The Domestic and International Effects of Interstate U.S. Banking: Appendix

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1   Historical Background

The Transition to Interstate Banking in the U.S.

For decades, state and federal laws limited where banks could operate in the U.S. As a result, the banking system was anything but national. Until the late 1970s, every state effectively barred banks from other states, so instead of one national banking system, the country had 50 banking systems, one per state (Morgan, Rime, and Strahan, 2004). Moreover, most states also prohibited branching across counties within the state, so the country had essentially as many banking systems as counties.[1] State-level deregulation beginning in the late 1970s lifted restrictions on bank expansion both within and across states. By the early 1990s, almost all states had removed restrictions. The transition to truly interstate banking was completed with the passage of federal legislation by the mid 1990s.

Restrictions on banks' ability to expand within a state through branching were initially imposed by the states in the nineteenth century. Although there was some deregulation of these branching restrictions in the 1930s, most states either prohibited branching altogether or limited branching

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[1]Banks were also shielded from competitive pressures in the deposit market. Regulation Q, the Prohibition Against the Payment of Interest on Demand Deposits, put in place by the Glass-Steagall Act of 1933, limited price competition by imposing ceilings on deposit interest rates. In the early 1980s, interest rate ceilings were largely removed, allowing banks to compete more vigorously for funds.

until the 1970s. For example, Florida prohibited branch banking entirely until 1977, when banks were allowed to branch within the county where their main offices were located, and finally permitted branching statewide in 1988. Only thirteen states allowed unrestricted intrastate branching in 1974. During the next two and a half decades, thirty-five states deregulated in waves, rather than all at once as in our simplified theoretical exercise, substantially eliminating restrictions on intrastate branching. By 1992, all but three states allowed some form of statewide branching (Jayaratne and Strahan, 1998).

Many states had allowed banking companies to expand within the state by forming multi-bank holding companies (MBHCs) before they allowed branch banking. By 1975, thirty-five states allowed MBHC expansion within state. Of the fifteen remaining states, all but Rhode Island relaxed MBHC restrictions between 1975 and 1992, about the same time as they relaxed branching restrictions (Jayaratne and Strahan, 1998). However, MBHCs are more costly to operate than branch banks because they require separate charters, boards of directors, and capitalization of each bank subsidiary.[2]

In addition to facing restrictions on within-state branching, the Douglas Amendment to the 1956 Bank Holding Company Act effectively prohibited MBHCs from establishing or purchasing bank subsidiaries outside the state where they were headquartered unless the target bank's state authorized it. Since no state allowed such transactions in 1956, the amendment effectively barred interstate banking. States had the option to allow out-of-state MBHCs to enter, but none exercised it until 1978, when Maine permitted such transactions, and Alaska and New York followed in 1982 (Morgan, Rime, and Strahan, 2004). As part of the Garn-St. Germain Act, federal legislators amended the Bank Holding Company Act in 1982 to allow failed banks and thrifts to be acquired by any bank holding company, regardless of state laws (Kroszner and Strahan, 1999). Many states then entered reciprocal arrangements whereby their banks could be bought by banks in any other state in the arrangement. By 1992, all states but Hawaii had entered an interstate banking agreement with other states. Interstate banking activity increased sharply as a result of deregulation. The percentage of deposits held by subsidiaries of out-of-state MBHCs in the typical state expanded from 2 to 28 percent between 1979 and 1994 (Berger, Kashyap, and Scalise, 1995).[3]

The transition to interstate banking was completed with passage of the Reigle-Neal Interstate

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[2] The high cost of the MBHC structure is confirmed by the fact that many multibank holding companies converted their bank subsidiaries into branches once branching was allowed (McLaughlin, 1995).

[3] According to Morgan, Rime, and Strahan (2004), in 1975, only 10 percent of bank assets in the typical state were owned by a multistate bank holding company. By 1994, this interstate bank asset ratio had risen to 60 percent.

Banking and Branching Efficiency Act of 1994. The Reigle-Neal Act made interstate banking a bank right, not a state right; banks or holding companies could now enter another state without having to obtain permission (Morgan, Rime, and Strahan, 2004). All the changes were codified at the national level in 1996 when Congress passed the Interstate Banking and Branching Efficiency Act. Banks may now branch not only within states but also across state lines in most cases, and bank holding companies may buy banks anywhere in the U.S. (Black and Strahan, 2002).

Banking Deregulation in the European Union, 1970s-1990s

Until the late 1970s, banking was heavily regulated in most European Union (EU) member countries, regulation was mostly uncoordinated across countries, and banking markets were severely segmented. Interest rate regulations, capital controls, bank branching restrictions, and branch-level capital requirement were widespread in EU member states. In addition, threats of potential capital controls substantially limited cross-border trade in banking activities (European Commission, 1988). Despite the recognition of freedom of establishment, foreign bank entry restrictions heavily constrained cross-border expansions. The 1980s brought a period of deregulation, gradually lifting most restrictions both within and across EU member states. Finally, starting in the late 1980s and going into the 1990s, the EU started to harmonize bank regulation, and, to some extent, to re-regulate the industry (Danthine, Giavazzi, Vives, and von Thadden, 1999). However, foreign bank penetration remains relatively low, partly indicating relatively high implicit entry barriers raised by national governments.

The Directive on The Abolition of Restrictions on Freedom of Establishment and Freedom to Provide Services for Self-Employed Activities of Banks and Other Financial Institutions, adopted in 1973, applies the national treatment principle, which ensures the equal regulatory and supervisory treatment of all firms operating in one country. Although entry restrictions could not be discriminatory, international competition, through the supply of cross-border services, was severely restricted by regulation on capital flows. Furthermore, there was no coordination of banking supervision, so that banks operating in different member states could be subject to different rules, raising costs of operating internationally (Dermine, 2002).

In the early 1980s, regulatory constraints imposed on banks by national authorities were widespread in the EU. Interest rate regulations were common, with the exception of Germany, the Netherlands, and the U.K. (Romero-Ávila, 2007). Capital controls were in place in Belgium, France, Greece, Ireland, Italy, Portugal, and Spain. Banks faced branching restrictions in France, Italy,

and Portugal, and there was a branch-level capital requirement in most countries (Romero-Ávila, 2007).

Over the next two decades, the constraints were gradually removed often as a preemptive move ahead of legislation harmonization, aimed at providing a level playing field for all credit institutions operating in different EU member states (Gual, 1999, and Romero-Ávila, 2007). For example, France and Italy lifted interest rate restrictions and liberalized capital flows in 1990, followed by Spain in 1992 (Gual, 1999). Portugal lifted restrictions on branching in 1984, France in 1987, Spain in 1988, and Italy in 1990 (Gual, 1999).

In general, the approach to the removal of regulatory barriers to an integrated EU banking market was threefold: minimum banking regulation permitting both the establishment of branches and the provision of services across borders throughout the EU; common rules on the supervision and regulation of financial institutions; and entrusting the responsibility for the supervision of banks operating in two or more member states from the host to the home country of the parent bank. The First and Second Banking Directives were the key measures as regards the creation of an integrated European banking market, with a number of other directives in this area playing a supporting role.[4]

The First Banking Directive, adopted in 1977, established the principle of home country control, shifting the responsibility for the supervision of credit institutions operating in two or more member countries from the host to the home country of the parent bank. The directive left national barriers to competition and differences virtually untouched (Danthine, Giavazzi, Vives, and von Thadden, 1999). As the directive provided no specific regulations, the European banking markets remained fragmented for the following reasons: A bank wishing to operate in another country still had to be authorized by the supervisors of that country; A foreign bank remained subject to supervision by the host country, and its range of activities could be constrained by host country laws; In most member states, branches had to be provided with earmarked capital as if they were new banks; Finally, restrictions on capital flows severely impaired the provision of international services (Dermine, 2002).

A first directive on the liberalization of capital movements was adopted in 1960 and a final directive in 1988. The 1988 directive stipulated that freedom of capital movements should exist, in principle, by July 1990. Only Greece, Ireland, Spain, and Portugal could apply derogation

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[4]Among these, the Solvency Ratio and the Capital Adequacy Directives of 1989 and 1993 (amended between 1992 and 1998), the Consolidated Accounts Directive of 1986, the Branch Establishment Directive of 1989, the Large Exposures Directive of 1992, and the Deposit-Guarantee Schemes Directive of 1994.

provisions until 1993, extended later to 1994 (Benink, 2000). Although the 1988 directive removed restrictions on capital flows, it also authorized member states to take necessary measures in the event of balance of payments problems. Some uncertainty, therefore, persisted concerning the complete and permanent freedom of capital flows (Dermine, 2002).

The Second Banking Directive, adopted in 1989, due to be implemented in 1993 and amended in 1992 and 1995, incorporated the principles of a single banking license, home country control, minimal harmonization of regulations, and mutual recognition of major commercial and investment banking activities (Danthine, Giavazzi, Vives, and von Thadden, 1999, and Dermine, 2002). Under this directive, all credit institutions authorized in a EU member country would be able to establish branches or supply cross-border financial services in other member countries without further authorization, provided that the bank was authorized to provide such services in the home country. Hence, a bank chartered in a EU member country has the right to open a subsidiary in another member country on the same conditions as nationals of the latter country.[5] The Second Banking Directive implies that national banking markets have become contestable. Hence, either incumbent banks adapt their conduct to prevent foreign entry, or foreign banks might indeed enter a new market.

The Treaty on European Union, adopted in 1992, envisaged a gradual transition to the common currency that concluded with the advent of Economic and Monetary Union in 1999. With irrevocably fixed exchange rates, money and capital markets moved to the euro, while the retail market continued to operate in legacy national currencies until 2002.[6] The Investment Services Directive of 1993 addressed the cross-border activities of all types of investment firms, including universal banks (Danthine, Giavazzi, Vives, and von Thadden, 1999). Finally, the Financial Services Action Plan, launched in 1999, outlined a series of initiatives to ensure the full integration of banking and capital markets—i.e., a single EU wholesale market—, open and secure retail banking and insurance markets, and development of prudential rules and supervision by 2005.

The harmonization of banking regulation in the EU should have been accomplished by 1993.

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[5] Note that, whereas the Glass-Steagall Act of 1933 legislated the separation of investment and commercial banking in the U.S., the banking model adopted in the EU was that of universal banking. Accordingly, the Second Banking Directive called for supervisory control of banks' permanent participation in the non-financial sector, while leaving control over financial conglomerates (the ownership structure of banks) to national regulators.

[6] As Gual (1999) notes, the introduction of the common currency did not necessarily mean in practice that a single market for financial services was created. First, in spite of advances in financial services provision with no need for physical proximity, there are still high "transport costs" in retail banking, and this means that entry into foreign markets must be based largely on the opening (or acquisition) of a branch network. Second, even though horizontal differentiation is hard to achieve in banking, this is not incompatible with preferences for domestic service providers, based on perceived quality. These preferences may lead to foreign competitors having only a very small share of local markets.

However, it can be argued that the harmonization, while substantial on paper, was not as effective in practice as of the late 1990s (Danthine, Giavazzi, Vives, and von Thadden, 1999). First, regulatory changes need time to feed through the legal systems of each member country. For example, the Second Banking Directive was implemented a year past the deadline for national implementation in the United Kingdom, Luxemburg, Belgium, and Spain. Second, despite the regulatory changes, a number of important impediments to cross-border activity—such as exceptions to the single market principle or host country control related to consumer protection or "general good"—remain. Cerasi, Chizzolini, and Ivaldi (1998) conclude that it is hard to identify the origin of changes in industry structure in the set of directives, even considering the actual implementation date in each country. Non-regulatory barriers, such as taxation of investment income that discriminates along national boundaries, might impede the cross-border activity of financial institutions as well. Legal differences between EU member states, in particular the lack of some form of common corporate law, also contribute to market segmentation.[7]

The Effects of Banking Deregulation in the EU

In anticipation of the Second Banking Directive, which stipulated removal of barriers to entry into new markets, banks consolidated locally in many EU member countries. Despite the resultant high bank concentration, both the costs and prices of banking services fell. Although bank market integration and competition in the EU lagged behind the U.S., motivating the assumed asymmetry across countries in our exercise, the improvements in banking appear to have lowered concentration in non-financial industries and boosted aggregate output growth, suggesting a reversal of effects as the EU catches up to the U.S. over time.

As we noted above, until the early 1990s, banks were still protected from competition through formal and informal barriers to market entry, collusive arrangements, and regulation.[8] However, at least until the early 1990s, this lack of competition was not associated with industry concentration at the national level, and it indicates rather fragmented national markets (Danthine, Giavazzi, Vives, and von Thadden, 1999). The surge in international consolidation in the late 1990s resulted in the emergence of large banks, mostly competing in wholesale markets and providing banking services to large firms (Dermine, 2002). However, the retail market servicing small and medium enterprises, which employ more than 50 percent of the labor force, has remained mostly domestic and local. In

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[7]We do not discuss post-2000 regulations such as the Regulation on the European Company Statute of 2001 and the EU Takeover Directive of 2004 because the focus of our paper is on the 1970s-1990s period.

