

# **The Monetary Policy Implications of Market Reforms and Trade Integration**

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## A Call for Research

“I would like to know how the macroeconomic model that I more or less believe can be reconciled with the trade models that I also more or less believe. [...] What we need to know is how to evaluate the microeconomics of international monetary systems. Until we can do that, we are making policy advice by the seat of our pants.”

Paul R. Krugman (1995), “What Do We Need to Know about the International Monetary System?” in Peter B. Kenen, ed., *Understanding Interdependence*, Princeton U Press.

## A Growing Response

- A fast growing literature has been answering this call for research in the last decade.
- The tools developed in this literature make it possible to study questions of interest to the CompNet community:
  - How does trade integration affect macroeconomic policy?
  - How do reforms of product and labor markets (“structural reforms”) affect macro policy?
- My goal today is to present results from a research program that began with Ghironi and Melitz (2005) and I am now developing further with Matteo Cacciatore (HEC Montréal) and Giuseppe Fiori (NC State) to address these questions for monetary policy in open economies.
  - Bilbiie, Fujiwara, and Ghironi (2014) provides the foundation for some of our results in a closed economy environment.
- Papers available at <http://faculty.washington.edu/ghiro>.

## A Classic Issue: Trade and Monetary Policy

- How does trade integration affect incentives for international monetary coordination? How does it affect the desirability of an exchange rate (ER) peg?
- Standard argument: Trade integration increases the desirability of monetary coordination (or ER stability).
  - Example: European monetary integration.
- High-brow backing: Frankel and Rose (1998), Clark and van Wincoop (2001):
  - Trade integration results in stronger business cycle comovement.
  - Countries may endogenously satisfy one of Mundell's (1961) optimum currency area criteria.

## The “Standard” Approach

- New Keynesian literature addressed the consequences of trade integration for monetary policy by using models in which higher trade integration is proxied by lower home bias in consumer preferences or larger share of imported inputs in production.
  - Coenen et al. (2007), Faia and Monacelli (2008), Pappa (2004), Lombardo and Ravenna (2014).
- Results are very valuable, but proxying a policy outcome (the extent of trade integration) with parameters of preferences and technology may confound the consequences of a policy change (lowering trade barriers) with determinants of agents' behavior that should be invariant to policy.

## Trade, Unemployment, and Monetary Policy

- In Cacciatore and Ghironi (2012—CG), we re-examine the classic issue of trade integration and optimal monetary policy in a two-country model that incorporates the ingredients of current workhorse frameworks in international trade and macro:
  - heterogeneous firms and endogenous producer entry in domestic and export markets (Melitz, 2003);
  - nominal rigidity;
  - dynamic, stochastic, general equilibrium.
- Reflecting the attention of policymakers to labor market dynamics and unemployment—and much trade literature—, we introduce search-and-matching frictions in labor markets (Diamond, 1982a,b; Mortensen and Pissarides, 1994).

## Results

- The model reproduces empirical regularities for the U.S. and international business cycle, including increased comovement following trade integration (captured by a reduction in “iceberg” trade costs, including tariffs).
  - Endogenous producer entry and labor market frictions are central to this result—a traditional challenge for international business cycle models (Kose and Yi, 2001, 2006).
    - The positive relation between trade and comovement is not captured by standard New Keynesian models that proxy trade integration with reduction in home bias.
- In the long run, trade integration results in reallocation of market shares toward the relatively more efficient producers, consistent with the evidence.

## Results, Continued

### Three Key Results on Monetary Policy

- First, when trade linkages are weak, Ramsey optimal, cooperative monetary policy is inward-looking but requires significant departures from price stability both in the long run and over the business cycle.
  - Optimal policy uses inflation to narrow wedges relative to the efficient allocation.
- Second, as trade integration reallocates market share toward more productive firms, the need of positive inflation to correct long-run distortions is reduced.
  - Reallocation of market shares results in an endogenous increase in average firm productivity.
  - This makes job matches more valuable and pushes employment toward the efficient level, reducing the need for inflation to accomplish that by eroding markups.



TABLE 5: TRADE INTEGRATION – NON STOCHASTIC STEADY STATE

	Ramsey Gain	Ramsey Inflation
$\frac{Trade}{GDP} = 0.1$	0.34%	1.40%
$\frac{Trade}{GDP} = 0.2$	0.22%	1.20%
$\frac{Trade}{GDP} = 0.35$	0.16%	1.05%

## Results, Continued

- Third, increased business cycle synchronization implies that country-specific shocks have more global consequences, and welfare gains from cooperation are small relative to optimal non-cooperative policy.
  - This echoes Benigno and Benigno's (2003) finding that there are no gains from cooperation when shocks (and, therefore, business cycles) are perfectly correlated across countries.
  - Our model provides a structural microfoundation for their finding, by making increased business cycle correlation an endogenous consequence of trade integration.

TABLE 7: TRADE INTEGRATION AND GDP COMOVEMENT

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 $\Delta corr(Y_{R,t}, Y_{R,t}^*)$ —Producer Currency Price
 

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 $\frac{Trade}{GDP} = 0.1$        $\frac{Trade}{GDP} = 0.2$        $\frac{Trade}{GDP} = 0.35$ 

Historical Rule	0.36	0.45	0.49
Peg	0.05	0.19	0.27
Ramsey	0.07	0.29	0.43
Nash	0.28	0.35	0.48

 $corr(Y_{R,t}, Y_{R,t}^*)$ —Local Currency Price
 

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 $\frac{Trade}{GDP} = 0.1$        $\frac{Trade}{GDP} = 0.2$        $\frac{Trade}{GDP} = 0.35$ 

Historical Rule	0.33	0.42	0.47
Peg	0.05	0.20	0.27
Ramsey	0.36	0.53	0.62
Nash	0.28	0.36	0.42

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## Results, Continued

### **Comovement and ER Pegs**

- Increased comovement makes a peg more desirable for the pegger.
- However, if the center country follows historical Federal Reserve behavior, this generates inefficient spillovers with strong trade linkages, offsetting the gain from increased comovement.

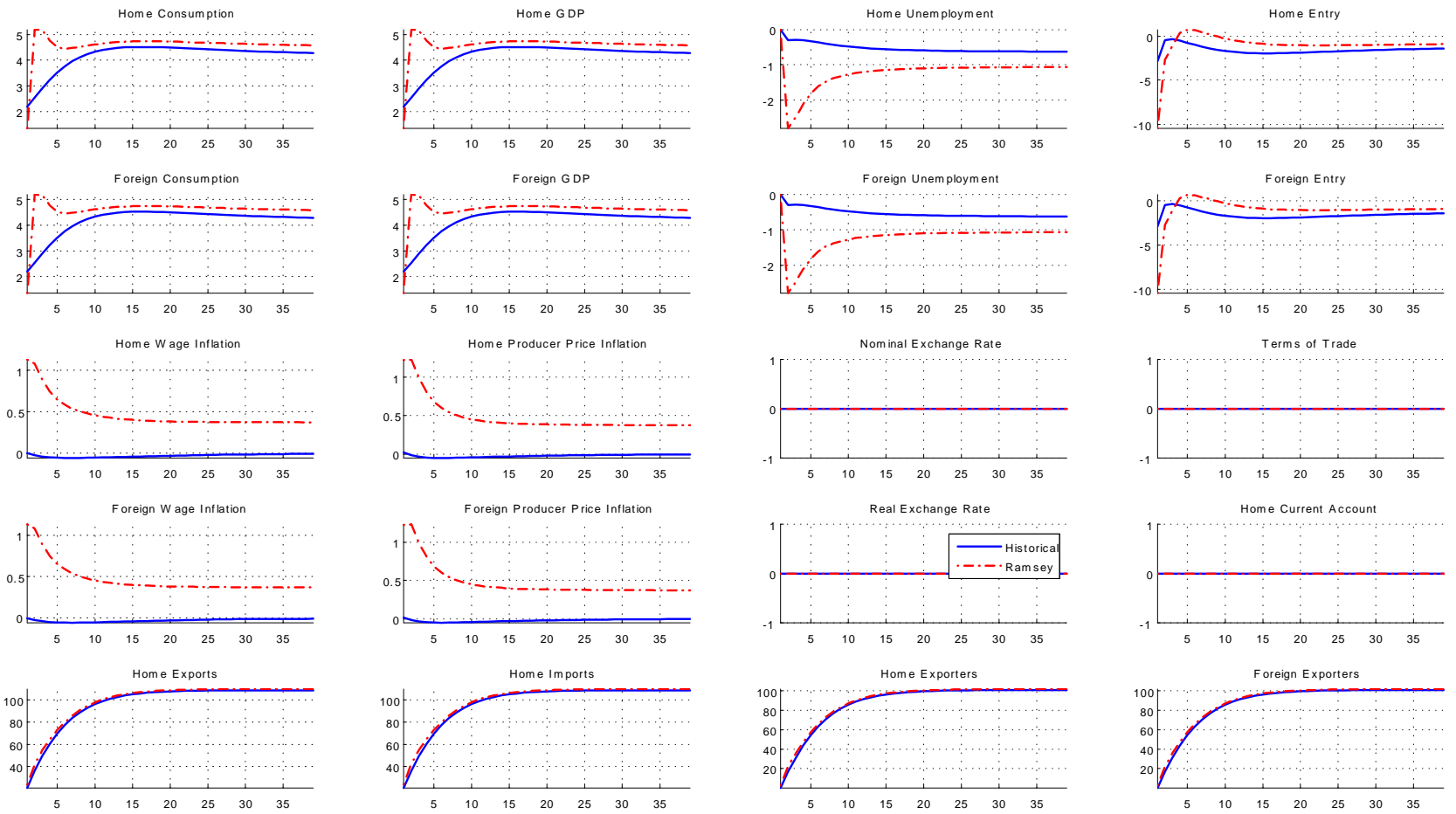
### **Cooperation versus Historical Behavior**

