The Micro and Macro Dynamics of Capital Flows

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Abstract

We empirically and theoretically study the effects of capital flows on resource allocation within sectors and cross-sectors. Novel data on service firms – in addition to manufacturing firms – allows us to assess two channels of resource reallocation. Capital inflows lower the relative price of capital, which promotes capital-intensive industries – an input-cost channel. Second, capital inflows increase aggregate consumption, which tilts the demand towards goods with high expenditure elasticities – a consumption channel. We provide evidence for these two channels using firm-level census data from the financial liberalization in Hungary, a policy reform that led to capital inflows. We show that firms in capital-intensive industries expand, as do firms in industries producing goods with high expenditure elasticities. In the short-term, the consumption channel dominates and resources reallocate towards high expenditure elasticity activities, such as services. We build a dynamic, multi-sector, heterogeneous firm model of an economy transitioning to its steady-state. We simulate a capital account liberalization and show that the model can rationalize our empirical findings. We then use the model to assess the permanent effects of capital flows and show that the structure of the economy depends on the extend of capital inflows upon the liberalization. When an economy with scarce capital opens to financial flows it receives larger capital inflows triggering more long-run debt pushing the country to a larger permanent trade surplus, than a similar liberalization performed by an economy with relatively more physical capital. The additional current account deficit further reduces consumption, depreciates the real exchange rate and tilts long-run production towards manufacturing exporters.

Keywords: firm dynamics, financial liberalization, reallocation, capital flows, extensive margin, non-homothetic preferences.

JEL classification: F15, F41, F43, F63.

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1 Introduction

Over the past half-century, advanced economy countries, followed by emerging market countries, have received large capital inflows that have shaped the evolution of their economies. The macroeconomic implications of these inflows have attracted considerable attention from scholars and policy makers. In recent years, there has been a recognition that a deep empirical and theoretical understanding of these macroeconomic implications requires an understanding of the effect of capital flows on the allocation of resources within and across industries and firms. This recent research has thus focused on the reallocation of resources within manufacturing firms or across broadly defined sectors, such as manufacturing or services. However, so far, there is no evidence on the impact of capital flows on services firms, which of course, constitute the vast majority of firms, inputs, and output in an economy. This gap prevents a full understanding of the impact of capital inflows.

In this paper, we seek to expand our understanding of the micro and macro-dynamics of capital flows empirically and theoretically with comprehensive firm-level data and a calibrated heterogeneous firm dynamic model. Specifically, our paper makes three contributions. First, we bring novel evidence about the impact of capital flows on service firms, in addition to manufacturing firms. In our empirical analysis, we employ the census of Hungarian firms over the period of Hungary's capital account liberalization in 2001. Second, we investigate the importance of two channels through which capital flows can affect the allocation of resources. Capital inflows reduce the relative price of capital, which favors capital intensive firms and industries – an input-cost channel. Also, such inflows increase current consumption and expand the demand for goods with high expenditure elasticities – a consumption channel. Third, we develop and calibrate a multi-sector, heterogeneous firm, dynamic open economy model, and then we use it to study the firm, sector, and aggregate effects, as well as the short-run and long-run effects, of an unexpected capital account liberalization in an economy transitioning to its financial autarky steady-state.

Our empirical investigation is centered around the capital account liberalization in Hungary in 2001 for three main reasons. First, while many countries perform financial and trade reforms jointly, Hungary presents an unusual *quasi* natural experiment of a pure capital account liberalization. Second, our firm-level data (APEH) is unique as it provides information on balance sheets for the universe of firms in all economic activities in Hungary for almost two decades (1992-2008). Finally, this extensive data set allows us to dissect movements in the extensive margin, as it reports the creation and destruction of every firm in the economy, from unipersonal firms to large corporations. We can then study –for the first time– the impact of capital inflows by building from firm individual data to aggregate outcomes.

We start by documenting that the financial liberalization in Hungary in 2001 led to large capital inflows, and to a reduction in the domestic interest rate. Five years after the reform, the net capital flows had increased by four-times and the net international investment position had dropped 25 percentage points of GDP. These flows translated into an expansion of the credit supply and a decrease in the lending interest rate by 3 percentage points. As a result, the wage-to-interest rate ratio increased by three-times. Capital inflows were also associated with increased demand, as consumption expenditure over GDP rose by 3 percentage points within the five years before and after the reform.

To motivate our empirical strategy, we develop a simple version of our quantitative model and show

how the relative input-cost and consumption channels affect firms' outcomes through two structural parameters of the model, i.e. the capital and expenditure elasticities. The model's structural relationships allow us to construct a difference-in-difference estimator to assess the impact of the reform within firms across industries. We exploit three sources of variation to identify the effect of capital inflows: reform (time) and heterogeneity in capital and expenditure elasticities across industries (cross section).

Our empirical results provide evidence for the relative input-cost channel, as firms in sectors with a high capital elasticity increased their value-added and capital differentially. Additionally, our results also point to the presence of a consumption channel, as firms in high expenditure elasticity industries differentially increase their value added. The estimated coefficients imply that moving from the p25 to the p75 of capital elasticity –such as from retail trade to machinery and equipment– leads to a higher increase in value added by 3.5%, and capital by 5%. Similarly, moving from the p25 to the p75 expenditure elasticity –such as moving from wholesale to other business activities– raises value added by 4%. The estimated coefficients remain statistically significant and similar in magnitude when we let the mechanisms compete and include both the capital and expenditure elasticities in the regression and add for a full set of controls. Additionally, we estimate standardized beta coefficients and show that the coefficients for the expenditure elasticity are larger, which indicates that at the firm level the consumption channel is stronger than the input-cost channel.

The granularity of the data allows us to study the reallocation of resources within sectors. We show that there is a decrease in the number of producing firms in capital-intensive industries, and an increase in high expenditure elasticity industries. The magnitude of these changes is economically significant. Going from the p25 to the p75 of the capital elasticity implies a 10% decrease in the number of firms, while going from the p25 to p75 of expenditure elasticity leads to a 12% increase in the mass of producing firms. The expansion in high expenditure elasticity industries is driven by the increase in the number of net entrants. Strikingly, while the number of net entrants was not related to expenditure elasticity in the pre-reform period, upon the increase in capital inflows the number of net entrants correlates strongly with the industry's expenditure elasticity. After controlling for pre-trends, an industry with an expenditure elasticity of 1.8 –as restaurants and bars– has on average more than 1,500 new firms created per year, which is 1,200 more firms than an industry with low expenditure elasticity (such as agriculture). Importantly, entrants are small-domestic firms and have an average of only three employees. Changes in the mass of firms go hand -in-hand with changes in the size of operating firms, as – upon the reform – firms' size decreases in the industry's expenditure elasticity.

These results suggest changes in the operational cut-off across industries with different capital and expenditure elasticities. Following the liberalization, the operating threshold seems to rise with the capital elasticity of the industry. Thus, in these activities, there are fewer firms, but the firms are larger and more productive. By contrast, the threshold for operating profitably seems to fall by more, the higher the expenditure elasticity of the industry. Thus, there are more firms, and the firms are smaller and less productive. We then build from the micro data to analyze the aggregate implications of input cost and consumption channels. Our data suggests that the consumption channel dominates and leads to reallocation of resources towards industries with high expenditure elasticity, which are chiefly in the service sector. On the aggregate, we observe that the share of value added, employment and number of firms in high expenditure elasticities and in services increases in the seven years after the financial liberalization.

These strong extensive margin movements and reallocation forces in the data are the motivation for developing a dynamic, heterogeneous firms, small open economy model. We build this model to rationalize our empirical findings and to conduct a quantitative assessment on the macroeconomic importance of the reallocation of resources following the financial liberalization. In our model, there are two sectors: manufacturing and services. The two sectors differ in three key features. First, they differ in the capital elasticity of their production technology. Second, they differ in their expenditure elasticities of demand. Specifically, we employ the Comin, Lashkari, and Mestieri (2018) version of non-homothetic preferences to allow for heterogenous expenditure elasticities across sectors. Third, manufactured goods can be traded, while services goods are not. Imports of manufactured goods are used for consumption and investment. Within each sector, there is a continuum of monopolistically competitive firms with heterogeneous productivity à la Melitz.

Our model economy is in transition to its long-run steady state. The economy faces an exogenously given world real interest rate and capital controls, in the form of a tax on each unit of foreign borrowing, that potentially limit capital flows. Hence, the domestic real interest rate equals the world real interest rate plus the capital controls tax. Financial liberalization eliminates the tax on foreign debt and triggers endogenous trade and current account dynamics. The endogenous current account dynamics affect the country's external foreign debt position during the transition and, potentially, the long-run steady state of the economy.

We calibrate the model primarily to match annual micro and macroeconomic data from Hungary. In particular, the model matches the differential labor and expenditure elasticities between manufacturing and service sectors at the core of the input-cost and consumption channels. The economy is initially in financial autarky as the level of capital controls is sufficiently high that the real return to capital is lower than the domestic real interest rate and, thus, there are no capital inflows. We perform a full financial liberalization to this economy while it transits at 60% of its long-run steady state capital. We then assess how the unexpected decrease in capital controls affects the allocation of resources within and across sectors, as well as the economy's transition dynamics and its terminal steady state.

Through the lens of the model we can unveil the intricate firm-level, sectoral, and macroeconomic dynamics set in motion by a financial liberalization. The liberalization produces rich short-term adjustments that match the Hungarian experience. In fact, the domestic interest rate drops on impact and capital flows into the economy. Financial openness breaks the trade-off between investment and consumption as both expand simultaneously. These dynamics lead to reallocation of resources across and within sectors. Across sectors, the lower cost of capital triggers the relative input-cost channel, which leads to higher investment and manufacturing activity. Higher capital accumulation and borrowing for consumption smoothing increase aggregate consumption, which – through non-homothetic preferences – tilts sectoral consumption towards services. In the short term, whether production reallocates resources towards manufacturing or services depends on the strength of the relative input-cost and consumption channels. At the time of the liberalization, the consumption channel dominates and production reallocates towards services. There is also extensive within sector reallocation upon the liberalization. The relative increase in the demand for services leads to a decrease in the operation productivity cut-off to operate, encouraging entry. Within the manufacturing sector, the lower relative demand and a real exchange appreciation raise the operational cut-off of domestic and exporting firms. These short-term dynamics confirm the reallocation toward services and movements along the extensive margins reported in our empirical analysis.

We then leverage our calibrated model by going beyond the time horizon of our empirical analysis to investigate the long-run implications of a financial liberalization. In fact, the short-term capital inflows occur hand-in-hand with external borrowing – current account deficits – and repayment obligations. In the long run, the liberalized economy eventually stabilizes its net foreign asset position at a negative level. This long-run negative net foreign asset position is sustained by net trade surpluses in the long-run. At the sectoral level, the debt repayment implies that resources shift away from non-traded services towards tradable manufacturing, so that the economy can run a permanent trade surplus. Thus, in the medium and long-term, production shifts away from services towards manufacturing. In parallel, there is reallocation within the manufacturing sector. The exporting cutoff falls relative to the domestic cutoff, which leads to more manufacturing firms exporting, and existing exporting firms expanding in size. The trade surplus required by debt repayment also implies lower domestic consumption, and induces a real exchange depreciation. A depreciated currency, all else equal, reduces the export productivity cut-off, and further promotes exports.

The model shows that the size of the capital inflows at the moment of the financial liberalization has long-run consequences in the allocation of resources across and within sectors and, therefore, on the long-run aggregate productivity of the economy. In fact, a liberalization in an economy with relatively low capital triggers more capital inflows and more permanent debt repayments and trade surpluses than the same liberalization in an economy with a larger capital stock. Therefore, large capital inflows at the moment of the liberalization imply long-run steady states tilted towards manufacturing production and with most resources among exporter firms. These economies have depreciated exchange rates and high aggregate productivity when compared to less liberalized economies. In our baseline calibration, a full removal of capital controls increases the long-run share of manufacturing in GDP, and long-run aggregate productivity by more than ten percent, relative to the financial autarky long-run equilibrium.

Hence, our model shows that the short-term and long term dynamics of capital flows differ in their implications for the sectoral composition of production and for firm-dynamics. In the short term, increased consumption translates into an expansion of services and the entry of small firms but, in the long term – when the economy stabilizes its external debt – production tilts to manufacturing, especially towards the larger, most productive, exporting firms.

The empirical identification of the effect of the financial liberalization is based on heterogeneous capital and expenditure elasticities across industries. To test that the observed effects correspond to the liberalization and not something else, we conduct a full set of robustness tests. First, we estimate a dynamic difference-in-difference and show that, while firms in sectors with different capital and expenditure elasticities shared similar growth trends prior to the reform, they grow differentially after it. Second, we show that the expansion in services is not driven by an ease of financial constraints in this sector, as results are robust to excluding firms with bank credit, and to controlling for dependence on external finance of firms. Third, results are robust to controlling for export status, foreign ownership, and using different methods to estimate the capital and the expenditure elasticities. Fourth, the general context around the liberalization and its timing minimizes reverse causality concerns, as it was part of a general program of fourteen transition economies to join the European Union (EU). Importantly, by 2001, the deregulation of capital controls in Hungary was the only missing requirement to join the EU. The Hungarian economy was already deeply integrated with the EU and trade and foreign direct investment (FDI) flows remained constant around the reform. Additionally, other transition economies undergoing the same process of joining the EU but with already deregulated financial accounts did not witness the same pattern of inflows of Hungary. Finally, to test external validity, we use data for 163 countries over 1970 to 2016 to assess whether financial liberalization associates with reallocation of resources towards services at the cross-country level. Confirming our results for Hungary, we find that liberalizing countries experience an increase in the value added share of services in the short term.

Related Literature. This paper adds to a long theoretical and empirical literature studying the impact of capital inflows into capital-scarce economies (among recent contributions, see, for example, Gourinchas and Jeanne 2006; Levchenko, Ranciere, and Thoenig 2009; Tille and van Wincoop 2010, Hoxha, Kalemli-Ozcan, and Vollrath 2013; Broner and Ventura 2015). Gourinchas and Jeanne (2006) study the aggregate macroeconomic effects of a financial liberalization in an open economy version of the neoclassical growth model. Levchenko, Ranciere, and Thoenig (2009) use an industry-level panel data set to study the growth and volatility effects of financial liberalization, as well as the drivers of these effects.

A related empirical literature consists of cross-country studies documenting that, in middle-income economies, expansions owing to capital inflows lead to resources shifting away from tradable activities (see, for example, Tornell and Westermann 2005; Reis 2013; Benigno, Converse, and Fornaro 2015). Building on these findings, Benigno and Fornaro (2013) develop a two-sector model with homogeneous agents and show that capital inflows can undermine productivity growth, as they reallocate resources from the tradable- productivity enhancing sector to the non-tradable stagnant sector.

Our paper also relates to recent literature assessing the impact of capital flows within and across firms (Gopinath, Kalemli-Ozcan, Karabarbounis, and Villegas-Sanchez 2017 and Varela 2018). This research focuses on incumbent manufacturing firm-level evidence and studies the productivity and/or mis-allocation effects of capital flows on these firms.

Our paper extends the above country-level and industry-level research by providing firm-level evidence on reallocation within sectors following a financial liberalization. Our paper extends the above firm-level research by focusing on services firms – for the first time – in addition to manufacturing firms. This enables us to study micro-level cross-sector reallocation over time.[1] In addition, we provide new evidence on the extensive margin of firms. Our paper also establishes the importance of two transmission channels, the input-cost channel, based on differences in the capital elasticity, and the consumption channel, based on differences in the expenditure elasticity, across firms and sectors over time. Our quasi-natural experiment allows us to show empirically that, following an increase in aggregate consumption, differences in sectoral expenditure elasticities lead to a shift in spending and resources towards services activities. This holds true even after controlling for firms' access to external finance. Our dynamic model quantifies the magnitude of these channels, and allows us to study the short-term and long-term allocation of resources, which depend on the degree of financial openness.

[1] See Bernard, Redding, and Schott (2007) for a multi-sector Melitz-type trade model that is used to study theoretically the micro-level cross-sector reallocation following a trade liberalization.

Our paper relates to Acemoglu and Guerrieri (2008) in that we build from heterogeneous capital elasticities across sectors to investigate capital accumulation We extend their analysis by introducing non-homothetic preferences –as in Herrendorf, Rogerson, and Valentinyi (2013); Boppart (2014) and Comin, Lashkari, and Mestieri (2018) – in a small open economy model and evaluating the input cost and consumption channels together in a unified framework.

Our consumption channel suggests the importance of non-homotheticities in preferences, which we build into our multi-sector model. Hence, our paper is related to the literature showing that differences in expenditure elasticities across sectors can lead, in response to a trade liberalization, for example, those with higher incomes to shift their consumption basket toward services. This, in turn, affects the income distribution further, reallocation across sectors, aggregate outcomes, and the long-term path of economies (Cravino and Levchenko 2017; Cravino and Sotelo 2019; Borusyak and Jaravel 2018; Fieler 2011; Hubmer 2018, among others). Our paper also relates to Aghion, Zilibotti, Peters, and Burgess (2019) who use micro data on expenditure shares on India to show that increases in income per capita associates with higher in the employment share in consumer services. Our paper contributes to this literature by assessing the impact of non-homotheticities in a dynamic open economy model with heterogenous firms, and by studying how they affect the extensive margin and reallocation within and across sectors at the short and long horizons.[2]

The paper is organized as follows. Section 2 reviews the financial liberalization in Hungary, and Section 3 overviews the data we use. Section 4 presents our identification strategy and empirical results. Section 5 lays out our model and Section 6 presents our quantitative analysis. Section 7 concludes.

2 Financial Liberalization in Hungary

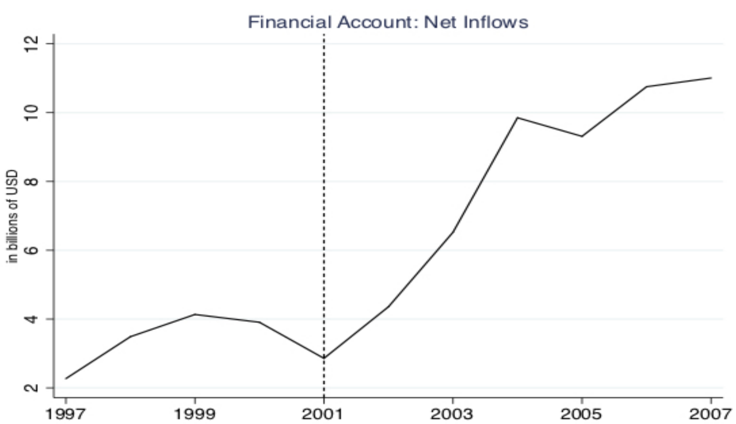
To analyze the effect of capital inflows on the reallocation of resources, we exploit the deregulation of international borrowing in Hungary in 2001. This section presents briefly the capital controls that were in place in Hungary prior to 2001, and describes the deregulation and its aggregate implications.

Capital controls were implemented by the Act XCV of 1995, which employed two main tools to limit international financial flows. The first tool restricted banks' international financial flows by banning all foreign currency instruments -chiefly among them foreign currency swaps and forward contracts. These instruments allow hedging the currency risk and, thus, are critical for banks to raise foreign funds. The second tool required banks' exchange rate spot transactions to be pre-approved by the Central Bank, which made the spot exchange rate market illiquid. As discussed in Varela (2018), these restrictions substantially limited banks' ability to intermediate foreign funds and made them reluctant to borrow internationally. As a result, banks based their credit supply on domestic savings, which led to a low level of credit. In 2000, Hungary's credit-to-GDP ratio (0.27) was three times smaller than the OECD average (0.86), and its credit-to-deposit ratio was a third lower (0.83 against 1.2 in OECD countries).[3]

[2]Our paper also relates to firm dynamics models emphasizing how different allocation of resources across firms can affect aggregate productivity (Restuccia and Rogerson 2008; Hsieh and Klenow 2009; Peters 2020; Buera and Moll 2015; Buera and Shin 2017, among others).

[3]There were additional regulations that prevented domestically-owned firms from borrowing from abroad, by banning

In 2001, the Act XCIII removed these regulations and allowed banks for intermediate international financial flows freely.[4] The reform had a large impact on capital inflows as shown in Figure 1. In the years after the liberalization (2001-2008), net financial inflows increased by more than three-fold compared to the pre-liberalization period (1995-2000) and rose from 2.5 to 8.2 billions of USD per year. The net foreign asset position of Hungary deteriorated and dropped by 25 percentage points of GDP between 1995-2000 and 2001-2008 (Figure C.2 in Appendix C). Banks started to raise foreign funds and to use intensively financial derivatives. Both cross-border and local derivatives soared and, by 2007, banks' stock of external debt had increased by nine-fold, from 5 billions U.S. dollars to 45 billions U.S. dollars (Figure C.1). These inflows translated into an expansion of the local credit supply and a decrease in the domestic lending rate. The credit-to-GDP ratio doubled (from 25 to 49%) and the domestic lending rate drop from 22% to 10% between 1995-2000 and 2001-2008. While there was already a deceasing trend in the domestic rate in Hungary since the nineties, after controlling from this pre-trend, the lending interest rate dropped by 3 percentage points in the years following the reform (see Table 7). Capital inflows associated an increased in consumption, shown by the raise of consumption expenditure over GDP by 3 percentage points within the five years before and after the reform.[5]



	Before 1995-2000	After 2001-2008
	(1)	(2)
Financial account (net)*	2.5	8.2
NFA/GDP	-62	-87
Credit-to-GDP ratio	25	49
Lending interest rate	22	10
Consumption/GDP	74	77

Note: in %. *In billions of USD dollars. Year averages.
Source: NBH, IMF, Lane and Milesi-Ferretti (2018).

Figure 1: Hungary: Net Capital Inflows

3 Data

To analyze the impact of financial liberalization at the micro level, we employ firm-level census data for the period 1992-2008. The dataset – APEH – contains panel data on balance sheets reported to tax authorities for all firms subject to capital taxation in agriculture, manufacture and services activities. It reports information on firms' value added, sales, output, capital, employment, wages, materials and

them from holding bank accounts in foreign currency (see Varela 2018 for more details).

[4]This reform was triggered by the accession to the European Union. To join the EU, all candidate countries have to accomplish the Copenhagen Criteria of 1993. One of these criteria is that candidates have to ensure free movement of capital, the only missing requirement in Hungary. The reform completed the deregulation of international financial flows. Importantly, this reform was not associated with an increase in trade (export nor imports) with the EU not with an increase in foreign direct investment, as shown in Figures C.3, C.4 and C.6 and discussed in Section 4.1.

[5]Table C.1 in Appendix C confirms these patterns by splitting the before and after into different these time horizons.

exports that we employ to construct measures of labor productivity (value added per worker), capital intensity (capital per worker), export shares (export over sales). To obtain real values, we use price indexes at four-digit NACE industries for materials, investment, value added and production. When we control for access to credit, we use the credit registry data, which reports information on all corporate loans with financial institutions in Hungary from 2005.

Our database covers the population of Hungarian firms between 1992 and 2008. We exclude firms in education, health and public administration activities, as in Hungary these are mostly public activities. Because small firms are subject to measurement error problems, we keep in our main regressions firms that have three or more employees. To analyze the extensive margin, we consider all firms (including those with less than three employees). Our analysis covers approximately all employment in manufacturing and service activities – 95% and 93% respectively – and more than 98% and 85% of their value added compared to EU-KLEMS data.[6] To better isolate the impact of the reform, we restrict the analysis to the period 1995-2008.

To identify the input cost and consumption channels, we need to obtain capital and expenditure elasticities. We estimate the capital elasticity at four-digit NACE industries using the Petrin and Levinsohn (2012) and Wooldridge (2009) method to obtain the elasticities of the production function. We compute them for the pre-liberalization period (1992-2000) to avoid endogeneity concerns. For robustness, we estimate the capital elasticity with the Olley and Pakes (1996) methodology and re-estimate our results using these elasticities. We employ the capital and labor elasticities to compute revenue total factor productivity (RTFP). We employ the expenditure elasticities produced by Bils, Klenow, and Malin (2013) who estimate product-level elasticities from the U.S. Consumer Expenditure Survey for 70 categories between 1982-2010. Importantly, Bils, Klenow, and Malin (2013) map the expenditure elasticities estimated for consumers to producers using input-output tables and EU-KLEMS data. We employ this map to assign to each two-digit sector an expenditure elasticity. Table C.2 in Appendix C reports these elasticities. For robustness, we use the expenditure elasticities estimated by Comin, Lashkari, and Mestieri (2018), who use data for 39 developed and developing economies since 1947 to estimate this elasticity for ten sectors (Table C.3 in Appendix C).

Table C.4 in Appendix C presents the summary statistics of the capital and expenditure elasticities. The mean capital and expenditure elasticities are 0.22 and 1.01, which correspond to printing activities and water transport, respectively. The sector with the highest capital elasticity is manufacture of general purpose machine (0.43) and with the lowest is farming of animals (0.05).The sector with the highest expenditure elasticity is real estate with an elasticity of 2.02, and the lowest is food, beverage and tobacco with an elasticity of 0.4. Importantly, although capital and expenditure elasticities are negatively correlated, this correlation is small and only reaches 2.5% (see Figure C.8 in Appendix C). This small correlation indicates that these elasticities are not collinear and there is enough variation among them to identify separately the input-cost and consumption channels. To visualize how capital and expenditure elasticities vary across broadly-defined sectors – agriculture, manufacturing and services–, we plot in

[6] Although the database accounts for almost all employment in the agricultural sector (98%), its share of agricultural value added reaches 54%. This smaller representativeness on agricultural value added does not significantly affect our results as the these activities accounted only for 5% of GDP according to EU KLEMS data. Note that mis-reporting is not uncommon in agricultural activities, see for example Herrendorf and Schoellman (2015).

Figure C.9 in Appendix C these elasticities by sectors. The blue circles show that agriculture activities have the lowest expenditure elasticities, and service activities the highest. Sectors with high capital elasticity tend to be in manufacturing, but there are spread out across the three sectors.

Firms' size varies according with sectors' capital and expenditure elasticities. As we show in Table C.5 in Appendix C, firms in sectors with higher capital elasticity were –on average– larger (value added, capital, employment), older and more productive prior to the reform (1995-2000). Inversely, firms in sectors with higher expenditure elasticity tend to be smaller, younger and less productive. Our regressions control for these heterogeneous firms' pre-reform characteristics.[7]

4 Empirics

4.1 Identification Strategy

To illustrate our empirical analysis, we start by sketching key features of our model. We then present our identification strategy for our firm-level analysis and discuss possible concerns, such as the parallel trend assumption, sample selection and reverse causality.