[8]See also Gual and Neven (1993) and Vives (1991).

fact, since the mid 1990s, domestic consolidation in the EU has considerably increased the level of concentration (European Central Bank, 2005). In several member countries, domestic incumbents have preserved their market share, and antitrust measures exceed the oligopoly threshold (Dermine, 2002). In contrast to the U.S., where the percentage of bank assets owned by a multistate bank holding company in the typical state surged following deregulation, foreign bank penetration in the EU remained relatively low, with the share of assets owned by foreign banks averaging 15 percent. The low foreign bank shares in EU member countries may primarily result from net comparative disadvantages for foreign banks and relatively high implicit government entry barriers (Berger, 2007). Indeed, cross-border mergers among commercial banks—which should be preferred to domestic consolidation because they exploit economies of scale without posing any threat to competition—run against a deeply ingrained and widespread desire to foster national champions and are often frowned upon, discouraged, or even prevented (Danthine, Giavazzi, Vives, and von Thadden, 1999).

The intermediation margin on the retail market has declined in many member states (Danthine, Giavazzi, Vives, and von Thadden, 1999 and Dermine, 2002). For example, Angelini and Cetorelli (2003) find that competitive conditions in the Italian banking industry improved substantially with the implementation of the Second Banking Directive, as indicated by the decline in estimated markups. They also find no evidence that consolidated banks gained market power; at the same time, these banks exhibited lower costs than the industry average. Cetorelli (2004) finds that enhanced bank competition following the implementation of the Second Banking Directive lowered concentration in non-financial industries in the EU.[9]

An important concern is whether consolidation may have lead to a reduction in small business lending. Some empirical evidence indicates that there might be hardly any negative effects. For example, Bonaccorsi di Patti and Gobbi (2003) show that bank consolidation had no negative impact on outstanding credit in Italy and did not raise the investment-cash flow sensitivity of privately held firms. They find that borrowers of acquired banks tended to experience an expansion of credit at least in the short run. Bank consolidation did not appear to have adverse effects even for smaller firms, those that depend on fewer banks and those that are riskier. However, no expansionary effect of acquisitions is found for these borrowers, suggesting that banks transferred part of the efficiency gains on their safer and larger corporate customers.

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[9]However, Cetorelli cautions against inferring the long-run effects of deregulation on the market structure of EU non-financial industries given the short span of the data set.

The Second Banking Directive, endorsing universal banking, encouraged banks to engage in non-commercial banking activities such as investment banking, asset management and insurance, thereby fostering cross-sector consolidation in the financial sector. As a result, the ratio of bank assets to GDP doubled in several member countries (Dermine, 2002). Similarly to the U.S., where states enjoyed faster income growth following banking deregulation (Jayaratne and Strahan, 1996), Romero-Ávila (2007) finds that banking deregulation raised output growth in the EU, mainly through improvements in the efficiency of financial intermediation, possibly furthered by competition pressures.

2   The Profit Destruction Externality

Consider profits from domestic sales: $d_{D,t} = \alpha \left(\rho_{D,t}\right)^{1-\theta} C_t/\theta$, with $\rho_{D,t} = \left(\rho_{T,t}\right)^{-1} \mu w_t/Z_t$. The price index for traded goods in the home country implies $1 = N_t \left(\rho_{D,t}\right)^{1-\theta} + N_t^* \left(\rho_{X,t}^*\right)^{1-\theta}$, or $\rho_{D,t} = (N_t)^{\frac{1}{\theta-1}} \left[1 - N_t^* \left(\rho_{X,t}^*\right)^{1-\theta}\right]^{\frac{1}{1-\theta}}$. An increase in the number of domestic producers thus decreases $d_{D,t}$ by

$$\frac{\partial d_{D,t}}{\partial N_t} \frac{\partial N_t}{\partial N_t(h)} = -\frac{\alpha}{\theta} \frac{1 - N_t^* \left(\rho_{X,t}^*\right)^{1-\theta}}{N_t^2} C_t,$$

and it is straightforward to verify that the derivative of $d_{D,t+1} N_{t+1}(h)$ with respect to $N_{t+1}(h)$ is given by $\left(1 - N_{t+1}(h)/N_t\right) d_{D,t+1}$. Under symmetry across banks, this reduces to $\left(1 - 1/H\right) d_{D,t+1}$ (see below). A similar reasoning applies to export profits.

3   Welfare- versus Data-Consistent Price Indexes

The welfare-based definition of the real exchange rate is $Q_t \equiv \varepsilon_t P_t^*/P_t$, computed using welfare-based price indexes (P_t and P_t^*). Under C.E.S. product differentiation, it is well-known that price indexes can be decomposed into components reflecting average prices and product variety. Domestic and foreign price indexes for tradable goods can be decomposed as $P_{T,t} = (N_t + N_t^*)^{1/(1-\theta)} \tilde{P}_{T,t}$ and $P_{T,t}^* = (N_t + N_t^*)^{1/(1-\theta)} \tilde{P}_{T,t}^*$, respectively, where the sum $N_t + N_t^*$ reflects product variety available in the two economies, and $\tilde{P}_{T,t}$ and $\tilde{P}_{T,t}^*$ are the average nominal prices for all varieties sold in the two countries. The consumption-based price indexes then can be decomposed as $P_t = (N_t + N_t^*)^{\alpha/(1-\theta)} \tilde{P}_t$ and $P_t^* = (N_t + N_t^*)^{\alpha/(1-\theta)} \tilde{P}_t^*$, where $\tilde{P}_t$ and $\tilde{P}_t^*$ are the average nominal price levels in the two countries. As noted in Ghironi and Melitz (2005), these average prices ($\tilde{P}_t$ and

$\tilde{P}_t^*$) correspond much more closely to empirically measured CPIs than the welfare-based indexes.[10] Thus, we define $\tilde{Q}_t = \varepsilon_t \tilde{P}_t^*/\tilde{P}_t$ as the theoretical counterpart to the empirical real exchange rate— since the latter relates CPI levels best represented by $\tilde{P}_t$ and $\tilde{P}_t^*$.

In the model with exogenously non-traded goods, the welfare-based real exchange rate, Q_t, and the data-consistent real exchange rate, $\tilde{Q}_t$, coincide, as we show below:

$$\tilde{Q}_t = \frac{\varepsilon_t \tilde{P}_t^*}{\tilde{P}_t} = \frac{(N_t + N_t^*)^{-\alpha/(1-\theta)} \varepsilon_t P_t^*}{(N_t + N_t^*)^{-\alpha/(1-\theta)} P_t} = \frac{\varepsilon_t P_t^*}{P_t} = Q_t.$$

4 Benchmark Model: The Steady State

Without normalizing $Z = Z^*$ and $L = L^*$ to 1, steady-state levels of selected variables are below:

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\begin{aligned}
N &= \frac{(1-\delta)\beta\left(1-\frac{1}{H}\right)}{\left(\frac{\theta}{\alpha}-1\right)\left[1-\beta(1-\delta)\right]+\delta\beta\left(1-\frac{1}{H}\right)}ZL, \\
w &= \left\{\frac{1}{\mu}\left[N(1+\tau^{1-\theta})\right]^{1/(\theta-1)}\right\}^{\alpha}Z, \\
q &= \frac{1}{1-\delta}\frac{w}{Z}, \\
\rho_N &= \frac{w}{Z}, \\
\rho_T &= \left(\frac{w}{Z}\right)^{(\alpha-1)/\alpha}, \\
\rho_D &= \mu\left(\frac{w}{Z}\right)^{1/\alpha}, \\
\rho_X &= \tau\rho_D, \\
d &= \left[\frac{1-\beta(1-\delta)}{(1-\delta)\beta\left(1-\frac{1}{H}\right)}\right]\frac{w}{Z}, \\
B &= \frac{w}{Z}\frac{\delta}{1-\delta}N, \\
C &= \frac{\theta}{\alpha}\left\{\left[\mu\left(\frac{w}{Z}\right)^{1/\alpha}\right]^{1-\theta}\left(1+\tau^{1-\theta}\right)\right\}^{-1}d.
\end{aligned}
$$

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[10]This is so because adjustment for variety in CPI data (when it happens) does not happen at the frequency captured by periods in our model. Even more importantly, adjustment for variety in CPI data is not tied to the specific preference specification that we adopt.

5   Home Bias in Consumption

Our alternative model setup does not feature non-traded goods but introduces home bias in consumption. We define the consumption basket as

$$C_t = \left[\alpha^{1/\theta} \left(C_{H,t}\right)^{(\theta-1)/\theta} + (1-\alpha)^{1/\theta} \left(C_{F,t}\right)^{(\theta-1)/\theta}\right]^{\theta/(\theta-1)},$$

where $C_{H,t}$ is the sub-basket of traded goods produced at home, $C_{F,t}$ is the sub-basket of traded goods produced in the foreign country, and θ is the elasticity of substitution between these sub-baskets. The positive parameter α is the weight of the home sub-basket in the overall home consumption basket (and the weight of the foreign sub-basket in the foreign consumption basket), and the assumption $\alpha > 1/2$ captures home bias in consumption.

The sub-baskets of home and foreign goods are defined as

$$C_{H,t} = \left(\int_{\omega \in \Omega} c_{H,t}(\omega)^{(\theta-1)/\theta} d\omega\right)^{\theta/(\theta-1)} \quad \text{and} \quad C_{F,t} = \left(\int_{\omega^* \in \Omega} c_{F,t}(\omega^*)^{(\theta-1)/\theta} d\omega^*\right)^{\theta/(\theta-1)},$$

where $\theta > 1$ is the symmetric elasticity of substitution across individual goods.[11] At any given time t, only a subset of home goods $\Omega_t \subset \Omega$ and foreign goods $\Omega_t^* \subset \Omega$ is available at home and abroad. Let $P_{D,t}$ and $P_{F,t}$ denote the home currency price indexes associated to the home and foreign sub-baskets. We assume that export prices are denominated in the currency of the export market. The consumption-based price index for the home economy is then $P_t = \left[\alpha \left(P_{D,t}\right)^{1-\theta} + (1-\alpha) \left(P_{F,t}\right)^{1-\theta}\right]^{1/(1-\theta)}$. Let $p_{D,t}(\omega)$ and $p_{F,t}(\omega^*)$ denote the home currency prices of home and foreign goods, respectively. Then,

$$P_{D,t} = \left(\int_{\omega \in \Omega_t} p_{D,t}(\omega)^{1-\theta} d\omega\right)^{1/(1-\theta)} \quad \text{and} \quad P_{F,t} = \left(\int_{\omega^* \in \Omega_t^*} p_{F,t}(\omega^*)^{1-\theta} d\omega^*\right)^{1/(1-\theta)}.$$

The household's demand for each individual home good ω is $c_{D,t}(\omega) = \alpha \left(p_{D,t}(\omega)/P_t\right)^{-\theta} C_t$ and for each individual foreign good ω^* is $c_{F,t}(\omega^*) = (1-\alpha) \left(p_{F,t}(\omega^*)/P_t\right)^{-\theta} C_t$. Consumer preferences and price indexes in the foreign economy are similar, except for the assumption that preferences are biased in favor of the sub-basket of goods produced in the foreign country. Home bias implies that

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[11] To avoid introducing a difference relative to the model with non-traded goods other than replacing the latter with the assumption of home bias, we assume that the elasticity of substitution between home and foreign traded sub-baskets is the same as the elasticity of substitution between individual goods within those sub-baskets. (The model with non-traded goods features equal substitutability of traded goods within and across countries.)

PPP does not hold even when the law of one price holds (i.e., even if trade costs are set to zero).

Firms set prices as constant markups $\mu = \theta/(\theta - 1)$ over marginal cost. Home firm prices, in real terms relative to the price index in the destination market, are then given by $\rho_{D,t}(\omega) = p_{D,t}(\omega)/P_t = \mu w_t/Z_t$ and $\rho_{H,t} = p_{X,t}(\omega)/P_t^* = \tau Q_t^{-1} \mu w_t/Z_t$. In the case of a home firm, total profits in period t are given by $d_t(\omega) = d_{D,t}(\omega) + d_{X,t}(\omega)$, where profits from domestic sales are $d_{D,t}(\omega) = \alpha/\theta \left(\rho_{D,t}\right)^{1-\theta} C_t$, and profits from export sales are $d_{X,t}(\omega) = (1 - \alpha)/\theta Q_t \left(\rho_{X,t}\right)^{1-\theta} C_t^*$. Since all firms are identical in equilibrium, we drop the index ω below. Foreign firms behave in a similar way.[12] Labor market equilibrium requires: $L = (\theta - 1) d_t N_t/w_t + N_{E,t}/Z_t$.

