Firm FE	YES	YES	YES
Time FE	YES	YES	YES

Recursive Equilibrium

For a given value of the interest rate r, a recursive stationary competitive equilibrium of this economy consists of prices (w, p) policy functions and value functions v and g such that:

1. Policy and value functions solve the entrepreneurs' problem.
2. Policy functions solve the final good producers' problem.
3. Labor market clears.
4. The government's budget constraint is satisfied.
5. Markets for domestic varieties and final goods market clear.
6. The measure ϕ of entrepreneurs is stationary.

Back to analysis

Table: Summary Statistics: 1990-2007

VARIABLES	(1) N	(2) mean	(3) sd	(4) min	(5) max
Fixed Capital	92,690	11.39	2.771	0	22.47
Total Workers	92,690	3.578	1.112	0	8.656
Interest Expenditures	92,690	4.895	4.675	0	18.24
TFP	92,690	2.151	0.149	-3.536	2.858
L_Exp	92,690	0.334	0.472	0	1
F_Exp	92,690	0.195	0.396	0	1
Misallocation	92,690	4.715	3.127	0	17.72
Rank_TFP	92,690	2,584	1,502	1	5,765
Young	92,690	0.486	0.500	0	1
Number of id	12,155	12,155	12,155	12,155	12,155

back

Summary Statistics: Macroeconomic Indicators 1990-2007

VARIABLES	(1) N	(2) mean	(3) sd	(4) min	(5) max
CC	18	0.881	1.109	0	2.649
Inflation	18	0.017	0.536	-0.626	1.887
RER_dev	18	-0.009	0.055	-0.082	0.113
Growth	18	0.055	0.028	-0.021	0.120
World Growth	18	3.054	1.000	1.369	4.476
Private Credit/GDP	18	0.613	0.107	0.442	0.743
Libor 12m	18	4.918	1.799	1.364	8.415

back

The Chilean *Encaje*

- Policy: Unremunerated Reserve Requirement: 20% (to 30%) of capital inflows had to be deposited at the Central Bank at 0% interest rate for a fixed period of time (6 to 12 months).
  $\Rightarrow$ Analogous to a tax on the interest rate for borrowers (De Gregorio et al., 2000).

- Context: Surge of capital inflows, RER appreciation.

- Aggregate effects: Longer maturity of capital inflows, increased interest rate differential, small effect on RER, not so robust. (De Gregorio, Edwards and Valdes, 2000.; Edwards, 1999)

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Main changes in the URR administration

Jun-1991	20% URR introduced for all new credit Holding period (months)=min(max(credit maturity, 3),12) Holding currency=same as creditor Investors can waive the URR by paying a fix fee (Through a repo agreement at discount in favor of the central bank) Repo discount= US$ libor
Jan-1992	20% URR extended to foreign currency deposits with proportional HP
May-1992	Holding period (months)=12 URR increased to 30% for bank credit lines
Aug-1992	URR increased to 30% Repo discount= US$ libor +2.5
Oct-1992	Repo discount= US$ libor +4.0
Jan-1995	Holding currency=US$ only
Sep-1995	Period to liquidate US$ from Secondary ADR tightened
Dec-1995	Foreign borrowing to be used externally is exempt of URR
Oct-1996	FDI committee considers for approval productive projects only
Dec-1996	Foreign borrowing $<$US$ 200,000 (500,000 in a year) exempt of URR
Mar-1997	Foreign borrowing $<$US$ 100,000 (100,000 in a year) exempt of URR
Jun-1998	URR set to 10%
Sep-1998	URR set to zero

Source: De Gregorio et al. (2000).

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The evolution of the Chilean encaje