-Sketch of a Model

We identify the consumption and relative input-cost channels during capital inflows through the lens of a heterogeneous firm-dynamics model with multiple sectors where the consumer has non-homothetic preferences. We present the full model in Section 5 but, to illustrate our empirical analysis, we describe below the main relationships that drive our identification strategy. Think of a small economy that produces a final good – C – which is composed by multiple sectors j that differ in their expenditure elasticity e_j. The representative household maximizes its intertemporal utility and has non-homothetic preferences à la Comin, Lashkari, and Mestieri (2018), with the following functional form $1 = \left[\sum_j \theta_j^{\frac{1}{\eta}} C_t^{\frac{e_j-\eta}{\eta}} C_{j,t}^{\frac{\eta-1}{\eta}}\right]$, where η is the elasticity of substitution between sectors and θ_j is constant weight parameter. Within each sector j, there are monopolistically competitive firms that produce an infinite number of differentiated varieties with an elasticity of substitution across varieties σ. These intermediate firms are heterogeneous in productivity à la Melitz (2003) and produce using a Cobb-Douglas technology based on capital and labor, $q_{(\varphi)t} = \varphi\, k_t^{\alpha_j} l_t^{\beta_j}$, where φ is a firm's productivity and the elasticities of capital and labor – α_j and β_j – are heterogenous across sectors. As in Melitz (2003), firms' optimal price is a constant markup over their marginal costs, e.g. $\frac{\phi_{j,t}}{\varphi\rho}$, where $\phi_{j,t} \equiv \left(\frac{r_t^k}{\alpha_j}\right)^{\alpha_j} \left(\frac{w_t}{\beta_j}\right)^{\beta_j}$ is the input-cost bundle and $1/\rho$ is the markup. In equilibrium, the optimal production of each firm – $q_{jt}(\varphi)$ – is given by

$$q_{jt}(\varphi) = \left[\left(\frac{\phi_j}{\varphi\rho}\right)^{-\sigma} \theta_j C_t^{e_j} P_{j,t}^{\sigma-\eta} P_t^{\eta}\right]. \tag{1}$$

Replacing the sectoral price level P_{jt} and applying logs, we can write the optimal production of each

[7] Table C.8 in Appendix C presents descriptive statistics for agriculture, manufacturing and services, and shows that these difference in firms' size is present across these broadly defined sectors. Additionally, Table C.9 shows that the difference in means is statistically significant among them.

firm as[8]

$$\log(q_{jt}(\varphi)) = -\alpha_j\eta\log(r_t^k/w_t) + e_j\log(C_t) + (\sigma-\eta)\tilde{\varphi}_{jt} - (\alpha_j+\beta_j)\eta\log(w_t) + \eta\log(P_t) + D_{\varphi j}, \quad (2)$$

where $\tilde{\varphi}_{jt} \equiv \frac{1}{\sigma-1}\log\left[\int_{\varphi^*_{jt}} \varphi^{\sigma-1}\mu(\varphi)d\varphi\right]$ reflects the weighted average of the firm productivity levels in each sector j, and $D_{\varphi j}$ is a constant term with sector and firm level parameters. Appendix B presents the derivations for firms' optimal capital and labor demands.

Equation (2) illustrates how the relative input-cost and consumption channels impact a firm's production. Intuitively, other things equal, a decrease in the relative price of capital (r^k and, thus, $\phi_{j,t}$) lowers the input-cost bundle and encourages production, especially in sectors with higher capital elasticity (higher α_j). Similarly, an increase in the final good consumption (C) promotes the production of firms in sectors with high expenditure elasticity (higher e_j). Formally, the partial effects are given by $\frac{\partial log(q_{jt}(\varphi))}{\partial log(r_t^k/w_t)} = -\alpha_j\eta < 0$ and $\frac{\partial log(q_{jt}(\varphi))}{\partial log(C_t)} = e_j > 0$. Hence, these two structural parameters of the model – α_j and e_j – allow us to identify the relative input-cost and consumption channels on firms' production. In the rest of the paper, we exploit differences in these two structural parameters to identify the impact of capital inflows across sectors.

-Identification Strategy

The identification strategy of the effect of the deregulation of capital flows in Hungary in 2001 is based on three sources of variation: the reform as a source of time variation and the differences in capital and expenditure elasticities across sectors as sources of cross-sectional variation. We evaluate the relative input-cost and consumption channels in three steps. First, we assess the relative input-cost channel by estimating the differential impact of the reform across sectors with different capital elasticity, and assess whether firms in more capital intensive sectors expand differentially upon the reform. Second, we study the consumption channel by exploiting variations in terms of sector's expenditure elasticity and testing whether firms grow differentially according to the implied expenditure elasticity in the sector. Third, we conduct a horse race between the capital and expenditure elasticities to assess whether the relative input cost or consumption channel dominates.

We estimate our main regressions in first differences, so that all constant firm and industry characteristics are differenced out. Following equation (2), we include the weighted average of the firm productivity levels at four-digit sectors to control for a sector time-variant trend. Alternatively, as a robustness, we control for the four-digit sector price index (instead of the weighted average sectoral productivity $\tilde{\varphi}_{jt}$). To show that our results are not an artifact of first differencing, we estimate panel regressions at the firm level and show that our results remain valid under this specification in which firm fixed effects are included.

A critical assumption of the empirical strategy is that firms across capital and expenditure elasticities shared similar growth trends before the reform. To assess the parallel trend assumption, we compute

[8]Note that the log of the sector price level is given by $\log(P_{jt}) = \frac{1}{1-\sigma}\log\left[\int_{\varphi^*_{jt}} p^{1-\sigma}_{jt(\varphi)}\mu(\varphi)d\varphi\right]$, which can be re-written as $\log(P_{jt}) = \log\phi_{jt} + \log\left(\frac{1}{\rho}\right) - \tilde{\varphi}_{jt}$. Appendix B presents a full derivation of this equation.

firms' yearly growth rates in the main variables analyzed –value added, capital and employment– during the pre-liberalization period (1995-2000) and regress them on the capital and expenditure elasticities. We include sector-fixed effects – defined at two-digit and one-digit levels for capital and expenditure elasticities, respectively – to control for sector-time invariant characteristics. Table C.6 in Appendix C shows that neither the capital elasticity or the expenditure elasticity correlate with higher growth before the reform. As an additional test, in our empirical analysis, we estimate a dynamic difference-in-difference to capture the effect by year and show that, while firms were not growing differentially before the reform, after it they grow more according with their capital and expenditure elasticities (Figure C.10).

A critical hypothesis is that the sample is not subject to selection issues. If the survival probability differed across sectors over time, the estimated coefficients would only be assessed with respect to the surviving firms (see Heckman 1974 and Heckman 1979). To assess whether this missing data problem challenges our estimations, we check whether there are differences in the probability of firms being observed across sectors. In particular, we define a surviving firm if it existed the year before the reform (2000) and did not exit by 2008. Next, we compute the survival ratio and regress it on sectors' capital and expenditure elasticities. Results show no statistically significant difference between the survival probability of firms across sectors with different capital elasticities (Table C.7 in Appendix C). Interesting, in sectors with high expenditure elasticity, the survival probability decreases. This result is not surprising in light with our findings pointing to a differential increase in entry upon the liberalization (Section 4.2.1). It would not be surprising that entrants increase competitive pressure on existing firms and trigger some exit. Our results on expenditure elasticity should then be considered as an upper bound conditional on survival.

The reform was driven by the accession of transition economies to the EU. The requirements to join the EU were predetermined by the Copenhagen Criteria in 1993 and have been equal for all accessing countries since then. In this sense, the content of the reform was exogenous to the country's political choice. As the agenda was jointly determined by the European Council and the candidate countries, it is unlikely to have been driven by political pressure from Hungarian firms.[9] The economy was growing at a steady pace during the years prior to the liberalization. Notably, real external flows –as trade and foreign direct investment– remained constant.[10] Second, major reforms had already taken place during the early 1990s, such as privatization of public companies, bank deregulation, and competition laws.[11] Furthermore, the number of credit institutions did not change (Table C.10). Finally, the Hungarian economy was already deeply integrated with the EU: exports to the EU already accounted for 80% of

[9]It is worth mentioning that, given the speed of the reform, it is unlikely that firms anticipated it and undertook investment in advance. In December 2000, the European Council defined the timing for the accession vote and the last requirements to be met by each candidate. The reform had to take place before the accession vote in December 2002. Soon after the European Council meeting, in March 2001, Hungary deregulated the remaining controls on financial flows.

[10]During the years preceding and following the reform, FDI remained constant and even showed a small slowdown following the deregulation (see Figure C.6). Moreover, Hungarian external trade did not seem to have particularly suffered from the world recession in 2001. The volume of exports and imports continued to grow during that period (Figure C.5).

[11]Major privatization programs occurred in the early 1990s, and by 1997, the share of public companies in manufacturing value added was only 2%. The banking sector had already achieved a major transformation by 1997, and neither banking concentration nor its efficiency changed around the liberalization. In particular, according to data from Beck, Demirguc-Kunt, and Levine (2010), there were no changes in banks' concentration index, interest rate margin, overhead costs-to-assets ratio, nor cost-income ratio (Varela 2018).

total exports in 2001 (Figures C.3 and C.4). It is worth mentioning that the patterns of capital inflows observed in Hungary cannot be attributed to the joining of the EU, as the timing does not coincide with the accession, and other similar candidates with already deregulated financial accounts do not show the pattern of capital inflows observed in Hungary (Figure C.7). Notice that Hungary did not join the Euro zone and, hence, did not have to fulfill any monetary or fiscal criteria.

4.2 Firm-Level Analysis: Relative Input-Cost and Consumption Channels

In this section, we assess the relative input-cost and consumption effects implied in international financial integration at the firm-level. We use our theoretical framework to guide our empirical analysis and identify the effect of the financial liberalization through the structural parameters of the model. In particular, we test whether upon the financial liberalization in Hungary, firms expanded differentially according with their capital and expenditure elasticities.

Consider equation (2) that indicates a firm's production in equilibrium. We can write this equation in a difference-in-difference estimator as follows

$$\log(q_{ijt}) = \gamma_0 \mathrm{FL}_t + \gamma_1(\alpha_j \times \mathrm{FL}_t) + \gamma_2(e_m \times \mathrm{FL}_t) + \gamma_3 \tilde{\varphi}_{jt} + \gamma_4((\alpha_j + \beta_j) \times \mathrm{FL}_t) + \mu_i + \varepsilon_{it}, \quad (3)$$

where i, j, t denote firm, four-digit industry and time. FL_t is a dummy variable equal to one for the post-reform period ($\mathrm{FL}_t = 1$ if year ≥ 2001, 0 otherwise). We denote the expenditure elasticity with the subscript m to highlight that this elasticity varies at two-digit industry level. μ_i are firm-fixed effects that absorb all firm and industry time-invariant characteristics.[12]

Each term of regression (3) has a direct mapping in equation (2). γ_0 captures time-varying trends that affect all sectors equally and absorbs the evolution of the aggregate price level $\eta \log(P_t)$. γ_1 captures the input-cost channel expressed in the term $\eta \log(r_t^k / w_t)$. γ_2 captures the effect of expenditure channel given by the evolution of aggregate consumption, $\log(C_t)$. γ_3 absorbs changes in the sectoral average productivity. γ_4 controls for the heterogeneous evolution according to the returns to scale of the sector, given by $\eta \log(w_t)$. The firm-fixed effects μ_i capture the constant parameters of the term $D_{\varphi j}$.

A potential concern about regression (3), estimated with yearly firm-level data, is that residuals could be serially correlated - across time within firms and across firms within sectors for a given year. Serial correlation in the error term might understate the OLS standard errors and induce a type II error, i.e. rejecting the null hypothesis when this is true. To account for this source of bias of the OLS standard errors, we use one of the solutions proposed by Bertrand, Duflo, and Mullainathan (2004) and remove the time series dimension of the data. More precisely, we aggregate the data into pre- and post-reform periods and compute growth rates as the average value of these periods. That is,

$$\Delta q_{ij} = \log\left(\frac{1}{8}\sum_{2001}^{2008} q_{ijt}\right) - \log\left(\frac{1}{6}\sum_{1995}^{2000} q_{ijt}\right).$$

Equation (3) in first differences becomes:

[12] The term $(\alpha_j + \beta_j)$ is multiplied by the financial liberalization dummy because it includes the effect of the instrument α_j. The term $\tilde{\varphi}_{jt}$ is not multiplied by this dummy because the instrument is not involved in the expression.

$$\Delta q_j(\varphi) = \gamma_0 + \gamma_1 \alpha_j + \gamma_2 e_m + \gamma_3 \Delta\tilde{\varphi}_j + \gamma_4(\alpha_j + \beta_j) + \Delta\varepsilon_i, \tag{4}$$

where γ_1 and γ_2 capture the effect of financial liberalization across sectors with different capital and expenditure elasticities, respectively. Given that the financial liberalization decreased the relative price of capital and increased consumption, we expect both to be positive, e.g. $\gamma_1, \gamma_2 > 0$. We cluster the OLS standard errors at the four-digit industry level to take into account the correlation across firms within sectors. Similarly, we express firms' capital and labor demands as a function of the structural parameters of the model, and obtain an equivalent expression to equation (4) (see Appendix B).

4.2.1 Empirical Results

We start by describing the effect of the financial liberalization within firms across sectors with different capital and expenditure elasticities in Hungary. The estimated coefficients are presented in Table 1, which reports in Panel A the results on the relative input cost channel, in Panel B the results on the consumption channel and in Panel C the horse race between the relative input-cost and consumption channels together.

Columns 1-3 in Panel A present the results on the cross-section of capital elasticities on firms' value added. The estimated coefficients are significant in all specifications and indicate that sectors with higher capital elasticity differently increase value added after the financial liberalization. In particular, column 1 – where only the capital elasticity is included in the regression – shows that a one standard deviation increase in the capital elasticity (0.045) associates with a 3.3% expansion in firms' value added. Column 2 adds the change in the sectoral aggregate productivity and column 3 controls the returns to scale of the sector. After the inclusion of all controls, the estimated coefficient implies that one standard deviation increase in the capital elasticity associates with 3% higher expansion in value added. This result implies that a sector in the p75 of capital elasticity –as machinery and equipment– has a 3.5% higher increase in value added than a sector in the p25 of capital elasticity – such as retail trade. Columns 4-6 reports the results of capital and show that all the estimated coefficients are positive and highly statistically significant. After including all controls, the coefficient in column 6 indicates that one standard deviation increase in the capital elasticity leads to 4.7% expansion in capital, and that a sector in the p75 of the capital elasticity has 5.4% higher growth than a sector in p25. Columns 7-9 shows that firms do not increase their employment in accordance with the capital elasticity of the sector.

Panel B reports the estimated coefficients for the consumption channel and shows that sectors with higher expenditure elasticity see a differential expansion in their value added. After including all controls in column 3, the estimated coefficient implies that a one standard deviation increase in the expenditure elasticity (0.42) raises firms' value added by 4.3%. This coefficient implies that, for example, a sector as other business activities (p75) experiences a 5.1% higher increase in value added than retail trade (p25). Firms in high expenditure elasticity elasticity sectors differentially increase their employment, as shown in columns 7-9. After including all controls, the coefficient implies that a one standard deviation increase in the expenditure elasticity raises firms' employment by 5.1%, and that firms in the p75 of the expenditure elasticity increase their employment 6.2% more than firms in the p25. Firms do not

Table 1: Relative Input Cost and Consumption Effects of Financial Liberalization

	Δ Value Added			Δ Capital			Δ Employment		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Panel A. Capital Elasticity								
Capital elasticity	0.728**	0.701**	0.656*	1.048***	1.026***	1.030***	0.492	0.429	0.410
	(0.351)	(0.343)	(0.342)	(0.340)	(0.343)	(0.331)	(0.349)	(0.347)	(0.322)
Average sectoral productivity		0.025	0.022		0.021	0.021		0.061***	0.059***
		(0.037)	(0.038)		(0.022)	(0.025)		(0.018)	(0.021)
Returns to scale			-0.122			0.011			-0.050
			(0.142)			(0.162)			(0.140)
R^2	0.001	0.001	0.001	0.001	0.002	0.002	0.001	0.003	0.003
	Panel B. Expenditure Elasticity								
Expenditure elasticity	0.094*	0.091*	0.102**	-0.086	-0.088	-0.088	0.117***	0.112***	0.123***
	(0.051)	(0.052)	(0.051)	(0.070)	(0.070)	(0.069)	(0.042)	(0.041)	(0.037)
Average sectoral productivity		0.034	0.026		0.028	0.028		0.060***	0.055***
		(0.036)	(0.039)		(0.019)	(0.022)		(0.014)	(0.017)
Returns to scale			-0.242			0.004			-0.153
			(0.148)			(0.152)			(0.121)
R^2	0.001	0.001	0.002	0.001	0.001	0.001	0.003	0.005	0.005
	Panel C. Capital and Expenditure Elasticities								
Capital elasticity	0.752**	0.725**	0.687*	1.033***	1.008***	1.030***	0.516	0.456	0.408
	(0.361)	(0.354)	(0.353)	(0.364)	(0.369)	(0.354)	(0.317)	(0.315)	(0.295)
Expenditure elasticity	0.079*	0.077*	0.079*	-0.083	-0.085	-0.088	0.119***	0.114***	0.123***
	(0.044)	(0.045)	(0.042)	(0.064)	(0.064)	(0.061)	(0.040)	(0.038)	(0.035)
Average sectoral productivity		0.025	-0.008		0.023	0.024		0.058***	0.054***
		(0.034)	(0.020)		(0.019)	(0.023)		(0.015)	(0.018)
Returns to scale			-0.185			0.058			-0.130
			(0.141)			(0.151)			(0.112)
R^2	0.002	0.002	0.002	0.002	0.002	0.002	0.004	0.006	0.006
N	56,525	56,525	56,525	53,987	53,987	53,987	54,251	54,251	54,251

Notes: *, **, *** significant at 10, 5, and 1 percent. Std. errors are clustered at four-digit NACE industries. The capital elasticity is estimated using the Petrin and Levinsohn (2012) and Wooldridge (2009) methods used at four-digit NACE industries, and the expenditure elasticity comes from Bils, Klenow, and Malin (2013), reported at two-digit NACE industries. Source: APEH.

change their capital stock in accordance with the expenditure elasticity (columns 4-6).

Panel C presents the results of equation (4) where both capital and expenditure elasticities are included as regressors. Importantly, the estimated coefficients for both elasticities on value added are statistically significant and similar in size to the regressions estimated separately in Panels A and B. This suggest that following the financial liberalization firms increase their value added in accordance with their capital and expenditure elasticities. In particular, after including all controls in column 3, the estimated coefficient implies that firms' value added expands by 3.1% and 3.3% following a one standard deviation increase in the capital and expenditure elasticities, respectively. As above, the coefficients in column 6 and 9 indicates that firms increase their capital according with their capital elasticity and their employment according with their expenditure elasticity.

The estimated coefficients in Table 1 suggest that the expansion in firms' value added is larger in sectors with high expenditure elasticity than in sectors with high capital elasticity. To assess this comparison econometrically, we estimate the standardized beta coefficients of columns 3, 6 and 9 of Panel C and report them in Table C.11 in Appendix C. This analysis confirms that firms expanded 0.2% more in accordance with their expenditure elasticity than with their capital elasticity. As we discuss over the next sections, this result provides support to our aggregate analysis that indicates that the consumption channel dominates and resources reallocate towards sectors with high expenditure elasticity.

-Robustness Tests and Extensions.

We conduct a full set of robustness tests and extensions that include estimating panel regressions and the effect of the liberalization by year, controlling for access to external finance, exporters, foreign firms and different methods to estimate the capital and expenditure elasticities.

First, our regression in first differences implicitly estimated the impact of the reform for firms present before and after the liberalization. To show that our results are robust to an unbalanced panel of firms, we estimate a panel regression of equation (3) for all firms in the sample. Table C.12 in Appendix C confirms our previous findings and shows that, after the reform, firms increase their value added as a function of their capital and expenditure elasticities. Additionally, our results are robust to considering continuing firms only, which we define as firms that exist all over the period 1995 to 2008 (Table C.17).[13]

Second, to assess whether the estimates are capturing the effect of the financial liberalization and not something else, we test whether the timing coincides with the deregulation. To this end, we interact the capital and expenditure elasticities with year dummies and estimate equation (4) in a panel regression. Figure C.10 in Appendix C plots the estimated coefficients for value added and shows that, while the estimated coefficients do not change significantly before the reform, they increase in accordance with sectors' capital and expenditure elasticities after it.

Third, to check that the our results are not driven by exporters or foreign-owned firms, we exclude them from the analysis. Columns 1-3 in Table C.13 in Appendix C present the results for non-exporters and show that the estimated coefficients for value added are larger for both capital and expenditures elasticities. We then assess whether results are robust to excluding foreign-owned companies. Columns 4-6 confirm that the coefficients remain statistically significant. Together these results indicate that the expansion upon the financial liberalization is mainly driven by non-exporters and domestic firms.[14]

Fourth, we show that our results are robust to estimating the capital and expenditure elasticities using different methodologies. Columns 1-3 in Table C.14 in Appendix C report our results for the capital elasticities estimated using Olley and Pakes (1996) method. Columns 6-9 present the results for the expenditure elasticities estimated by Comin, Lashkari, and Mestieri (2018).

Fifth, an important assumption in the analysis is that sectors' characteristics do not correlate with differential access to external finance. If – for example – firms in sectors with high expenditure elasticity were more credit constrained, the estimated coefficients could be subject to omitted variable bias and capture a relaxation of financial constraints, instead of the consumption channel. We test this possibility in two steps. In our first step, we employ the financial dependence index of Rajan and Zingales (1998) at

[13]These results argue against a theory of "involuntary entrepreneurs" in which laid-off workers would become entrepreneurs in high expenditure elasticity sectors. As shown in Table C.17, the estimated coefficients for both capital and expenditure elasticities remain significant and similar in size to the main specification, which indicates that the input-cost and consumption channel are also present for incumbent firms.

[14]Table C.19 shows that our results are robust to controlling for firms' imports.

four-digit industries level, and re-estimate equation (4) augmented with this variable. If the expansion after the liberalization was driven by a relaxation of credit constraints instead of the input-cost and consumption channels, the coefficients for the capital and expenditure elasticities would be smaller and could potentially become insignificant.[15] Table C.15 in Appendix C presents the results and shows that, although the financial dependence index is positive and statistically significant, it does not overpower the relative input-cost and consumption channels. The estimated coefficients for both capital and income elasticities remain statistically significant and similar in size than in our main specification, confirming the validity of these two channels.

In our second step, we test whether the expansion in the consumption channel corresponds to increased demand and not to a differential ease of credit constraints for firms in high expenditure elasticity sectors. More precisely, we assess whether this channel remains valid for firms without access to external finance in two steps. First, we employ data from short-term loans with financial institutions between 1999 and 2008 and re-estimate regression (4) for firms that do not employ this financing.[16] Results – presented in column 1 of Table C.16– confirm that firms in sectors with high expenditure elasticity expand differentially their value added, even in the absence of short-term credit. Second, we use credit registry data from 2005 and conduct a similar analysis for firms that do not report any type of credit between 2005 and 2008.[17] Column 3 in Table C.16 confirms our previous result and shows that firms in high expenditure elasticity sectors expand their value added more, even in the absence of credit. It is worth remarking on the results on the capital elasticity, which are non-statistically significant for firms without access to credit. These results indicate that the expansion in value added and capital observed in the main specifications is driven by firms with credit. This is not surprising as firms in these industries are capital intensive and, hence, need external finance more to invest in capital and increase their production.

Finally, equation (4) could also be estimated using the sectoral price index instead of the average productivity of the sector. In Table C.18, we report the results of this exercise and show that the estimated coefficients remain unaltered when using the sectoral price index.

Results presented in this section provide support for the input-cost and consumption channel at the firm-level after the financial liberalization. In the next section, we evaluate the impact of these forces at the industry level.

[15] This index measures the amount of investment that cannot be financed through internal cash flows for U.S. listed firms and is used as a proxy for sectors' *technological* needs for external finance. As capital markets are largely advanced in the U.S. and listed firms are less likely to be credit constrained, this index tends to capture the technical needs for external finance in the sector. As this index was originally built for only manufacturing firms, we follow Rajan and Zingales (1998) methodology to build this index for all sectors at four-digit industry level. Note that using an index estimated for U.S. firms avoids endogeneity concerns of financial frictions in Hungary. The correlation of the financial dependence index and the capital and expenditure elasticities is positive but small reaching 6.4% and -3.8%, respectively.

[16] Unfortunately, the APEH balance sheet data only reports short-term credit with financial institutions since 1999, but it does not report long-term credit.

[17] The credit registry data only begins in 2005. Nevertheless, it worth remarking that firms that access to credit tend to keep it during the period (i.e. there is not much turn over in the access to credit within firms from one year to another).

4.3 Industry-Level Analysis

Last section considered the impact of the financial liberalization within firms for sectors with different capital and expenditure elasticities. We now turn to assess its impact at the industry level. With this end, we analyze the data at four-digit NACE industries and estimate the following regression:

$$\Delta y_j = \gamma_0 + \gamma_1 \alpha_j + \gamma_2 e_m + \Delta \varepsilon_j, \tag{5}$$

where $y_j = \{$number of firms, firm size, industry TFP, producer price index$\}$. We cluster the standard errors at four-digit NACE industries.[18]

Column 1 in Table 3 reports the estimated coefficient for the mass of firms. The coefficients for both capital and expenditure elasticities are highly statistically significant, and indicate that the number of firms decreases in sectors' capital elasticity and increases in sectors' expenditure elasticity. The magnitude of these changes is economically significant as well, following a one standard deviation increase in the capital elasticity the number of firms drops by 8.8%. In contrast, a one standard deviation increase in the expenditure elasticity raises the number of firms by 10.2%. The expansion of sectors with high expenditure elasticity is parallel to changes in firms' size, as shown by the decrease in the value added per firm (13.8%). These results could suggest a decrease in the operational cut-off for producing in industries with high expenditure elasticity. To assess this, we compute the RTFP at the four-digit level and show in column 3 that, indeed, sectoral productivity decreases as a function of the sector's expenditure elasticity. In line with these changes, the producer price index increases in a sector's expenditure elasticity.

Table 2: Industry-Level Analysis

	Δ Number of Firms	Δ Firm Size (VA x firm)	Δ Industry RTFP	Δ Producer Price Index
	(1)	(2)	(3)	(4)
	Capital and Expenditure Elasticities			
Capital elasticity	-1.913***	0.645	0.552	-0.149
	(0.492)	(0.570)	(0.518)	(0.098)
Expenditure elasticity	0.244***	-0.138*	-0.144*	0.048***
	(0.085)	(0.076)	(0.079)	(0.012)
R^2	0.060	0.015	0.014	0.040
N	348	348	348	348

Notes: *, **, *** significant at 10, 5, and 1 percent. Std. errors are clustered at four-digit NACE industries. The capital elasticity is estimated using the Petrin and Levinsohn (2012) and Wooldridge (2009) methods used at four-digit NACE industries, and the expenditure elasticity comes from Bils, Klenow, and Malin (2013), reported at two-digit NACE industries. Source: APEH.