- Gains from cooperation are sizable relative to historical Federal Reserve behavior.
  - Sims (2007).
- The constrained efficient allocation generated by optimal cooperative policy can still be achieved by appropriately designed inward-looking policy rules, but suboptimal (historical) policy implies inefficient fluctuations in cross-country demand that result in large welfare costs when trade linkages are strong.

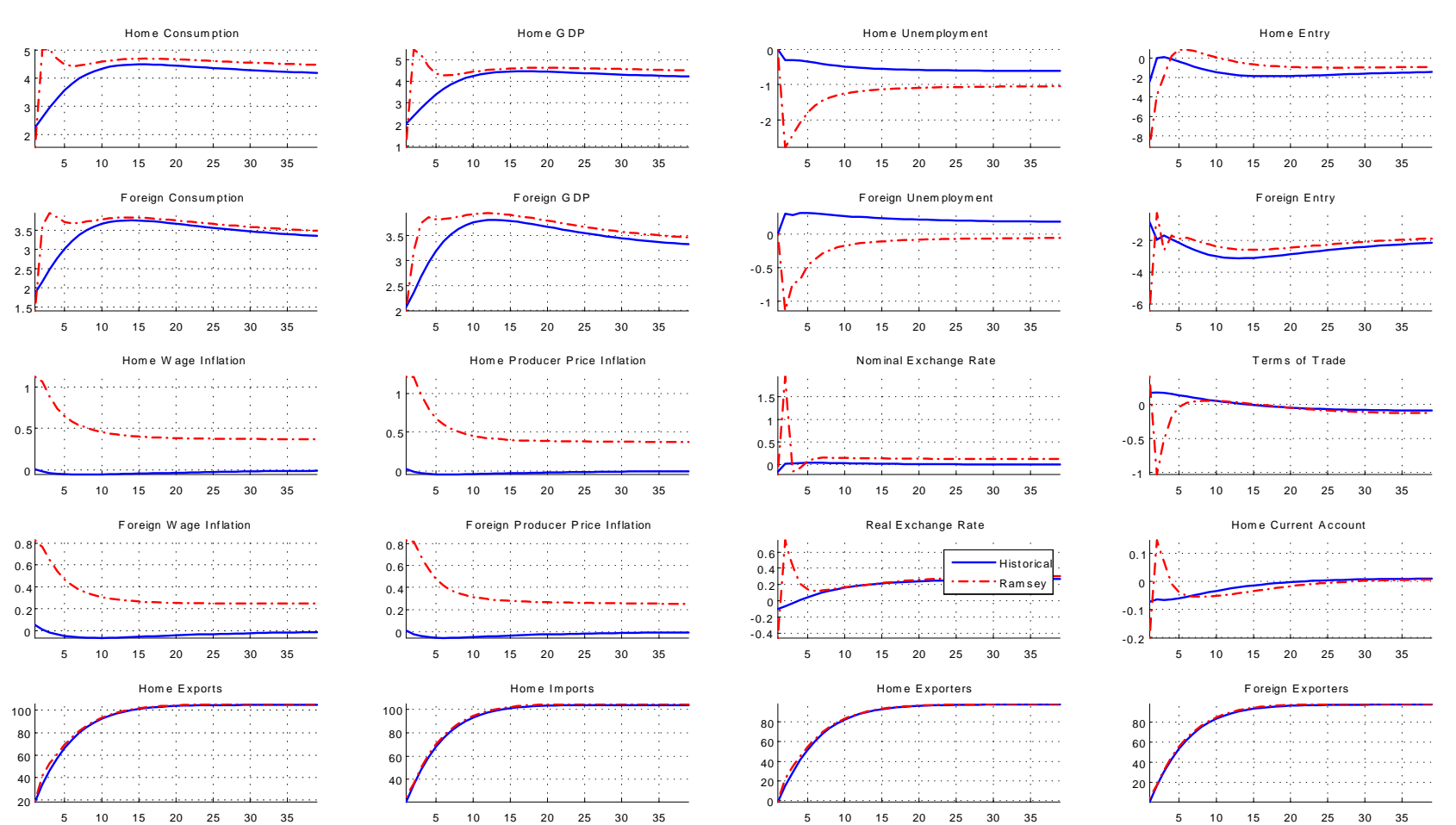
TABLE 6: TRADE INTEGRATION – NON STOCHASTIC STEADY STATE

<i>Relative Gain from Coordination – PCP</i>					
	Optimal Rule	Historical Rule	Peg		Nash
			Leader	Follower	
$\frac{Trade}{GDP} = 0.1$	0.88%	18.62%	18.81%	43.45%	0.0001%
$\frac{Trade}{GDP} = 0.2$	3.13%	25.36%	26.90%	45.40%	0.001%
$\frac{Trade}{GDP} = 0.35$	3.15%	29.69%	32.31%	48.39%	0.09%
<i>Relative Gain from Coordination – LCP</i>					
	Optimal Rule	Historical Rule	Peg		Nash
			Leader	Follower	
$\frac{Trade}{GDP} = 0.1$	2.17%	20.91%	20.89%	44.90%	0.10%
$\frac{Trade}{GDP} = 0.2$	2.66%	29.09%	29.49%	47.34%	0.90%
$\frac{Trade}{GDP} = 0.35$	3.16%	36.16%	37.00%	51.97%	2.42%

Note: gains are the percentage reduction in welfare costs of business cycle under the Ramsey-optimal policy.



Trade Integration, Symmetric Flexible Countries, Historical Policy (Solid) versus Optimal Policy (Dashed).



Trade Integration, Asymmetric Countries, Historical Policy (Solid) versus Optimal Policy (Dashed).

## A “Newer” Issue: Market Reforms

- A frequently made argument in policy circles: Market reforms that facilitate product creation and enhance labor market flexibility would be beneficial for rigid economies, such as those of several European countries.
  - More flexible markets would foster more rapid recovery from recessions and, in general, would result in better economic performance.
    - Deregulation of product markets would accomplish this by boosting business creation and enhancing competition;
    - Deregulation of labor markets would do it by facilitating reallocation of resources and speeding up the adjustment to shocks.
- Results in the academic literature support these arguments.
  - Blanchard and Giavazzi (2003), Cacciatore and Fiori (2011), Dawson and Seater (2011), Ebell and Haefke (2009), Felbermayr and Prat (2011), Fiori et al. (2011), Griffith, Harrison, and Maccartney (2007), Krebs and Scheffel (2014), Messina and Vallanti (2007).