The model with traded goods only and home bias in consumption can be summarized by deleting the overall price index equation from Table 1 in the paper and replacing the tradable price index, the goods pricing equations, and the firm profit equation with the following equations (only the equations pertaining to the home variables are shown):

Overall price index: $\qquad \alpha N_t \left(\rho_{D,t}\right)^{1-\theta} + (1 - \alpha) N_t^* \left(\rho_{X,t}^*\right)^{1-\theta} = 1,$

Goods pricing, home market: $\qquad \rho_{D,t} = \mu \frac{w_t}{Z_t},$

Goods pricing, foreign market: $\qquad \rho_{X,t} = \tau Q_t^{-1} \mu \frac{w_t}{Z_t},$

Firm profit: $\qquad d_t = \frac{\alpha}{\theta} \left(\rho_{D,t}\right)^{1-\theta} C_t + \frac{1-\alpha}{\theta} Q_t \left(\rho_{X,t}\right)^{1-\theta} C_t^*.$

Note that, in the economy with only traded goods and home bias in consumption, the home (foreign) consumption-based price index can be decomposed as $P_t = (\alpha N_t + (1 - \alpha) N_t^*)^{1/(1-\theta)} \tilde{P}_t$ $(P_t^* = (\alpha N_t^* + (1 - \alpha) N_t)^{1/(1-\theta)} \tilde{P}_t^*)$, where $\tilde{P}_t$ $(\tilde{P}_t^*)$ is the average nominal price for all varieties sold in home (foreign). The data-consistent real exchange rate $\tilde{Q}_t \equiv \varepsilon_t \tilde{P}_t^*/P_t$ no longer coincides with the welfare-consistent real exchange rate Q_t. In this case it is:

$$Q_t = \left[\frac{\alpha N_t + (1 - \alpha) N_t^*}{\alpha N_t^* + (1 - \alpha) N_t}\right]^{\frac{1}{\theta-1}} \tilde{Q}_t.$$

Importantly, Q_t and $\tilde{Q}_t$ need not move in the same direction following shocks. The terms of labor, TOL_t, remain the main determinant of $\tilde{Q}_t$, so that banking deregulation continues to induce appreciation of the data-consistent real exchange rate. However, the same banking deregulation can now induce the welfare-based real exchange rate to depreciate. Suppose this is indeed the case: $\tilde{Q}_t$ falls (driven by TOL_t) and Q_t rises (because N_t increases by more than N_t^*). The intuition for this result is straightforward and hinges on the welfare gains from increased product variety: Even

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[12] Note though that a foreign firm earns export profits $d_{X,t}^* = (1 - \alpha)/\theta Q_t^{-1} \left(\rho_{X,t}^*\right)^{1-\theta} C_t$.

if average prices are higher in the home country, home agents are better off (on welfare grounds) spending a given nominal amount at home because they have access to a larger number of goods toward which their preferences are biased.

When we consider a model with a discrete set of producers in each country, the baskets of home and foreign goods are defined as

$$C_{D,t} = \left(\sum_{\omega \in \Omega} c_{D,t}(\omega)^{(\theta-1)/\theta} d\omega \right)^{\theta/(\theta-1)} \quad \text{and} \quad C_{F,t} = \left(\sum_{\omega^* \in \Omega} c_{F,t}(\omega^*)^{(\theta-1)/\theta} d\omega^* \right)^{\theta/(\theta-1)},$$

and the corresponding price indexes for home and foreign baskets are

$$P_{D,t} = \left(\sum_{\omega \in \Omega_t} p_{D,t}(\omega)^{1-\theta} d\omega \right)^{1/(1-\theta)} \quad \text{and} \quad P_{F,t} = \left(\sum_{\omega^* \in \Omega_t} p_{F,t}(\omega^*)^{1-\theta} d\omega^* \right)^{1/(1-\theta)}.$$

Analogously to the model with non-traded goods, each producer no longer ignores the effects of its nominal domestic price, $p_{D,t}(\omega)$, on the home overall price index, P_t, and the effect of its nominal export price, $p_{X,t}(\omega)$, on the foreign overall price index, P_t^*. The home demand elasticities is then $\theta_{D,t}(\omega) = \theta \left(1 - (p_{D,t}(\omega)/P_t)^{1-\theta} \right)$, and the foreign demand elasticity is $\theta_{X,t}(\omega) = \theta \left(1 - (p_{X,t}(\omega)/P_t^*)^{1-\theta} \right)$. The implied markups in the domestic and foreign markets are, respectively, $\mu_{D,t}(\omega) = \theta_{D,t}(\omega)/\left(\theta_{D,t}(\omega) - 1\right)$ and $\mu_{X,t}(\omega) = \theta_{X,t}(\omega)/\left(\theta_{X,t}(\omega) - 1\right)$. Prices, in real terms relative to the price index in the destination market, are then given by $\rho_{D,t}(\omega) = p_{D,t}(\omega)/P_t = \mu_{D,t}(\omega)w_t/Z_t$ and $\rho_{X,t}(\omega) = p_{X,t}(\omega)/P_t^* = Q_t^{-1}\tau\mu_{X,t}(\omega)w_t/Z_t$. Similar price equations hold for foreign firms. Dropping the index ω because of symmetry, a home firms total profit is $d_t = d_{D,t} + d_{X,t}$, with $d_{D,t} = \alpha \left(\rho_{D,t} \right)^{1-\theta} C_t/\theta_{D,t}$ and $d_{X,t} = (1 - \alpha) Q_t \left(\rho_{X,t} \right)^{1-\theta} C_t^*/\theta_{X,t}$. Foreign firms behave in a similar way. In this economy, the bank internalizes the effect of entry on firm profits through the effect of entry on the nominal domestic price, $p_{D,t}$, and then on the home general price index, P_t, and the effect of entry on the nominal export price, $p_{X,t}$, and then on the foreign general price index, P_t^*. Labor market equilibrium (with elastic labor supply) requires:

$$L_t = \left(\frac{\theta_{D,t} - 1}{w_t} d_{D,t} + \frac{\theta_{X,t} - 1}{w_t} d_{X,t} \right) N_t + \frac{N_{E,t}}{Z_t}.$$

The following equations replace equations in Table 2 in the paper (after deleting the equation for

the overall price index):

Overall price index (home): $\qquad \alpha N_t \left(\rho_{D,t}\right)^{1-\theta} + (1-\alpha) N_t^* \left(\rho_{X,t}^*\right)^{1-\theta} = 1,$

Goods pricing, home market: $\qquad \rho_{D,t} = \left(\frac{\theta_{D,t}}{\theta_{D,t}-1}\right)\frac{w_t}{Z_t},$

Goods pricing, foreign market: $\qquad \rho_{X,t} = \tau Q_t^{-1}\left(\frac{\theta_{X,t}}{\theta_{X,t}-1}\right)\frac{w_t}{Z_t},$

Firm profit, home market: $\qquad d_{D,t} = \frac{\alpha}{\theta_{D,t}}\left(\rho_{D,t}\right)^{1-\theta}C_t,$

Firm profit, foreign market: $\qquad d_{X,t} = \frac{1-\alpha}{\theta_{X,t}}Q_t\left(\rho_{X,t}\right)^{1-\theta}C_t^*,$

Labor market clearing: $\qquad L_t = \left(\frac{\theta_{D,t}-1}{w_t}d_{D,t} + \frac{\theta_{X,t}-1}{w_t}d_{X,t}\right)N_t + \frac{N_{E,t}}{Z_t}.$

Figures A.1-A.6 and tables A.1-A.2 repeat the experiments of figures 1-6 and tables 3-4, showing the qualitative similarity of key results between the model with non-traded goods and the model with home bias. In the latter case, the steady-state import share of GDP is $(1-\alpha) N^* \left(\rho_X^*\right)^{1-\theta} C/Y$, and we set $\alpha = 0.755$ to match the 12 percent U.S. average import share. The same initial value of H (1.468) results in a 10 percent bank markup, but the new value required to generate a 12 percent increase in the number of firms changes slightly. The only significant difference between figures 1 and A.1 is that the welfare-based real exchange rate appreciates in the short run, but it depreciates in the long run (while the data-consistent real exchange rate appreciates steadily). The intuition follows from the discussion above: The number of firms does not respond to deregulation on impact. Hence, Q_t is driven by TOL_t in the very short run, as is $\tilde{Q}_t$. However, as the number of home firms increases, the welfare benefit of having access to a larger number of goods toward which preferences are biased pushes Q_t upward and eventually induces depreciation. The comparison of figures with international capital flows is similar. In the version of the model with variable markups and elastic labor supply, given $\tau = \tau^* = 1.33$, we adjust the weight of home goods in the consumption basket to 0.797, which yields a steady-state import share of about 12 percent.

6 International Deposits

The budget constraint of the representative home household, in units of the home consumption basket, is now

$$B_{t+1}+Q_t B_{*,t+1}+\frac{\eta}{2}Q_t\left(B_{*,t+1}\right)^2+v_t x_{t+1}+C_t = (1+r_t)B_t+Q_t(1+r_t^*)B_{*,t}+(\pi_t+v_t)x_t+T_t^F+w_t L,$$

where B_t denotes holdings of home deposits, $B_{*,t}$ denotes holdings of foreign deposits, $\eta Q_t (B_{*,t+1})^2 /2$ is the cost of adjusting holdings of foreign deposits, T_t^F is the fee rebate, taken as given by the household, and equal to $\eta Q_t (B_{*,t+1})^2 /2$ in equilibrium. For simplicity, we assume that the scale parameter $\eta > 0$ is identical across costs of adjusting holdings of home and foreign deposits. Also, there is no cost of adjusting equity holdings, since our assumption of no international trade in bank shares makes such costs unnecessary for our purposes. The representative foreign household faces a similar constraint in units of foreign consumption.

Home and foreign households maximize the respective intertemporal utility functions subject to the respective constraints. The first-order conditions for the choice of share holdings in the mutual fund of domestic banks and for holdings of domestic deposits are unchanged relative to the case of financial autarky. A new Euler equation for foreign deposit holdings must be added to Table 1 in the paper, and a new deposit market clearing condition and expression for bank profits replace equations in that table. Since trade is no longer balanced with international deposits, we must explicitly impose labor market clearing conditions in both countries. Finally, to close the model, we must add the net foreign asset equation. Budget constraints at home and abroad (after imposing equity market clearing, labor market clearing, and fee rebates) imply:

$$
\begin{aligned}
B_{t+1} + Q_t B_{*,t+1} + C_t &= (1+r_t)B_t + Q_t(1+r_t^*)B_{*,t} + \pi_t + w_t L, \\
\frac{B_{t+1}^*}{Q_t} + B_{*,t+1}^* + C_t^* &= (1+r_t)\frac{B_t^*}{Q_t} + (1+r_t^*)B_{*,t}^* + \pi_t^* + w_t^* L^*,
\end{aligned}
$$

Multiplying the foreign aggregate budget constraint by Q_t, subtracting from the home aggregate budget constraint, and using $B_{t+1} = (w_t/Z_t) N_{E,t} - B_{t+1}^*$, $B_{*,t+1}^* = (w_t^*/Z_t^*) N_{E,t}^* - B_{*,t+1}$, $\pi_t = d_t N_t - (1+r_t) (w_t/Z_t) N_{E,t}$, and $\pi_t^* = d_t^* N_t^* - (1+r_t^*) (w_t^*/Z_t^*) N_{E,t}^*$ yields the law of motion for home net foreign assets:

$$
\begin{aligned}
Q_t B_{*,t+1} - B_{t+1}^* &= Q_t(1+r_t^*)B_{*,t} - (1+r_t)B_t^* + \frac{1}{2}(w_t L - Q_t w_t^* L^*) + \frac{1}{2}(d_t N_t - Q_t d_t^* N_t^*) \\
&\quad - \frac{1}{2}(C_t - Q_t C_t^*) - \frac{1}{2}\left(\frac{w_t}{Z_t}N_{E,t} - Q_t \frac{w_t^*}{Z_t^*}N_{E,t}^*\right).
\end{aligned}
$$

This is the analog to the law of motion for net foreign assets in Ghironi and Melitz (2005) (note that $B_{t+1}^* = -B_{t+1}$ there). It states that net foreign assets (home holdings of foreign deposits minus foreign holdings of home deposits) entering $t+1$ are determined by net interest income on net foreign assets entering t, and the differentials in aggregate labor and dividend incomes (GDP's),

consumptions, and investments (in new firms). Thus, we define net foreign assets as:

$$A_{t+1} \equiv Q_t B_{*,t+1} - B_{t+1}^*;$$

the current account as:

$$CA_t \equiv Q_t \left(B_{*,t+1} - B_{*,t} \right) - \left(B_{t+1}^* - B_t^* \right);$$

and the trade balance as:

$$TB_t \equiv \frac{1}{2} \left(w_t - Q_t w_t^* \right) + \frac{1}{2} \left(d_t N_t - Q_t d_t^* N_t^* \right) - \frac{1}{2} \left(C_t - Q_t C_t^* \right) - \frac{1}{2} \left(\frac{w_t}{Z_t} N_{E,t} - Q_t \frac{w_t^*}{Z_t^*} N_{E,t}^* \right).$$

When variables are zero in steady state (net foreign assets, current account, trade balance), we normalize by the symmetric steady-state level of consumption in log-linearizing the model.