[18] Sectoral RTFP is computed as the sum of firms' individual productivities weighted by their respective value added share in the sector. See for example Foster, Haltiwanger, and Syverson (2008) and Baqaee and Farhi (2017) for a similar measure of RTFP.

4.4 Extensive Margin

Results presented in the previous section suggest changes in the extensive margin as a function of industries' capital and expenditure elasticities. We assess this by re-estimating equation (5) using the change in number of net entrants (entry-exit) and entrants as dependent variables. In line with the increase in the mass of firms, column 1 in Table 3 indicates an increase in net entry in sectors with high expenditure elasticity. A one standard deviation increase in the expenditure elasticity raises the number of net entrants by 17%.[19] Column 2 reports the expansion of number of entrants as a function of sectors' expenditure elasticity. To evaluate the characteristics of new entrants, we restrict our analysis to entrant firms and test whether they differ in observable characteristics –RTFP and value added – upon the financial liberalization. Columns 3 and 4 in Table 3 show that, in sectors with high expenditure elasticity, entrants were less productive and smaller, which confirms the expansion in the extensive margin. In contrasts, sectors with high capital elasticity show a decrease in entry and firms that entry were entrants more productive and larger.

Table 3: Extensive Margin

	Industry-Level Analysis		Firm-Level Analysis	
	Δ Net Entrants	Δ Entrants	Log RTFP	Log VA
	(1)	(2)	(3)	(4)
Capital elasticity	-0.984	-1.481**		
	(0.724)	(0.593)		
Expenditure elasticity	0.420***	0.325***		
	(0.112)	(0.117)		
FL * Capital Elasticity			1.327***	0.404**
			(0.323)	(0.205)
FL * Expenditure Elasticity			-0.090**	-0.038*
			(0.040)	(0.023)
Year FE			Yes	Yes
Sector FE			Yes	Yes
R^2	0.042	0.039	0.096	0.127
N	348	348	95,576	185,609

Notes: *, **, *** significant at 10, 5, and 1 percent. Std. errors are clustered at four-digit NACE industries. The capital elasticity is estimated using the Petrin and Levinsohn (2012) and Wooldridge (2009) methods used at four-digit NACE industries, and the expenditure elasticity comes from Bils, Klenow, and Malin (2013), reported at two-digit NACE industries. Source: APEH.

To illustrate the expansion of entry as a function of the industry's expenditure elasticity, we evaluate the number of net entrants and entrants per year in each industry before and after the reform. In particular, we estimate a regression: $y_{m,t} = \gamma_1(e_m \text{ x } \text{FL}_t) + \gamma_2 e_m + \gamma_3(\alpha_m \text{ x } \text{FL}_t) + \gamma_4\alpha_m + \varepsilon_{m,t}$, where $y_{m,t}$ is net entry or entry, and plot the predicted values for these variables before and after the reform.[20] These values capture the relationship between entrants and expenditure elasticity, once

[19] Table C.20 in Appendix C presents the standardized beta coefficients of these regressions and shows that the expansion in sectors with high capital elasticity is larger.

[20] FL_t is a dummy variable that equals to 1 for the post-reform period ($\text{FL}_t \geq 2001$) and 0 otherwise. Therefore, the coefficient γ_1 captures the relationship in the post-liberalization period, and γ_2 captures the relationship in the pre-liberalization period (i.e. when $\text{FL}_t = 0$). For robustness, Figure C.11 in Appendix C presents these relationships constructed as simple difference in means (i.e. without regression analysis).

capital elasticity is controlled for. Figure 2 shows that the number of net entrants and entrants is highly and positively related with sector's expenditure elasticity after the financial liberalization. The contrast with the pre-liberalization period is stunning. Before the reform, the relationship between entry and expenditure elasticity is almost flat. After the reform, an industry with an expenditure elasticity of 1.8 –as restaurants and bars– had on average more than 1,500 new firms created per year, which is 1,200 more firms than an industry with low expenditure elasticity (such as agriculture).

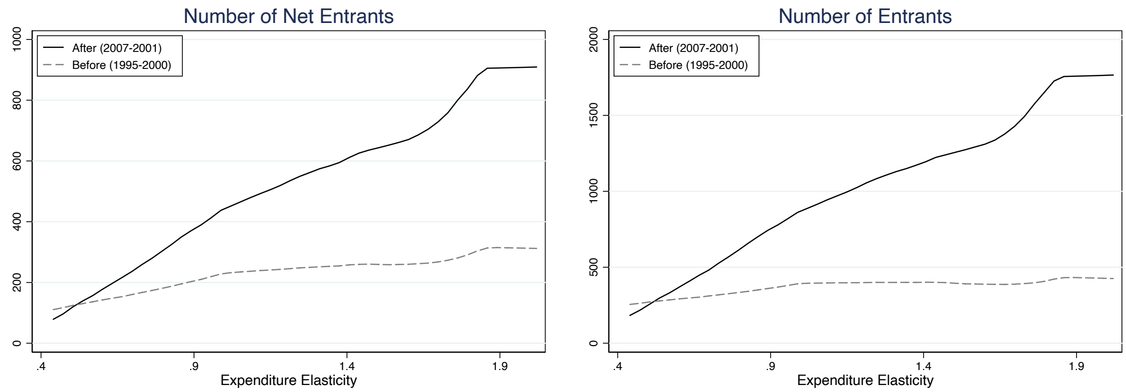


Figure 2: Net Entrants

This figure confirms that the financial liberalization in Hungary associates with higher entry in those sectors that high expenditure elasticity and, hence, that experienced the highest increase in demand. We now go one step further and show in Table 4 the top fifteen sectors defined at four-digit NACE industries that experienced the highest number of net entrants in the post-liberalization period.

Table 4: Top 15 Industries in Net Entry (2001-2007)

Broad Sector	Sector (II digits)	Industry (IV digits)	Description	Expenditure elasticity	Net entry per year	Number of employees	Share agg. employment (in %)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Service	Real estate activities	7012	Buying and selling of own real estate	2.02	982	2	0.08
Service	Construction	4521	General construction of buildings and civil engineering works	0.89	505	3	0.21
Service	Hotels and restaurants	5530	Restaurants	1.80	480	3	0.13
Service	Other business activities	7414	Business and management consultancy activities	1.35	446	2	0.08
Service	Other business activities	7487	Other business activities n.e.c.	1.35	439	3	0.10
Service	Retail trade	5248	Other retail sale in specialized stores	0.83	420	2	0.06
Service	Land transport	6024	Freight transport by road	2.02	404	3	0.08
Service	Other business activities	7420	Architectural and engineering activities and consultancy	1.35	363	2	0.06
Service	Real estate activities	7020	Letting of own property	2.02	297	4	0.03
Service	Retail trade	5211	Non-specialized stores with food, beverages or tobacco	0.83	271	4	0.11
Service	Repair of motor vehicles	5010	Sale, maintenance and and repair of motor vehicles	0.85	250	2	0.06
Service	Hotels and restaurants	5540	Bars	1.80	248	2	0.04
Service	Retail trade	5263	Other non-store retail sale	0.83	229	2	0.02
Service	Construction	4531	Installation of electrical wiring and fittings	0.89	212	3	0.05
Service	Other business activities	7411	Legal activities	1.35	211	2	0.04
Total					5,755		1.68

Note: this table presents the yearly number of entrants in the post-liberalization period per four-digit NACE industries. Source: APEH.

Column 1 shows that all these sectors are in services and are dominated by real estate, construction, restaurants and bars, retail trade, transport and business activities. The four-digit industries that have seen larger number of net entrants are: buying and selling own real state, construction of buildings, restaurants, consultancy and other business activities, which are sectors that have expenditure elasticity (columns 4-6). It is important to note that firms entering are typically very small and do not exceed four employees on average (column 7). Finally, the importance of new entrants in aggregate employment is not negligible. In the year of entry, they account for 1.7% of aggregate employment.[21] By 2008, firms that entry after the reform accounted for more than 15 percentage points of the share of value added and employment in services (Figure C.12 in Appendix C).

4.5 Aggregate Analysis

The previous sections reported that, upon the financial liberalization, firms expanded more their value added and employment as a function of sectors' expenditure elasticity and that there was an increase in the extensive margin in those sectors. These changes suggest the presence of reallocation forces across sectors and, in particular, towards sectors with high expenditure elasticity. In this section, we assess this in two exercises.

In our first exercise, we define sectors below and above the median of the expenditure elasticity across industries and check whether there is reallocation towards them. More precisely, we sum the value added, employment and mass of firms of sectors with above median expenditure elasticity and compute the share of high expenditure elasticity sectors on the economy. We then regress these shares on a time trend and dummy variables for the years following the financial liberalization, as follows

$$\text{share}_t = \sum_{i=2001}^{2008} \beta_i D_i + \text{Time}_t + \varepsilon_{st}, \tag{6}$$

where $D_i = 1$ if year $= i$ and 0 otherwise. The β coefficients capture whether the share of sectors with high expenditure elasticities increases differentially than the time trend following the financial liberalization in 2001. Figure 4 plots the estimated coefficients for each year and shows that upon the liberalization, the share of value added, employment and mass of firms in sectors with high expenditure elasticity increases and is statistically different from the pre-liberalization trend. As an additional test, we then divide sectors into four groups high/low expenditure elasticity and high/low capital elasticity and re-estimate regression (6) for each group. Figure C.13 in Appendix C presents the estimated coefficients and shows that, to the same exposure to capital elasticity, sectors with high expenditure elasticity grew more after the financial liberalization.[22] These exercise indicate that the consumption channel dominates and that, after the liberalization, resources reallocated towards sectors with expenditure elasticity.

In our second exercise, we analyze the aggregate implication of these forces for broadly-defined sectors. As discussed in Section 3, our estimations for capital and expenditure elasticities imply that the manufacturing sector is capital intensive and has lower expenditure elasticity, while the service sector is labor intensive and has high expenditure elasticity. We then re-estimate equation (6) for the share of service firms. Figure 4 plots the estimated coefficients for each year and shows that upon the liberaliza-

[21]For completeness, Table C.21 in Appendix C presents the top 30 sectors in net entry.
[22]The estimated coefficients are reported in Table C.22 in Appendix C.

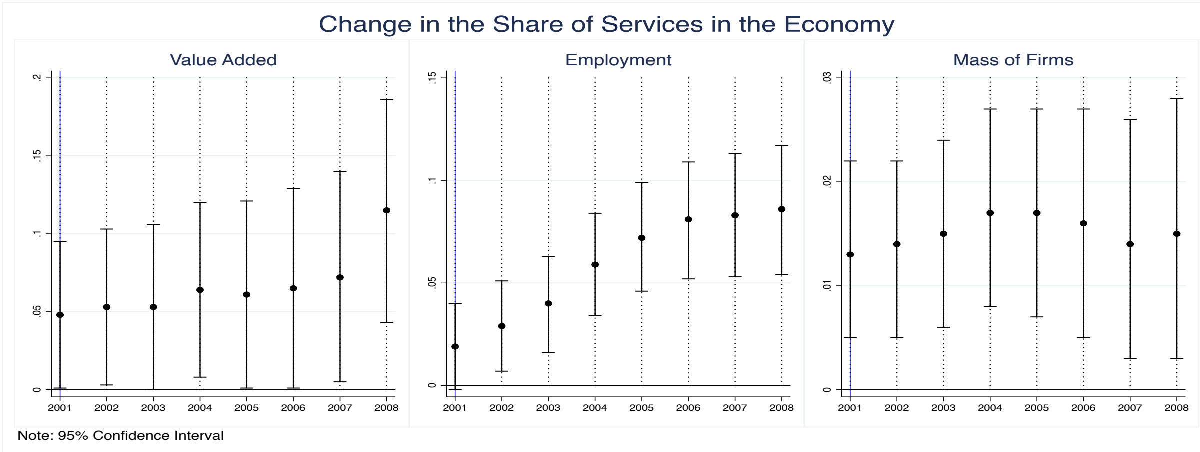


Figure 3: Reallocation across sectors: High Expenditure Elasticities

tion, the share of services in value added, employment and mass of firms increases and is statistically different from the pre-liberalization trend. This result provides additional support for our previous finding and shows that, on the aggregate, resources shift towards activities with higher expenditure elasticities. In the next section, we develop a heterogeneous firm dynamic model with multiple sectors to rationalize these findings and study the long-term implications of capital inflows.

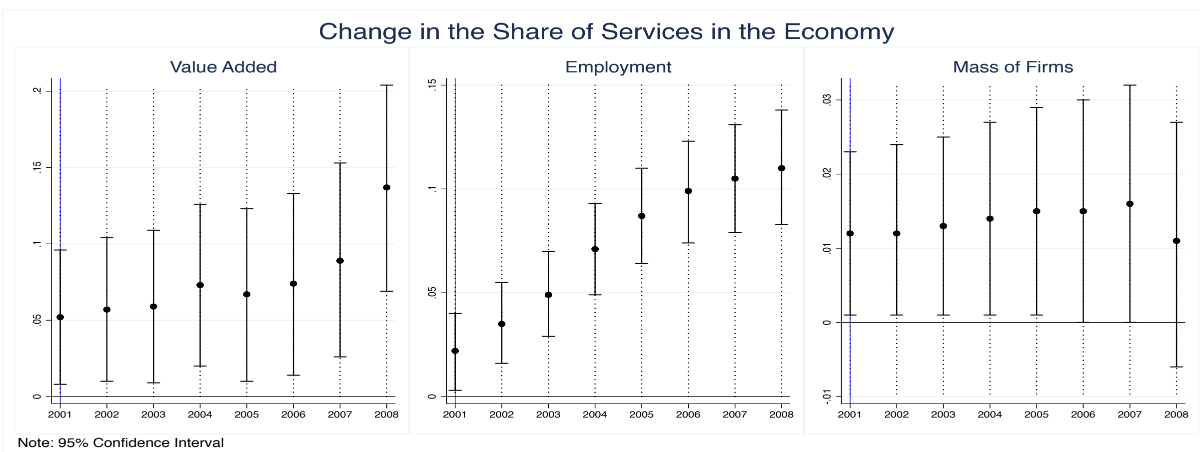


Figure 4: Reallocation across sectors: Services

Taking Stock and External Validity

Results presented above assessed the relative input-cost and consumption channels implied in financial liberalization. We showed that, accordingly with the relative input-cost channel, firms in industries with high capital elasticity differentially increased their value added and capital intensity. Additionally, we provided evidence for the consumption channel, as firms in high expenditure elasticity industries increased their value added relatively more. Our results also point to large reallocation of resources within sectors. In particular, they suggest that the productivity threshold to operate decreases as a function of sectors' expenditure elasticity. The increase in the number of producing firms and the decrease in firms' size point to this direction. On the aggregate, our results suggest that the consumption channel dominates and resources shift toward services.

A final question about the external validity of our results remains. The Hungarian financial liberalization illustrates that after this reform resources shifted towards services, but does this fact hold true for the cross-section of countries? We now assess this question by checking whether financial liberalization correlates with increases in the share of value added in services in the cross-section of countries. For expositional purposes, we present the details of this analysis in Appendix A and focus here on the main results. We employ the Chinn and Ito (2008) index of capital account openness and World Bank Data for 163 countries over the period 1970 to 2015, and assess this correlation in three steps. First, we compute a simple correlation and show in Figure A1 that financial liberalization episodes correlate with increases in the value added share of services. Second, we employ five years non-overlapping panel data and confirm this correlation in an OLS estimator (Table A1 column 7). Finally, since the OLS estimator could be subject to simultaneity bias, we estimate a GMM dynamic panel. After including a full set of controls –such as trade openness, government size, financial depth and financial crises–, we confirm that financial liberalization episodes associate with reallocation of resources towards services. The estimated coefficient is highly statistically significant and indicates that a one standard deviation increase in the index of financial openness associates with a 2.1% increase in the value added share of services within the five years after the reform (Table A1, columns 8 and 9). This expansion is also economically significant and implies that – for the average country – the value added share of services raises by 1.1 percentage points five years after the liberalization.[23] In the next section, we build a heterogeneous firm dynamics model that rationalizes these findings, quantifies the aggregate implications of the financial liberalization, and assesses whether the findings are permanent.

5 Model

This section develops a small economy model to study the macroeconomic and microeconomic impacts of capital account liberalization. In the model, there are two sectors –manufacturing and services– each of which consists of heterogeneous firms à la Melitz (2003). Firms use capital and labor as factors of production. The manufacturing good can be traded internationally, but services are non-traded. We allow for capital control to prevent local households from perfectly accessing international funds. We model a financial liberalization as an unexpected elimination of capital controls during the economy's transition to its steady state. We employ the model to study the impact of financial liberalization on consumption and saving patters, current account imbalances, entry and exit of firms, and the reallocation of resources within and across sectors. For expositional simplicity, in this section, we present only the main relationships of the model; all derivations are in the Appendix.

[23]These results are close to Benigno, Converse, and Fornaro (2015) who identify episodes of large capital inflows for 70 middle- and high-income countries and show that large inflows associate with increases in the value added share of services.

5.1 Representative Household

The domestic household has the following intertemporal preferences:

$$U = \sum_{t=0}^{\infty} \beta^t \frac{(C_t^{1-\gamma} - 1)}{1-\gamma}, \tag{7}$$

where $\beta \in (0,1)$ is the discount factor and γ determines the elasticity of intertemporal substitution. C_t represents the consumption basket, or aggregate consumption, which consists of composite manufacturing, C_{Mt}, and composite services, C_{St}, according to the implicitly defined function:

$$1 = \left[\theta_M^{\frac{1}{\eta}} C_t^{\frac{e_M - \eta}{\eta}} C_{Mt}^{\frac{\eta-1}{\eta}} + \theta_S^{\frac{1}{\eta}} C_t^{\frac{e_S - \eta}{\eta}} C_{St}^{\frac{\eta-1}{\eta}} \right], \tag{8}$$

where $\eta \in (0,1)$ is the elasticity of substitution between manufacturing and services goods, and θ_j with $j = \{M, S\}$ are constant weight parameters. e_j is the (constant) aggregate consumption elasticity of demand for sectoral good C_{jt}. The above preferences draw from Comin, Lashkari, and Mestieri (2018), and are a non-homothetic generalization of the CES aggregator. Equation (8) implies that, as aggregate consumption C_t increases, sectoral consumption C_{jt} grows more than proportionately if $e_j > 1$, and less than proportionately if $e_j < 1$. The usual homothetic CES preferences are a special case of the above with $e_j \equiv 1$.

The manufacturing good C_{Mt} is, in turn, a CES aggregate of domestically produced C_{Mt}^D and foreign imported goods C_{Mt}^F according to:

$$C_{Mt} = \left[(\theta_D)^{\frac{1}{\eta_M}} \left(C_{Mt}^D \right)^{\frac{\eta_M - 1}{\eta_M}} + (\theta_F)^{\frac{1}{\eta_M}} \left(C_{Mt}^F \right)^{\frac{\eta_M - 1}{\eta_M}} \right]^{\frac{\eta_M}{\eta_M - 1}}, \tag{9}$$

where $\eta_M \in (0,1)$ is the elasticity of substitution between C_{Mt}^D and C_{Mt}^F, and θ_D and θ_F control the importance of each good. Finally, C_{St} and C_{Mt}^D are each a CES aggregate of a continuum of differentiated varieties:

$$C_{St} = \left[\int_{\omega \in \Omega_t} q_{St}^d(\omega)^{\frac{\sigma-1}{\sigma}} \right]^{\frac{\sigma}{\sigma-1}} \quad \text{and} \quad C_{Mt}^D = \left[\int_{\omega \in \Omega_t} q_{Mt}^d(\omega)^{\frac{\sigma-1}{\sigma}} \right]^{\frac{\sigma}{\sigma-1}} \tag{10}$$

where Ω_t is the (endogenous) time-varying set of individual varieties sold in the domestic market and $\sigma > 1$ is the elasticity of substitution across varieties which, for simplicity, is the same in both sectors. Manufacturing varieties can be traded internationally, but services are non-tradable.

The representative household accumulates capital over time (K_t) by importing investment goods (I_t). K_t is rented to domestic manufacturing and services firms. The price of imported goods (including C_{Mt}^F and I_t) is the numéraire of the economy ($P_{Mt}^F = 1$). The household can issue foreign bonds (B_t) that are traded internationally and priced at the domestic interest rate (r_t), where $B_t < 0$ implies foreign debt. Importantly, the domestic interest rate includes capital controls that impose a tax τ per unit of foreign bond borrowing. This tax then is redistributed lump-sum to households via T_t.

The household maximizes her utility in equation (7) subject to the following budget constraint:

$$P_{Mt}^D C_{Mt}^D + C_{Mt}^F + P_{St} C_{St} + K_{t+1} - (1 - \delta^k) K_t + B_{t+1} = w_t L + r_t^k K_t + (1 + r_t) B_t + \Pi_t + T_t, \tag{11}$$

where w and r^k are the wage and rental rate of capital, L denotes the country's labor endowment, which is supplied inelastically, and Π are economy-wide profits redistributed to households. The domestic interest rate r_t is endogenously determined and depends on the foreign interest rate (r^*), and the level of capital controls.

$$r_t = r^* + \tau \{B_t < 0\} - \tau \{B_t > 0\} \tag{12}$$

Note that, there is a level of capital control $\bar{\tau} > 0$ such that when $\tau \geq \bar{\tau}$, the economy is in financial autarky along the transition, i.e., $B_t = 0$ and trade must be balanced. We impose symmetric discounting between national and foreigners, i.e., $r^* = \frac{1}{\beta} - 1$.[24] Thus, a non-zero level of capital control τ, could trigger financial flows–current account and trade imbalances– during the transition to the long-run steady state, but only $\tau = 0$ can support long-run debt and trade imbalances. Consistently with Gourinchas and Jeanne (2006), we focus on the case in which a capital scarce economy fully eliminates financial-autarky levels of capital controls ($\bar{\tau}$) receiving capital inflows $B_t < 0$ and accumulating long-run debt. We will also explore how the degree of capital scarcity at the moment of this liberalization impact the short- and long-run effects of the policy.

The household's optimal demand for manufacturing and service goods are:

$$C_{S,t} = \left(\frac{P_{S,t}}{P_t}\right)^{-\eta} \theta_S C_t^{e_S} \qquad \text{and} \qquad C_{M,t} = \left(\frac{P_{M,t}}{P_t}\right)^{-\eta} \theta_M C_t^{e_M}, \tag{13}$$

$$C_{M,t}^D = \left(\frac{P_{M,t}^D}{P_{Mt}}\right)^{-\eta_M} \theta_D C_{Mt} \qquad \text{and} \qquad C_{M,t}^F = \left(\frac{1}{P_{Mt}}\right)^{-\eta_M} \theta_F C_{Mt}, \tag{14}$$

and the demands for individual varieties are given by:

$$q_{St}^d(\omega) = C_{St} \left(\frac{p_{St}(\omega)}{P_{St}}\right)^{-\sigma} \qquad \text{and} \qquad q_{Mt}^d(\omega) = C_{Mt}^D \left(\frac{p_{Mt}(\omega)}{P_{Mt}^D}\right)^{-\sigma}, \tag{15}$$

where P_t, P_{jt}, and $p_{jt}(\omega)$ $\omega \in \Omega_{jt}$ are the price of the aggregate consumption bundle, the sectoral consumption bundles, and the prices of individual varieties. The household's maximization problem gives the following Euler equations:

$$1 = \Lambda_{t,t+1}(1 - \delta^k + r_{t+1}^k) \qquad \text{and} \qquad 1 = \Lambda_{t,t+1}\left(1 + r_{t+1} - \psi \cdot B_{t+1} \cdot \exp(-B_{t+1})\right). \tag{16}$$

where the discount factor and the marginal utility of consumption are given by:

$$\Lambda_{t,t+1} = \beta \frac{\lambda_{t+1}}{\lambda_t} \qquad \text{and} \qquad \lambda_t = \frac{C_t^{-\gamma}}{P_t} \left[\frac{\epsilon_M \theta_M^{\frac{1}{\eta}} C_t^{\frac{\epsilon_M - \eta}{\eta}} C_{Mt}^{\frac{\eta-1}{\eta}} + \epsilon_S \theta_S^{\frac{1}{\eta}} C_t^{\frac{\epsilon_S - \eta}{\eta}} C_{St}^{\frac{\eta-1}{\eta}} - \eta}{1-\eta}\right]^{-1}. \tag{17}$$

[24] The specific level of $\bar{\tau}$ depends on the capital stock at each point in time. As capital increases, $\bar{\tau}$ decreases.

5.2 *Production*

There is a continuum of firms in each sector $j \in \{S, M\}$. Firms are monopolistically competitive, so that each variety ω is produced by a single firm. Firms are heterogeneous in productivity (φ), which is drawn from a sector-specific distribution $G_j(\varphi)$ after paying a one-time sunk entry cost f_{jt}^e. In order to keep operating, firms must pay a fixed operational cost ($f_j^d > 0$) every period. Operating firms combine labor (l) and capital (k) in a Cobb-Douglas production function. The production function in sector $j \in \{S, M\}$ is given by $q_{jt}(\varphi) = \varphi k_{jt}(\varphi)^{\alpha_j} l_{jt}(\varphi)^{1-\alpha_j}$.

Manufacturing firms can also choose to export subject to paying an additional fixed exporting cost (f_M^x), in which case they face the following foreign demand: $q_{Mt}^x(\varphi) = A p_{Mt}(\varphi)^{-\sigma}$, where A is a constant reflecting that, in this small open economy, the non-price part of foreign demand is not affected by Hungary's liberalization. For simplicity, we assume that foreign consumers have the same price elasticity as domestic consumers.

All fixed and variable costs are valued in units of the (*sectoral*) composite price derived from the optimal input demands for production: $\phi_{jt} \equiv \left(\frac{r_t^k}{\alpha_j}\right)^{\alpha_j} \left(\frac{w_t}{1-\alpha_j}\right)^{(1-\alpha_j)}$. Firms choose their optimal price given the household demands in (15) and the production technology. A firm in sector j charges a constant markup ($1/\rho$) over its marginal costs $p_{jt}(\varphi) = \frac{\phi_{jt}}{\rho\varphi}$.