## Market Reforms and the Macroeconomy

- What are the domestic and international consequences of structural reforms?
- The Euro Area crisis has put structural reforms at the center of ongoing debates in Europe, and earlier analyses placed market reforms in the context of understanding differences and interdependence between the U.S. and Europe.
- In Cacciatore and Ghironi (2013), we calibrate the model of CG to the U.S. vs. a country that differs from the U.S. by having more rigid markets (“Europe”).
- European producer entry costs, unemployment benefits, and worker bargaining power are then lowered to U.S. levels.
- These reforms result in increased domestic producer entry and lower unemployment at home and abroad, but a worse domestic external balance—at least for some time.
- By putting upward pressure on labor costs, producer entry implies stronger terms of trade during much of the transition.
  - Contrast with Corsetti, Martin, and Pesenti (2013) and the “reduced form” approach to structural reforms in Andrés, Arce, and Thomas (2014—AAT), Eggertsson, Ferrero, and Raffo (2013—EFR), Fernández-Villaverde, Guerrón-Quintana, and Rubio-Ramírez (2012—FGR), and others.

## Market Reforms and Monetary Policy

- What is the role of monetary policy in managing dynamics triggered by market reforms?
  - Barkbu et al. (2012): Market reforms in Europe should be accompanied by active policies supporting aggregate demand.
- How do structural reforms affect optimal monetary policy?

## Results

- When regulation is high, Ramsey optimal, cooperative policy requires significant departures from price stability both in the long run and over the business cycle (as in the case of low trade).
- Adjustment to market reforms requires expansionary policy, but deregulation reduces static and dynamic inefficiencies, making price stability more desirable at home and abroad once the transition is complete.
- Optimal cooperative monetary policy maximizes the benefits of market reforms, with non-negligible welfare gains relative to historical policy behavior.

WELFARE EFFECTS OF REFORMS, STEADY STATE, HIGH TRADE

Market Reform	$\Delta$ Welfare (Historical)		$\Delta$ Welfare (Peg)		$\Delta$ Welfare (Ramsey)		Ramsey Inflation	
	Home	Foreign	Home	Foreign	Home	Foreign	Home	Foreign
Status Quo (Flexible Partner)	0%	0%	0%	0%	0.53%	0.27%	2.07%	1.55%
Asymmetric PMR	3.41%	0.08%	3.41%	0.08%	3.89%	0.35%	2.01%	1.54%
Asymmetric LMR	3.95%	0.23%	3.94%	0.23%	4.22%	0.48%	1.55%	1.53%
Asymmetric JOINT	6.64%	0.28%	6.64%	0.28%	6.91%	0.52%	1.52%	1.52%

Note: PMR  $\equiv$  Product Market Reform; LMR  $\equiv$  Labor Market Reform;

JOINT  $\equiv$  Product and Labor Market Reform; Asymmetric  $\equiv$  Home country reform;

$\Delta$ Welfare (Historical)  $\equiv$  Welfare change under historical policy;

$\Delta$ Welfare (Peg)  $\equiv$  Welfare change under exchange rate peg (Foreign leader);

$\Delta$ Welfare (Ramsey)  $\equiv$  Welfare change under Ramsey policy.

## WELFARE EFFECTS OF REFORMS, BUSINESS CYCLE, HIGH TRADE

Market Reform	Welfare Cost (Historical)		Welfare Cost (Peg)		Welfare Cost (Ramsey)	
	Home	Foreign	Home	Foreign	Home	Foreign
Status Quo (Flexible Partner)	2.37%	1.15%	2.42	1.15	2.033%	0.92%
Asymmetric PMR	1.95%	1.12%	1.98%	1.12%	1.62%	0.89%
Asymmetric LMR	1.10%	1.07%	1.14%	1.07%	0.87%	0.85%
Asymmetric JOINT	1.08%	1.06%	1.12%	1.06%	0.85%	0.85%

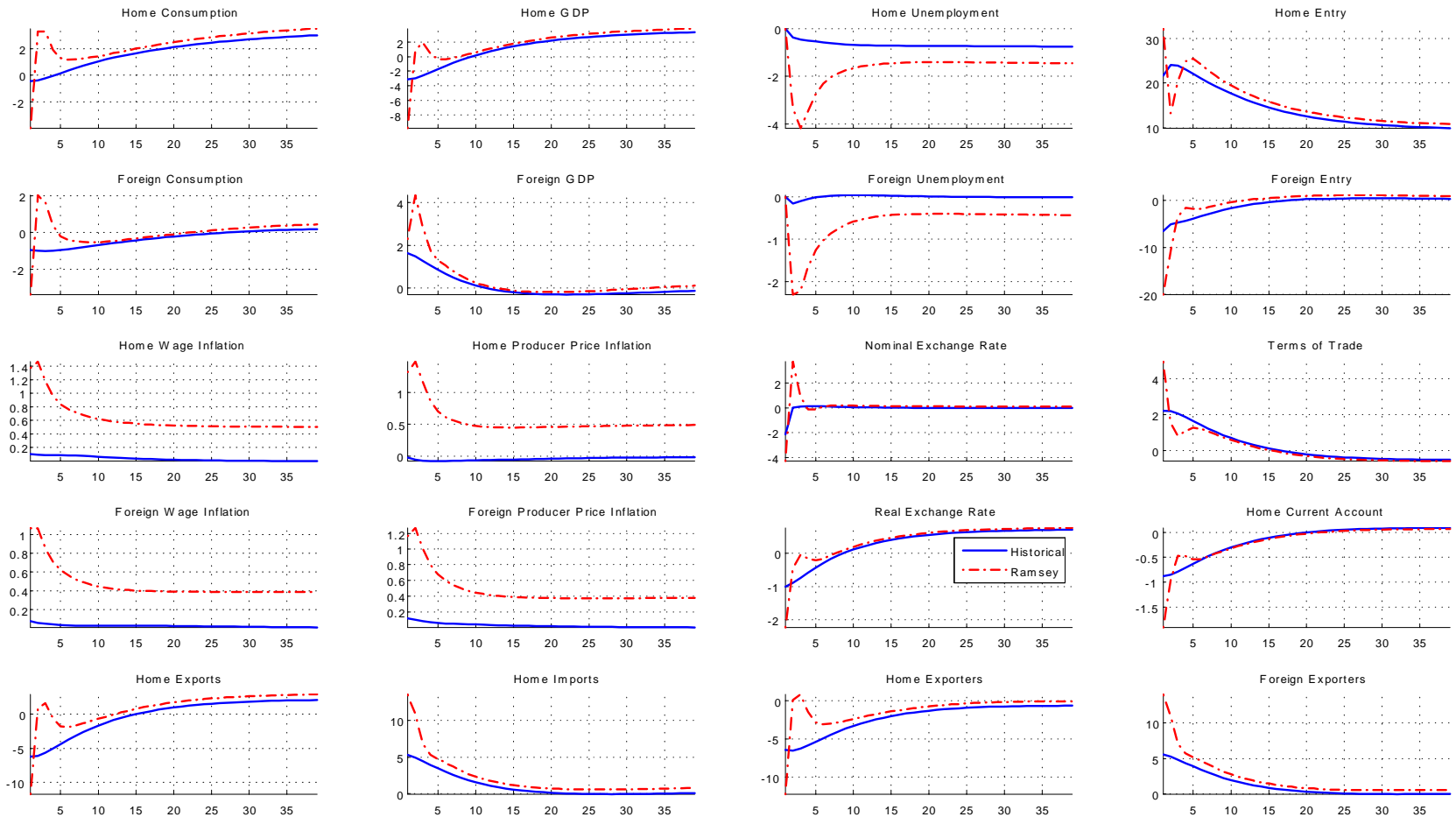
Note: PMR  $\equiv$  Product Market Reform; LMR  $\equiv$  Labor Market Reform;

JOINT  $\equiv$  Product and Labor Market Reform; Asymmetric  $\equiv$  Home country reform;