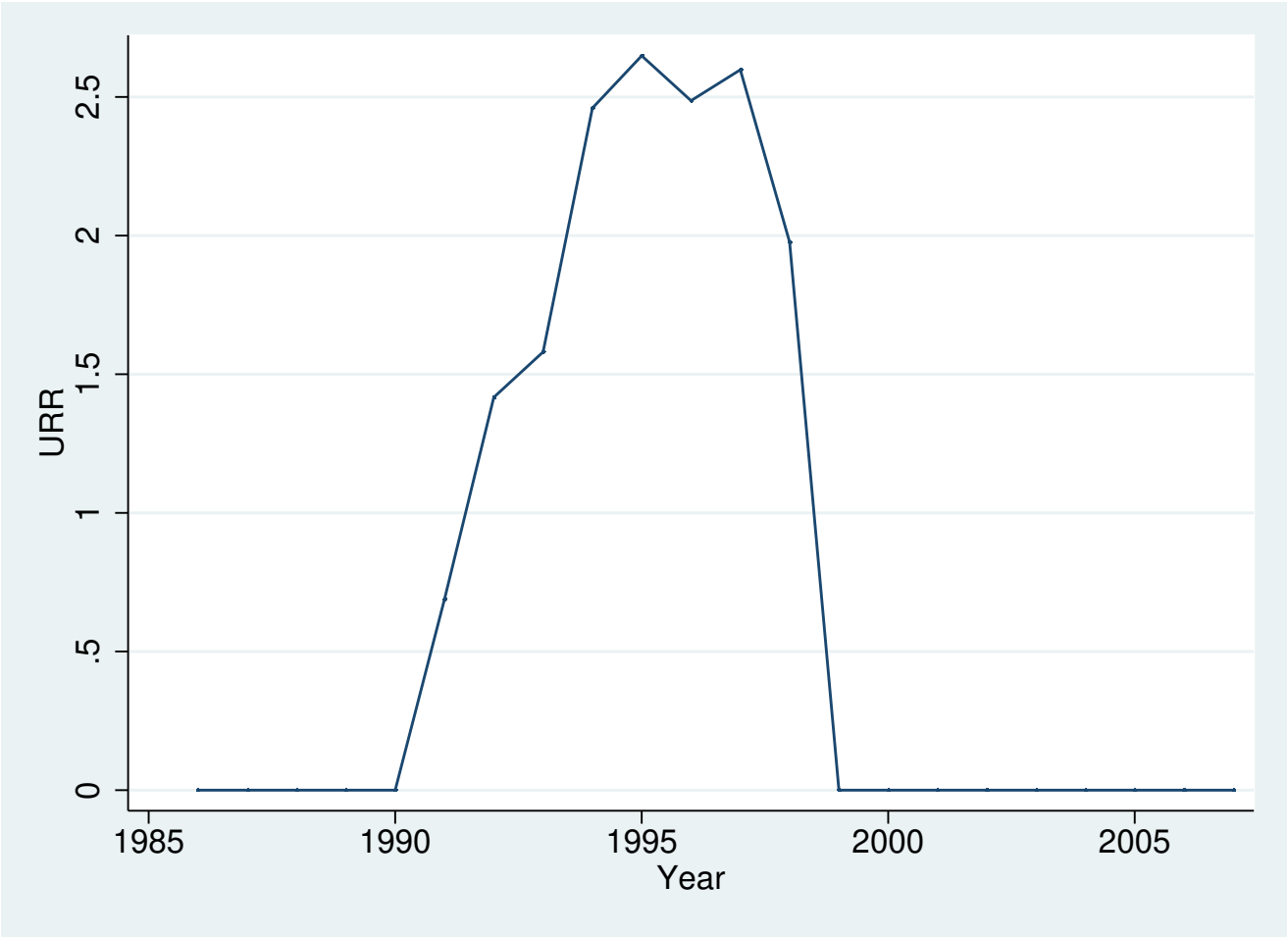

Figure: Tax equivalent

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Why Chile?

- Most well-known example of market-based control.
- Economic importance: 1.9% of GDP (Gallego, Hernandez and Schmidt-Hebbel, 2002).
- Firm level data in period of analysis.
- Time period large enough to do SS analysis and to have enough variation for the empirical analysis.

Back

Capital controls on inflows (Fernandez et. al., IMF ER (2016))

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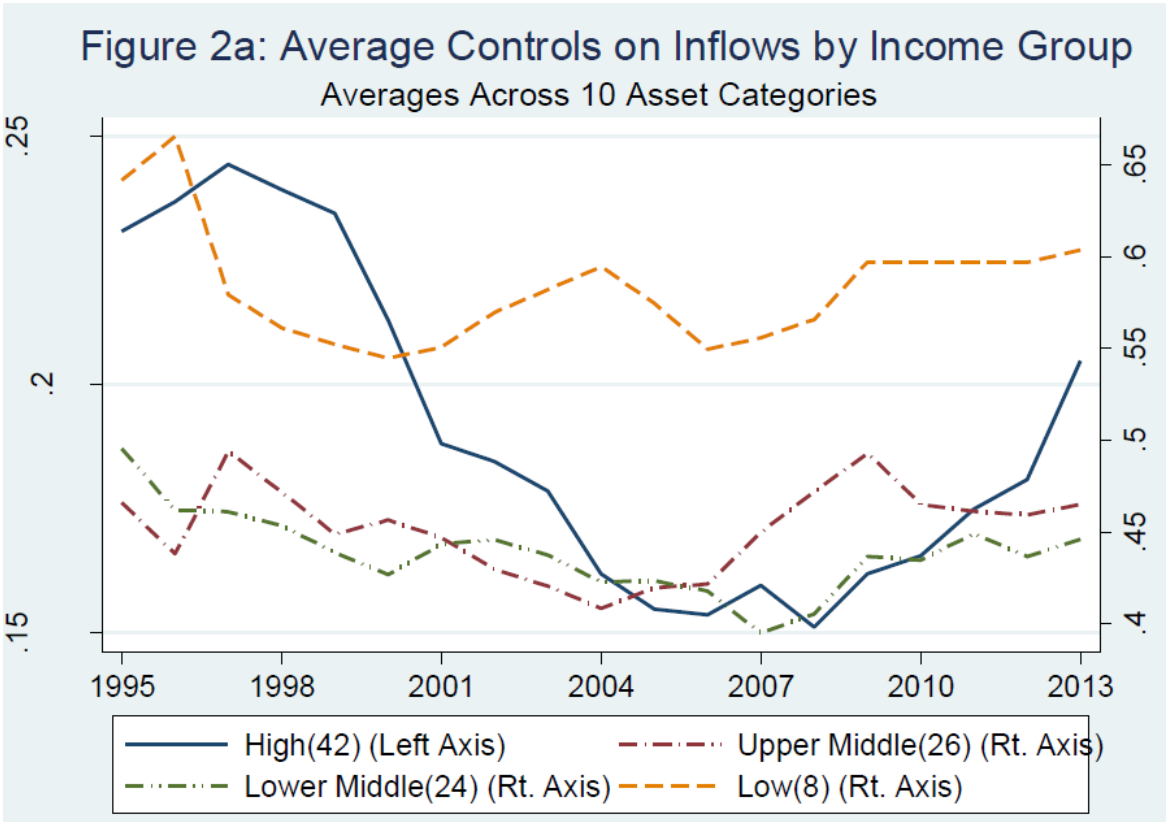