5.3 *Value Functions, Entry and Exit*

The value function of type-φ firms operating in services is:

$$V_{St}(\varphi) = \max\Big\{0, \pi_{St}^d(\varphi) + (1-\delta)\Lambda_{t,t+1} V_{S,t+1}(\varphi)\Big\}, \tag{18}$$

and in manufacturing is:

$$V_{Mt}(\varphi) = \max\Big\{V_{Mt}^d(\varphi), V_{Mt}^x(\varphi)\Big\}, \tag{19}$$

where,

$$V_{Mt}^d(\varphi) = \max\Big\{0, \pi_{Mt}^d(\varphi) + (1-\delta)\Lambda_{t,t+1} V_{M,t+1}(\varphi)\Big\}, \tag{20}$$

$$V_{Mt}^x(\varphi) = \max\Big\{0, \pi_{Mt}^d(\varphi) + \pi_{Mt}^x(\varphi) + (1-\delta)\Lambda_{t,t+1} V_{M,t+1}(\varphi)\Big\}. \tag{21}$$

Domestic profits are defined by $\pi_{jt}^d(\varphi) = \Big[p_{jt}(\varphi) - c_{jt}(\varphi)\Big] q_{jt}^d(\varphi) - \phi_{jt} f_j^d$ for $j \in \{S, M\}$. Exporting profits for manufacturing firms are defined by $\pi_{Mt}^x(\varphi) = \Big[p_{Mt}(\varphi) - c_{Mt}(\varphi)\Big] q_{Mt}^x(\varphi) - \phi_{Mt} f_M^x$. Therefore, total profits for manufacturing firms are $\pi_{Mt}(\varphi) = \pi_{Mt}^d(\varphi) + \pi_{Mt}^x(\varphi)$. δ is the exogenous exit rate. The continuation value for service and manufacturing firms takes into account endogenous exit decisions:

$$V_{S,t+1}(\varphi) = \begin{cases} V_{S,t+1} & \text{if} \quad \varphi > \varphi^d_{S,t+1} \\ 0 & \text{otherwise,} \end{cases} \qquad V_{M,t+1}(\varphi) = \begin{cases} V^d_{M,t+1} & \text{if} \quad \varphi^d_{M,t+1} \leq \varphi < \varphi^x_{M,t+1} \\ V^x_{M,t+1} & \text{if} \quad \varphi \geq \varphi^x_{M,t+1} \\ 0 & \text{otherwise.} \end{cases}$$

The operational productivity cut-offs φ^d_{St}, φ^d_{Mt}, and φ^x_{Mt} are defined implicitly by the following marginal conditions: $V_{St}(\varphi^d_{St}) = 0$, $V^d_{Mt}(\varphi^d_{Mt}) = 0$, and $\pi^x_{Mt}(\varphi^x_{Mt}) = 0$.

In each period, there is a mass of potential entrants that draw their productivity from a cumulative distribution $G_j(\varphi)$ and a probability density function $g_j(\varphi)$. Denote M^e_{jt} as the mass of potential entrants that pays a sector-specific entry cost to observe their permanent individual productivity. This entry cost is composed of a fixed cost and a variable cost that depends on the current mass of potential entrant firms in the sector.[25] In particular, in sector j, the entry cost is given by $f^e_{jt} = f^e_j + \xi \left(\exp(M^e_{jt} - \overline{M}^e_j) - 1\right)$, where f_{ej} is the fixed entry cost and ξ is a constant governing the size of the variable cost. The parameters $\overline{M}^e_j$ are set to the long-run open economy ($\tau = 0$) steady state sector value of potential entry to eliminate the variable cost component in the long-run. The free-entry condition implies that the expected value of a firm in sector j should equal the sunk cost of entry in the sector:

$$\int_{\varphi^d_{jt}}^{\infty} V_{jt}(\varphi) g_j(\varphi) d\varphi = \phi_{jt} \left[f^e_j + \xi \left(e^{M^e_{jt} - \overline{M}^e_j} - 1 \right) \right] \qquad j \in \{S, M\} \tag{22}$$

The time-varying distribution of producers in each sector depends on the mass of surviving producers $(M_{j,t})$ and the mass of potential entrants. In particular,

$$M_{j,t+1}\mu_{j,t+1}(\varphi) = \begin{cases} (1-\delta) M_{jt} \mu_{jt}(\varphi) + M^e_{j,t+1} g_j(\varphi) & \text{if} \quad \varphi \geq \varphi^d_{j,t+1} \\ 0 & \text{otherwise} \end{cases} \qquad j \in \{S, M\} \tag{23}$$

The law of motion that characterizes the mass of producers in sector j and time $t+1$ is:

$$M_{j,t+1} = (1-\delta) M_{jt} \int_{\varphi^d_{j,t+1}}^{\infty} \mu_{jt}(\varphi) d\varphi + M^e_{j,t+1} \int_{\varphi^d_{j,t+1}}^{\infty} g_j(\varphi) d\varphi \qquad j \in \{S, M\} \tag{24}$$

5.4 Equilibrium Conditions

Labor and Capital market. The inelastic household supply of labor L equals labor demand for production and entry costs used in both sectors. That is, $\overline{L} = L_{St} + L_{Mt}$, where $L_{jt} = L^{prod}_{jt} + L^{entry}_{jt}$ and $j \in \{S, M\}$. Similarly, the equilibrium condition in the capital market is given by $K_t = K_{St} + K_{Mt}$, where $K_{jt} = K^{prod}_{jt} + K^{entry}_{jt}$ and $j \in \{S, M\}$, where the capital supply is time-varying and predeter-

[25] The variable entry cost is common in the firm dynamics literature and captures the congestion externalities or competition for a fixed resource at entry, see Fattal Jaef and Lopez (2014) and Benguria, Saffie, and Urzua (2018). Importantly, it does not affect the model's qualitative results and helps avoiding corner solutions and excess volatility in the entry margin.

mined by the household's investment decision in the previous period.

Goods markets. Using the ideal price indexes we can write the market-clearing conditions for service as $P_{St}C_{St} = M_{St}\int_{\varphi^d_{St}}^{\infty} p_{St}(\varphi)q^d_{St}(\varphi)\mu_{St}(\varphi)d\varphi$ and for manufacturing as $P^D_{Mt}C^D_{Mt} = M_{Mt}\int_{\varphi^d_{Mt}}^{\infty} p_{Mt}(\varphi)q^d_{Mt}(\varphi)\mu_{Mt}(\varphi)d\varphi$.

Balance of Payments. The small open economy's net foreign assets position evolves according to:[26]

$$B_{t+1} = (1 + r_t - \tau)B_t + TB_t, \tag{25}$$

where the trade balance – TB_t – can be written as:

$$TB_t = X_{Mt} - C^F_{Mt} - (K_{t+1} - (1 - \delta^k)K_t). \tag{26}$$

That is the trade balance is manufacturing exports (X_{Mt}) less imports of final consumption goods (C^F_{Mt}) less imports of new capital goods.

6 Quantitative Analysis

This section calibrates the quantitative model to the Hungarian economy in order to explore how the relative input-cost and consumption channels can shape the macro effects of a financial liberalization in the medium and long run.

6.1 Calibration

We calibrate the model at an annual frequency to Hungarian micro and macro data, and to standard parameters from the literature. We assume that Hungary reaches a financially open steady state characterized by $\tau = 0$ in the year 2008, and solve the model targeting that equilibrium. The model has 31 parameters that we divide into two groups.

Table 5 lists the first group of 17 parameters that are set directly to match the Hungarian data or to standard values from the literature. We set the international interest rate ($r^* = \frac{1}{\beta} - 1$) to 4%. We choose standard values for the parameters governing risk aversion, substitution between varieties, and depreciation of capital ($\gamma, \eta, \eta_M, \sigma$, and δ). The exogenous exit rates of each sector (δ_S, δ_M) are set to the firm-level sectoral exit rate in the micro data. We set the capital intensity of each sector (α_S, α_M) to the average elasticity estimated at the industry level.[27] We set the fixed entry costs parameters in each sector (f^e_S, f^e_M) to unity, so that the operation cost is a ratio relative to the entry cost. We set the average log-productivity for the services productivity distribution (μ_S) to 0, so that μ_M captures relative differences in average size between sectors. For simplicity, the foreign demand scale of each

[26] Assuming $B_t \leq 0$ for all t. If the economy saves ($B_t > 0$), then: $B_{t+1} = (1 + r_t + \tau)B_t + TB_t$.

[27] We compute the capital elasticities for manufacturing and services, as the weighted average of the elasticities estimated at four-digit level, where weights are given by the value added in the industry. The mean and median capital elasticities are close to the values reported in Table 5, specifically 0.36 and 0.36 in manufacturing, and 0.33 and 0.31 in services. Note that, because the model implies constant returns to scale, we normalize the capital and labor elasticities to sum one.

variety (A) is set to unity.[28] We set the parameter governing the variable entry cost (ξ) to 2 in order to avoid corner solutions (without significant impact on the dynamics).[29] Consistent with a fully open economy calibration, we set the capital controls (τ) to zero.

Table 5: Externally-Calibrated Parameters

Parameter	Description	Value	Source
r^*	World interest rate	0.04	Macro Data
β	Discount Rate	0.96	$\frac{1}{1+r^*}$
γ	Risk aversion	2	Corsetti, Dedola, and Leduc (2008)
η	Substitution C_M-C_S	0.50	Comin, Lashkari, and Mestieri (2018)
η_M	Substitution C_M^D-C_M^F	0.85	Corsetti, Dedola, and Leduc (2008)
σ	Substitution M varieties	3.8	Ghironi and Melitz (2005)
δ^k	Depreciation of capital	0.12	Macro Data
δ_S	Exogenous exit rate M	0.11	Micro data
δ_M	Exogenous exit rate S	0.08	Micro data
α_S	Capital Share S Sector	0.30	Micro data
α_M	Capital Share M Sector	0.36	Micro data
f_S^e	Fixed entry cost S	1	normalization
f_M^e	Fixed entry cost M	1	normalization
ξ	Variable entry cost	2	small
μ_S	Mean prod dist S	0	normalization
A	Foreign demand for M	1	normalization
τ	Capital control tax	0	na

A second group of 14 parameters is internally calibrated, i.e., the parameters are chosen so that the model matches particular moments or targets. Table 6 presents the results of the calibration. Although every moment is affected by every parameter, we can point to some strong economic relationships between particular moments and particular parameters. The consumption share of services disciplines the weight of services in the aggregate basket ($\theta_S = 1 - \theta_M$), and the share of domestic manufacturing consumption is related to the weight of domestic manufacturing on the manufacturing basket ($\theta_D = 1 - \theta_F$).[30] The mean of the log-productivity entry distribution in the manufacturing sector determines the relative mass of firms between sectors. Intuitively, on average, manufacturing firms are larger and more productive; hence, few firms can produce a large share of production. The fixed operating costs (f_M^d, f_S^d) along with the standard deviations of the log-productivity entry distribution (Σ_M, Σ_S) determine the distribution of value-added within and across sectors. In particular, we target inter-quantile ranges and relative moments of this distribution. The fixed exporting cost in manufacturing (f_x) is used to discipline the fraction of exporters in the manufacturing sector. The parameters governing the non-homotheticity of the preferences (ϵ_S, ϵ_M) are used to target the average expenditure elasticity for services and manufacturing estimated by Bils, Klenow, and Malin (2013) for U.S. sectors. The timing of the liberalization–the level of K_0 at which the capital controls are eliminated– is pinned down by the decrease in the interest rate in the five years that follow the liberalization. Labor supply ($\bar{L}$) is set so that nominal GDP equals unity in the steady state. The centrality parameters of the congestion

[28]Because we target the fraction of exporters, other values for A just change the level of entry cost into exporting.

[29]The absolute value of the steady state mass of firms is low; see Table 6, so 2 is in fact a small fraction of the entry cost relative to $f_j^e = 1$.

[30]Because there are 8 times more services firms than manufacturing firms, a small θ_S generates a large share of consumption by services.

externality in the entry cost ($\overline{M}^e_S, \overline{M}^e_M$) are set internally to the open economy entry levels so that there are no congestion externalities in the long-run absent any capital controls.

Table 6: Internally-Calibrated Parameters

Parameter	Description	Value	Target	Data	Model
θ_S	Share C_S in C	0.31	$(P_S \cdot C_S)/(P \cdot C)$	0.59	0.56
θ_D	Share C_M^D in C_M	0.62	$(P_M^D \cdot C_M^D)/(P_M \cdot C_M)$	0.64	0.63
μ_M	Mean Prod. dist. M	1.46	M_S/M_M	8.10	8.04
f_S^d	Fixed operating cost M	0.02	$\log(VA_S^{p75}) - \log(VA_S^{p50})$	1.10	1.06
f_M^d	Fixed operating cost S	0.08	$\log(VA_M^{p75}) - \log(VA_M^{p50})$	1.35	1.31
Σ_S	Std. Prod. dist. S	0.78	$\log(VA_M^{p50}) - \log(VA_S^{p50})$	1.13	1.09
Σ_M	Std. Prod. dist. M	1.72	$\log(VA_M^{p25}) - \log(VA_S^{p25})$	1.02	1.00
f_M^x	Fixed exporting cost M	7.00	$\frac{1-G(\varphi_M^x)}{1-G(\varphi_M^d)}$	0.13	0.12
e_S	Expenditure Elasticity S	2.6	Bils, Klenow, and Malin (2013)	1.15	1.14
e_M	Expenditure Elasticity M	1.41	Bils, Klenow, and Malin (2013)	0.78	0.82
K_0	Initial Condition K	$0.55 \times K_{SS}$	r^k decrease during liberalization	-0.035	-0.035
$\overline{L}$	Labor supply	2.9e-4	Nominal GDP Y	1	1
$\overline{M}^e_S$	Convex entry cost S	3.5e-4	Open SS Value	na	na
$\overline{M}^e_M$	Convex entry cost M	5.8e-4	Open SS Value	na	na

Table 6 indicates that the manufacturing sector is more capital-intensive, but has a lower expenditure elasticity, compared to the service sector. Therefore, we would expect that the manufacturing sector expands more from the increase in investment, but less from the front-loading of consumption.

The reminder of this section explores the calibrated economy to study the medium-run and long-run effects of a financial liberalization. Because the liberalization occurs when the economy has 55% of its long-run capital, it has strong reasons to borrow. We solve for a baseline transition with a closed current account, and balanced trade (no liberalization), in every period. With this financial autarky baseline, we then study an unexpected financial liberalization, in which capital controls are removed completely and permanently – decreasing τ from $\bar{\tau}$ to 0. This allows the economy to smooth consumption by supporting trade imbalances and borrowing in the long-run.

6.2 Model Validation

In order to validate the calibrated model, we compare the model's predictions with the Hungarian post-financial liberalization experience (2001-2008). For the Hungarian data, we estimate differences with respect to the trend by regressing the variable on a time trend and a dummy for the reform period, i.e., $y_t = \alpha \mathrm{FL}_t + T_t + \varepsilon_t$, where $\mathrm{FL}_t = 1$ if year ≥ 2001 and 0 otherwise, and T is a time trend. In the model, we calculate the average difference between the liberalization path and the financial autarky path in the seven periods following liberalization. Recall that the calibration only targets the interest rate decrease during the liberalization, no other information from the Hungarian economy along its transition path. Table 7 compares the model and data along seven non-targeted dimensions.

The table shows that the model is able to replicate the increase in the share of services at the onset of the reform in terms of value added, employment and consumption. The model also captures the increase in the relative price of services. Therefore, the model economy correctly captures the main qualitative features of the reallocation of resources at the onset of the transition. Due to the lack

Table 7: Non Targeted Moments

	Model	Data
	(1)	(2)
Capital (log diff)	0.215	0.064*
		(0.034)
Share of consumption in services	0.013	0.009*
		(0.004)
Share value added in services	0.030	0.038*
		(0.021)
Share employment in services	0.024	0.039*
		(0.021)
Relative entry rate (S/M)	0.069	0.153**
		(0.063)
Relative price index (S/M) (log diff)	0.018	0.047***
		(0.013)

Note: *, **, *** significant at 10, 5, and 1 percent. Std. errors in parenthesis. Coefficients in column 2 are computed in a regression of the variable on a time trend and a dummy for the reform period: $y_t = \alpha \mathrm{FL}_t + T_t + \varepsilon_t$, where $\mathrm{FL}_t = 1$ if year ≥ 2001 and 0 otherwise. Relative consumption data comes from OECD expenditure of households data. Interest rate and wage data come from the World Bank data.

of adjustment frictions, the aggregate capital stock increases faster in the model.[31] The next section describes the forces at play during the transition to the open economy steady-state, and explores the micro and macro dynamics that a financial liberalization can trigger.

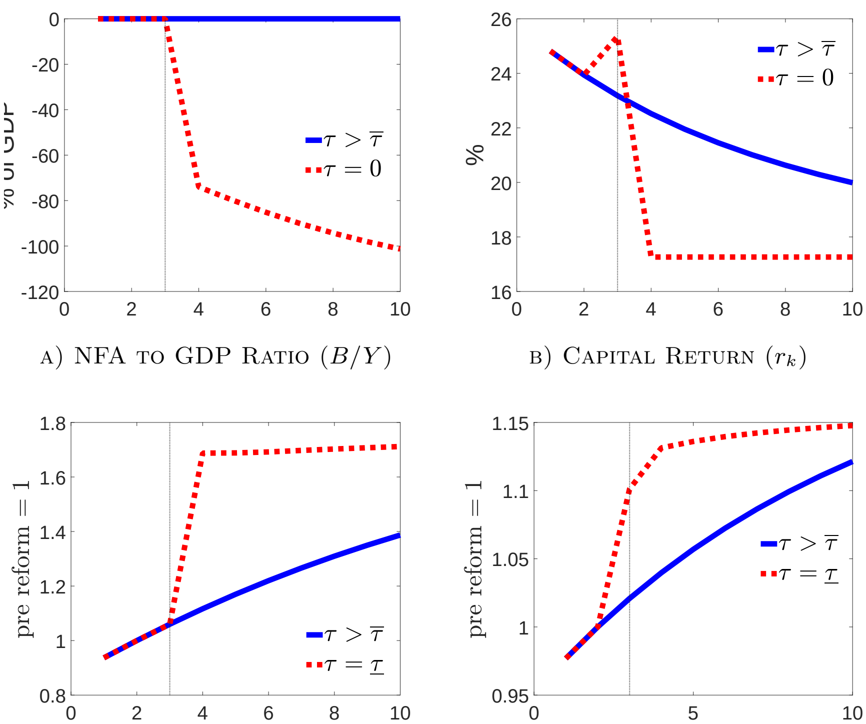
6.3 Macro and Micro Dynamics in the Short-Term

To study the impact of a reduction in capital controls, we start with an economy in financial autarky that is transitioning to its steady state. The economy then implements an unexpected and permanent elimination of capital controls that lowers the tax on foreign borrowing to zero. This shock triggers dynamics at both the macro and micro levels.

At the macro-level, the reduction in capital controls promotes investment and consumption growth. Investment increases because the reduction in the tax for foreign borrowing lowers the domestic interest rate, which – becoming lower than the autarky rental rate – encourages the household to borrow internationally to invest in physical capital. This is the relative input-cost channel that promotes capital accumulation. Consumption increases for two reasons. First, the increased rate of capital accumulation raises the permanent income of the economy. Second, the lower interest rate encourages an intertemporal shift of consumption to the present. These two forces will also lead to higher international borrowing, in part because current income does not rise as much as permanent income. Hence, both higher capital accumulation and higher consumption lead to increased international borrowing.

[31] An alternative calibration of the capital stock at the moment of the liberalization ($K_0 = 0.85$) can deliver an increase in capital stock of the empirical magnitude. This will be used as an example of a *small* financial liberalization.

These dynamics are plotted in Figure 5, which shows the dynamics of the domestic return to capital (r_k), the net foreign asset position (NFA) as a share of GDP, the consumption level, and the capital level for an economy in financial autarky that transitions to its steady-state, and for an economy that starts on the autarky transition path, but then, in the third year, implements a financial liberalization.[32] The economy in financial autarky is depicted by the solid blue line, which shows that – as the economy transitions and accumulates more capital – the capital return decreases and consumption increases. The dashed red line shows the dynamic of the economy hit by the liberalization. Panel A shows that the liberalization triggers international borrowing, and a deterioration of the net foreign asset position of the country. The return of capital increases on impact as the capital stock is fixed in the period of the liberalization and desired capital increases due to the lower interest rate. After the investment boom, the return of capital decreases permanently to a level consistent with r^*, accompanied by a higher capital accumulation and consumption (panels B, C and D).



A) NFA to GDP Ratio (B/Y)

B) Capital Return (r_k)

C) Capital (K)

D) Consumption (C)

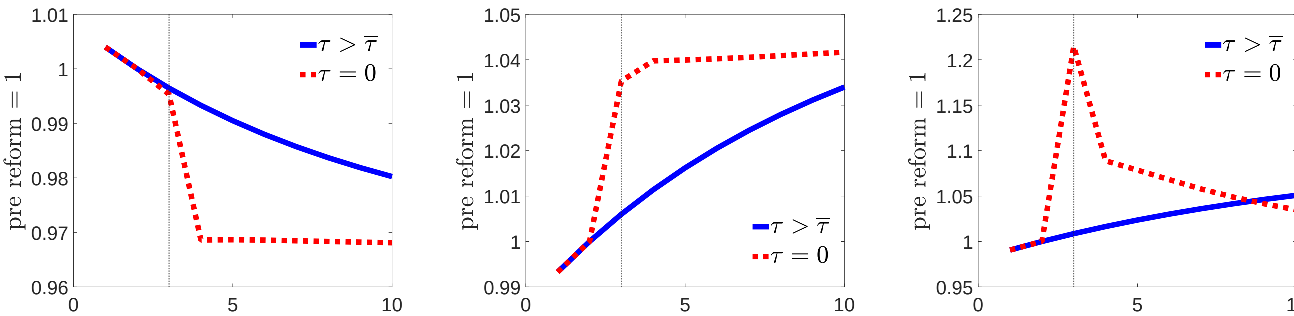
Figure 5: Relative Input-Cost and Consumption Channels in the short term

Note: This figure shows the dynamics of the domestic return of capital (top left), the net foreign asset position over GDP (top right), the consumption level (left bottom), and the capital level (right bottom). The blue and solid line corresponds to an economy in financial autarky and the red and dashed line corresponds to a financially open economy.

The relative input-cost and consumption channels imply intricate dynamics at the micro level, and trigger reallocation effects across sectors. The reduction in capital controls affects the manufacturing input-bundle cost relative to that of services – $\frac{\phi_M}{\phi_S}$ – and lowers the relative cost of production of

[32]There is an initial burning period for the autarky transition to allow for a stable path independent of the initial distribution of firms.

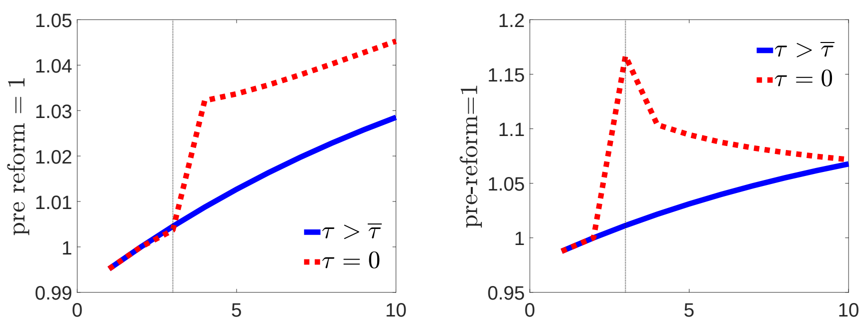
manufacturing goods (Panel A in Figure 6). This lower relative production cost stems from the lower rental rate of capital and higher wages owing to higher capital accumulation. Hence, the relative input-cost channel favors the manufacturing capital-intensive sector. In parallel, increased aggregate consumption raises demand relatively more for goods with a high expenditure elasticity, encouraging production of service goods. These two forces – relative input-cost and (non-homothetic) consumption forces – compete with one another and can shift resources to manufacturing or services depending on which force dominates. As Figure 6 shows, in the short-term, the consumption channel dominates and resources reallocate towards services. Upon the liberalization, the consumption share of services increases, which is parallel to an increase its production share (Panels B and C). This higher consumption of services raises the relative price of services and the ideal price index (Panels A and B in Figure 7), which induce a real exchange rate appreciation.



A) Relative Cost Ratio ($\frac{\phi_M}{\phi_S}$) B) Consumption share of Services $\left(\frac{P^S \times C^S}{P \times C}\right)$ C) Production share of Services $\left(\frac{P^S \times C^S}{P^S \times C^S + P^M_D \times C^D_M + XM}\right)$

Figure 6: Reallocation across Sectors in the short term

Note: This figure shows the dynamics of the relative cost ratio (left), the consumption share of services (middle) and the production share of services (right). The blue and solid line corresponds to an economy in financial autarky and the red and dashed line corresponds to a financially open economy.

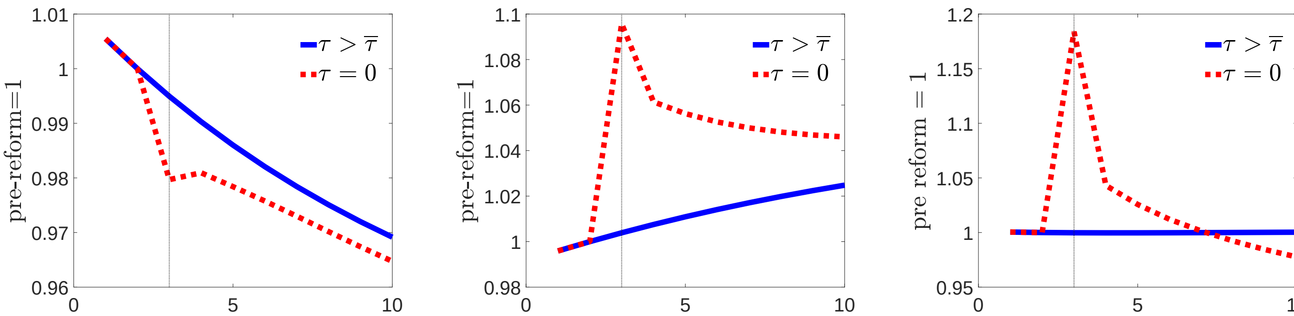


A) Relative Price ($\frac{P_S}{P^D_M}$) B) Ideal Price Index (P)

Figure 7: Relative Price and Ideal Price Index in the short term

Note: This figure shows the dynamics of the relative price of service-to-manufacturing goods (left) and the ideal price index (right). The blue and solid line corresponds to an economy in financial autarky and the red and dashed line corresponds to a financially open economy.