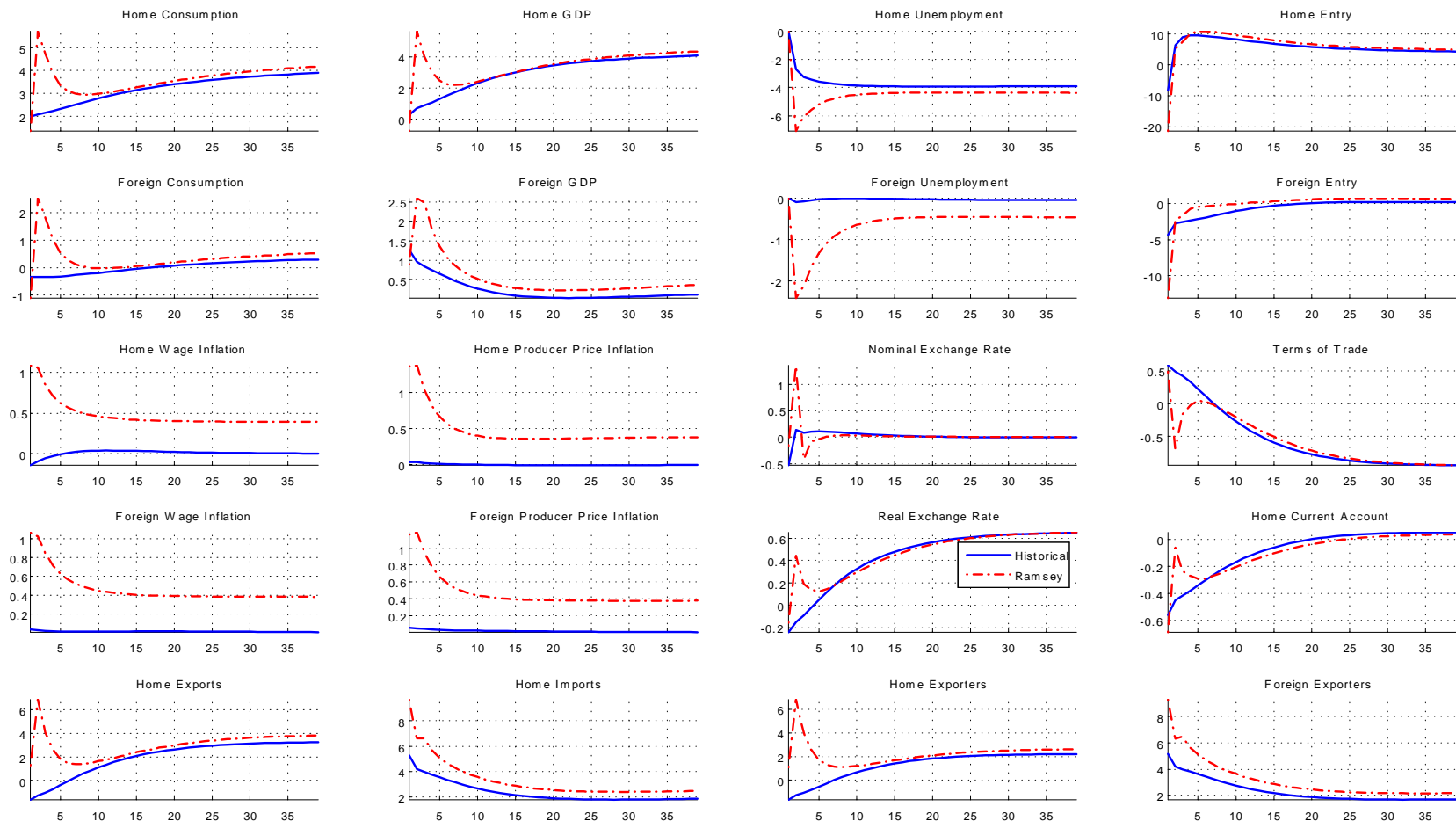
Welfare Cost (Historical)  $\equiv$  Welfare cost of business cycles under historical policy;

Welfare Cost (Peg)  $\equiv$  Welfare cost of business cycles under exchange rate peg (Foreign leader);

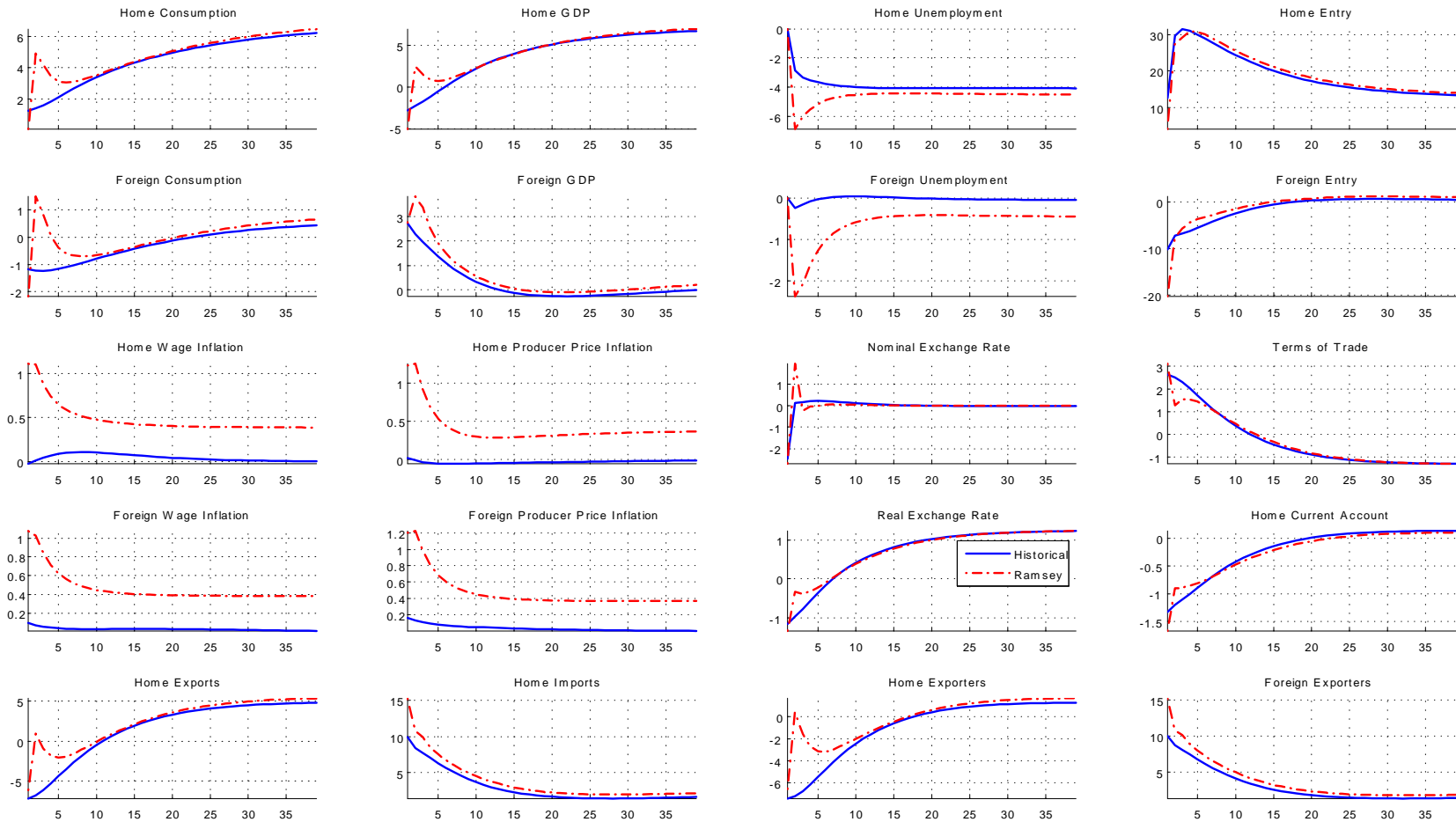
Welfare Cost (Ramsey)  $\equiv$  Welfare cost of business cycles under Ramsey policy.



Home Product Market Deregulation, Flexible Regulation in Foreign, High Trade, Historical Policy (Solid) versus Optimal Policy (Dashed).



Home Labor Market Deregulation, Flexible Regulation in Foreign, High Trade, Historical Policy (Solid) versus Optimal Policy (Dashed).



Home Product and Labor Market Deregulation, Flexible Regulation in Foreign, High Trade, Historical Policy (Solid) versus Optimal Policy (Dashed).