A summary of new (or changed) equations (for the home country) relative to Table 1 in the paper is below:

Bank profits:	$\pi_t = d_t N_t - (1 + r_t)(B_t + B_t^*),$
Euler equations for foreign deposits:	$1 + \eta B_{*,t} = \beta \left(1 + r_{t+1}^*\right) E_t \left[\left(\frac{Q_{t+1}}{Q_t} \right) \left(\frac{C_{t+1}}{C_t} \right)^{-\gamma} \right],$
Deposit market clearing:	$B_t + B_t^* = \frac{w_t}{Z_t} N_{E,t},$
Net foreign assets:	$Q_t B_{*,t+1} - B_{t+1}^*$
	$= Q_t(1 + r_t^*)B_{*,t} - (1 + r_t)B_t^*$
	$+ \frac{1}{2} \left(w_t L - Q_t w_t^* L^* \right) + \frac{1}{2} \left(d_t N_t - Q_t d_t^* N_t^* \right)$
	$- \frac{1}{2} \left(C_t - Q_t C_t^* \right) - \frac{1}{2} \left(\frac{w_t}{Z_t} N_{E,t} - Q_t \frac{w_t^*}{Z_t^*} N_{E,t}^* \right),$
Current account:	$CA_t = Q_t \left(B_{*,t+1} - B_{*,t} \right) - \left(B_{t+1}^* - B_t^* \right),$
Labor market clearing (with non-traded goods):	$L = \frac{\theta - 1}{w_t} d_t N_t + \frac{N_{E,t}}{Z_t} + \frac{1 - \alpha}{Z_t} \frac{C_t}{\rho_{N,t}}$
Labor market clearing (with home bias):	$L = \frac{\theta - 1}{w_t} d_t N_t + \frac{N_{E,t}}{Z_t}$

The presence of the term that depends on the stock of deposits in the left-hand side of the equations for deposit holdings abroad is crucial for determinacy of the steady state and stationarity of responses to non-permanent shocks. To see that fees on deposits abroad are enough to pin down a unique steady state that coincides with that under financial autarky, proceed as follows. Steady-state Euler equations for domestic deposits in each country imply $\beta (1 + r) = 1$ and $\beta (1 + r^*) = 1$. Hence, steady-state Euler equations for deposits abroad imply the unique steady-state holdings

$B_* = 0$ and $B^* = 0$ (as long as $\eta > 0$). Deposit market clearing conditions then imply $B = wN_E/Z$ and $B_*^* = w^*N_E^*/Z^*$. The steady state will then be symmetric across countries and coincide with that under financial autarky under the assumptions $L = L^*$, $Z = Z^*$, and $H = H^*$.

7 Complete Markets and Banking Deregulation

Figures A.7 and A.8 illustrate the discussion in the paper. In these figures, we use the trade balance as measure of cross-country resource transfer. In the corresponding incomplete-market cases (Figure 2 in the paper and Figure A.2), the response of the trade balance (not plotted) is similar to that of the current account.

8 Countercyclical Firm Markups

Internalization of Profit Destruction Externality

The first order condition with respect to $N_{t+1}(h)$ gives the Euler equation for the shadow value of an additional producing firm to bank h, $q_t(h)$, and involves a term capturing the internalization of the profit destruction externality:

$$q_t(h) = \beta E_t \left\{ \left(\frac{C_{t+1}}{C_t}\right)^{-1} \left[\begin{array}{c} d_{D,t+1} + d_{X,t+1} + N_{t+1}(h)\left(\frac{\partial d_{D,t+1}}{\partial N_{t+1}}\frac{\partial N_{t+1}}{\partial N_{t+1}(h)} + \frac{\partial d_{X,t+1}}{\partial N_{t+1}}\frac{\partial N_{t+1}}{\partial N_{t+1}(h)}\right) \\ +(1-\delta)q_{t+1}(h) \end{array} \right] \right\}.$$

Internalization of the effect of entry on firm profits through the effect on the nominal domestic price, $p_{D,t}$, and then on the home tradable price index $P_{T,t}$ (or the overall home price index, P_t, in the model with home bias), and the effect of entry on the nominal export price, $p_{X,t}$, and then on the foreign tradable price index $P_{T,t}^*$ (or the overall foreign price index, P_t^*, in the model with home bias), works as follows. Rearrange the home tradable price index (or the overall home price index) as $\left(\rho_{D,t}\right)^{1-\theta} = \left[1 - N_t^*\left(\rho_{X,t}^*\right)^{1-\theta}\right]/N_t$, then the elasticity of demand is $\theta_{D,t} = \theta\left\{N_t - \left[1 - N_t^*\left(\rho_{X,t}^*\right)^{1-\theta}\right]\right\}/N_t$, Firm profits in the home market are $d_{D,t} =$

$$\left[1 - N_t^* \left(\rho_{X,t}^*\right)^{1-\theta}\right] C_t / \left\{\theta \left[N_t - \left(1 - N_t^* \left(\rho_{X,t}^*\right)^{1-\theta}\right)\right]\right\}, \text{ and, under symmetry,}$$

$$
\begin{aligned}
\frac{\partial d_{D,t+1}}{\partial N_{t+1}} \frac{\partial N_{t+1}}{\partial N(h)_{t+1}} N(h)_{t+1} + d_{D,t+1} &= \left\{1 - \frac{1}{H} \frac{N_{t+1}}{\left(N_{t+1} - \left(1 - N_{t+1}^* \left(\rho_{X,t}^*\right)^{1-\theta}\right)\right)}\right\} d_{D,t+1} \\
&= \left[1 - \frac{1}{H} \frac{1}{1 - \left(\rho_{D,t+1}\right)^{1-\theta}}\right] d_{D,t+1} \\
&= \left(1 - \frac{1}{H} \frac{\theta}{\theta_{D,t+1}}\right) d_{D,t+1}.
\end{aligned}
$$

Similarly,

$$\frac{\partial d_{X,t+1}}{\partial N_{t+1}} \frac{\partial N_{t+1}}{\partial N(h)_{t+1}} N(h)_{t+1} + d_{X,t+1} = \left(1 - \frac{1}{H} \frac{\theta}{\theta_{X,t+1}}\right) d_{X,t+1}.$$

Substituting these results into the Euler equation above yields the Euler equation in the main text.

9   Complete Markets and Productivity Shocks

We discuss here the consequences of complete versus incomplete markets for the transmission of productivity shocks. For ease of comparison with the case of banking deregulation, we focus on an increase in home productivity in the model with inelastic labor and constant markups. We plot the response of the trade balance in all the figures below.

We begin by discussing the case of a shock with persistence 0.9, assuming zero productivity spillovers. Figure A.9 presents responses for the model with non-traded goods and incomplete markets The shock causes a small, very short-lived depreciation of the terms of labor, followed by appreciation and return to the steady state from below. The real exchange rate depreciates for approximately four years (an effect of the initial depreciation of TOL_t and the trade-cost saving from expanding home variety), but then it appreciates and returns to the steady state from below (consistent with appreciated terms of labor and N_t decreasing toward the steady state). With complete markets (Figure A.10), the terms of labor never fall below the steady state, and the real exchange rate never appreciates: Both return to the original position from above. Risk sharing under complete markets implies that the consumption differential is tied to the real exchange rate. Even if the shock results in increased producer entry at home, complete markets restore the standard transmission channel of productivity shocks that results in terms of trade deterioration throughout the transition. (Recall that terms of trade, T_t, and terms of labor are related by $T_t = (\tau/\tau^*) TOL_t^{-1}$

in our model.) Depreciation of the terms of trade (and the real exchange rate) delivers the transfer of purchasing power to foreign households required to achieve full risk sharing. (Figures A.11 and A.12 repeat the exercise for the model with home bias. The only qualitative change in results is that there is no longer an initial small depreciation of the terms of labor under incomplete markets.)

If the shock is permanent, incomplete markets and non-traded goods (Figure A.13) imply that the terms of labor is always below the initial steady state and there is an immediate real appreciation. As domestic variety rises, trade-cost saving implies a subsequent small depreciation, before the real exchange rate settles at a permanently appreciated level. With complete markets (Figure A.14), the terms of labor and real exchange rate depreciate on impact and rise monotonically to permanently depreciated levels. The long-run depreciation of the real exchange rate under complete markets is considerably larger than the long-run appreciation under incomplete markets. (The model with home bias—Figures A.15 and A.16—implies no change in these results.) The intuition for the difference between incomplete and complete markets is the same as for the case of non-permanent shocks, but the difference between scenarios is significantly more pronounced if the shocks are permanent. This is consistent with results in Baxter and Crucini (1995) and Corsetti, Dedola, and Leduc (2008).

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Table A.1. Welfare Effects of Deregulation

Non-Stochastic Steady State[1]		
	Home	*Foreign*
ΔW: Financial Autarky	2.74%	0.06%
ΔW: International Deposits, Inelastic Labor, and Fixed Markups	2.79%	0.02%
ΔW: International Deposits, Elastic Labor, and Fixed Markups	3.20%	0.07%
ΔW: International Deposits, Elastic Labor, and Time-Varying Markups	4.93%	0.03%
Stochastic Steady State[2]		
	Home	*Foreign*
ΔW: Backus-Kehoe-Kydland Calibration	0.007%	0.0007%
ΔW: Baxter Calibration	0.009%	0.001%

[1]Welfare calculations include transition dynamics.

[2]We report results only for the model with international deposits, elastic labor, and time-varying markups.

A positive welfare change denotes a reduction in the welfare costs of business cycle following deregulation.