There are also reallocation effects within sectors. Higher consumption of services increases expected profits and expands the extensive margin. As Panels A and B in Figure 8 show, there is a decrease in the relative cut-off for producing ($\frac{\varphi_s^d}{\varphi_M^d}$) and an increase in the relative entry rates in services. Conversely, in manufacturing, resources shift to large and productive firms. The higher demand for services, which have a high expenditure elasticity, shifts demand away from manufacturing products, which reduces the market share of these goods. Among manufacturing firms, resources shifts towards domestic production. Because foreign demand is constant in this small open economy, but domestic demand has increased, manufacturing firms shift their production towards the domestic market. As Panel C in Figure 8, there is an increase in the cut-off for exporting in the short term. This shift in production away from exports is the flip side of a real exchange rate appreciation, which arises from the increase in wages and the relative price of services.



a) Relative Domestic Production Cut-off $\left(\frac{\varphi_S^d}{\varphi_M^d}\right)$

b) Relative Entry Rate ($\frac{S}{M}$)

c) Relative Cut-offs within Manufacturing $\left(\frac{\varphi_M^x}{\varphi_M^d}\right)$

Figure 8: Reallocation Within Sectors in the short term

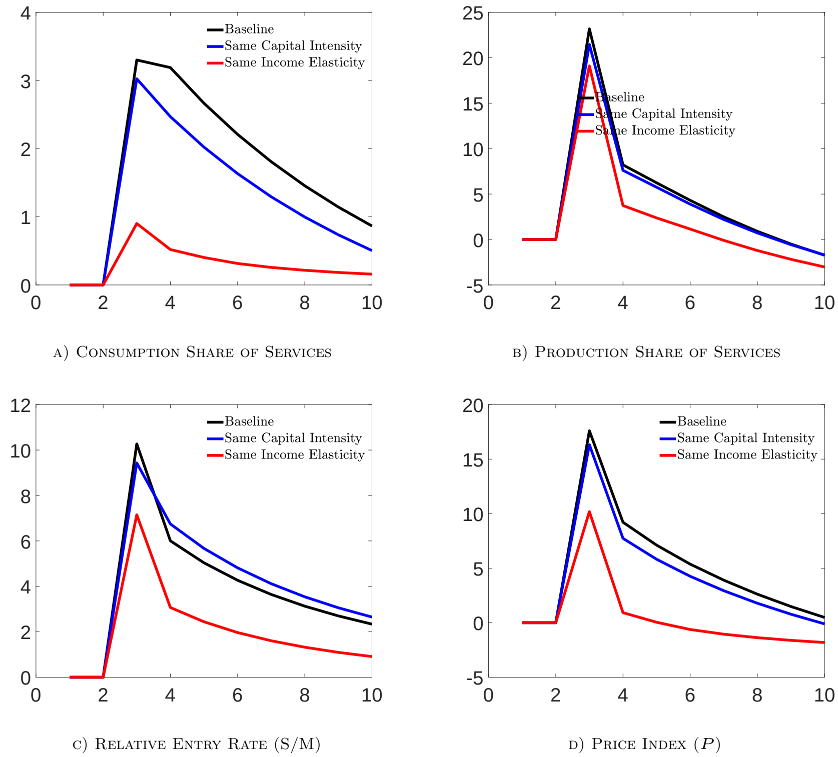
Note: This figure shows the dynamics of the relative domestic production cut-offs (left), the relative entry rate (middle), the relative cut-offs in the manufacturing sector (right). The blue and solid line corresponds to an economy in financial autarky and the red and dashed line corresponds to a financially open economy.

In sum, the liberalization leads to a short-term boost in capital accumulation, consumption and foreign borrowing. Because the consumption channel dominates the relative input-cost channel, consumption and production shift towards services. The liberalization, then, triggers resources reallocation across sectors and towards services. There is also reallocation within sectors. The higher demand for services allows expanding the extensive margin, encouraging the entry of small firms in the services sector. Conversely, the lower relative demand for manufacturing goods increases the relative cut-off for producing in this sector, which increases exit. Among surviving manufacturing firms, the real exchange appreciation and increased domestic demand shift resources away from exports towards domestic production.

6.4 The Role of Preference Non-Homotheticity and Heterogeneous Capital Intensity

To assess the importance of heterogeneous expenditure and capital elasticities in the short-run dynamics surrounding the financial liberalization we develop two general equilibrium counterfactual economies:

i) an economy where preferences are homothetic ($\epsilon_M = \epsilon_S = 1.01$), and a version of the non-homothetic economy without heterogeneous technologies ($\alpha_S = \alpha_M = 0.33$). In both counetfactual economies we adjust the supply of labor such that in the long-run autarky steady state they have the same level of output than the baseline economy ($Y = 1$) and we adjust the preference levels (θ_j) such that the three economy also feature the same consumption share across sectors in the autarky steady state. All other parameters are common between the economies.



A) Consumption Share of Services

B) Production Share of Services

C) Relative Entry Rate (S/M)

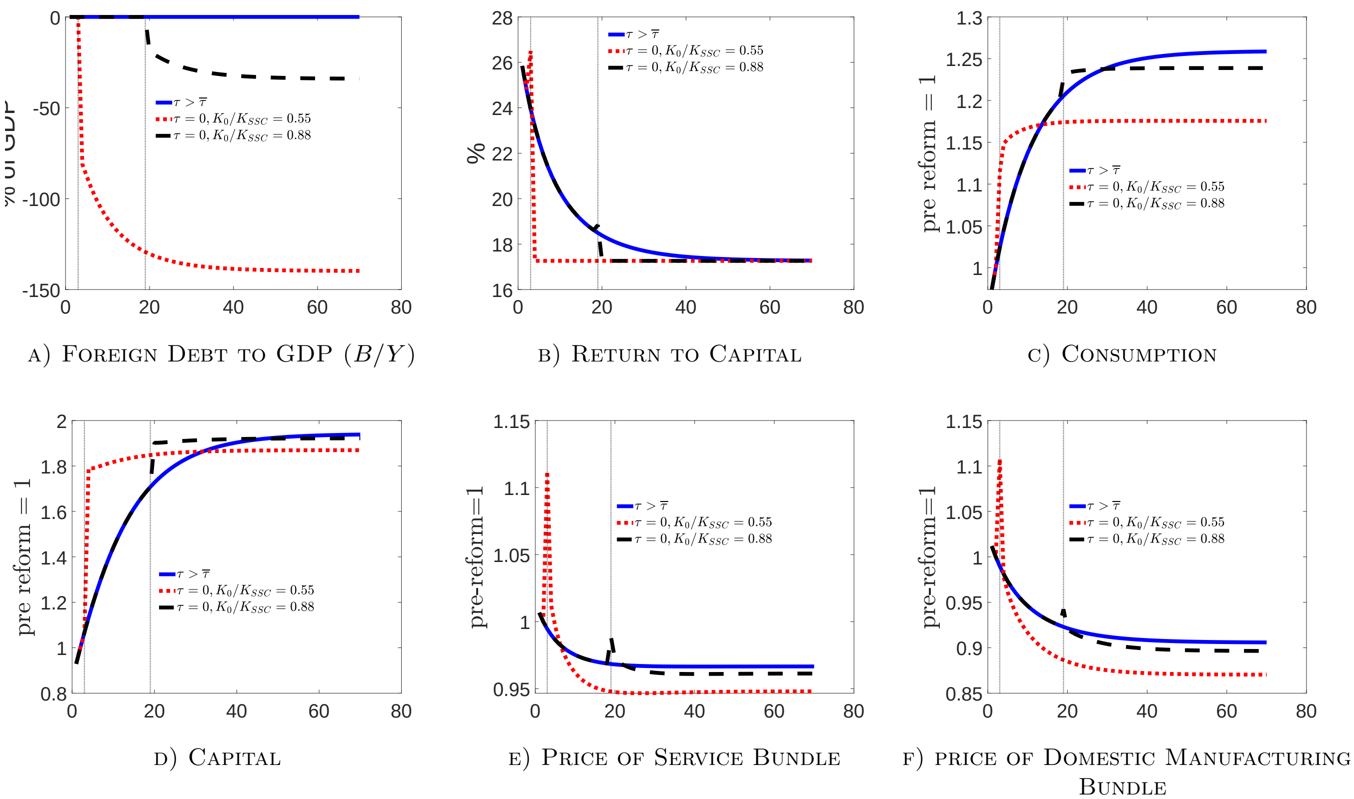
D) Price Index (P)

Figure 9: Counterfactual Economies in the short term

Figure 9 displays the short-run percentage difference of liberalized economy with respect to their autarky transition for the relative consumption, production, and entry rate of services to manufacturing ratio and for the overall price index in the economy. Note that the homothetic economy exhibit the largest deviations from the baseline economy. Thus, heterogeneous expenditure elasticity are key when capturing the short-run dynamics of between sector resource allocation and the dynamic of prices. Along these dimensions, although more limited in their effect, we see that heterogeneous technologies also impact the short-run dynamics of the economy.

6.5 Permanent Effects of Financial Liberalization

We proceed to study the permanent effects of a financial liberalization. Note first that the non-arbitrage condition between capital and bonds implies that in the long-run, every economy will be characterized by the same return on capital ($r_k^{ss} = r^* + \delta$). In a one good representative firm economy with a traditional Ramsey-Cass-Koopmans structure as in Gourinchas and Jeanne (2006) the unique r_k implies a common long-run level of capital that is independent of the magnitude of capital inflows ($r_k = \frac{\partial F(K,L)}{\partial K}$). In fact, larger capital inflows has to be sustained by trade surpluses that decrease the level of long-run consumption without affecting any other aspect of the long-run allocation. When the economy produces two goods, the relative price of these goods with respect the numéraire (the foreign good) affects the mapping between the unique capital return and the level of capital in the long run. In fact, the same Ramsey-Cass-Koopmans structure structure with two representative firms imply that for each sector j the level of capital is determined by $\frac{r_k}{P_j}$ where P_j is the long-run price level of the sector in units of the imported good. Therefore, if larger capital inflows affect long-run prices, the size of capital inflows also determine the long-run level of physical capital in the economy. Moreover, when only one sector can be exported, the long-run trade imbalance required to serve the debt can affect permanently the exchange rate and the allocation of resources between the two sectors. The same logic carries to our two sector heterogeneous firm model with monopolistic competition. In fact, permanent changes in the exchange rate level trigger permanent reallocation of resources within sectors, especially between exporter and non-exporter firms in the manufacturing sector.



A) Foreign Debt to GDP (B/Y)

B) Return to Capital

C) Consumption

D) Capital

E) Price of Service Bundle

F) price of Domestic Manufacturing Bundle

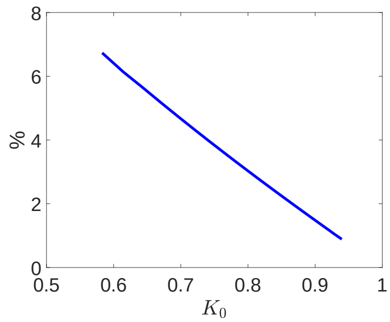
Figure 10: Medium and Long-Term Adjustments of Macroeconomic Aggregates

Note: This figure shows the long-term dynamics of the net foreign asset position over GDP (top left), the return to capital (top center), the consumption level (top right), the capital level (bottom left), the price of the service bundle (center bottom), and the price of the manufacturing bundle (right bottom). The solid blue corresponds to an economy in financial autarky; The dashed black line corresponds to and economy with lower capital inflows, and the dotted red line corresponds to the baseline economy.

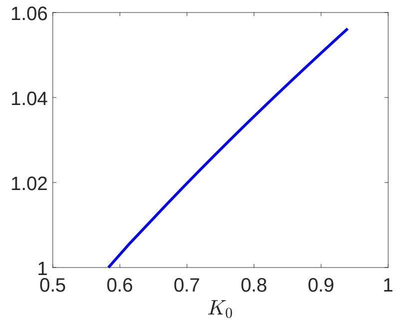
Figure 10 illustrates how the size of the capital inflows can affect the long-run capital level and the allocation of resources within and across sectors. In particular, we study two alternative financial liberalizations that only differ on the timing of the reform. The baseline liberalization (large capital inflows) characterized by a capital scarce economy– with capital at 55% of its autarky long-run level– and an alternative liberalization (moderate capital inflows) characterized by an economy with more capital– with capital at 85% of its autarky long-run level. Panel A shows that the larger capital inflows (dotted red line) entail larger long-run debt. Panel B shows that the non-arbitrage condition between bonds and capital hols in the long-run for every economy as they all converge to the same long-run level of capital return. Panel C shows that larger repayment obligations are met with lower levels of long-run consumption. Panel D shows that, although every economy reaches the same rental rate of capital, larger debt obligations are associated with lower levels of long-run capital. The reason is that the real return of capital depends on the long-run prices of the goods. In the long-run, the repayment obligations depress domestic absorption relative to the financial autarky steady state, reducing the return of capital in both sectors and therefore the long-run level of capital and real output in the economy. Because the external demand is independent of domestic conditions, the demand for the manufacturing sector contracts less than the demand for services. Therefore the manufacturing price level decreases less than the services price level in the long-run, triggering a depreciation of the exchange rate and a reallocation of resources towards manufacturing, and within manufacturing, towards exporter firms.

To further explore the between-sector and within-sector reallocation, we compare long-run steady states as the scarcity of capital at the moment of the reform varies. The results are shown in Figure 11. As stated above, to sustain long-run borrowing, economies with larger inflows (lower K_0) exhibit a larger long-run trade imbalance (Figure C.18a) and lower long-run consumption (Figure C.18b). The lower expenditure elasticity in manufacturing, coupled with the slight decrease in long-run consumption, implies a modest shift of the consumption basket towards manufacturing goods (Figure C.18c). Because only manufacturing output is tradable and the higher long-run debt is serviced by exporting, production is shifted further towards manufacturing (Figure C.18d). Consequentially, an economy with larger debt holding must also have more firms in the manufacturing sector (Figure C.18e). Importantly, the lower domestic demand reduces the ideal consumption price, inducing a real exchange depreciation (Figure C.18f). Smaller services sectors in economies with larger debt obligations imply a larger services price index relative to manufacturing, which in turn implies the services cutoff shifts to the left (relative to manufacturing) (Figure C.18g). Along with the reallocation towards manufacturing goods, there is reallocation within this sector towards exporter firms. The reduction in the domestic demand relative to the foreign demand, and the real exchange depreciation, imply that the export cutoff shifts to the left. More manufacturing firms export, and existing exporting firms expand (Figure C.18h). Both of these reallocation effects imply economy-wide long-run productivity gains (Figure C.18i). These gains can be sizable, as an economy that liberalizes with 70% of the long-run autarky capital level ends with 6% higher aggregate productivity in the long run when compared to an economy with no long-run borrowing.[33]

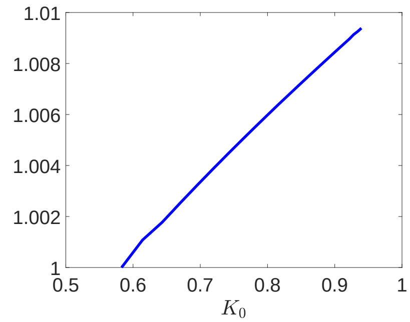
[33] Appendix Appendix F shows that the main short- and long-run dynamics of the model are not affected when including a risk premium as in Schmitt-Grohe and Uribe (2003) allowing for a less patient ($\beta < \frac{1}{1+r^*}$) domestic economy.



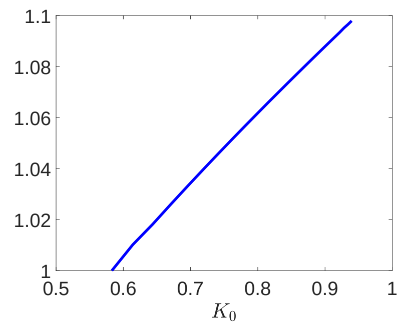
A) Trade Balance to GDP Ratio (TB/Y)



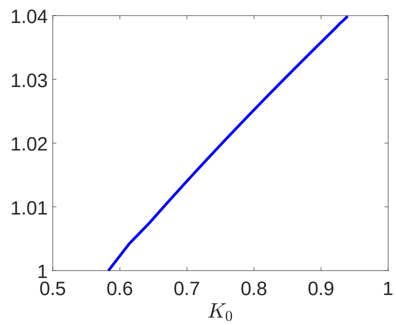
B) Consumption (C)



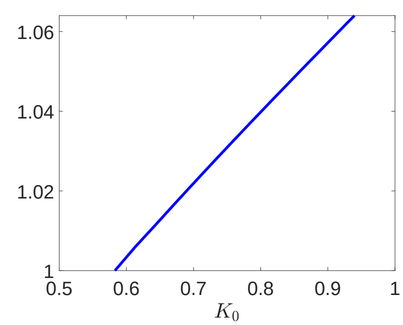
C) Consumption Share of Services $(\frac{P_S \cdot C_S}{P_S \cdot C_S + P_M^D \cdot C_M^D})$



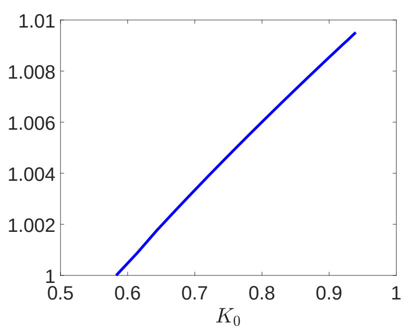
D) Production Share of Services $(\frac{P_S \cdot C_S}{Y})$



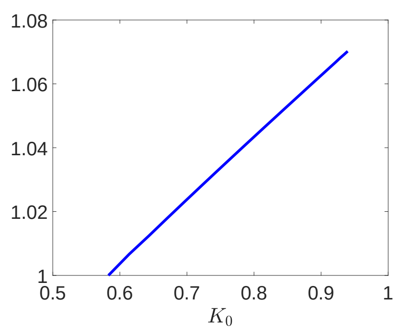
E) Relative Sectoral Firm Mass (M_S/M_M)



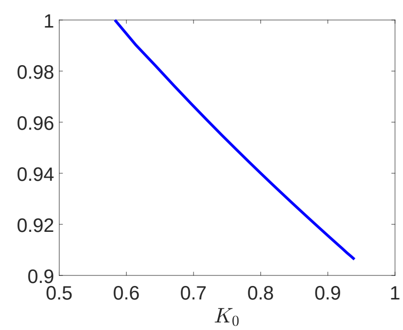
F) Aggregate Price Index (P)



G) Relative sectoral operating cutoffs $(\bar{\varphi}_S/\bar{\varphi}_M^d)$



H) Manufacturing relative cutoffs $(\bar{\varphi}_M^x/\bar{\varphi}_M^d)$



I) Aggregate TFP

Figure 11: Comparison of Long-Run Steady States

Note: In figures (b)-(i), the values in the open steady state with the lowest capital at the moment of the liberalization are normalized to 1.

Taking Stock and Relationship with the Literature

Our model shows that capital flows imply non-trivial short-run and long-run dynamics in the allocation of resources across and within sectors. At the onset of the liberalization, large capital inflows boost consumption, and tilt consumption and production towards the sector with the higher expenditure elasticity, i.e. services. This reallocation leads to an increase in the extensive margin of services, allowing less productive firms to join the market. The increase in entry of service firms, along with increased consumption, raise the value added share of this sector.

Over time, as the economy transitions to the new open steady-state, the dynamics evolve. In particular, the accumulated debt must be serviced. The economy will continuously transfers resources to foreigners, which implies that production must shift to exportable manufacturing goods. This, in turn, leads to a decrease in the extensive margins in services relative to manufacturing and, as described above, resources reallocating towards the most productive manufacturing firms in the economy. Aggregate productivity increases and is higher than in financial autarky.

These long-run effects complement other forces that can also generate long-run effects following a financial liberalizations. For example, Benigno and Fornaro (2013) consider a two-sector economy in which productivity growth depends on the size of the domestic tradable sector. In their model, financial liberalization tilts domestic consumption towards the nontradable sector, because the economy borrows internationally to import tradable goods. As a result, the long-run technology gap between the economy and the world frontier increases with financial openness. In contrast, following a large liberalization, our model generates endogenous movements in aggregate productivity through reallocation effects within and across sectors (without relying on productivity externalities). In this respect, the effect in our model can be related to the study of commodity cycles in Alberola and Benigno (2017). In their model, because of debt repayment forces, a wealth shock (changes in the price of the commodity good) can trigger permanent differences in the allocation of resources between non-tradable and tradable sectors even in the absence of growth externalities in manufacturing. Both of these papers used perfect competition and representative firm models, ignoring by design the reallocation within manufacturing between exporters and non-exporters.[34] This reallocation among heterogeneous firms is key to rationalize the entry and selection dynamics studied in Section 4. Moreover, firm selection generates permanent productivity effects after a financial liberalization that are independent of any endogenous growth externality.

7 Conclusion

In our paper, we demonstrate that services play an integral role in the short-run and long-run adjustment of an economy following the capital inflows that accompany a financial liberalization. Services tend to have higher expenditure elasticities, lower capital elasticities, and less tradability, than manufactured goods. Using the census of firms in Hungary, we are able to trace out the dynamics of manufacturing and services firms' adjustment following Hungary's financial liberalization in 2001. A key part of the adjustment is the two channels we have highlighted – the consumption channel, which stems from different expenditure elasticities across firms and sectors, and the input cost channel which stems from different capital elasticities across firms and sectors. Owing to the higher expenditure elasticities, existing services firms grow, and there is increased entry. The latter force is sufficiently strong that value-added per firm in services declines. The forces affecting services are stronger, overall, then the forces that affect manufacturing. The input-cost channel favors manufacturing firms, as they are more

[34]Benguria, Saffie, and Urzua (2018) do not focus on capital inflows, but their model does generate permanent changes in the allocation of resources between and within sectors after a commodity boom.

capital elastic, and existing firms grow. But, there is also less entry, and the mass of firms declines. Overall, the share of services (manufacturing) in employment and value-added increases (decreases).

Our calibrated model delivers the above short and medium-term firm and sector-level dynamics, even as it also implies at the macroeconomic level that the domestic interest rate falls, the net foreign asset position becomes negative, and consumption and capital accumulation increase. In addition, the relative price of services rises, and the real exchange rate appreciates. We examine our model's implications for the long-run, as well. Large capital inflows are associated with large long-run levels of debt that have to be served by exporting. This long-run trade surplus implies another set of dynamics, which, reverses much of the short and medium-term dynamics. For example, in the long-run the trade surplus must occur in manufacturing. As part of the adjustment, the manufacturing exporting cutoff falls; more firms export and existing exporters become larger. There is reallocation to manufacturing, and to manufacturing exporters in particular. A real exchange rate depreciation facilitates this reallocation. Overall, the manufacturing sector becomes larger, and the services sector smaller. Finally, there are important shifts in productivity. Productivity in the manufacturing sector, and aggregate productivity, increase in the long-run, and the increase is larger, the larger the liberalization.

Our model, then, shows how the micro-level and sector-level heterogeneity have implications for the macro-dynamics, and vice versa, and that these micro-macro interrelationships differ in the short-run and the long-run. In the long-run, in particular, aggregate productivity increases only because of the selection effects induced within and across firms.

We have emphasized two important ways in which services firms differ from manufacturing firms. But, there is much more heterogeneity across these firms. Two sources of heterogeneity are skill intensity differences and differences in tradability. Home health care services, for example, have low tradability, while corporate legal services have high tradability. Studying how these sources of heterogeneity serve as transmission mechanisms following a financial liberalization would be useful for future work.

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Empirical Appendices

Appendix A Cross-Country Analysis

In this section we assess whether international financial integration associates with sectoral allocation across countries. In particular, we test if financial liberalization episodes –measured with the Chinn and Ito (2008) index of capital account openness– associates with changes in the share of value added in agriculture, manufacturing and services, using World Bank Data for 163 countries over 1970 to 2015.[35]

A first glance at the data suggests that, indeed, financial liberalization episodes correlate with reallocation of resources towards services to the expense of agriculture and manufacturing. Figure A1 shows that, within the three years before and after the reform, capital account liberalization associates with an increase share of value added share of services activities (blue line on the right axis), and with a parallel decrease in the value added share in agriculture activities (green-dashed line, left axis) and, to a lesser extent, a drop in manufacturing (red-dotted line, left axis).

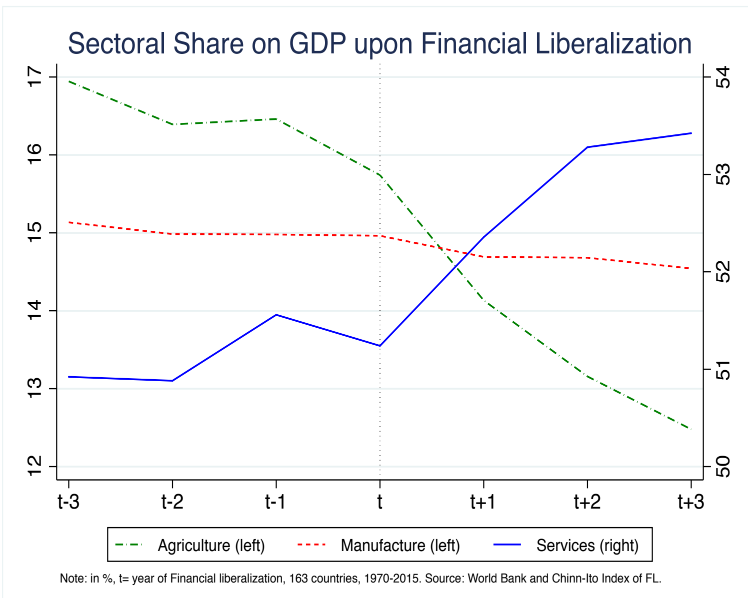


Figure A1: Financial Liberalization: A Cross-Country Analysis

Yet this correlation could certainly be omitting other factors and mislead the real effect of financial liberalization. As extensively discussed in the international economics literature, capital account openness often associates with other reforms, such as trade liberalizations or banking deregulations (see Henry 2007, Bonfiglioli 2008 and Varela 2018 for example). To account for these factors, one could estimate this relationship econometrically by regressing:

$$\log s_{jit} = \alpha \log s_{ijt-1} + \beta FL_{it} + \gamma X_{it} + \varepsilon_{ijt}, \tag{A.1}$$

[35] The Chinn and Ito index uses the Annual Report on Exchange Arrangements and Exchange Restrictions produced by the International Monetary Fund to create a measure accounting for restrictions on capital account and current account transactions. This measure goes from -1.9 to 2.35 –with a standard deviation of 1.52– for closed to fully open economies.

where j, i, t represent sector (agriculture, manufacturing, services), country and year, respectively; s is the value added share in the sector, FL is the measure of financial liberalization; and X_{it} is a vector of controls including trade openness (export+ import/ GDP), government size (government expenditure/ GDP), financial depth (private credit/GDP) and a dummy for financial crisis. Our control data comes from the World Development Indicators of the World Bank and the indicator for financial crisis from Reinhart and Rogoff (2014). The variable $\log s_{ijt-1}$ is the sector's previous year value added share that controls for the sector's specific trend. The variable of interest is β, which captures the effect of financial liberalization on the value added share of each sector.