## Margins and Distortions

- The worldwide Ramsey central bank uses its policy instruments (home and foreign interest rates) to address the consequences of a set of distortions.
- I will not go into model details, but I will summarize the sources of inefficiency with reference to the margins on which they impinge.
- Price and wage stickiness, firm monopoly power, positive unemployment benefits, “red tape” regulation, trade costs, and incomplete asset markets affect five margins of adjustment and the resource constraint for consumption output in the market economy.

# 1. Product Creation Margin

- Sticky prices result in inefficient time-variation and lack of synchronization of domestic and export markups that introduce inefficiency in the product creation margin (described by the Euler equations for product creation at Home and abroad).
  - Time variation and lack of synchronization of markups across markets imply inefficient deviations of the monopoly profit incentive for product creation (the markup) from the welfare benefit of product variety determined by the elasticity of substitution across products.
- Moreover, the product creation margin is distorted by the presence of non-technological entry costs and by any trade cost that is the result of (suboptimal) trade policy.
  - Trade costs affect overall firm profitability and hence the incentives for product creation.
- The Euler equations for domestic and foreign product creation coincide with those of the first-best environment only when prices are flexible and there is no “red tape” nor suboptimal trade barriers.

## 2. Export Entry Margin

- Trade costs affect the export entry margin, described by the zero-profit conditions that determine the productivity cutoffs for export entry at home and abroad.
  - We may view trade costs as entirely determined by trade technology, in which case they are not a source of distortion, or as the result of trade policy.
  - In the latter case, suboptimal trade policy will imply that trade costs are a distortion.
  - The consequences of changes in trade costs for monetary policy do not change with the interpretation of trade costs.

### 3. Job Creation Margin

- This margin of adjustment is described by the Euler equations for job creation in the two countries.
- Monopoly power in the final consumption sector distorts the job creation decision by inducing a suboptimally low return from vacancy posting.
  - Price stickiness impacts this departure from efficiency by inducing endogenous markup variation.
- Failure of the Hosios condition (for which equality of the firm's bargaining share and the vacancy elasticity of the matching function is necessary for efficiency) is an additional distortion in this margin.
  - This is affected both by the flexible-wage value of the bargaining share and the presence of wage stickiness, which induces time variation of the bargaining share.
    - Sticky wages are sufficient to generate a wedge between private and social returns to vacancy posting.
- Sticky wages distort job creation also by affecting the outside option of firms through the cost of wage adjustment.
- Finally, unemployment benefits increase the workers' outside option above its efficient level.

## 4. Labor Supply Margin

- With endogenous labor supply, monopoly power in product markets induces a misalignment of relative prices between consumption goods and leisure.
  - This is the distortion that characterizes standard New Keynesian models without labor market frictions and endogenous product dynamics.
- Sticky prices induce time variation of this distortion.

## 5. Cross-Country Risk Sharing Margin

- Incomplete markets imply inefficient risk sharing between Home and Foreign households:
  - The ratio of marginal utilities of consumption at Home and abroad is not tied to the welfare-based real exchange rate.
- The departure of consumption dynamics from the perfect risk sharing outcome is also affected by costs of adjusting bond holdings.

## Resource Constraint

- Sticky prices and wages, the non-technological portion of product creation costs, and costs of adjusting bond holdings imply inefficient diversion of resources from consumption and creation of new products and vacancies.

## The Role of Monetary Policy

- The market allocation is efficient if and only if *all* the distortions are zero at all points in time.
- We abstract from optimal fiscal policy, and we allow for asymmetric shocks.
- Hence, we work in a second-best environment in which the efficient allocation cannot be achieved.
- The worldwide Ramsey central bank of the optimal, cooperative scenario uses its leverage on the economies via sticky prices and wages, trading off their costs against the possibility of addressing the distortions that characterize the market economy under flexible wages and prices.



## Some Intuition for Results

- Optimal policy uses inflation to narrow inefficiency wedges relative to the efficient allocation along the economies' margins of adjustment.
- For instance, positive long-run inflation pushes job creation closer to the efficient level by eroding markups and reducing worker bargaining power in the presence of sticky wages.
- Market reform reduces the need for inflation to accomplish this.
- Similarly, the reallocation of market share that is implied by trade integration results in an endogenous increase in average firm productivity.
- This makes job matches more valuable and pushes employment toward the efficient level, reducing the need for average inflation to accomplish this.
- The incentive to use inflation over the business cycle is determined by the tradeoffs between domestic and international distortions (which imply more active monetary policy for the relatively more distorted economy) and the tension between price stability and wage stability.

# Market Deregulation and Optimal Monetary Policy in a Monetary Union

- The debate on the benefits of market reforms has been particularly heated recently in the context of the Euro Area.
- What are the consequences of structural reforms for monetary policymaking by the central bank of a monetary union of countries that may implement asymmetric reforms?
- EFR argue that the deflationary pressure generated by reforms can exacerbate the problem posed by the zero lower bound on interest rate setting.
- In Cacciatore, Fiori, and Ghironi (2013), we study the implications of market reforms for monetary policy in a monetary union.

## The Exercise

- We assume a common currency and monetary policy for the two countries in the model.
- We simplify the framework relative to CG by removing heterogeneity and the endogenous trade margin.
- We allow for endogenous flexible-price markups by assuming translog preferences to capture pro-competitive effects of product market reforms under flexible prices.
- Translog preferences introduce an additional source of misalignment between monopoly profit incentive for product creation (the markup) and the welfare benefit of product variety—and an additional motive for a positive steady-state inflation target.

## Results

- Under high regulation, it is optimal to have a positive inflation target and to let inflation deviate from target over the cycle by more than under historical ECB policy.
- The optimal response to market reforms is more expansionary than historical behavior.
- Price stability is less costly in the post-deregulation environment.
- Coordinated (synchronized) reforms are more beneficial than asymmetric reforms across countries, which create an additional tradeoff for monetary policy by causing the desirability of inflation to differ across countries.
- The intuitions for results are similar to those above.

TABLE 5: WELFARE EFFECTS OF REFORMS – NON STOCHASTIC STEADY STATE

Market Reform	$\Delta$ Welfare (Historical)		$\Delta$ Welfare (Ramsey)		Ramsey Inflation
	Home	Foreign	Home	Foreign	
Status Quo	0%	0%	0.21%	0.21%	1.20%
Asymmetric PMR	5.00%	0.22%	5.09%	0.41%	1.07%
Asymmetric LMR	3.32%	0.21%	3.44%	0.39%	1.00%
Asymmetric JOINT	7.38%	0.38%	7.41%	0.55%	0.96%
Symmetric PMR	5.22%	5.22%	5.30%	5.30%	1.00%
Symmetric LMR	3.51%	3.51%	3.61%	3.61%	0.85%
Symmetric JOINT	7.72%	7.72%	7.76%	7.76%	0.76%

Note: PMR  $\equiv$  Product Market Reform; LMR  $\equiv$  Labor Market Reform;

JOINT  $\equiv$  Product and Labor Market Reform; Asymmetric  $\equiv$  Home country reform;

Symmetric  $\equiv$  Home and Foreign country reform;

$\Delta$ Welfare (Historical)  $\equiv$  Welfare change under historical policy;

$\Delta$ Welfare (Ramsey)  $\equiv$  Welfare change under Ramsey policy.