Effects of capital controls on aggregate outcomes

	Benchmark ($\Delta\%$) (1)	Lump-sum ($\Delta\%$) (2)	LTV ($\Delta\%$) (3)
Exports	-0.92%	-0.35%	-1.01%
Share of exporters	-5.74%	3.67%	-1.62%
Domestic Sales	-0.96%	-0.46%	-0.23%
Investment	-1.55%	-1.90%	-1.00%
Consumption	-0.74%	-0.28%	-0.09%
Final goods output	-0.87%	-0.54%	-0.24%
Real GDP	-0.60%	-0.77%	-0.43%
Wage	-1.09%	-0.35%	-0.44%
Price level (Real ex. rate)	-0.35%	0.33%	0.03%
Agg. credit/Value Added	-14.09%	-13.49%	-14.11%

Lump Sum: % change in misallocation and welfare, by z

Productivity	% change Misallocation	% change Welfare
1	0.12%	−0.62%
2	0.23%	−0.59%
3	0.43%	−0.51%
4	0.61%	−0.37%
5	0.63%	−0.27%
6	0.88%	0.01%
7	0.81%	−0.56%
8	0.73%	−0.51%
9	0.71%	−0.49%
10	0.70%	−0.49%

LTV: % change in misallocation and welfare, by z

Productivity	% change Misallocation	% change Welfare
1	0.02%	−0.42%
2	0.05%	−0.41%
3	0.10%	−0.39%
4	0.18%	−0.33%
5	0.25%	−0.22%
6	0.21%	−0.11%
7	0.70%	0.11%
8	0.72%	0.19%
9	0.73%	0.21%
10	0.73%	0.22%

Earnings-linked collateral constraint

$$qd_{t+1} \leq \theta(\pi_{t+1}/p_{t+1})$$

Earnings-linked collateral constraint

$$qd_{t+1} \leq \theta(\pi_{t+1}/p_{t+1})$$

- Static effects: Capital in region 1 solves a nonlinear eq.

$$k' = \frac{1}{1-\theta\frac{\pi(k',z;w',p',y')}{p'k'}}a',$$

  1. Effective pledgeable collateral shrinks by $\pi(\cdot)/p'k'$ (flatter region 1)
  2. Feedback effect: $\pi(\cdot)/p'k'$ falls with k' (constraint tightens endogenously)

- Interacts with monopolistic competition (under perfect competition, $\pi(\cdot)$ is linear in k and ELCC is similar to KLCC)
- Pecuniary and nonpecuniary externalities via p', w', y'
- Calibration to observed credit ratio requires higher θ than with KLCC (similar effects of CCs)

Effects of CCs with earnings-linked collateral constraint

	% change Misallocation	% change Welfare
All firms	0.61%	−0.33%
Exp. status		
Exporters	0.93%	−1.08%
Non-exporters	0.55%	−0.30%
OSG		
Large	0.64%	—
Small	0.18%	—

Parameter Values: ELCC

Predetermined parameters				Calibrated parameters		
β	Discount factor	0.96	Standard	ζ	Iceberg trade cost	3.8271
γ	Risk aversion	2	Standard	ω_z	Productivity dispersion	0.4350
σ	Substitution elasticity	4	Leibovici (21)	F	Sunk export entry cost	1.3993
δ	Depreciation rate	0.06	Midrigan & Xu (14)	θ^{NE}	NEs collateral coef.	0.3481
ρ	Death probability	0.08	Chilean data	θ_f	Es collateral factor	1.0361
				α	Capital intensity	0.4491
				κ	Fraction of std. st. capital as initial capital	0.4012

Moments: ELCC

Target Moment	Data (1990-1991) (1)	Model (No C.controls) (2)
Share of exporters	0.18	0.18
Average sales (exporters/non-exporters)	8.55	8.64
Average sales (age 5 / age 1)	1.26	1.24
Aggregate exports / sales	0.21	0.21
Aggregate credit / Value added	0.33	0.33
Aggregate capital stock / wage bill	6.60	6.53
(Investment /VA)$_{exporters}$ / (Investment/VA)$_{non_exporters}$	1.84	1.84