Nevertheless, estimating equation (A.1) with OLS poses two econometric concerns: simultaneity bias –if sectoral reallocation induces countries to deregulate their capital accounts– and inconsistent estimators due to the presence of lagged dependent variable. To address these issues, we follow the literature on capital account openness (Bekaert, Harvey, and Lundblad 2005 and Bekaert, Harvey, and Lundblad 2011, and Bonfiglioli 2008) and estimate a GMM dynamic panel (Arellano and Bond 1991 and Blundell and Bond 1998), where we employ five years past information of endogenous variables as instrument for current variables. We employ five years non-overlapping panel data to avoid endogeneity issues. The identification assumption is that the five year lags of the sectoral shares are valid instruments for the lagged dependent variable and the financial liberalization measure. In particular, we estimate the following system:

$$d\log s_{jit} = \alpha \; d\log s_{ijt-5} + \beta \; dFL_{it} + \gamma \; dX_{it} + d\iota_t + d\varepsilon_{ijt}, \tag{A.2}$$

$$\log s_{jit} = \alpha \; \log s_{ijt-5} + \beta FL_{it-5,t} + \gamma \; dX_{it-5,t} + \mu_i + \iota_t + \varepsilon_{ijt}, \tag{A.3}$$

where $d\log s_{ijt-5}$ is the log difference between t and $t-5$, variables indexed by $(t-5,t)$ are averages over the period $t-5$ and t, and μ_i and ι_t are country and year fixed effects. The identification strategy is to estimate differences of the endogenous and the pre-determine variables in equation (A.2) with lagged levels, and levels in equation (A.3) with differenced variables. We estimate the system by the two-step Generalized Method of Moments with moments conditions $E[\log s_{jit-5s}(\varepsilon_{it} - \varepsilon_{it-5})] = 0$ and $E[\log z_{it-5s}(\varepsilon_{ijt} - \varepsilon_{ijt-5})] = 0$ for $s \geq 2$ on the predetermined variables z for equation (A.2); and $E[d\log s_{ijt-5}\varepsilon_{ijt}] = 0$ and $E[dz_{it-5}\varepsilon_{ijt}] = 0$ for equation (A.3). We treat both the financial liberalization measure and controls as pre-determined. Instruments would be valid whenever the residuals from equation (A.2) are not second order serially correlated. Then, the coefficients are efficient and consistent where both the moment conditions and the no-serial correlation are satisfied. In order to test for no-serial correlation of the residuals, we employ the Sargan test of over-identifying restrictions. To ensure the consistency of results, we keep countries that report at least ten years of consecutive data.

Table A1 presents the results. Column 1 shows the OLS coefficient of equation (A.1) for the agricultural sector. The estimated coefficient is negative and highly statistically significant, suggesting that financial liberalization associates with a decrease in the value added share of agriculture activities. Columns 2 and 3 confirm this correlation when estimating the dynamic panel. After the inclusion of all controls in column 3, the coefficient implies that one standard deviation increase in the index of financial liberalization (1.52) associates with a 3.9% decrease in the value added share in agriculture activities.

Table A1: Financial Liberalization: A Cross-Country Analysis

	Log share in value added								
	Agriculture			Manufacturing			Services		
	OLS	GMM		OLS	GMM		OLS	GMM	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
FL Index	-0.020***	-0.028*	-0.026***	0.007	0.032**	-0.000	0.010**	0.007**	0.014***
	(0.007)	(0.015)	(0.008)	(0.008)	(0.015)	(0.017)	(0.004)	(0.003)	(0.005)
Trade Openness			-0.363**			-0.136			0.100***
			(0.143)			(0.315)			(0.022)
Government Size			0.337***			0.132			-0.109***
			(0.127)			(0.264)			(0.019)
Financial Depth			-0.041*			-0.017			0.032***
			(0.021)			(0.062)			(0.006)
Financial Crisis			0.034**			-0.103**			0.033***
			(0.015)			(0.051)			(0.006)
Lag Dep. Var.	1.006***	0.983***	1.004***	0.877***	0.827***	0.709***	0.817***	0.807***	0.704***
	(0.009)	(0.040)	(0.027)	(0.027)	(0.047)	(0.132)	(0.037)	(0.028)	(0.023)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	914	914	342	914	914	342	914	914	342
Countries	163	163	62	163	163	62	163	163	62
Sargan (pvalue)		0.410	0.821		0.313	0.220		0.208	0.265

Notes: *, **, *** significant at 10, 5, and 1 percent. All regressions include a constant term. Period 1970-2015. Chinn and Ito (2016) index of Financial Liberalization. Source: World Bank, IMF, Chinn and Ito (2016).

This result implies that, upon the financial liberalization, the value share in agriculture decreases 0.7 percentage points in the average country. Columns 4-6 present the results for the manufacturing sector. Interestingly, the estimated coefficient of the dynamic panel is close to zero and non-statistically significant after the inclusion of all controls in column 6. This insignificant effect is not surprising given that the value added share in manufacturing usually displays a hump shape on country's income per capita (Buera and Kaboski 2009; Jorgenson and Timmer 2011; Herrendorf, Rogerson, and Valentinyi 2014, among others). Lastly, columns 7-9 confirm the increase in services following financial liberalization episodes. In particular, a one standard deviation increase in the level of international financial integration associates with a 2.1% increase in the share of service activities. This expansion implies an increase of 1.1 percentage points for the average country.

We present below several robustness tests and extensions. First, we show in Table A2 that the expansion in value added share of services remains significant in a shorter horizons using a GMM of 3 non-overlapping year panel (columns 1-3). Second, in columns 4-6, we use data from Abiad, Detragiache, and Tressel (2010) who construct a narrowly defined measure of financial openness by focusing on restrictions on capital flows and show that the increase in the share of services change remains true when using this measure.[36] Third, to assess whether the effect of financial integration for manufacturing varies according with the country's level of economic development, in Table A3, we split countries by below and above the median income per capita and re-estimate column 6. For less developed economies, the coefficient is positive and statistically significant suggesting that financial liberalization enhances

[36] In particular, Abiad, Detragiache, and Tressel (2010) create an index indicating: whether the exchange rate system is unified, whether banks are allowed to borrow from abroad, and whether capital outflows are allowed to flow freely.

the manufacturing sector in countries with a low income per capita. The effect is non-significant in developed economies. Finally, Table A3 uses the employment shares as dependent variables and confirms the increase in the share of services following financial openness. Columns 3 and 5 report the decrease in the employment share in agriculture and the increase in this share in services.[37]

Table A2: Financial Liberalization: A Cross-Country Analysis-Robustness

	Log VA Share (3 years)			IMF- Index of FL		
	Agriculture	Manufacturing	Services	Agriculture	Manufacturing	Services
	(1)	(2)	(3)	(4)	(5)	(6)
FL Index	-0.018	0.013	0.007*	-0.111***	0.000	0.014***
	(0.015)	(0.015)	(0.004)	(0.022)	(0.014)	(0.005)
Trade Openness	-0.232	-0.021	-0.015	0.478***	0.049	-0.153**
	(0.171)	(0.238)	(0.054)	(0.143)	(0.223)	(0.074)
Government Size	0.228	0.036	0.007	-0.388***	-0.052	0.112*
	(0.176)	(0.211)	(0.052)	(0.086)	(0.204)	(0.064)
Financial Depth	-0.039	0.024	0.018*	-0.002	-0.001	0.038***
	(0.031)	(0.049)	(0.011)	(0.015)	(0.029)	(0.009)
Financial Crisis	0.03	-0.003	0.003	0.028	0.001	0.014*
	(0.031)	(0.030)	(0.007)	(0.036)	(0.054)	(0.007)
Lag Dependent Variable	0.926***	0.842***	0.747***	0.991***	0.751***	0.795***
	(0.042)	(0.127)	(0.060)	(0.013)	(0.098)	(0.052)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
N	602	602	602	229	229	229
Countries	62	62	62	48	48	48
Sargan (pvalue)	0.638	0.796	0.898	0.318	0.116	0.147

Notes: *, **, *** significant at 10, 5, and 1 percent. All regressions include a constant term. Period 1970-2015. Source: World Bank, IMF, Chinn and Ito (2008) and Abiad, Detragiache, and Tressel (2010).

[37] Note that sectors have a slightly different classification in the employment data of World Bank. In particular, the World Bank uses data from International Labour Organization, ILOSTAT database, which defines industry (instead of manufacturing) as manufacturing, construction and utilities (electricity, gas and water). In consequence, the service data excludes construction and utilities.

Table A3: Financial Liberalization: A Cross-Country Analysis-Extensions

	Log share in value added		Log share in employment		
	Manufacturing		Agriculture	Industry	Services
	(1)	(2)	(3)	(4)	(5)
FL Index	0.041*	0.003	-0.009*	-0.015	0.003*
	(0.022)	(0.064)	(0.005)	(0.014)	(0.002)
Trade Openness	-0.613	-0.936***	0.348***	-0.256	-0.086***
	(0.950)	(0.313)	(0.085)	(0.195)	(0.029)
Government Size	0.735	0.862***	-0.292***	0.256	0.028
	(1.018)	(0.328)	(0.087)	(0.169)	(0.026)
Financial Depth	0.018	0.015	-0.214***	0.043	0.026***
	(0.077)	(0.075)	(0.010)	(0.029)	(0.006)
Financial Crisis	-0.033	-0.023	0.024**	-0.047	0.022***
	(0.054)	(0.048)	(0.010)	(0.043)	(0.003)
Lag Dep. Var.	0.613**	0.792***	0.872***	0.732***	0.840***
	(0.278)	(0.216)	(0.007)	(0.057)	(0.015)
Year FE	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes
N	209	127	187	187.000	187
Countries	31	27	63	63	63
Sargan (pvalue)	0.314	0.648	0.236	0.110	0.100

Notes: *, **, *** significant at 10, 5, and 1 percent. All regressions include a constant term. Period 1970-2015. Chinn and Ito (2016) index of Financial Liberalization. Industry: includes construction and utilities (electricity, gas and water) as reported in the WDI. Source: World Bank, IMF and Chinn and Ito (2008) .

Appendix B Empirical Design

-Value Added. To assess the impact of the financial liberalization on firms' value added, we consider the production function $q_{ijt} = \varphi\, k_{ijt}^{\alpha_j} l_{ijt}^{\beta_j}$ and use the optimal capital and labor demand employed in domestic production. In particular, the optimal capital and labor demands for variable domestic costs are

$$k_{dj,t}(\varphi) = \frac{\alpha_j}{r_t^k}\phi_{j,t}\left[\left(\frac{p_{j,t}(\varphi)}{P_{j,t}}\right)^{-\sigma}\left(\frac{P_{j,t}}{P_t}\right)^{-\eta}\frac{\theta_j C_t^{e_j}}{\varphi}\right] \quad \text{and} \quad l_{dj,t}(\varphi) = \frac{\beta_j}{w_t}\phi_{j,t}\left[\left(\frac{p_{j,t}(\varphi)}{P_{j,t}}\right)^{-\sigma}\left(\frac{P_{j,t}}{P_t}\right)^{-\eta}\frac{\theta_j C_t^{e_j}}{\varphi}\right].$$

Replacing these equations into the production function, we obtain

$$q_{jt}(\varphi) = \left[\left(\frac{p_{j,t}(\varphi)}{P_{j,t}}\right)^{-\sigma}\left(\frac{P_{j,t}}{P_t}\right)^{-\eta}\theta_j C_t^{e_j}\right].$$

Re-arranging terms and applying logs, the optimal production of each firm $q_{jt}(\varphi)$ becomes:

$$\begin{aligned}\log(q_{jt}(\varphi)) = & -\alpha_j\sigma\log(r_t^k/w_t) + e_m\log(C_t) + (\sigma-\eta)\log(P_{jt}) \\ & -(\alpha_j+\beta_j)\sigma\log(w_t) + \eta\log(P_t) + \log(\theta_m) + \alpha_j\sigma\log(\alpha_j) + \beta_j\sigma\log(\beta_j) + \sigma\log(\varphi\rho),\end{aligned} \tag{B.1}$$

We can solve for the sectoral price level P_{jt} and replace it into equation (B.1). Recall that the price level is given by

$$\log(P_{jt}) = \frac{1}{1-\sigma}\log\left[\int_{\varphi_{jt}^*} p_{jt(\varphi)}^{1-\sigma}\mu(\varphi)d\varphi\right].$$

After re-arranging terms, sector j's price level becomes

$$\log(P_{jt}) = \log\phi_{jt} + \log\left(\frac{1}{\rho}\right) - \underbrace{\frac{1}{\sigma-1}\log\left[\int_{\varphi_{jt}^*}\left(\frac{1}{\varphi}\right)^{1-\sigma}\mu(\varphi)d\varphi\right]}_{\equiv\tilde{\varphi}_{jt}} \tag{B.2}$$

Replacing equation (B.2) on (B.1), we obtain

$$\begin{aligned}\log(q_{jt}(\varphi)) = & -\alpha_j\eta\log(r_t^k/w_t) + e_m\log(C_t) + (\sigma-\eta)\tilde{\varphi}_{jt} \\ & \underbrace{-(\alpha_j+\beta_j)\eta\log(w_t)}_{\tilde{A}_{jt}\text{:sector time-varying}} + \underbrace{\eta\log(P_t)}_{\tilde{B}_t\text{:agg time-varying}} + \underbrace{\log(\theta_m) - \alpha_j\eta\log(\alpha_j) - \beta_j\eta\log(\beta_j)}_{\tilde{C}_j\text{:sector time-invariant}} + \underbrace{\sigma\log(\varphi) - \eta\log(\rho).}_{\tilde{D}_i\text{:firm time-invariant}}\end{aligned} \tag{B.3}$$

From equation (B.3), it is straightforward to see the effect of the input-cost and consumption channels on firm's production. Taking derivatives with respect to the input cost ratio, we obtain $\frac{\partial\log(q_{jt}(\varphi))}{\partial\log(r_t^k/w_t)} = -\alpha_j\eta < 0$, which indicates that a decrease in the relative price of capital leads to an increase in firms' production, particularly in sectors with higher capital elasticity. Similarly, $\frac{\partial\log(q_{jt}(\varphi))}{\partial\log(C_t)} = e_m > 0$, indicating that an increase in aggregate consumption leads to a higher increase in firms' production for sectors with higher expenditure elasticity.

We can express equation (B.3) in a difference-in-difference estimator. Define FL_t a dummy variable equal one for the post-reform period, and 0 otherwise. The effect of the policy could be estimated as

$$\log(q_{ijt}) = \gamma_0 \mathrm{FL}_t + \gamma_1(\alpha_j \times \mathrm{FL}_t) + \gamma_2(e_m \times \mathrm{FL}_t) + \gamma_3\tilde{\varphi}_{jt} + \gamma_4((\alpha_j + \beta_j) \times \mathrm{FL}_t) + \mu_i + \varepsilon_{it}, \quad \text{(B.4)}$$

where γ_0 captures time-varying general trends of the economy that affect all sectors homogeneously and, in particular, the term $\tilde{B}_t$ of equation (B.3). γ_1 captures the effect of the input-cost channel, that is, how $-\eta \log(r_t^k/w_t)$ affects sectors differentially according to their capital elasticity. γ_2 captures the effect of expenditure channel and how aggregate consumption – $\log(C_t)$ – affects sector heterogeneously according with their expenditure elasticity e_m. γ_3 captures changes in the sectoral average productivity by $(\sigma - \eta)\tilde{\varphi}_{jt}$. γ_4 controls for how aggregate trends affect sectors differently according to their returns to scale of the sector, which are driven by the term $\tilde{A}_{jt}$. μ_i captures firms' and sectors' time-invariant characteristics given by $\tilde{C}_j$ and $\tilde{D}_i$ in equation (B.3).

To obtain a first-difference estimator, consider that in period $t = 1$, the effect of the financial liberalization would be

$$\log(q_{ij1}) = \gamma_0 \mathrm{FL}_1 + \gamma_1(\alpha_j \times \mathrm{FL}_1) + \gamma_2(e_m \times \mathrm{FL}_1) + \gamma_3\tilde{\varphi}_{j1} + \gamma_4((\alpha_j + \beta_j) \times \mathrm{FL}_1) + \mu_i + \varepsilon_{i1}. \quad \text{(B.5)}$$

In $t = 0$ when $\mathrm{FL}_t = 0$, equation (B.4) becomes

$$\log(q_{j0}(\varphi)) = \gamma_3\tilde{\varphi}_{j0} + \mu_i + \varepsilon_{i0} \quad \text{(B.6)}$$

Subtracting equation (B.6) to (B.5), we obtain the difference-in-difference estimator

$$\Delta q_j(\varphi) = \gamma_0 \mathrm{FL}_1 + \gamma_1(\alpha_j \times \mathrm{FL}_1) + \gamma_2(e_m \times \mathrm{FL}_1) + \gamma_3\Delta\tilde{\varphi}_j + \gamma_4((\alpha_j + \beta_j) \times \mathrm{FL}_1) + \Delta\varepsilon_i,$$

which is equivalent to write

$$\Delta q_j(\varphi) = \gamma_0 + \gamma_1\alpha_j + \gamma_2 e_m + \gamma_3\Delta\tilde{\varphi}_j + \gamma_4(\alpha_j + \beta_j) + \Delta\varepsilon_i. \quad \text{(B.7)}$$

-Capital. A firm's optimal capital demand for local variable production is given by $k_{jt}(\varphi) = \alpha_j \frac{\phi_{jt}}{r_t^k} \frac{q_{jt}(\varphi)}{\varphi}$. Applying logs we obtain

$$\log(k_{jt}(\varphi)) = \log(\alpha_j) + \log(\phi_{jt}) - \log(r_t^k) + \log(q_{jt}(\varphi)) - \log(\varphi). \quad \text{(B.8)}$$

Replacing equation (B.3) and considering that $\log(\phi_{jt}) = \alpha_j \log(r_t^k/w_t) + (\alpha_j + \beta_j)\log(w_t) - \alpha_j \log(\alpha_j) + \beta_j \log(\beta_j)$, we can rewrite equation (B.8) as

$$\log(k_{ijt}) = -\alpha_j(\eta - 1)\log(r_t^k/w_t) + e_m \log(C_t) + (\sigma - \eta)\tilde{\varphi}_{jt} + (\alpha_j + \beta_j)\log(w_t) + \tilde{B}'_t + \tilde{C}'_j + \tilde{D}'_i, \quad \text{(B.9)}$$

where $\tilde{B}'_t$, $\tilde{C}'_j$, and $\tilde{D}'_i$ absorb aggregate time-varying, sectoral time-invariant, and firm time-invariant trends.

We can take partial derivatives in equation (B.9) to assess the effect of the input-cost and consumption channels on firm's capital. Formally, $\frac{\partial \log(k_{ijt})}{\partial \log(r_t^k/w_t)} = -\alpha_j(\eta - 1) < 0$, which (if $\eta > 1$) indicates that a decrease in the relative price of capital leads to an increase in firms' capital demand, particularly in sectors with higher capital elasticity. Similarly, $\frac{\partial \log(k_{ijt})}{\partial \log(C_t)} = e_m > 0$, indicating that an increase in aggregate consumption leads to a higher increase in firms' capital demand for sectors with higher expenditure elasticity.

In a difference-in-difference estimator, equation (B.9) becomes

$$\Delta k_j(\varphi) = \gamma_0 + \gamma_1 \alpha_j + \gamma_2 e_m + \gamma_3 \Delta\tilde{\varphi}_j + \gamma_4(\alpha_j + \beta_j) + \Delta\varepsilon_i, \tag{B.10}$$

-Labor. A firm's optimal labor demand for local variable production is given by $l_{jt}(\varphi) = \beta_j \frac{\phi_{jt}}{w_t} \frac{q_{jt}(\varphi)}{\varphi}$. Applying logs we obtain

$$\log(l_{jt}(\varphi)) = \log(\beta_j) + \log(\phi_{jt}) - \log(w_t) + \log(q_{jt}(\varphi)) - \log(\varphi). \tag{B.11}$$

Replacing equation (B.3) and $\log(\phi_{jt})$, we can rewrite equation (B.11) as

$$\log(l_{ijt}) = -\alpha_j(\eta - 1)\log(r_t^k/w_t) + e_m \log(C_t) + (\sigma - \eta)\tilde{\varphi}_{jt} + (\alpha_j + \beta_j)\log(w_t) + \tilde{B}_t'' + \tilde{C}_j'' + \tilde{D}_i', \tag{B.12}$$

where $\tilde{B}_t''$, $\tilde{C}_j''$, and $\tilde{D}_i'$ absorb aggregate time-varying, sectoral time-invariant, and firm time-invariant trends.

Taking partial derivatives in equation (B.12), we obtain $\frac{\partial \log(l_{ijt})}{\partial \log(r_t^k/w_t)} = -\alpha_j(\eta - 1) < 0$, which indicates that a decrease in the relative price of capital leads to an increase in firms' labor demand, particularly in sectors with higher capital elasticity. Similarly, $\frac{\partial \log(l_{ijt})}{\partial \log(C_t)} = e_m > 0$, indicating that an increase in aggregate consumption leads to a higher increase in firms' labor demand for sectors with higher expenditure elasticity.

In a difference-in-difference estimator, equation (B.12) becomes

$$\Delta l_{ij} = \gamma_0 + \gamma_1 \alpha_j + \gamma_2 e_m + \gamma_3 \Delta\tilde{\varphi}_j + \gamma_4(\alpha_j + \beta_j) + \Delta\varepsilon_i, \tag{B.13}$$