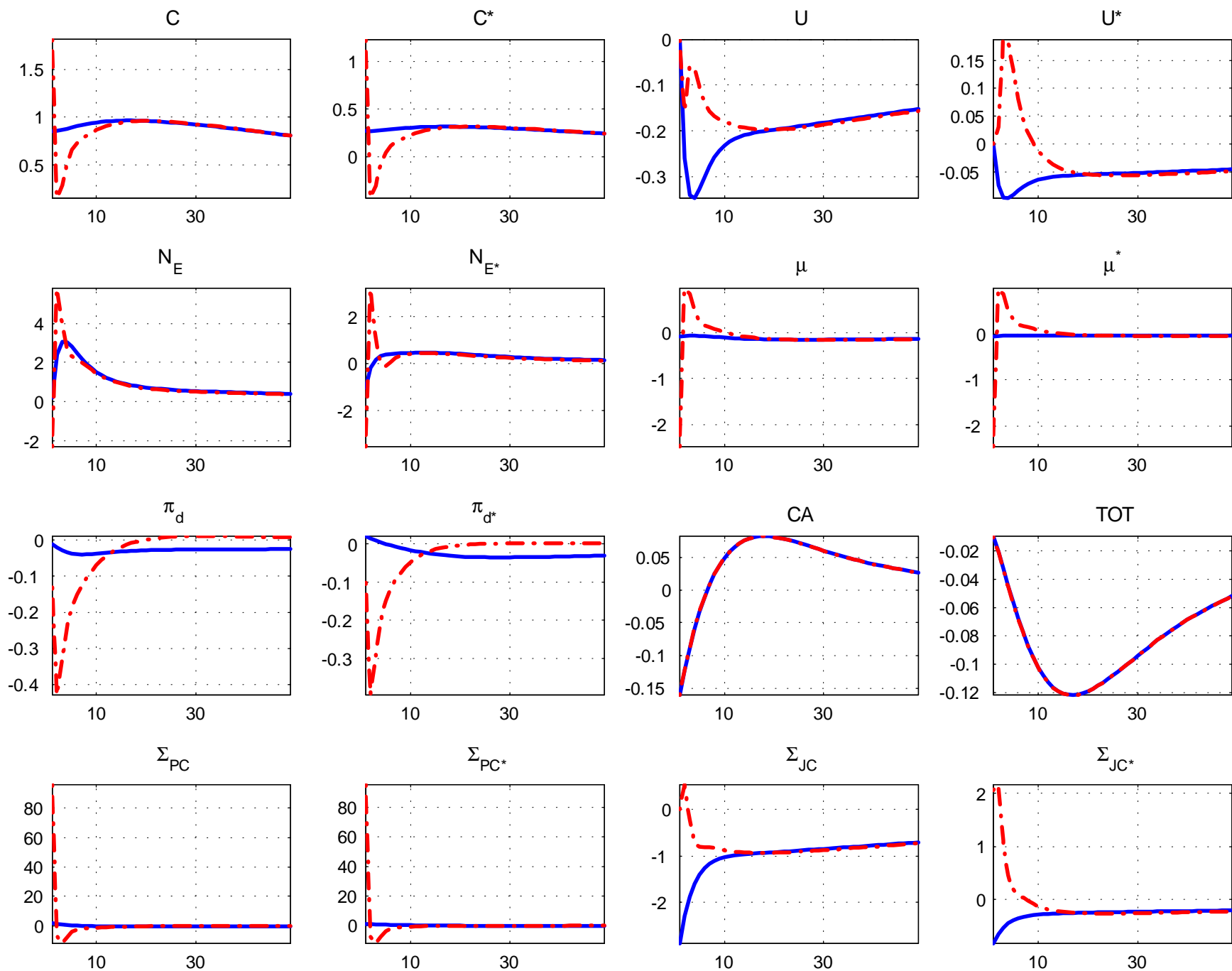


Figure 1: Home Productivity Shock, High Regulation, Historical Policy (Solid) versus Optimal Policy (Dashed).

TABLE 6: WELFARE EFFECTS OF REFORMS — STOCHASTIC STEADY STATE

Market Reform	Welfare Cost (Historical)		Welfare Cost (Ramsey)	
	Home	Foreign	Home	Foreign
Status Quo	0.94%	0.94%	0.75%	0.75%
Asymmetric PMR	0.78%	0.93%	0.65%	0.72%
Asymmetric LMR	0.55%	0.92%	0.50%	0.70%
Asymmetric JOINT	0.54%	0.92%	0.49%	0.69%
Symmetric PMR	0.77%	0.77%	0.62%	0.62%
Symmetric LMR	0.54%	0.54%	0.46%	0.46%
Symmetric JOINT	0.53%	0.53%	0.45%	0.45%

Note: PMR  $\equiv$  Product Market Reform; LMR  $\equiv$  Labor Market Reform;  
 JOINT  $\equiv$  Product and Labor Market Reform; Asymmetric  $\equiv$  Home country reform;  
 Symmetric  $\equiv$  Home and Foreign country reform;  
 Welfare Cost (Historical)  $\equiv$  Welfare cost of business cycles under historical policy;  
 Welfare Cost (Ramsey)  $\equiv$  Welfare cost of business cycles under Ramsey policy.

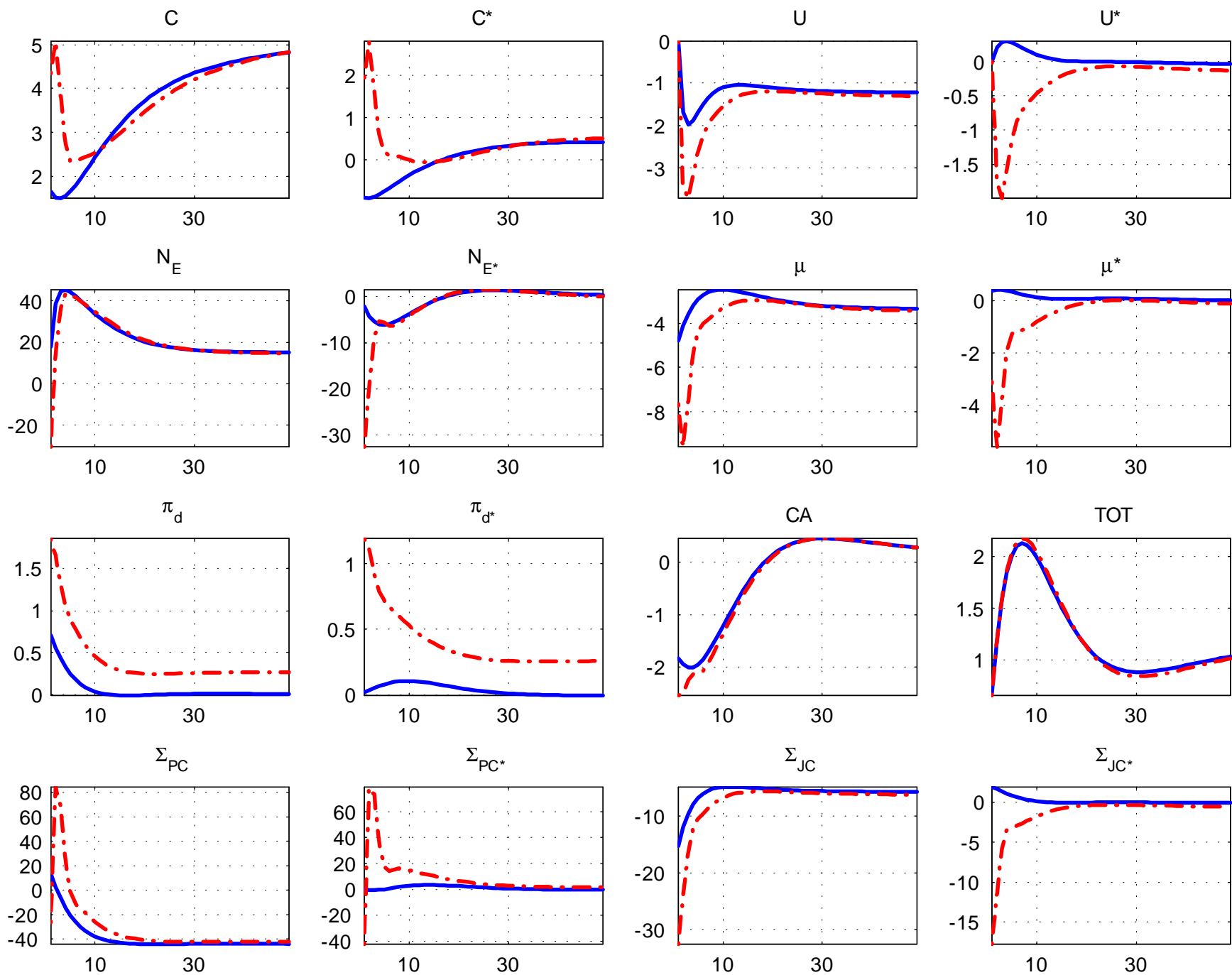


Figure 2: Home Product Market Deregulation, Historical Policy (Solid) versus Optimal Policy (Dashed).