Table A.2. Standard Deviations Before and After Deregulation

Backus-Keohe-Kydland Calibration			
	Before	After	% Change
Y_R	4.01017	3.6623	-8.67
Y_R^*	4.01017	3.8991	-2.77
C_R	1.24480	1.0689	-14.13
C_R^*	1.24480	1.2676	1.83
I_R	43.6717	35.6792	-18.30
I_R^*	43.6717	42.3358	-3.06
L	3.3911	3.1103	-8.28
L^*	3.3911	3.2900	-2.98
Baxter Calibration			
	Before	After	% Change
Y_R	2.1262	1.9651	-7.58
Y_R^*	2.1262	2.0827	-2.05
C_R	1.2114	1.1166	-7.83
C_R^*	1.2114	1.2263	1.23
I_R	17.8814	13.6631	-23.59
I_R^*	17.8814	17.6903	-1.07
L	1.2075	1.0644	-11.85
L^*	1.2075	1.1560	-4.27
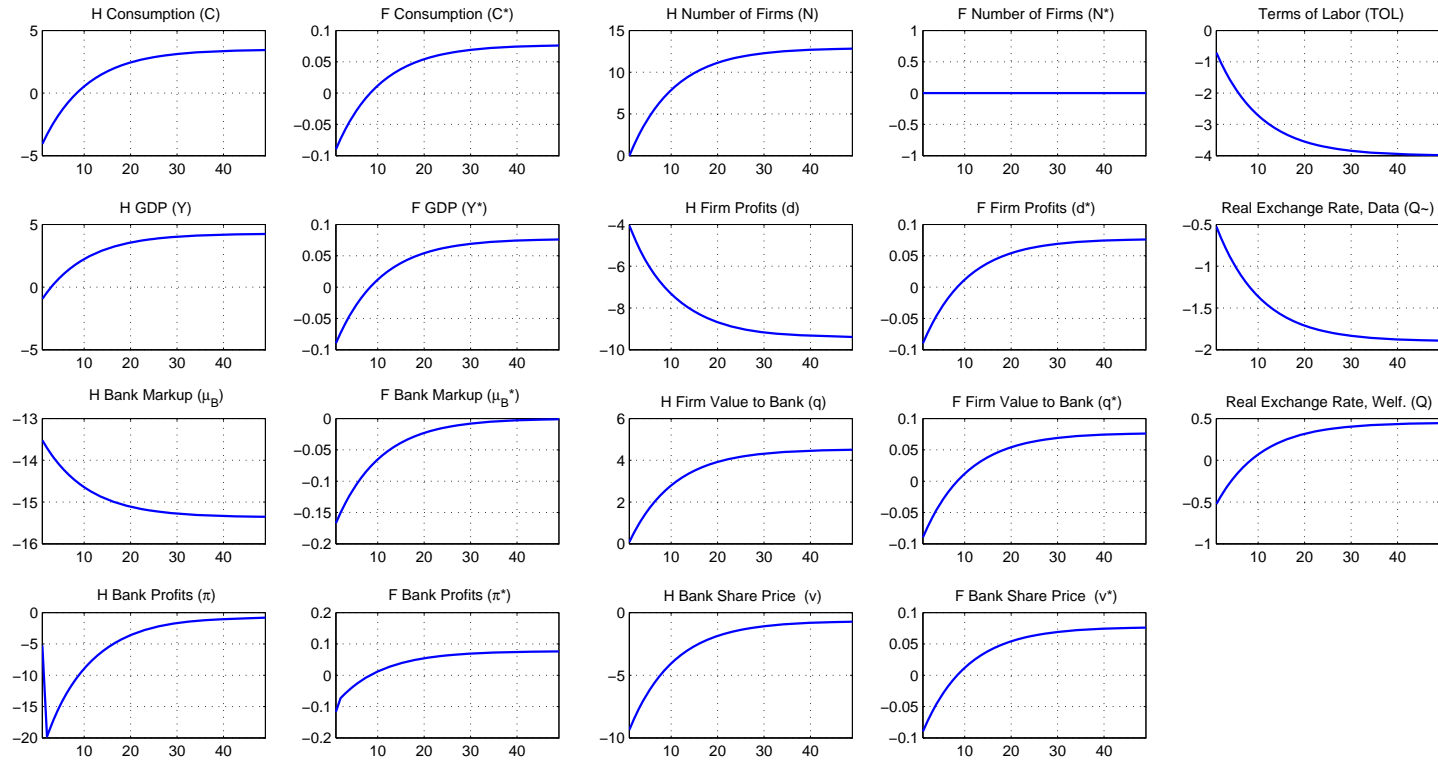
Figure A.1. Banking Deregulation under Financial Autarky, Home Bias Model
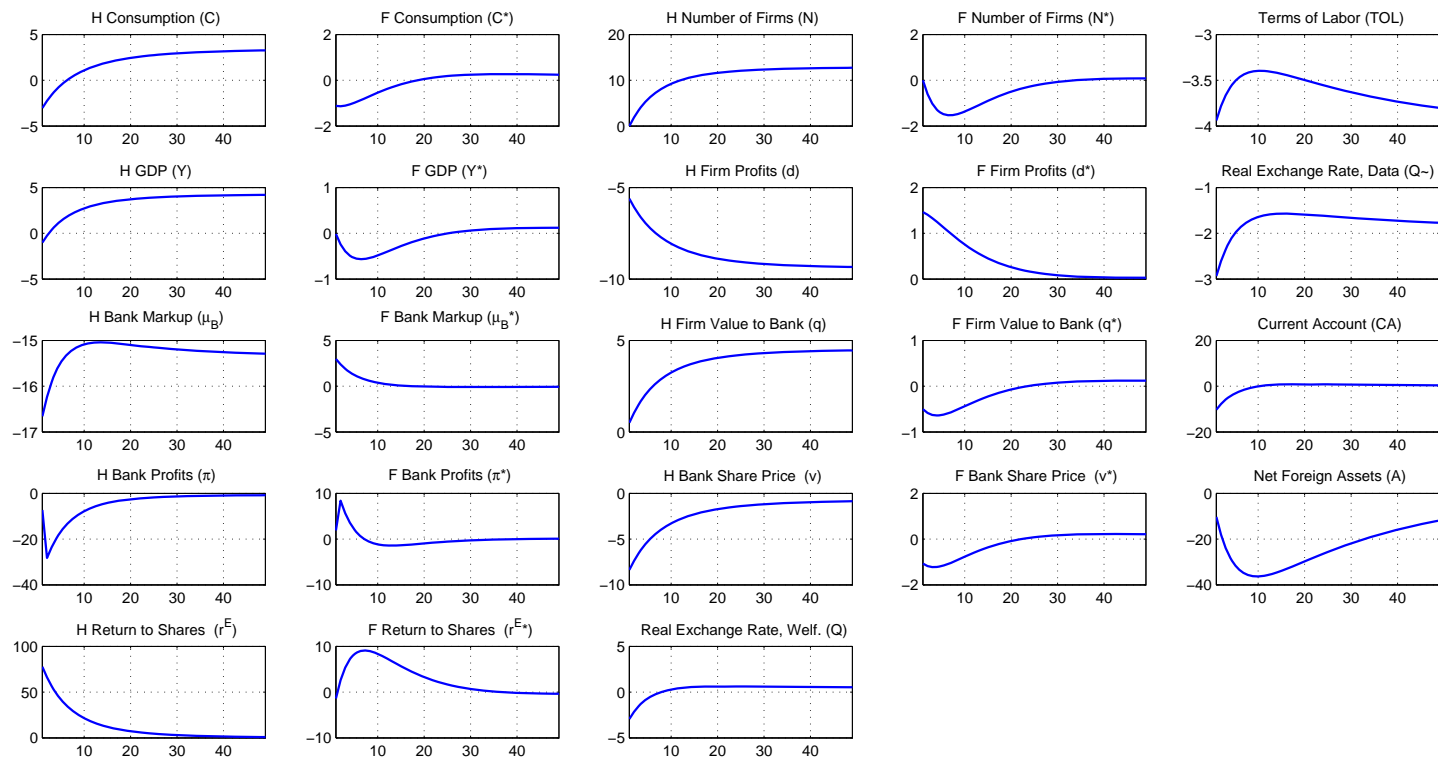
Figure A.2. Banking Deregulation with International Deposits, Home Bias Model
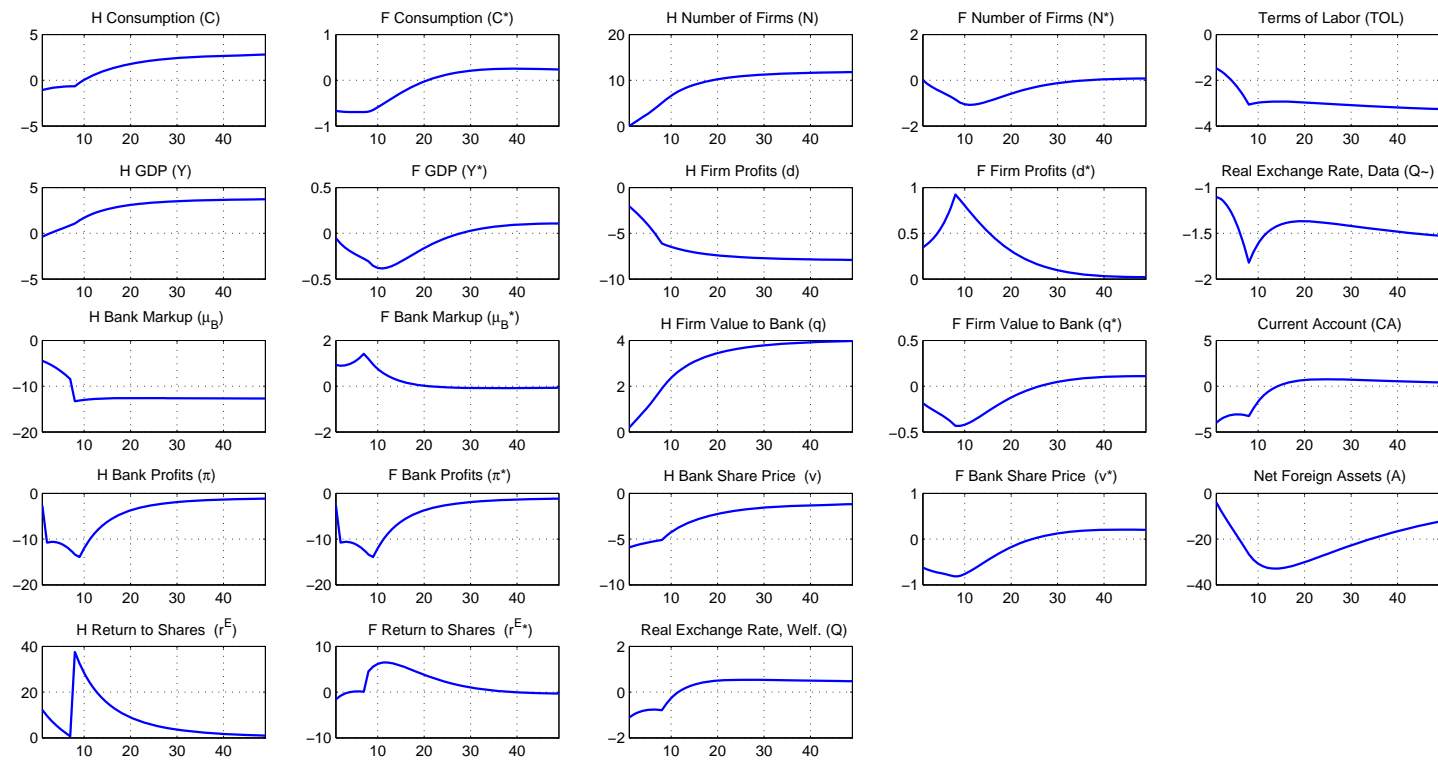
Figure A.3. Anticipated Banking Deregulation with International Deposits, Home Bias Model
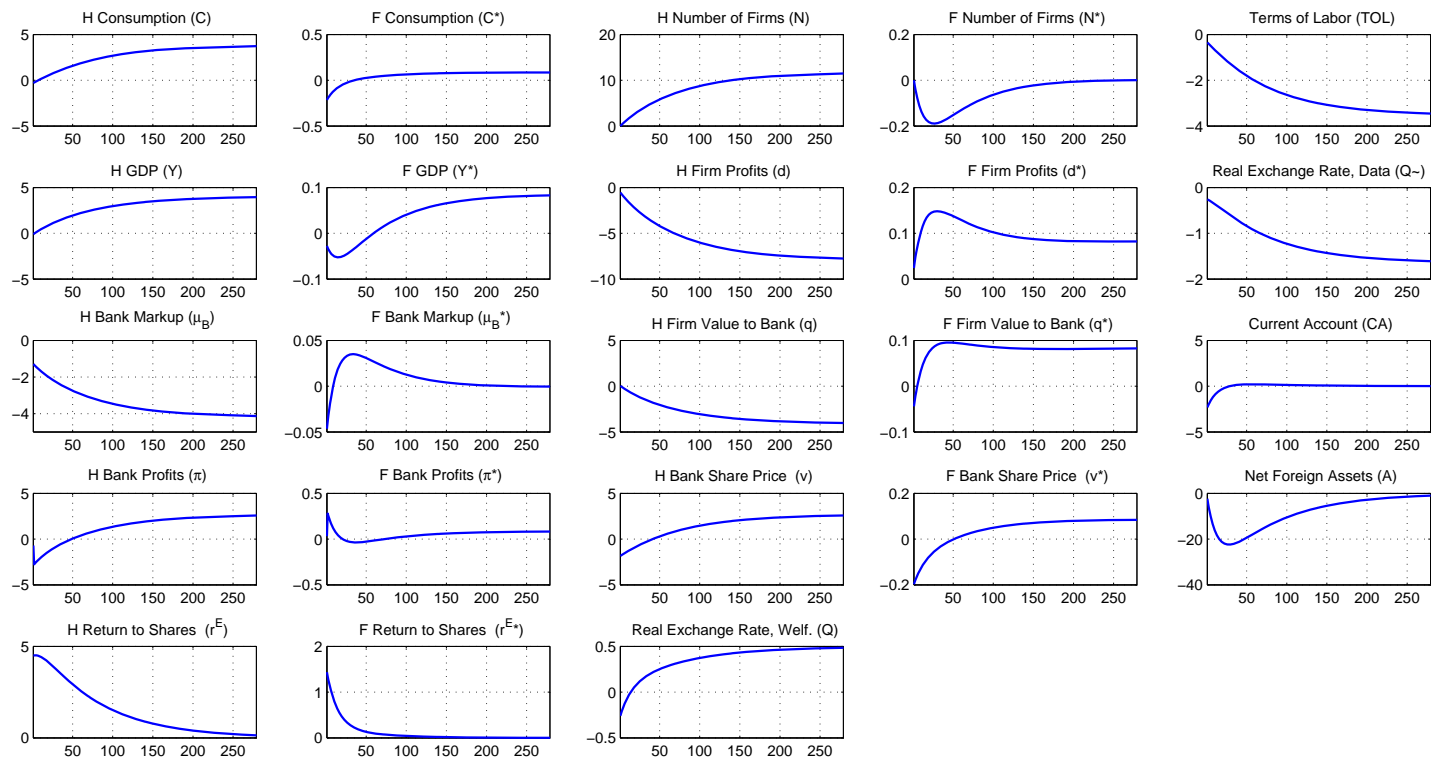
Figure A.4. Banking Deregulation with International Deposits, Grossman-Helpman Entry Cost, Home Bias Model