Appendix C Additional Figures and Tables

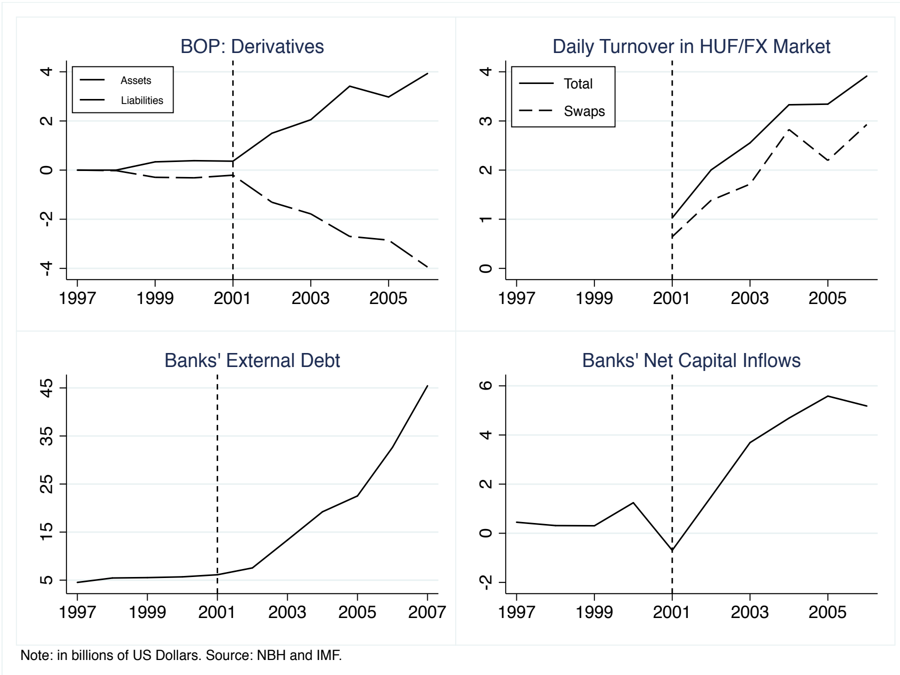


Figure C.1: Capital Flows and Financial Liberalization in Hungary

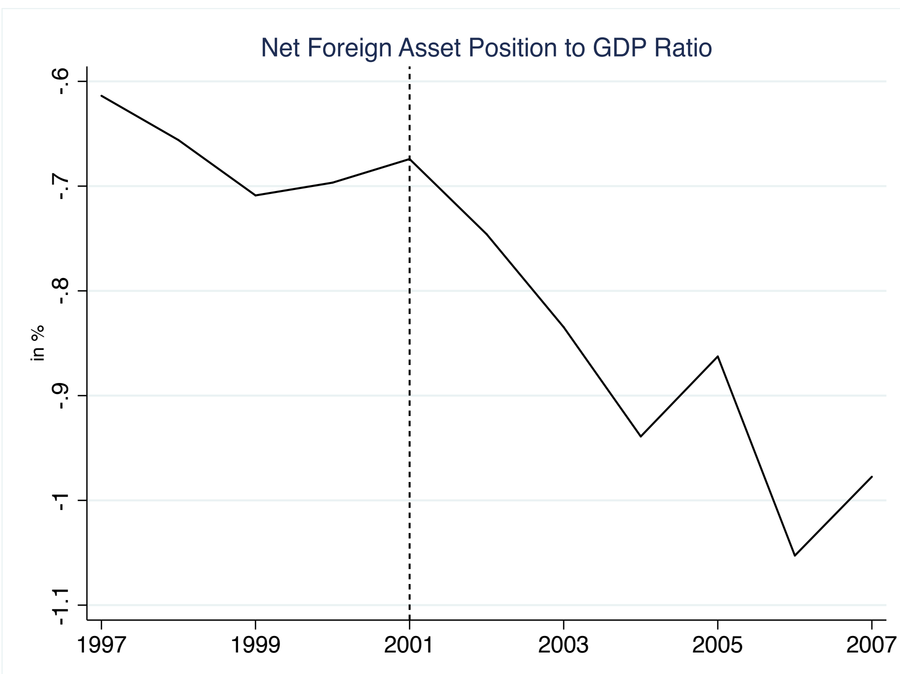


Figure C.2: Hungary: Evolution of Net Foreign Asset Position over GDP

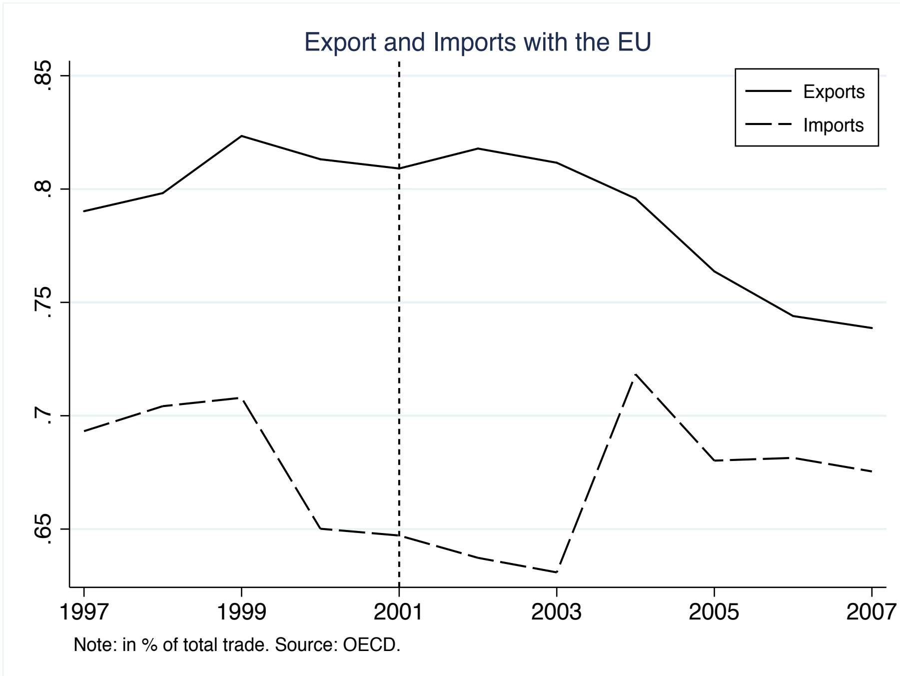


Figure C.3: Hungary: Total Exports and Imports with the EU

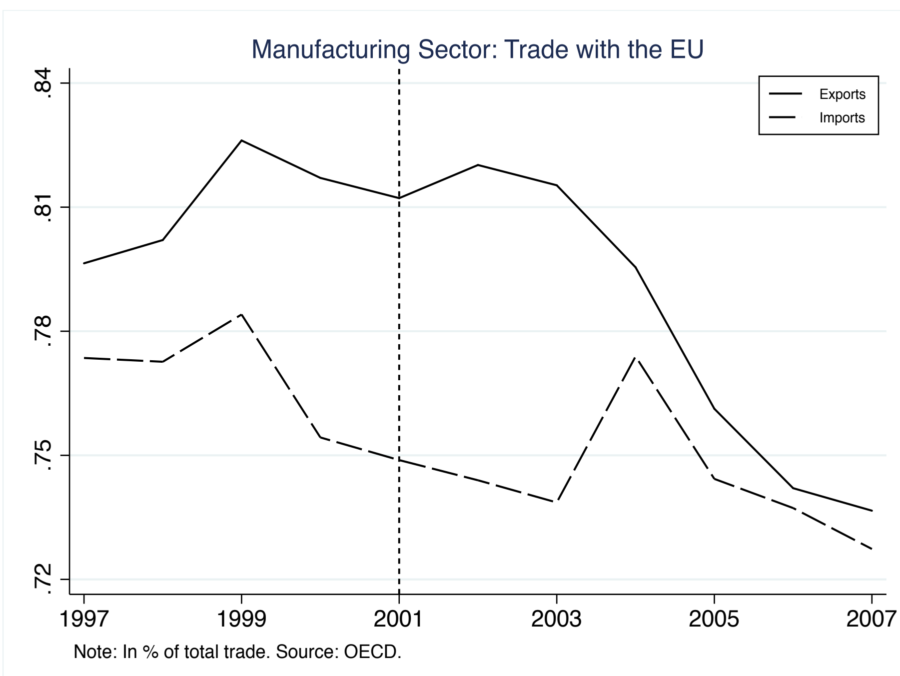


Figure C.4: Hungary: Manufacturing Trade and Exports with the EU

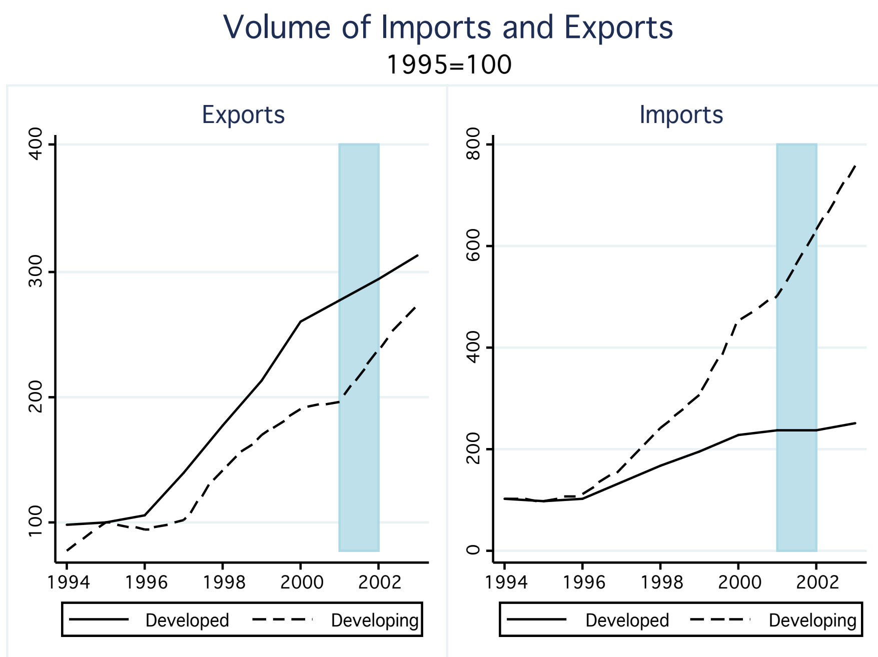


Figure C.5: Hungary: Volume of Trade

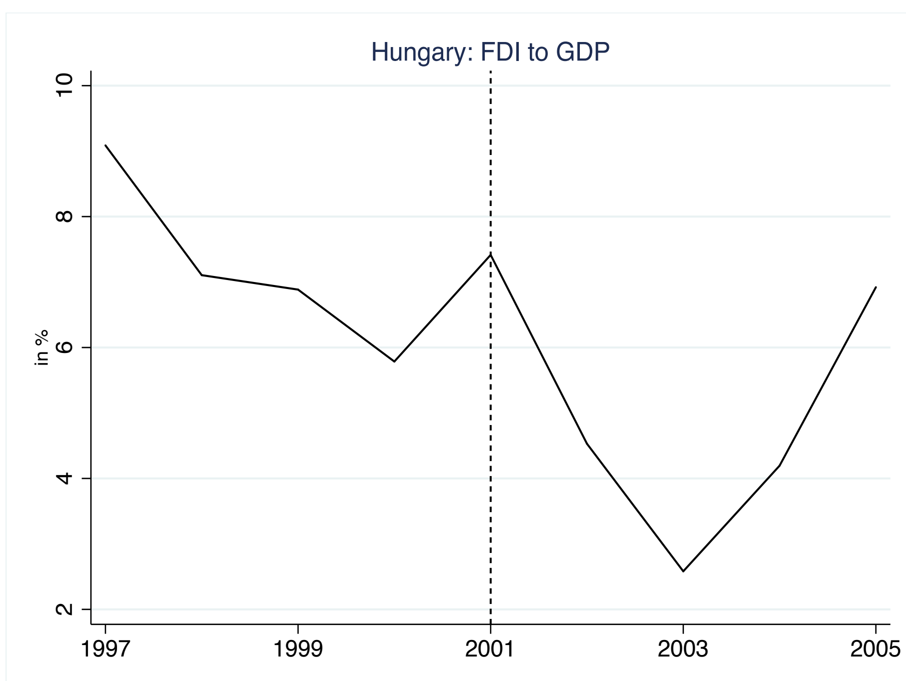


Figure C.6: Hungary: Evolution of Foreign Direct Investment

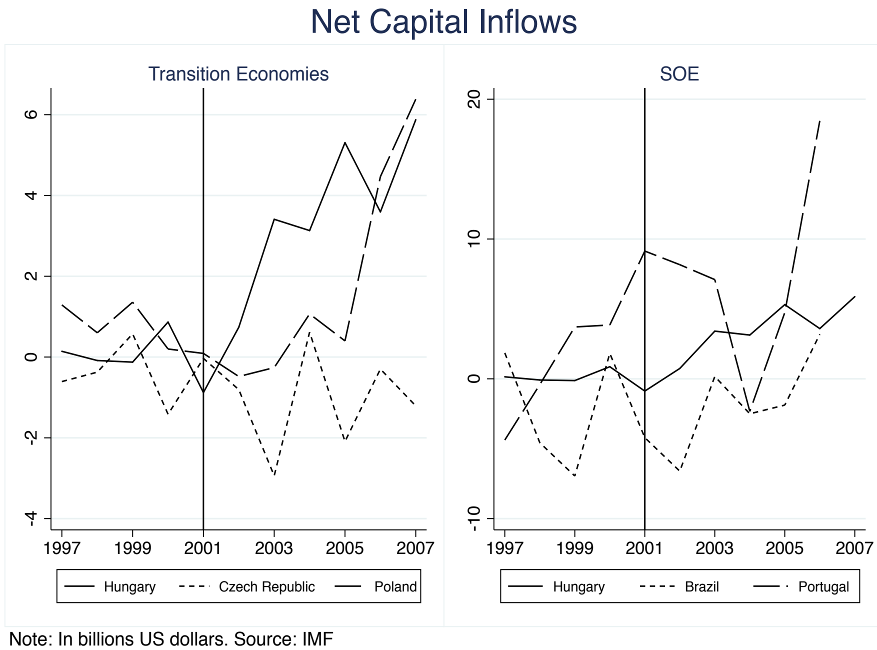


Figure C.7: Net Capital Inflows to Transition and Small Open Economies

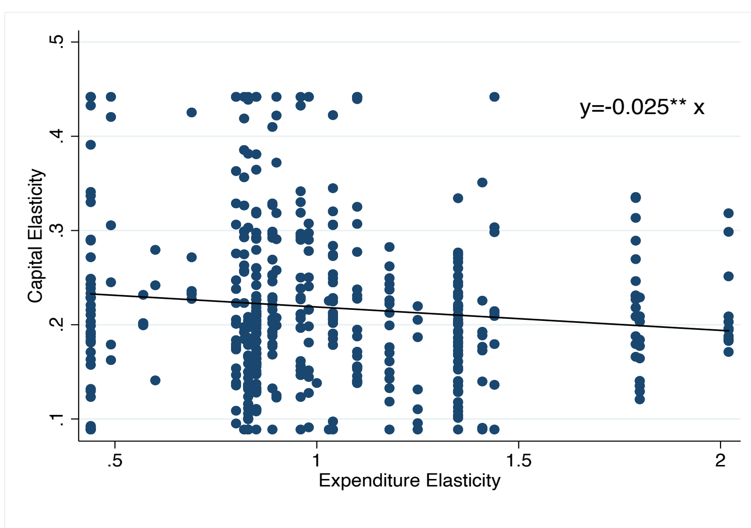


Figure C.8: Correlation between Capital and Expenditure Elasticities

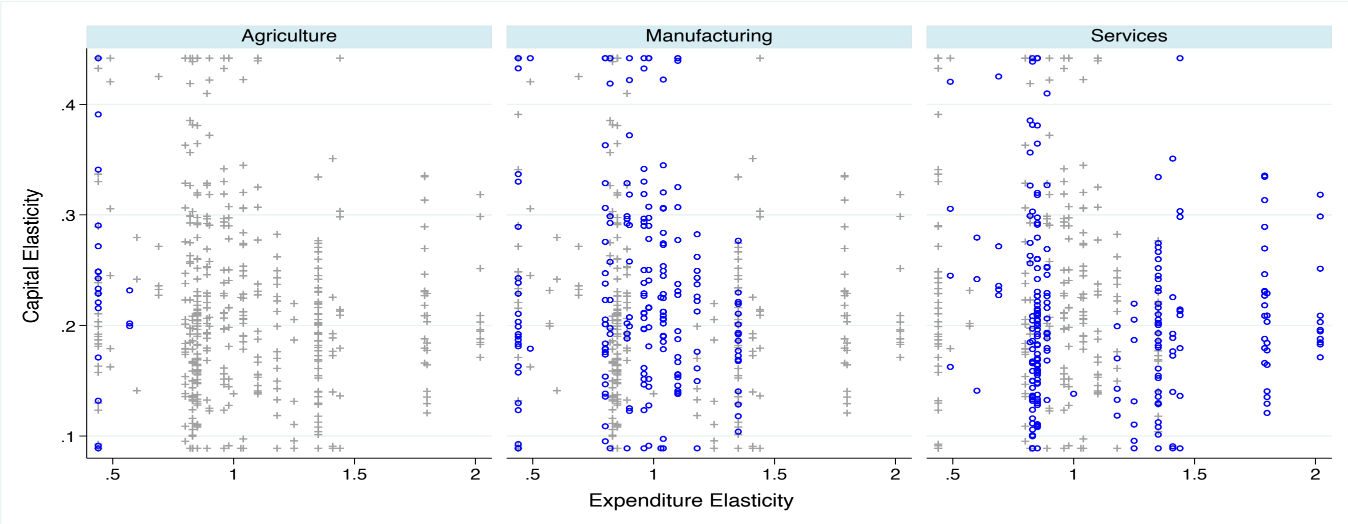


Figure C.9: Capital and Expenditure Elasticities across broadly-defined sectors

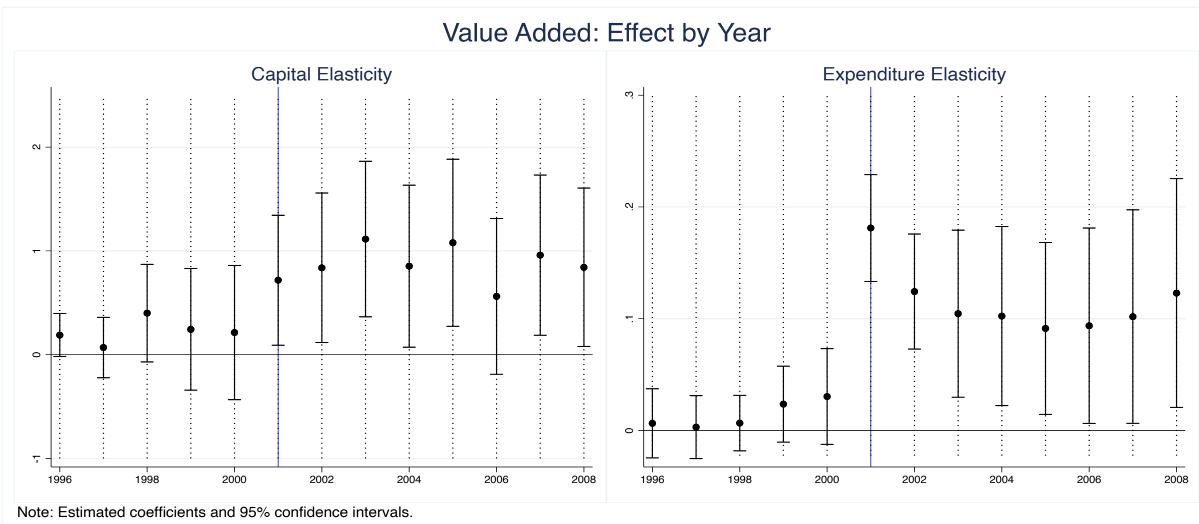


Figure C.10: Value Added: Effect by Year

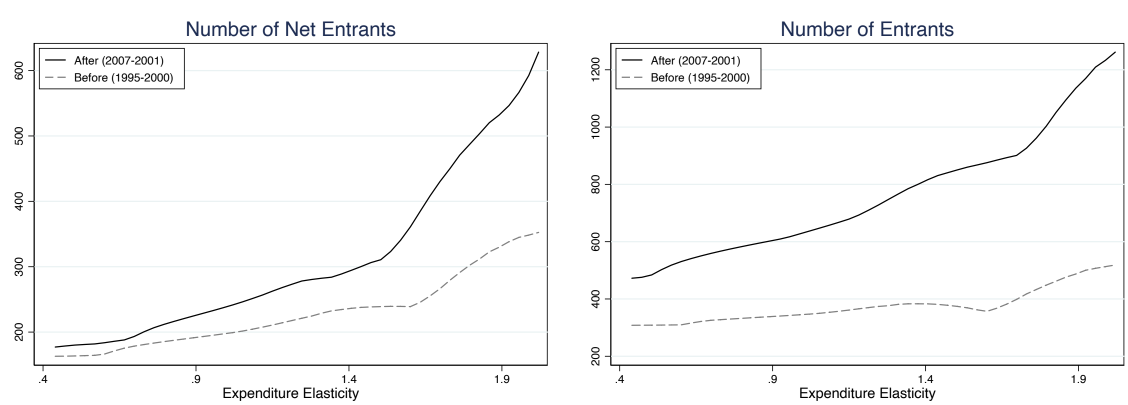


Figure C.11: Net Entrants

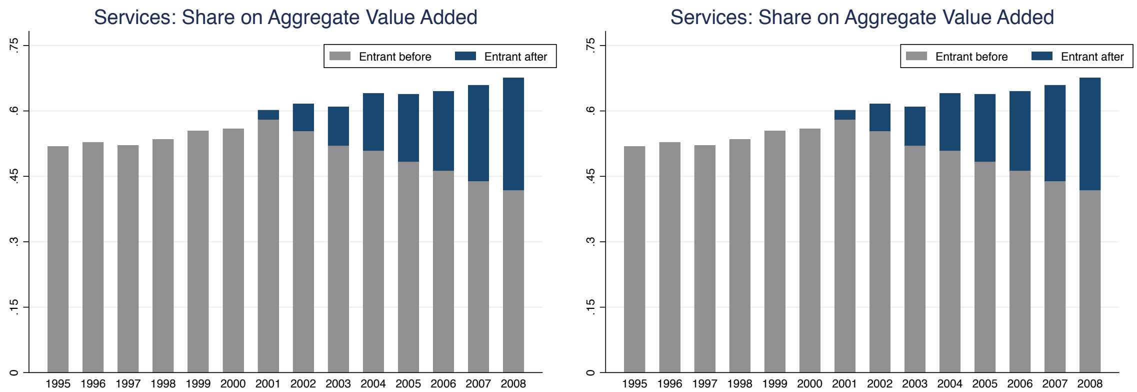


Figure C.12: Entrants Before and After the Financial Liberalization

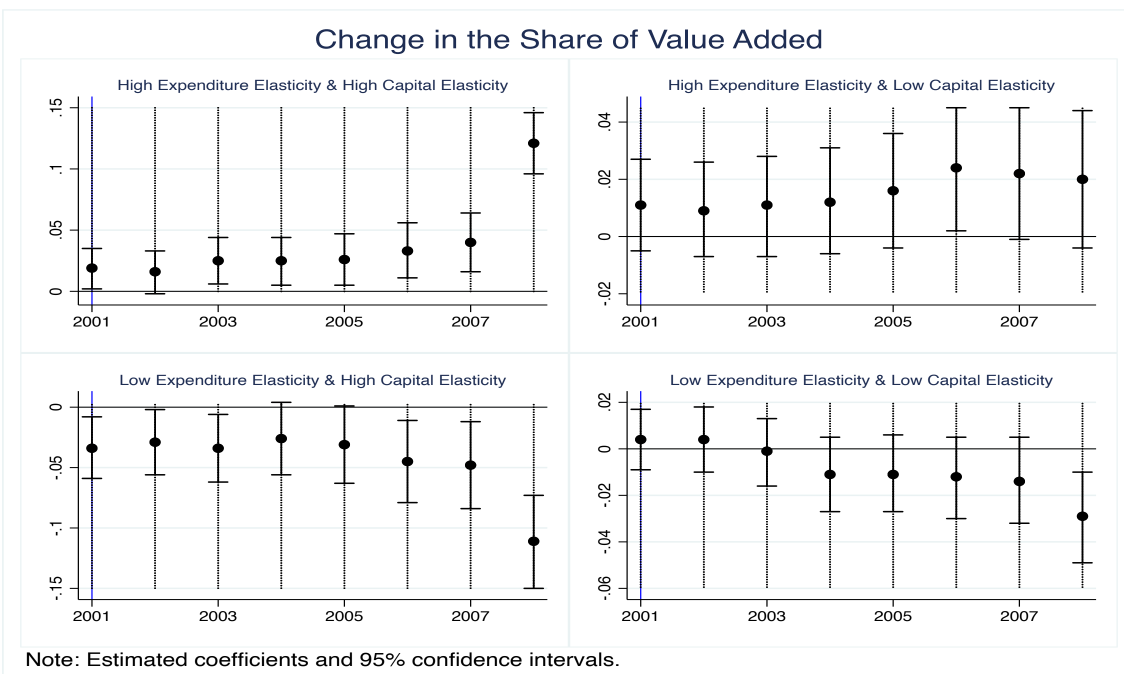


Figure C.13: Reallocation across sectors: Capital and Expenditure Elasticities

Table C.1: Financial Liberalization and Net capital Inflows

	Before	**After**	Before		After	
	1995-2000	**2001-2008**	1995-1998	1998-2000	2001-2004	2005-2008
	(1)	(2)	(3)	(4)	(5)	(6)
Financial account (net)*	2.5	8.2	1.2	3.8	6.1	10.4
NFA/GDP	-62	-87	-57	-67	-79	-95
Credit-to-GDP ratio	25	49	23	27	39	59
Lending interest rate	22	10	27	16	11	9
Consumption/GDP	74	77	74	74	77	76

Note: in %. *In billions of USD dollars. Before is 2000 and after is 2004. Source: NBH, IMF, Lane and Milesi-Ferretti (2018).

Table C.2: Expenditure Elasticity (Bils, Klenow, and Malin 2013)

Sector	Description	Expenditure elasticity
1	Agriculture, hunting and related services	0.44
2	Forestry, logging and related services	0.44
10	Mining of coal and lignite; extraction of peat	0.57
11	Extraction of crude petroleum and natural gas	0.57
12	Mining of uranium and thorium ores	0.57
13	Mining of metal ores	0.57
14	Other mining and quarrying	0.57
15	Manufacture of food products and beverages	0.44
16	Manufacture of tobacco products	0.44
17	Manufacture of textiles	1.1
18	Manufacture of wearing apparel; dressing and dyeing of fur	1.1
19	Tanning & dressing of leather; manufacture of luggage, handbags, saddlery, harness and footwear	1.1
20	Manufacture of wood & wood products & cork and straw & plaiting materials	0.82
21	Manufacture of pulp, paper and paper products	1.35
22	Publishing, printing and reproduction of recorded media	1.35
23	Manufacture of coke, refined petroleum and nuclear fuel	0.66
24	Manufacture of chemicals, and chemical products	0.9
25	Manufacture of rubber and plastic products	0.8
26	Manufacture of other non-metallic mineral products	0.8
27	Manufacture of basic metals	1.04
28	Manufacture of fabricated metal product, except machinery and equipment	1.04
29	Manufacture of machinery and equipment n.e.c	0.96
30	Manufacture of office machinery and computers	1.03
31	Manufacture of electrical machinery and apparatus n.e.c	0.98
32	Manufacture of radio, television and communication equipment and apparatus	0.98
33	Manufacture of medical, precision and optical instruments, watches and clocks	0.98
34	Manufacture of motor vehicles, trailers	0.89
35	Manufacture of other transport equipment	0.89
36	Manufacture of furniture; manufacturing n.e.c	1.18
37	Recycling	0.49
40	Electricity, gas, steam and hot water supply	0.49
41	Collection, purification and distribution of water	0.49
45	Construction	0.89
50	Sale, maintenance & repair of motor vehicles; retail sale of automotive fuel	0.85
51	Wholesale trade & commission trade, except of motor vehicles & motorcycles	0.85
52	Retail trade, except of motor vehicles and motorcycles; repair of personal & household goods	0.83
55	Hotels and restaurants	1.8
60	Land transport; transport via pipelines	2.02
61	Water transport	1
62	Air transport	1.41
63	Supporting & auxiliary transport activities; activities of travel agencies	1.41
64	Post and telecommunications	0.6
65	Financial intermediation, except insurance and pension funding	1.44
66	Insurance and pension funding, except compulsory social security	1.44
67	Activities auxiliary to financial intermediation	1.44
70	Real estate activities	2.02
71	Renting of machinery & equipment without operator & of personal & household	0.82
72	Computer and related activities	1.35
73	Research and development	1.35
74	Other business activities	1.35
85	Health and social work	1.25
90	Sewage and refuse disposal, sanitation and similar activities	0.69
91	Activities of membership organization n.e.c.	1.79
92	Recreational, cultural and sporting activities	1.79
93	Other services activities	1.18

Notes: expenditure elasticity from Bils, Klenow, and Malin (2013).

Table C.3: Expenditure Elasticity (Comin, Lashkari, and Mestieri 2018)

	Expenditure Elasticity
Agriculture	0.32
Mining	0.41
Public Utilities	1.59
Construction	1.03
Wholesale and Retail	1.62
Transport, storage, communications	1.44
Finance, insurance, real estate	2.17
Community, social and personal services	1.18

Notes: sectoral elasticities computed relative to manufacturing, which is normalized to 1. Sample: 39 developed and developing economies since 1947. Source: Comin, Lashkari, and Mestieri (2018).

Table C.4: Summary Statistics Capital and Expenditure Elasticities

	Capital elasticity (1)	Expenditure Elasticity (2)
Mean	0.22	1.01
Median	0.20	0.90
Standard Deviation	0.09	0.36
p25	0.16	0.83
p75	0.26	1.18

Notes: capital elasticity was estimated at four-digit NACE industries following Wooldridge (2009) and Petrin and Levinsohn (2012) methodology. Expenditure elasticity comes from Bils, Klenow, and Malin (2013).

Table C.5: Firms' Characteristics across Sectors

	Mean (1)	Capital Elasticity (2)	Expenditure Elasticity (3)
Log value added	7.238	4.692***	-0.429***
		(0.151)	(0.018)
Log capital	7.188	4.915***	-0.284***
		(0.165)	(0.019)
Log employment	1.414	1.211***	-0.395***
		(0.095)	(0.012)
Log RTFP	5.139	-2.448***	-0.125***
		(0.103)	(0.013)
Log age	1.335	1.106***	-0.129***
		(0.046)	(0.005)
Log export share	0.036	0.244***	-0.007***
		(0.010)	(0.001)
Number of firms	255,008	255,008	255,008

Notes: *, **, *** significant at 10, 5, and 1 percent. This table reports the estimated coefficients from a regression of the log of each variable on the capital and expenditure elasticities for the pre-reform period (1995-2000). The capital elasticity is estimated using the Petrin and Levinsohn (2012) and Wooldridge (2009) methods and the expenditure elasticity is obtained from Bils, Klenow, and Malin (2013). Source: APEH.

Table C.6: Growth Rate in the Pre-Reform Period

	Capital Elasticity			Expenditure Elasticity		
	Value Added Growth	Capital Growth	Employment Growth	Value Added Growth	Capital Growth	Employment Growth
	(1)	(2)	(3)	(4)	(5)	(6)
Capital Elasticity	-0.125	0.135	-0.080			
	(0.148)	(0.114)	(0.078)			
Expenditure Elasticity				0.003	-0.022	-0.007
				(0.014)	(0.041)	(0.005)
R^2	0.002	0.001	0.002	0.001	0.000	0.001
N	274,591	256,947	242,221	274,591	256,947	242,221
Sector FE	Yes	Yes	Yes	Yes	Yes	Yes
N	313,512	313,512	335,895	335,895	335,895	335,895

Notes: *, **, *** significant at 10, 5, and 1 percent. This table reports the estimated coefficients from a regression of the growth rate of each variable on the capital and expenditure elasticities for the pre-reform period (1995-2000). The capital elasticity is estimated using the Petrin and Levinsohn (2012) and Wooldridge (2009) methods, and the expenditure elasticity is obtained from Bils, Klenow, and Malin (2013). Source: APEH.