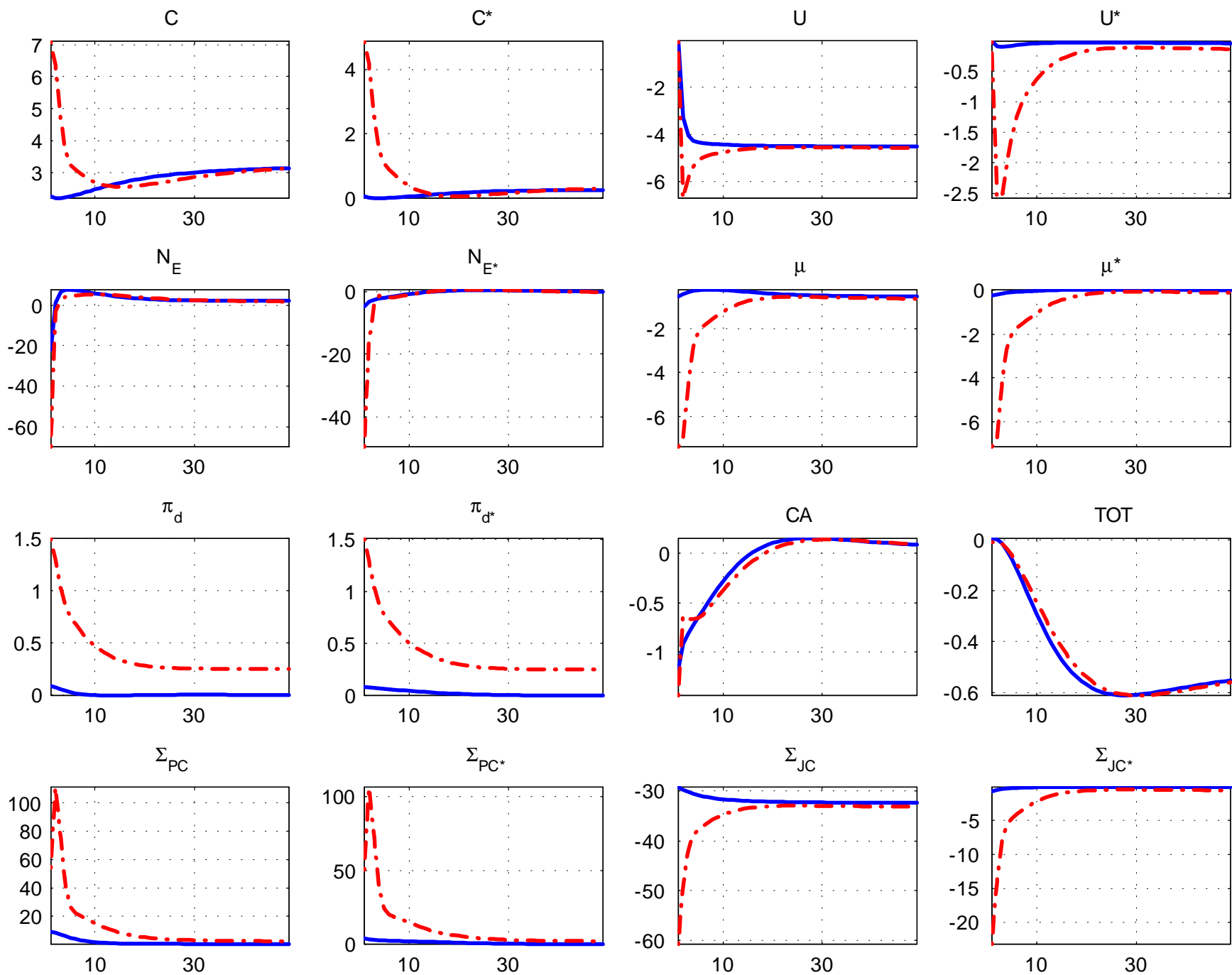


Figure 3: Home Labor Market Deregulation, Historical Policy (Solid) versus Optimal Policy (Dashed).

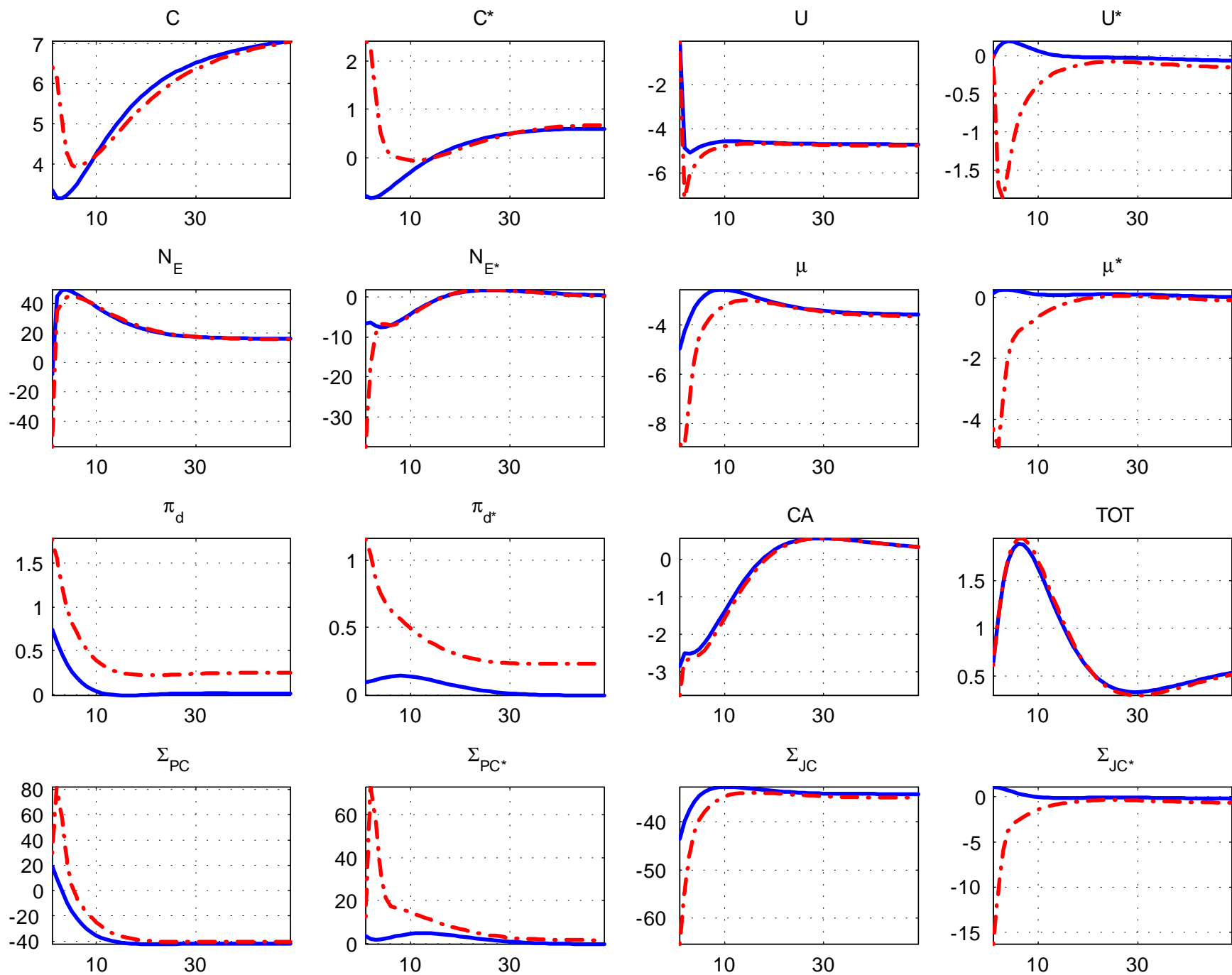


Figure 4: Home Product and Labor Market Deregulation, Historical Policy (Solid) versus Optimal Policy (Dashed).