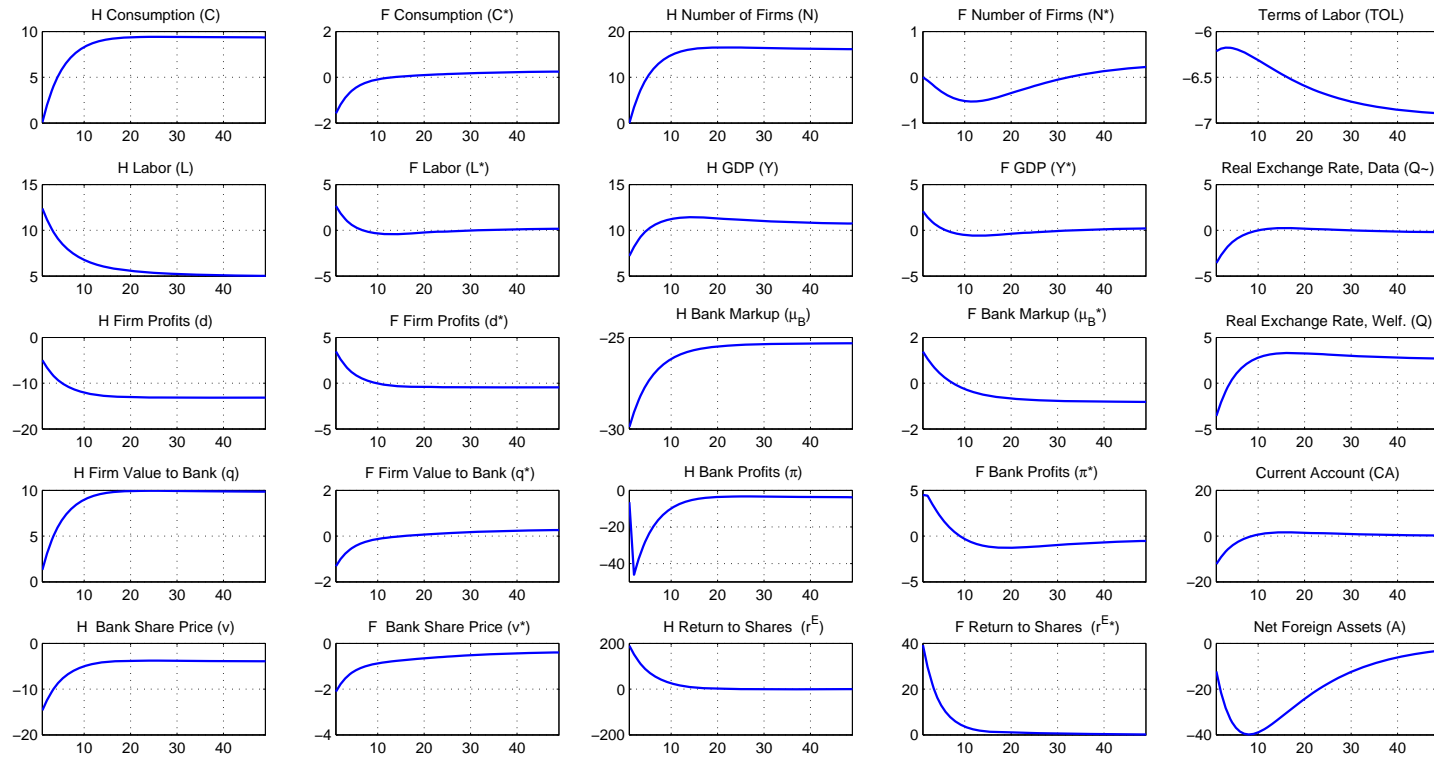
Figure A.5. Banking Deregulation with Elastic Labor and Endogenous Firm Markups, Home Bias Model
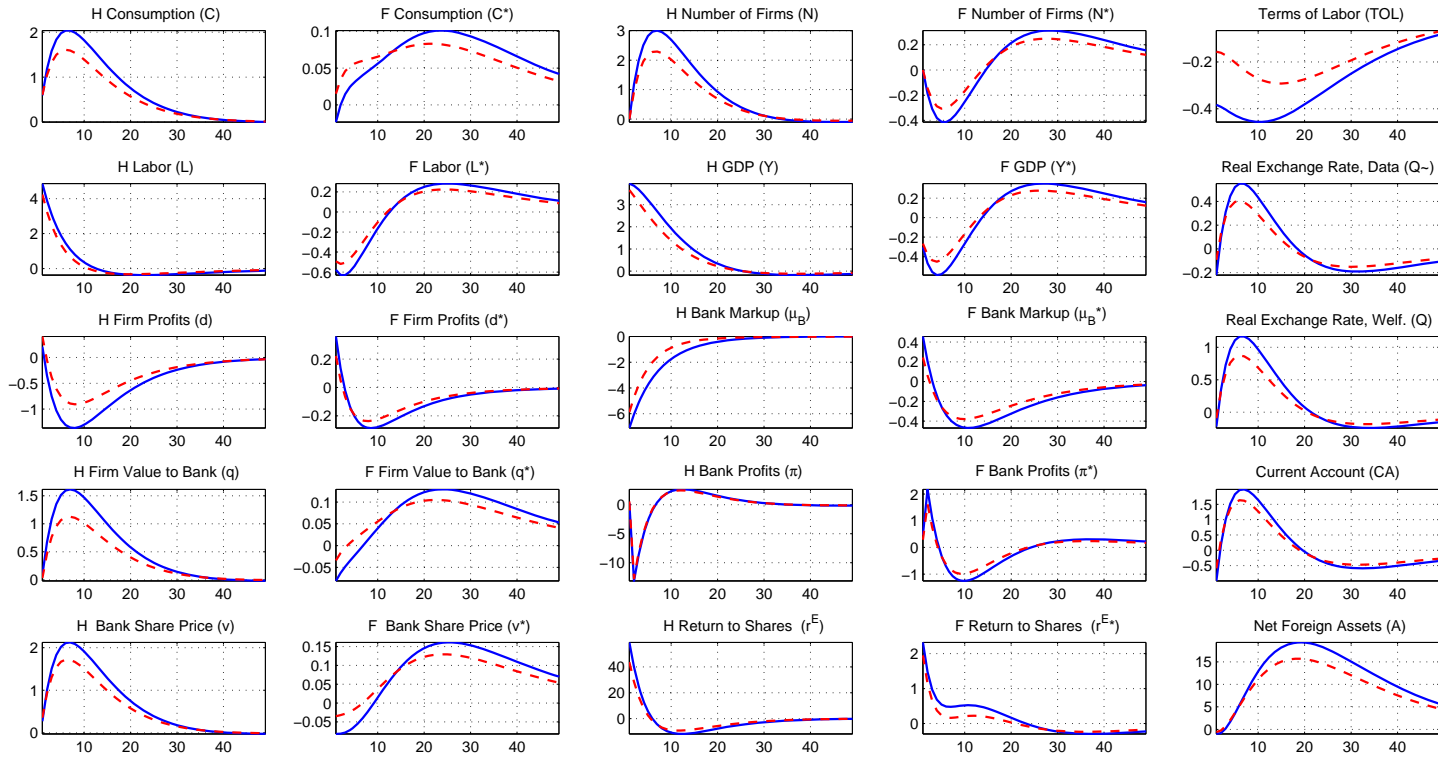
Figure A.6. Business Cycles, Pre- and Post-Deregulation, Home Bias Model
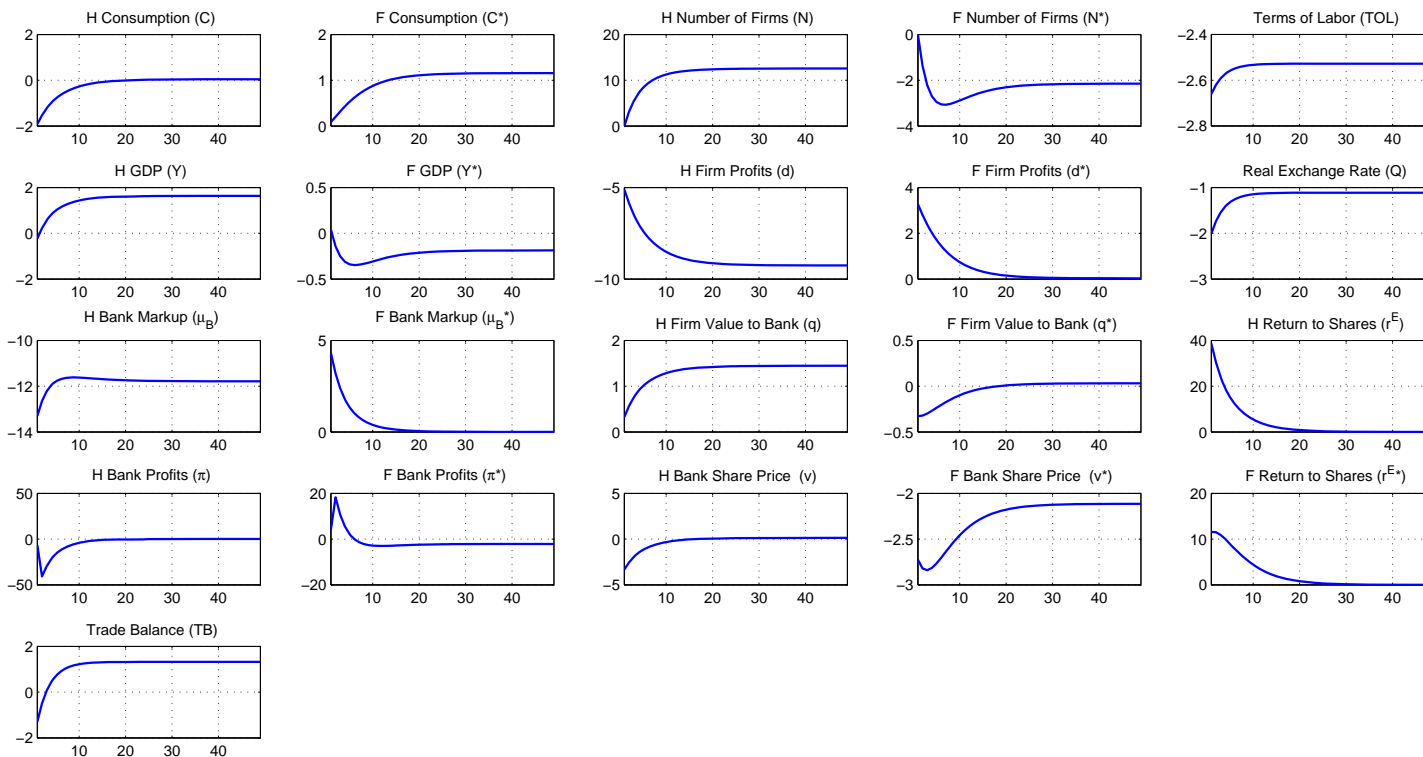
Figure A.7. Banking Deregulation with Complete Markets, Non-Traded Goods Model
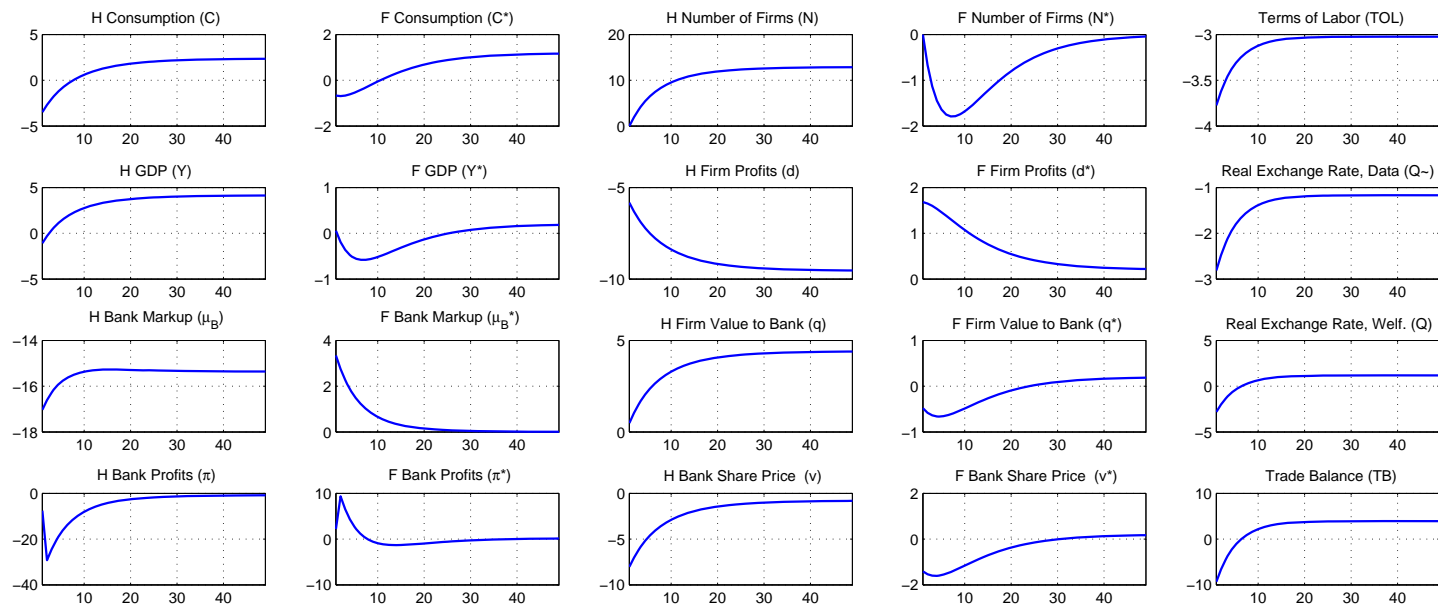
Figure A.8. Banking Deregulation with Complete Markets, Home Bias Model
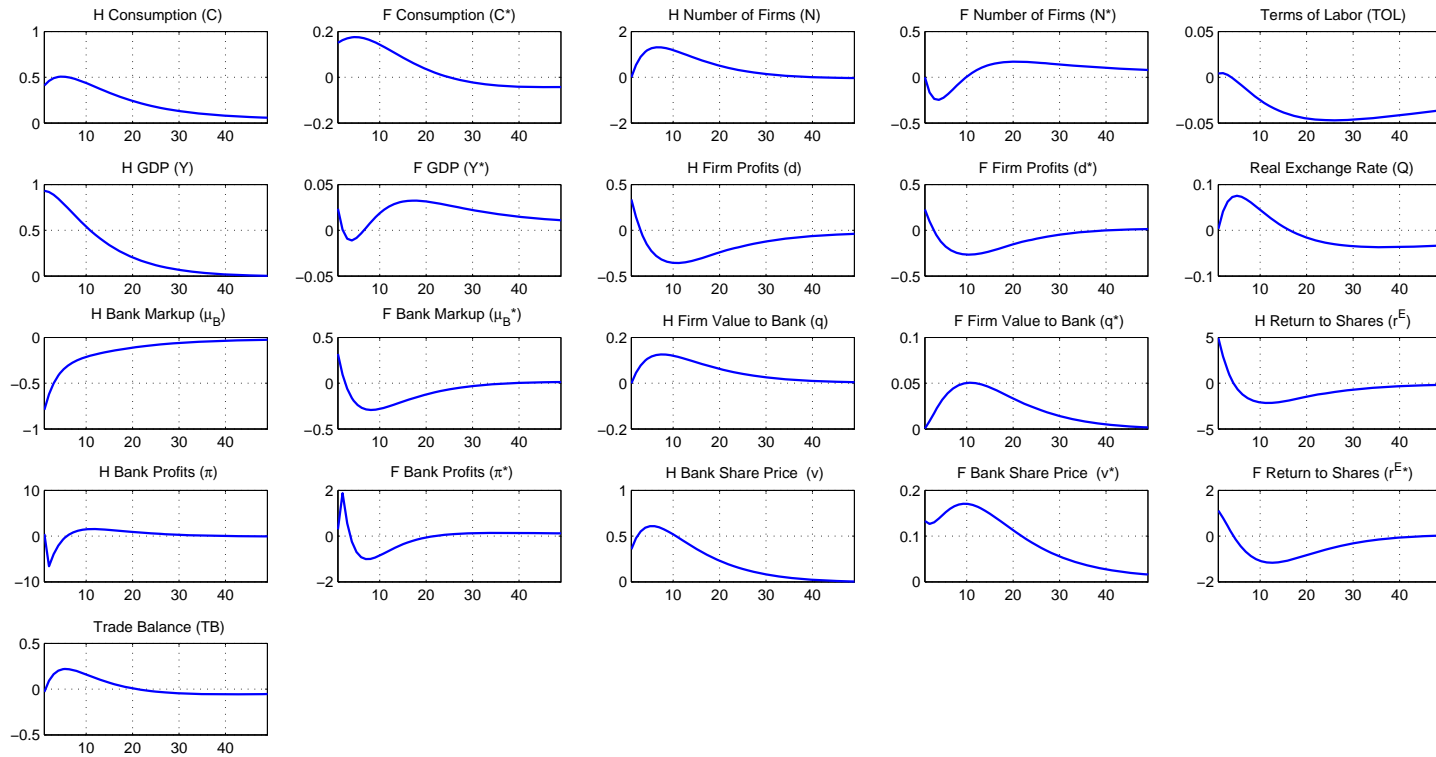
Figure A.9. Productivity Shock with International Deposits, Persistence 0.9, Non-Traded Goods Model
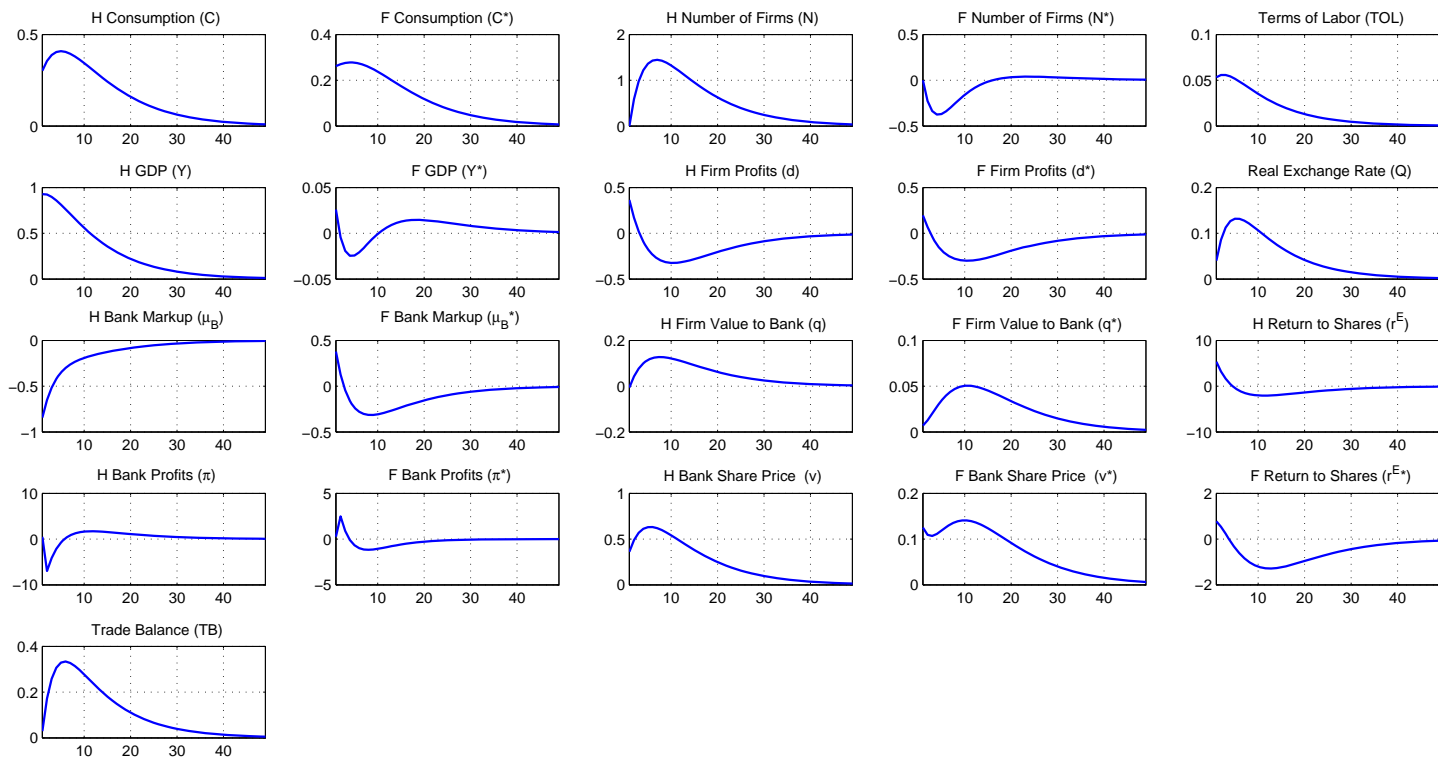
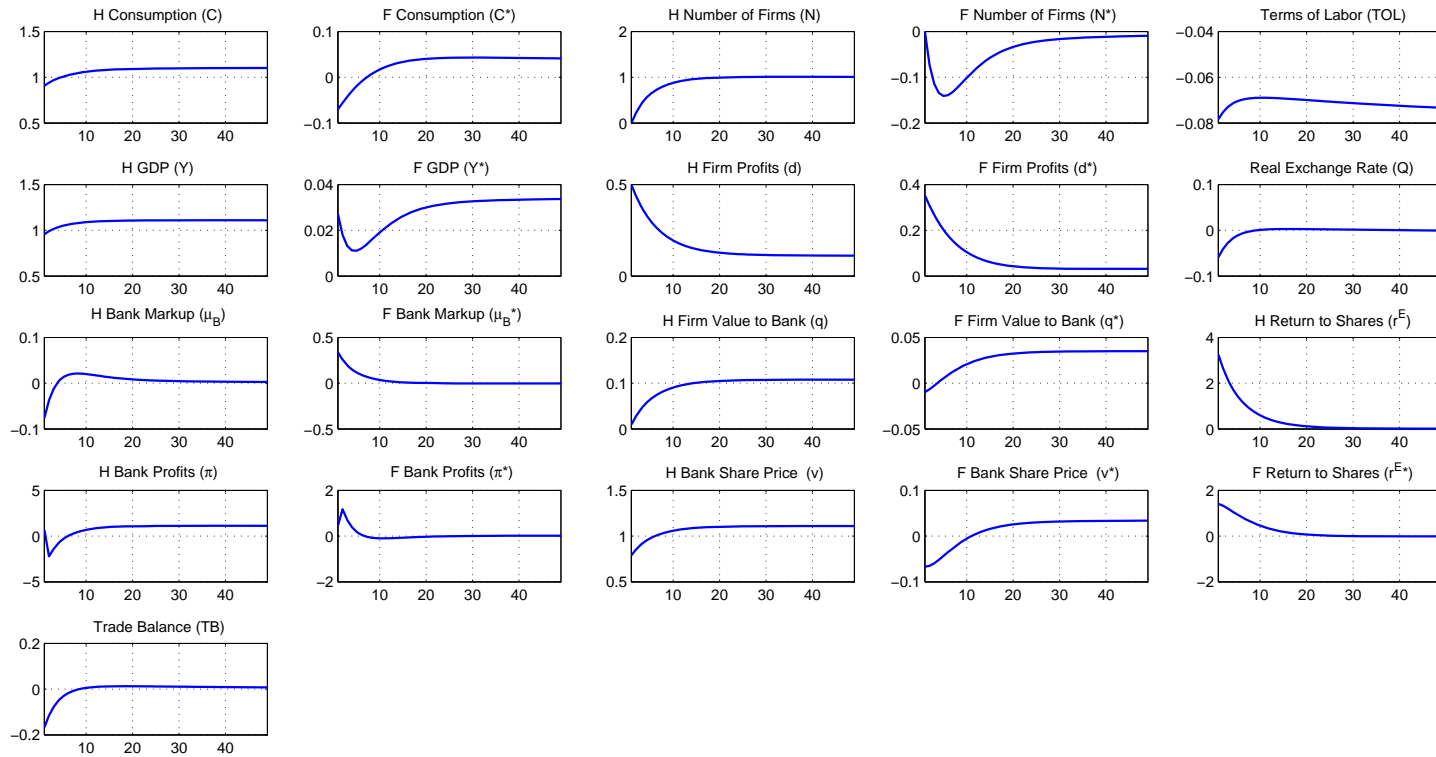**Figure A.10.** Productivity Shock with Complete Markets, Persistence 0.9, Non-Traded Goods Model
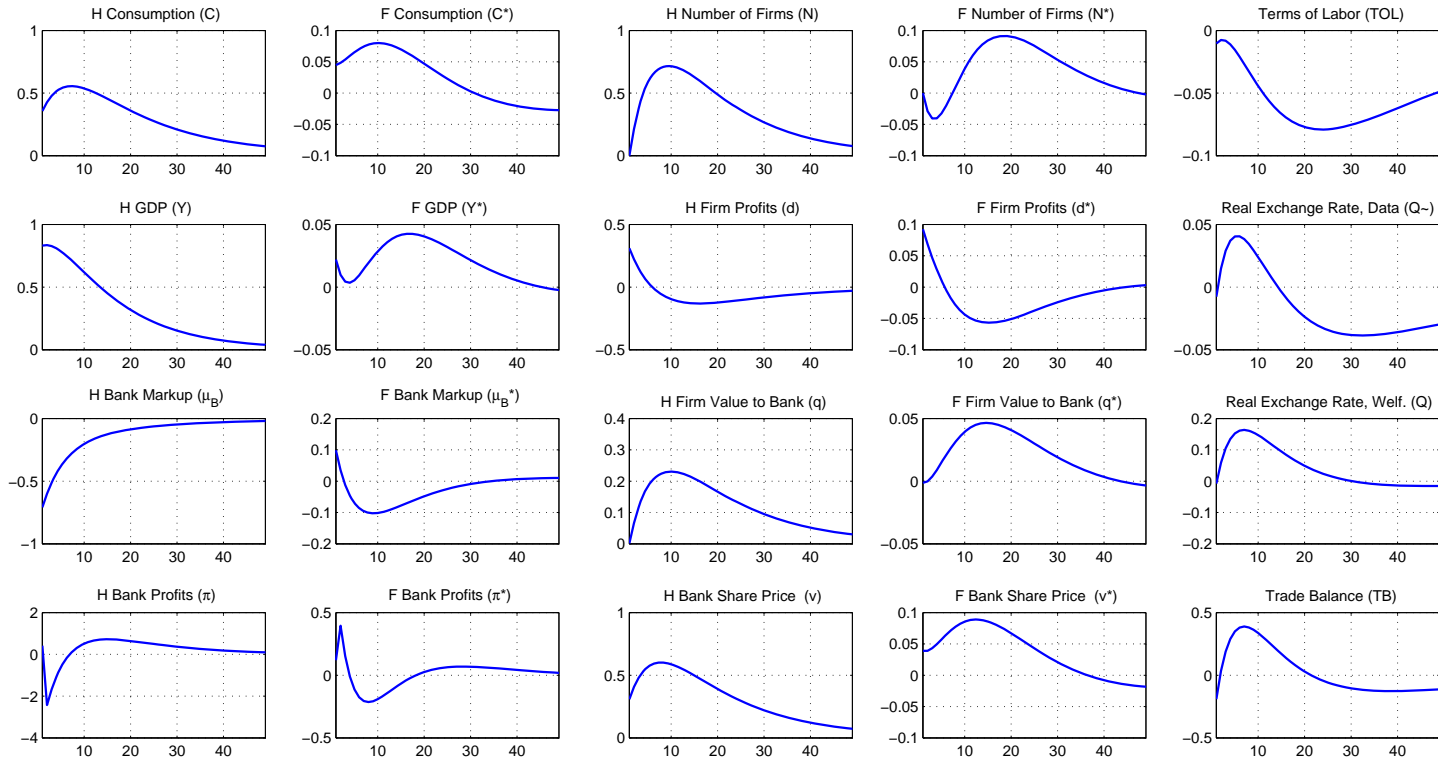
Figure A.11. Productivity Shock with International Deposits, Persistence 0.9, Home Bias Model
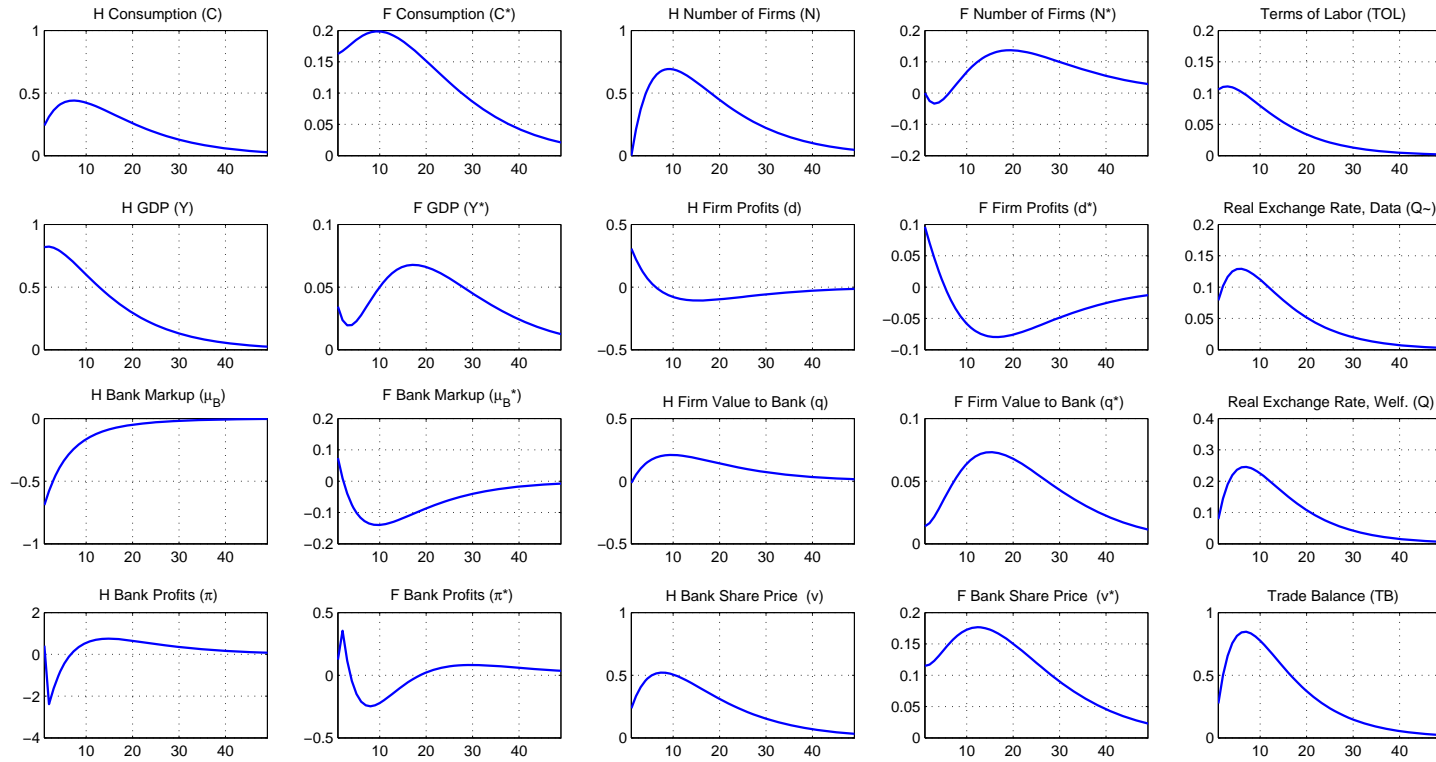
Figure A.12. Productivity Shock with Complete Markets, Persistence 0.9, Home Bias Model