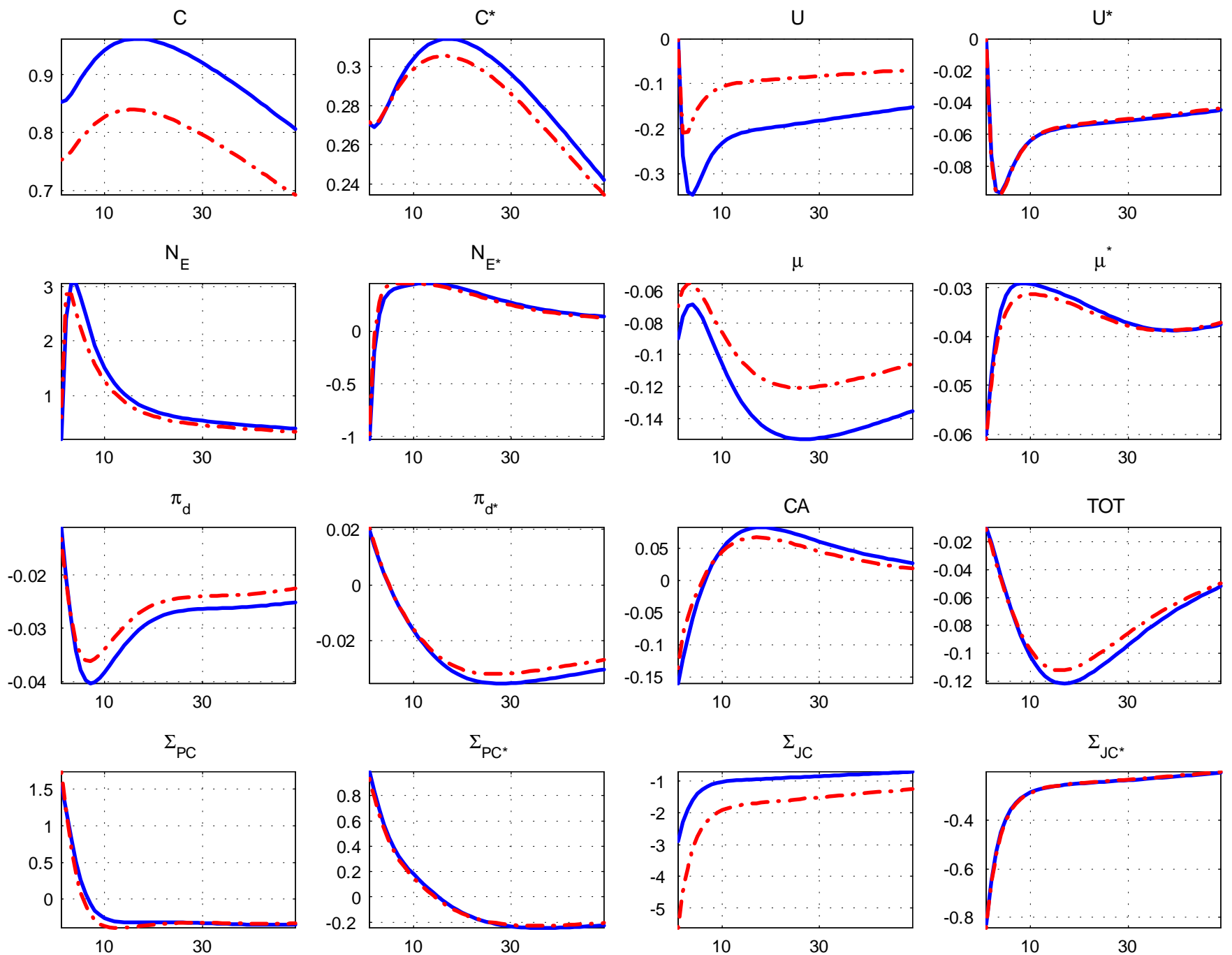


Figure 5: Home Productivity Shock, Historical Policy, High Regulation (Solid) versus Low Regulation (Dashed).

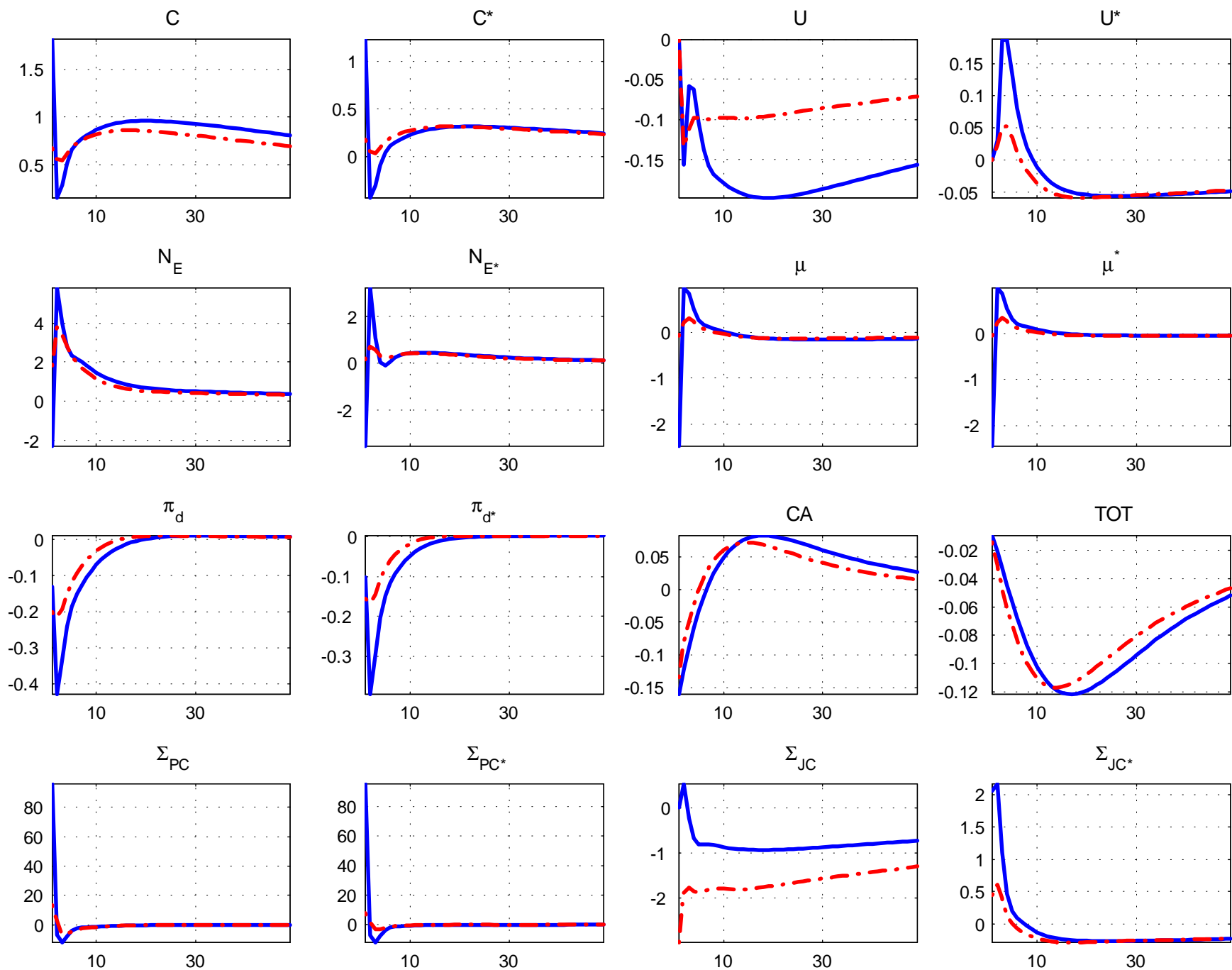


Figure 6: Home Productivity Shock, Optimal Policy, High Regulation (Solid) versus Low Regulation (Dashed).

## Structural versus Reduced Form Structural Reforms

- Different from AAT, EFR, FGR, and others, market reforms
  - are not deflationary,
  - they do not necessarily cause the terms of trade to depreciate,
  - they cause (optimal) current account deficit.
- Why these differences?
- In those papers, reforms are modeled in “reduced form” way as exogenous cuts to price and wage markups.
  - These are obviously deflationary, induce the terms of trade to depreciate, and cause a current account surplus.
- “Structural” structural reforms cause an “investment boom” (in business and job creation) that has opposite effects.

## Conclusions

- A fast growing literature has been developing modeling tools that can provide the theoretical framework to study questions of interest to CompNet.
- A crucial next step will be to confront these tools with the wealth of data that CompNet has been collecting, building on the data for model calibration, evaluation, refinement.
- Important next steps in the specific research program I have been pursuing will also include the study of strategic interactions between different policies (monetary-trade, monetary-regulation) and the role of financial market frictions.
- Thank you.