Figure A.13. Permanent Productivity Shock with International Deposits, Non-Traded Goods Model
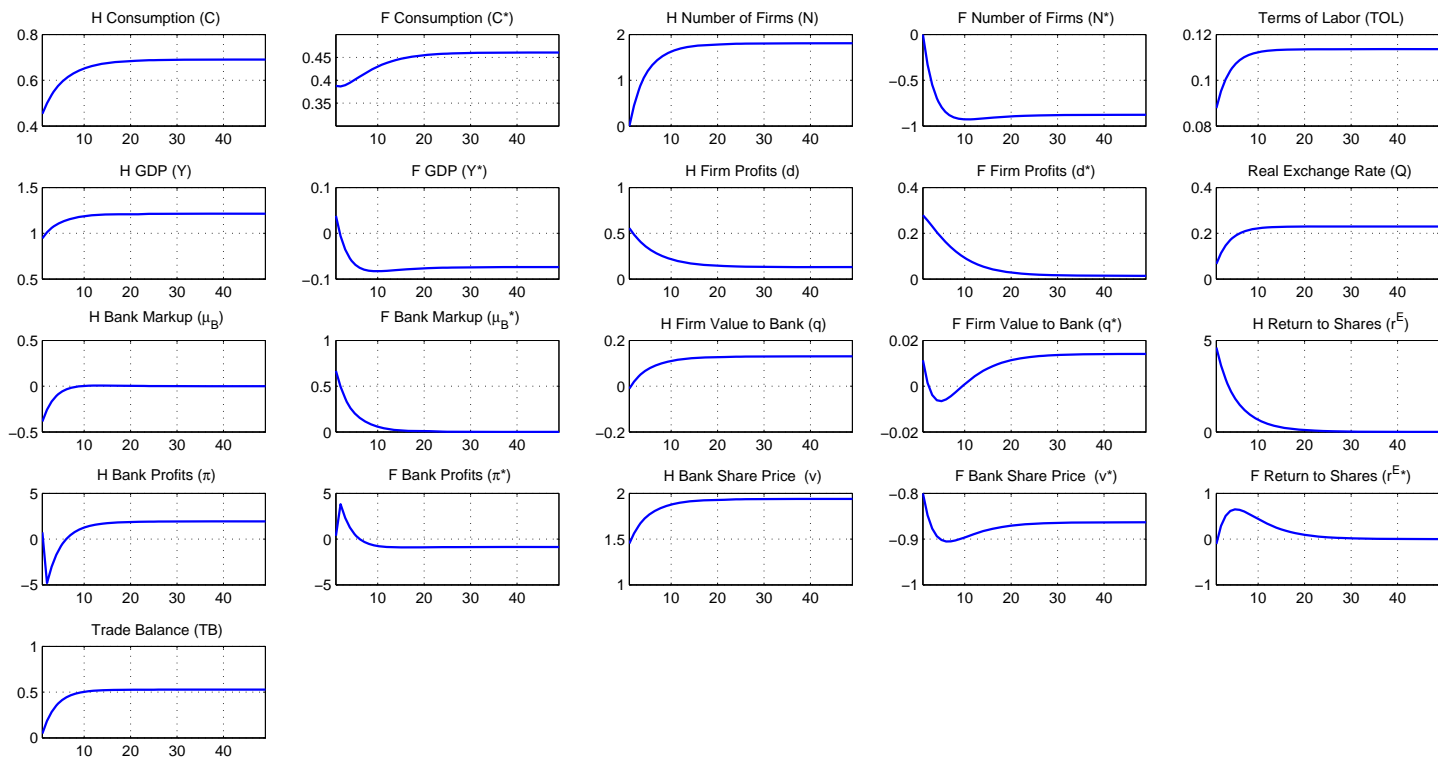
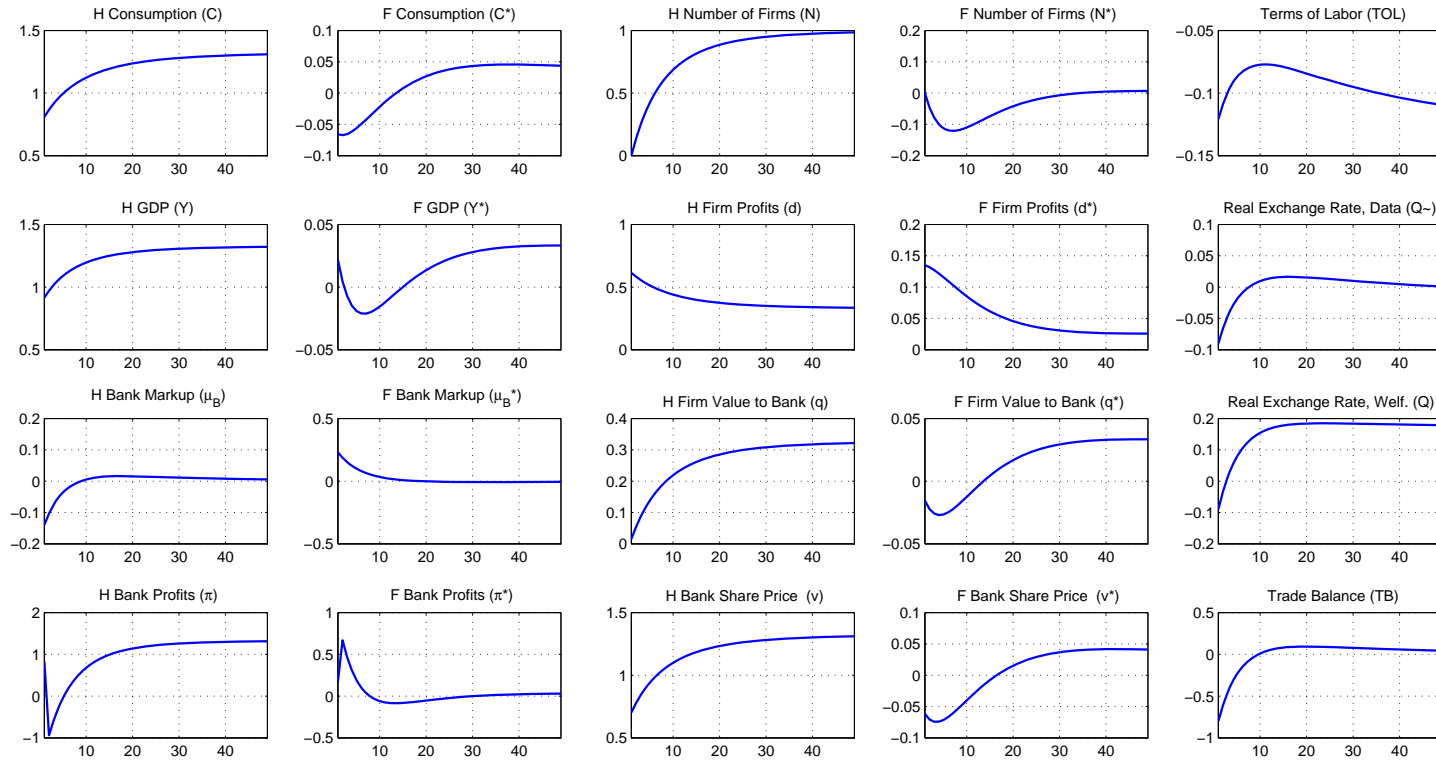**Figure A.14.** Permanent Productivity Shock with Complete Markets, Non-Traded Goods Model

Figure A.15. Permanent Productivity Shock with International Deposits, Home Bias Model
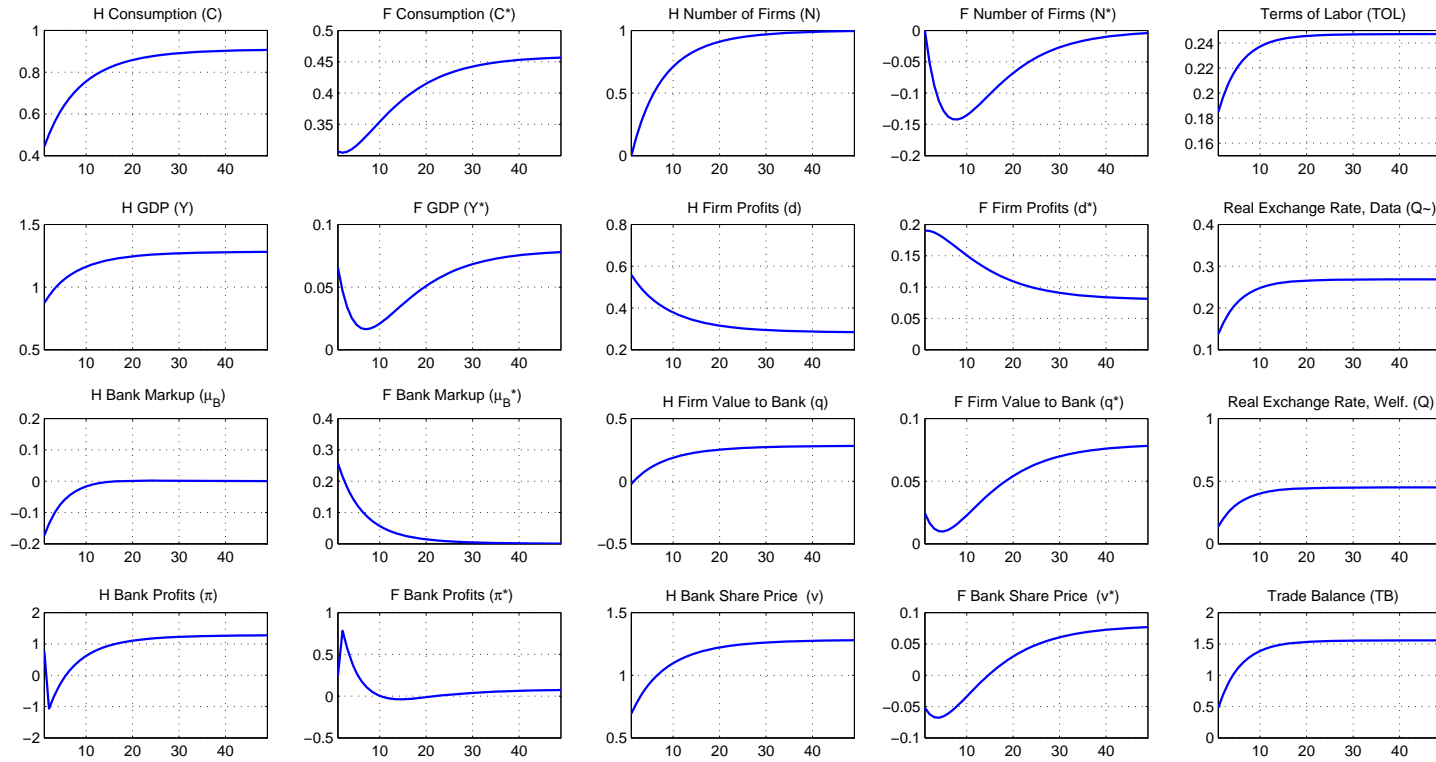
Figure A.16. Permanent Productivity Shock with Complete Markets, Home Bias Model