Table C.7: Identification Strategy: Survival Ratio

	Capital Elasticity	Expenditure Elasticity
	(1)	(2)
Survival Ratio	0.036	-0.064***
	(0.033)	(0.007)
N	103,555	103,555

Notes: *, **, *** significant at 10, 5, and 1 percent. This table reports the estimated coefficients from a regression of the survival rate between 2000 and 2007 on the capital and expenditure elasticities. The capital elasticity is estimated using the Petrin and Levinsohn (2012) and Wooldridge (2009) methods used at four-digit NACE industries, and the expenditure elasticity comes from Bils, Klenow, and Malin (2013). All regressions include a constant term. Source: APEH.

Table C.8: Firms' Characteristics across Sectors

	Agriculture	Manufacture	Services
	(1)	(2)	(3)
Value Added*	2,058	3,029	1,008
Capital*	5,200	2,140	1,038
Capital Intensity*	1,150	386	358
Employment	5	6	3
Log RTFP	5.40	5.53	5.10
Age	5	5	4
Export Share**	0.19	0.31	0.19
Number of firms	6,925	23,231	115,949

Notes: *in thousands of Forints. ** Conditional on Exporting/Importing. Median values. Average over 1995-2000. Source: APEH.

Table C.9: Firms' Characteristics across Sectors: Difference in Means

	Agriculture	Manufacturing	Services
Log value added	7.618	8.057	6.933
F-stat	177.69		4541.20
pvalue	0.00		0.00
Log capital	8.361	7.624	6.805
F-stat	471.15		2054.66
pvalue	0.00		0.00
Log capital Intensity	6.821	5.775	5.685
F-stat	1212.91		34.19
pvalue	0.00		0.00
Log employment	1.889	1.979	1.180
F-stat	19.50		5867.70
pvalue	0.00		0.00
Log TFP	5.209	5.498	5.060
F-stat	154.60		1452.39
pvalue	0.00		0.00
Log age	1.345	1.305	1.197
F-stat	17.21		446.86
pvalue	0.00		0.00
Log export share	0.025	0.082	0.029
F-stat	872.38		2608.26
pvalue	0.00		0.00
Log import share	0.023	0.098	0.042
F-stat	773.73		1424.46
pvalue	0.00		0.00

Notes: estimated coefficients of a regression of each variable on sectoral dummies in the pre-reform period (1995-2000). In particular, $y = \beta_1\text{Agriculture} + \beta_2\text{Manufacturing} + \beta_3\text{Services}$. F-statistics and p-value come from the test of equality of coefficients with respect to manufacturing firms. Source: APEH.

Table C.10: Number of Banks in Hungary

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Number of banks	43	43	43	45	45	45	45	44	44	44	44

Source: National Bank of Hungary.

Table C.11: Robustness: Standardized Beta Coefficient

	Δ Value Added (1)	Δ Capital (2)	Δ Employment (3)
Capital elasticity	0.029*	0.035***	0.022
	(0.015)	(0.012)	(0.016)
Expenditure elasticity	0.031*	-0.027	0.060***
	(0.016)	(0.019)	(0.017)
Average sectoral productivity	-0.007	0.013	0.043***
	(0.017)	(0.012)	(0.014)
Returns to scale	-0.023	0.006	-0.020
	(0.017)	(0.015)	(0.017)
R^2	0.002	0.002	0.006
N	56,525	53,987	54,251

Notes: *, **, *** significant at 10, 5, and 1 percent. Std. errors are clustered at four-digit NACE industries. The capital elasticity is estimated using the Petrin and Levinsohn (2012) and Wooldridge (2009) methods used at four-digit NACE industries, and the expenditure elasticity comes from Bils, Klenow, and Malin (2013), reported at two-digit NACE industries. Source: APEH.

Table C.12: Robustness: Panel Regression

	Log Value Added (1)	Log Capital (2)	Log Employment (3)
FL * Capital Elasticity	0.534*	1.068**	0.573*
	(0.316)	(0.392)	(0.304)
FL * Expenditure Elasticity	0.066*	-0.072	0.098**
	(0.039)	(0.065)	(0.039)
Average sectoral productivity	0.027***	0.016*	0.020**
	(0.008)	(0.008)	(0.008)
FL * Returns to scale	-0.158	0.130	-0.099
	(0.130)	(0.144)	(0.109)
Firm FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
R^2	0.802	0.865	0.781
N	905,630	846,162	791,981

Notes: *, **, *** significant at 10, 5, and 1 percent. Std. errors are clustered at year and four-digit NACE industries. The capital elasticity is estimated using the Petrin and Levinsohn (2012) and Wooldridge (2009) methods used at four-digit NACE industries, and the expenditure elasticity comes from Bils, Klenow, and Malin (2013), reported at two-digit NACE industries. Source: APEH.

Table C.13: Robustness: Non-Exporters and Domestically-Owned Firms

	Non-Exporters			Domestically-Owned Firms		
	Δ Value Added	Δ Capital	Δ Employment	Δ Value Added	Δ Capital	Δ Employment
	(1)	(2)	(3)	(4)	(5)	(6)
Capital elasticity	0.887**	1.274***	0.546*	0.653*	1.030***	0.408
	(0.399)	(0.387)	(0.327)	(0.368)	(0.354)	(0.295)
Expenditure elasticity	0.087*	-0.100	0.125***	0.103**	-0.088	0.123***
	(0.052)	(0.065)	(0.040)	(0.048)	(0.061)	(0.035)
Average sectoral productivity	0.042	0.035	0.061***	0.024	0.024	0.054***
	(0.036)	(0.028)	(0.019)	(0.038)	(0.023)	(0.018)
Returns to scale	-0.268*	0.022	-0.171	-0.210	0.058	-0.130
	(0.162)	(0.168)	(0.123)	(0.153)	(0.151)	(0.112)
R^2	0.004	0.003	0.007	0.003	0.002	0.006
N	49,102	46,636	46,805	56,525	53,987	54,251

Notes: *, **, *** significant at 10, 5, and 1 percent. Std. errors are clustered at four-digit NACE industries. Columns 1-3 exclude exporters. Columns 4-6 exclude multinational firms (where MNC are firms with 10% foreign ownership). The capital elasticity is estimated using the Petrin and Levinsohn (2012) and Wooldridge (2009) methods used at four-digit NACE industries, and the expenditure elasticity comes from Bils, Klenow, and Malin (2013), reported at two-digit NACE industries. Source: APEH.

Table C.14: Robustness: Capital and Expenditure Elasticities

	Capital Elasticity Olley and Pakes (1996)			Expenditure Elasticity Comin, Lashkari, and Mestieri (2018)		
	Δ Value Added	Δ Capital	Δ Employment	Δ Value Added	Δ Capital	Δ Employment
	(1)	(2)	(3)	(4)	(5)	(6)
Capital elasticity	0.800**	0.888***	0.887***	0.873**	1.211***	1.073***
	(0.321)	(0.244)	(0.201)	(0.431)	(0.358)	(0.255)
Expenditure elasticity	0.081*	-0.109*	0.102***	0.083*	0.076	0.288***
	(0.042)	(0.058)	(0.027)	(0.050)	(0.069)	(0.036)
Average sectoral productivity	0.015	0.017	0.043**	0.001	0.013	0.027
	(0.041)	(0.021)	(0.017)	(0.027)	(0.027)	(0.017)
Returns to scale	-0.232	0.015	-0.139	-0.210	-0.013	-0.162*
	(0.145)	(0.143)	(0.115)	(0.156)	(0.173)	(0.087)
R^2	0.004	0.002	0.009	0.002	0.002	0.015
N	56,485	53,978	54,242	47,579	53,950	54,212

Notes: *, **, *** significant at 10, 5, and 1 percent. Std. errors are clustered at four-digit NACE industries. Columns 1-3 employ capital elasticities computed with Olley and Pakes (1996) method and expenditure elasticity from Bils, Klenow, and Malin (2013). Columns 4-6 employ capital elasticity estimated using the Petrin and Levinsohn (2012) and Wooldridge (2009) methods and expenditure elasticity from Comin, Lashkari, and Mestieri (2018). Source: APEH.

Table C.15: Robustness: Financial Dependence

	Δ Value Added	Δ Capital	Δ Employment
	(1)	(2)	(3)
Capital elasticity	0.770**	1.250***	0.653**
	(0.354)	(0.377)	(0.290)
Expenditure elasticity	0.072*	-0.089	0.107***
	(0.041)	(0.074)	(0.039)
Financial Dependence	0.010**	-0.002	-0.004
	(0.004)	(0.005)	(0.004)
Average sectoral productivity	0.074	0.022	0.037
	(0.056)	(0.044)	(0.037)
Returns to scale	-0.422**	0.184	-0.141
	(0.163)	(0.205)	(0.155)
R^2	0.005	0.003	0.005
N	49,538	47,573	47,875

Notes: *, **, *** significant at 10, 5, and 1 percent. Std. errors are clustered at four-digit NACE industries. The capital elasticity is estimated using the Petrin and Levinsohn (2012) and Wooldridge (2009) methods and the expenditure elasticity comes from Bils, Klenow, and Malin (2013). Financial Dependence is the Rajan and Zingales (1998) index estimate at four-digit NACE industries. Source: APEH.

Table C.16: Robustness: Firms without Debt

	Firms Without Debt					
	Δ Value Added	Δ Capital	Δ Employment	Δ Value Added	Δ Capital	Δ Employment
	(1)	(2)	(3)	(4)	(5)	(6)
Capital elasticity	0.132	0.504	0.327	0.159	0.419	-0.125
	(0.461)	(0.327)	(0.267)	(0.371)	(0.304)	(0.328)
Expenditure elasticity	0.178*	-0.087*	0.095**	0.131**	-0.003	0.157***
	(0.095)	(0.052)	(0.041)	(0.054)	(0.037)	(0.042)
Average sectoral productivity	0.021	0.024	0.047***	0.034	0.028**	0.067***
	(0.037)	(0.020)	(0.014)	(0.033)	(0.013)	(0.017)
Returns to scale	-0.408*	0.135	-0.133	-0.104	0.118	-0.039
	(0.235)	(0.131)	(0.098)	(0.162)	(0.119)	(0.118)
R^2	0.005	0.001	0.004	0.003	0.001	0.007
N	24,919	23,053	22,973	27,790	25,712	25,578

Notes: *, **, *** significant at 10, 5, and 1 percent. Std. errors are clustered at four-digit NACE industries. Columns 1-3 exclude firms that report short-term debt between 1999-2008. Columns 4-6 exclude firms that report any type of debt with banks between 2005-2008. Source: APEH and credit registry.

Table C.17: Robustness: Continuing Firms

	Δ Value Added (1)	Δ Capital (2)	Δ Employment (3)
Capital elasticity	0.665*	1.121***	0.376
	(0.368)	(0.375)	(0.353)
Expenditure elasticity	0.094*	-0.037	0.107***
	(0.048)	(0.052)	(0.038)
Average sectoral productivity	0.024	0.027	0.060***
	(0.028)	(0.023)	(0.021)
Returns to scale	-0.287*	-0.024	-0.097
	(0.159)	(0.155)	(0.133)
R^2	0.004	0.003	0.006
N	20,936	20,936	20,936

Notes: *, **, *** significant at 10, 5, and 1 percent. Std. errors are clustered at four-digit sector level. This regressions only consider existing all over the period 1995-2008. The capital elasticity is estimated using the Petrin and Levinsohn (2012) and Wooldridge (2009) methods used at four-digit NACE industries, and the expenditure elasticity comes from Bils, Klenow, and Malin (2013), reported at two-digit NACE industries. Column 1 controls for the investment price index, columns 2 and 3 control for the value added price index. All these price indeces are defined at four-digit NACE industries. Source: APEH.

Table C.18: Robustness: Price Index

	Δ Value Added (1)	Δ Capital (2)	Δ Employment (3)
Capital elasticity	0.671*	1.135***	0.603**
	(0.365)	(0.350)	(0.280)
Expenditure elasticity	0.080*	-0.103	0.101***
	(0.047)	(0.063)	(0.034)
Sectoral price index	-0.024	0.182***	0.315***
	(0.312)	(0.069)	(0.069)
Returns to scale	-0.175	0.007	-0.226**
	(0.137)	(0.135)	(0.096)
R^2	0.002	0.003	0.008
N	56,525	53,987	54,251

Notes: *, **, *** significant at 10, 5, and 1 percent. Std. errors are clustered at four-digit sector level. The capital elasticity is estimated using the Petrin and Levinsohn (2012) and Wooldridge (2009) methods used at four-digit NACE industries, and the expenditure elasticity comes from Bils, Klenow, and Malin (2013), reported at two-digit NACE industries. Source: APEH.

Table C.19: Robustness: Controlling for Imports

	Δ Value Added	Δ Capital	Δ Employment
	(1)	(2)	(3)
Capital elasticity	0.564*	1.005***	0.352
	(0.339)	(0.365)	(0.283)
Expenditure elasticity	0.082**	-0.087	0.122***
	(0.041)	(0.063)	(0.034)
Imports	0.011***	0.004	0.016***
	(0.003)	(0.003)	(0.002)
Average sectoral productivity	0.012	0.022	0.048***
	(0.036)	(0.022)	(0.018)
Returns to scale	-0.113	0.065	-0.035
	(0.139)	(0.156)	(0.112)
R^2	0.004	0.002	0.011
N	55,928	53,535	53,278

Notes: *, **, *** significant at 10, 5, and 1 percent. Std. errors are clustered at four-digit NACE industries. The capital elasticity is estimated using the Petrin and Levinsohn (2012) and Wooldridge (2009) methods used at four-digit NACE industries, and the expenditure elasticity comes from Bils, Klenow, and Malin (2013), reported at two-digit NACE industries. Source: APEH.

Table C.20: Extensive Margin: Standardized Beta coefficients

	Industry-Level Analysis	
	Δ Net Entrants	Δ Entrants
	(1)	(2)
Capital elasticity	-0.074	-0.114**
	(0.054)	(0.046)
Expenditure elasticity	0.194***	0.154***
	(0.052)	(0.055)
R^2	0.042	0.039
N	348	348

Notes: *, **, *** significant at 10, 5, and 1 percent. Std. errors are clustered at four-digit NACE industries. The capital elasticity is estimated using the Petrin and Levinsohn (2012) and Wooldridge (2009) methods used at four-digit NACE industries, and the expenditure elasticity comes from Bils, Klenow, and Malin (2013), reported at two-digit NACE industries. Source: APEH.

Table C.21: Top 30 Sectors: Net Entry (2001-2007)

Activity	Broad sector (II digits)	Sector (IV digits)	Description	Expenditure elasticity	Net entry per year	Number of employees	Share agg. employment (in %)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Service	Real estate activities	7012	Buying and selling of own real estate	2.02	982	2	0.08
Service	Construction	4521	General construction of buildings and civil engineering works	0.89	505	3	0.21
Service	Hotels and restaurants	5530	Restaurants	1.80	480	3	0.13
Service	Other business activities	7414	Business and management consultancy activities	1.35	446	2	0.08
Service	Other business activities	7487	Other business activities n.e.c.	1.35	439	3	0.10
Service	Retail trade	5248	Other retail sale in specialized stores	0.83	420	2	0.06
Service	Land transport	6024	Freight transport by road	2.02	404	3	0.08
Service	Other business activities	7420	Architectural and engineering activities and related technical consultancy	1.35	363	2	0.06
Service	Real estate activities	7020	Letting of own property	2.02	297	4	0.03
Service	Retail trade	5211	Retail sale in non-specialized stores with food, beverages or tobacco predominating	0.83	271	4	0.11
Service	Sale, maintenance and repair of motor vehicles	5010	Sale of motor vehicles	0.85	250	2	0.06
Service	Hotels and restaurants	5540	Bars	1.80	248	2	0.04
Service	Retail trade	5263	Other non-store retail sale	0.83	229	2	0.02
Service	Construction	4531	Installation of electrical wiring and fittings	0.89	212	3	0.05
Service	Other business activities	7411	Legal activities	1.35	211	2	0.04
Service	Retail trade	5242	Retail sale of clothing	0.83	201	2	0.06
Service	Computer and related activities	7222	Other software consultancy and supply	1.35	199	2	0.04
Service	Construction	4533	Plumbing	0.89	197	3	0.04
Service	Sale, maintenance and repair of motor vehicles	5020	Maintenance and repair of motor vehicles	0.85	189	2	0.03
Service	Activities auxiliary to financial inter	6720	Activities auxiliary to insurance and pension funding	1.44	182	1	0.02
Service	Real estate activities	7011	Development and selling of real estate	2.02	176	2	0.01
Service	Other business activities	7460	Investigation and security activities	1.35	170	6	0.11
Service	Other services activities	9302	Hairdressing and other beauty treatment	1.18	151	2	0.02
Service	Retail trade	5246	Retail sale of hardware, paints and glass	0.83	143	2	0.03
Service	Other business activities	7440	Advertising	1.35	141	2	0.03
Service	Recreational, cultural and sporting activities	9262	Other sporting activities	1.79	131	2	0.01
Service	Activities auxiliary to financial inter	6713	Activities auxiliary to financial intermediation n.e.c.	1.44	123	2	0.01
Service	Computer and related activities	7220	Software consultancy and supply	1.35	121	2	0.03
Service	Other business activities	7470	Industrial cleaning	1.35	121	7	0.08
Service	Construction	4544	Painting and glazing	0.89	112	2	0.03
Total					8109		1.68

Table C.22: Aggregate Trends

	High Expenditure Elasticity & High Capital Elasticity			High Expenditure Elasticity & Low Capital Elasticity			Low Expenditure Elasticity & High Capital Elasticity			Low Expenditure Elasticity & Low Capital Elasticity		
	Value Added (1)	Empl. (2)	Number of Firms (3)	Value Added (4)	Empl. (5)	Number of Firms (6)	Value Added (7)	Empl. (8)	Number of Firms (9)	Value Added (10)	Empl. (11)	Number of Firms (12)
2001	0.019**	0.011**	0.013***	0.011	-0.002	0.013**	-0.034**	0.004	-0.017**	0.004	-0.013**	-0.009***
	(0.007)	(0.003)	(0.003)	(0.007)	(0.004)	(0.005)	(0.011)	(0.006)	(0.007)	(0.006)	(0.005)	(0.002)
2002	0.016*	0.019***	0.010**	0.009	-0.001	0.010	-0.029**	0.002	-0.010	0.004	-0.021***	-0.010***
	(0.007)	(0.004)	(0.003)	(0.007)	(0.005)	(0.006)	(0.011)	(0.006)	(0.007)	(0.006)	(0.005)	(0.002)
2003	0.025**	0.025***	0.010**	0.011	0.003	0.011	-0.034**	0.005	-0.004	-0.001	-0.033***	-0.017***
	(0.008)	(0.004)	(0.003)	(0.008)	(0.005)	(0.006)	(0.012)	(0.007)	(0.007)	(0.006)	(0.006)	(0.002)
2004	0.025**	0.031***	0.000	0.012	0.015**	0.025***	-0.026*	-0.005	-0.020**	-0.011	-0.041***	-0.005*
	(0.008)	(0.004)	(0.004)	(0.008)	(0.005)	(0.006)	(0.013)	(0.007)	(0.008)	(0.007)	(0.006)	(0.002)
2005	0.026**	0.039***	0.001	0.016	0.013**	0.022**	-0.031*	0.001	-0.013	-0.011	-0.053***	-0.010***
	(0.009)	(0.004)	(0.004)	(0.009)	(0.005)	(0.007)	(0.014)	(0.008)	(0.008)	(0.007)	(0.007)	(0.002)
2006	0.033***	0.046***	0.008*	0.024**	0.016**	0.019**	-0.045**	0.005	-0.004	-0.012	-0.067***	-0.024***
	(0.009)	(0.005)	(0.004)	(0.009)	(0.006)	(0.007)	(0.014)	(0.008)	(0.009)	(0.007)	(0.007)	(0.002)
2007	0.040***	0.051***	0.003	0.022*	0.018**	0.017*	-0.048**	0.011	0.004	-0.014	-0.080***	-0.024***
	(0.010)	(0.005)	(0.004)	(0.010)	(0.006)	(0.007)	(0.015)	(0.009)	(0.009)	(0.008)	(0.007)	(0.003)
2008	0.121***	0.071***	0.067***	0.020*	0.011	-0.022**	-0.111***	0.013	0.009	-0.029**	-0.096***	-0.054***
	(0.011)	(0.005)	(0.005)	(0.010)	(0.006)	(0.008)	(0.016)	(0.009)	(0.010)	(0.008)	(0.008)	(0.003)
Time trend	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.980	0.973	0.995	0.983	0.997	0.997	0.985	0.997	0.998	0.819	0.987	0.991
N	17	17	17	17	17	17	17	17	17	17	17	17

Notes: *, **, *** significant at 10, 5, and 1 percent. The capital elasticity is estimated using the Petrin and Levinsohn (2012) and Wooldridge (2009) methods used at four-digit NACE industries, and the expenditure elasticity comes from Bils, Klenow, and Malin (2013), reported at two-digit NACE industries. Source: APEH.

Theory Appendices

Appendix D Steady State System

$$
\begin{aligned}
Endogenous(39) &= \{P, P_S, P_M, P_M^D, w, r^k, r, \phi_j\} = 8 \\
&= \{C, C_S, C_M, C_M^D, C_M^F, B, TB, K, X_M, Y, TBY\} = 11 \\
&= \{M_j, M_j^e, \varphi_S^d, \varphi_M^d, \varphi_M^x\} = 5 \\
&= \{c_j(\varphi), p_j(\varphi), q_j^d(\varphi), q_M^x(\varphi), \pi_j^d(\varphi), \pi_M^x(\varphi), V_S(\varphi), V_M(\varphi), V_M^d(\varphi), V_M^x(\varphi), \mu_j(\varphi)\} = 11 \\
&= \{k_j^d(\varphi), k_M^x(\varphi), l_j^d(\varphi), l_M^x(\varphi)\} = 4
\end{aligned}
$$

Appendix D.1 Household

$$P_M = \left[\theta_D (P_M^D)^{1-\eta_M} + \theta_F (P_M^F = 1)^{1-\eta_M}\right]^{\frac{1}{1-\eta_M}} \tag{G.1}$$

$$P = \left[\theta_M P_M^{1-\eta} C^{e_M - 1} + \theta_S P_S^{1-\eta} C^{e_S - 1}\right]^{\frac{1}{1-\eta}} \tag{G.2}$$

$$C_S = \left(\frac{P_S}{P}\right)^{-\eta} \theta_S C^{e_S} \tag{G.3}$$

$$C_M = \left(\frac{P_M}{P}\right)^{-\eta} \theta_M C^{e_M} \tag{G.4}$$

$$C_M^D = \left(\frac{P_M^D}{P_M}\right)^{-\eta_M} \theta_D C_M \tag{G.5}$$

$$C_M^F = \left(\frac{P_M^F = 1}{P_M}\right)^{-\eta_M} \theta_F C_M \tag{G.6}$$

$$r^k = \frac{1}{\beta} - 1 + \delta^k \tag{G.7}$$

$$1 = \beta\,(1 + r) \tag{G.8}$$

$$r = r^* + \tau \tag{G.9}$$

Appendix D.2 Production

Appendix D.2.1 Composite price, costs, prices, demands, profits, inputs demands

$$\phi_j = \left(\frac{r^k}{\alpha_j}\right)^{\alpha_j}\left(\frac{w}{1-\alpha_j}\right)^{1-\alpha_j} \qquad j \in \{S, M\} \tag{G.10}$$

$$c_j(\varphi) = \frac{\phi_j}{\varphi} \qquad j \in \{S, M\} \tag{G.11}$$

$$p_j(\varphi) = \frac{1}{\rho} c_j(\varphi) \qquad j \in \{S, M\} \tag{G.12}$$

$$q_S^d(\varphi) = C_S \left(\frac{p_S(\varphi)}{P_S}\right)^{-\sigma} \tag{G.13}$$

$$q_M^d(\varphi) = C_M^D \left(\frac{p_M(\varphi)}{P_M^D}\right)^{-\sigma} \tag{G.14}$$

$$q_M^x(\varphi) = A\left(p_M(\varphi)\right)^{-\sigma} \tag{G.15}$$

$$\pi_j^d(\varphi) = \Big[p_j(\varphi) - c_j(\varphi)\Big] q_j^d(\varphi) - \phi_j f_j^d \qquad j \in \{S, M\} \tag{G.16}$$

$$\pi_M^x(\varphi) = \Big[p_M(\varphi) - c_M(\varphi)\Big] q_M^x(\varphi) - \phi_M f_M^x \tag{G.17}$$

$$k_j^d(\varphi) = \alpha_j \frac{\phi_j}{r^k}\left[\frac{q_j^d(\varphi)}{\varphi} + f_j^d\right] \qquad j \in \{S, M\} \tag{G.18}$$

$$k_M^x(\varphi) = \alpha_M \frac{\phi_M}{r^k}\left[\frac{q_M^x(\varphi)}{\varphi} + f_M^x\right] \tag{G.19}$$

$$l_j^d(\varphi) = (1-\alpha_j)\frac{\phi_j}{w}\left[\frac{q_j^d(\varphi)}{\varphi} + f_j^d\right] \qquad j \in \{S, M\} \tag{G.20}$$

$$l_M^x(\varphi) = (1-\alpha_M)\frac{\phi_M}{w}\left[\frac{q_M^x(\varphi)}{\varphi} + f_M^x\right] \tag{G.21}$$

Appendix D.2.2 Value Functions and Cut-Offs

$$V_S(\varphi) = \max\left\{0, \frac{\pi_S^d(\varphi)}{1-\beta(1-\delta)}\right\} \tag{G.22}$$

$$V_M(\varphi) = \max\left\{V_M^d(\varphi), V_M^x(\varphi)\right\} \tag{G.23}$$

$$V_M^d(\varphi) = \max\left\{0, \frac{\pi_M^d(\varphi)}{1-\beta(1-\delta)}\right\} \tag{G.24}$$

$$V_M^x(\varphi) = \max\left\{0, \frac{\pi_M^d(\varphi) + \pi_M^x(\varphi)}{1 - \beta(1-\delta)}\right\} \tag{G.25}$$

$$V_S(\varphi_S^d) = 0 \tag{G.26}$$

$$V_M^d(\varphi_M^d) = 0 \tag{G.27}$$

$$V_M^x(\varphi_M^x) = 0 \quad \Leftrightarrow \quad \pi_M^x(\varphi_M^x) = 0 \tag{G.28}$$

Appendix D.2.3 Stationary distribution, mass of firms, and free-entry condition

$$\mu_j(\varphi) = \begin{cases} \frac{g(\varphi)}{1-G(\varphi_j^d)} & \text{if} \quad \varphi \geq \varphi_j^d \\ 0 & \text{otherwise} \end{cases} \qquad j \in \{S, M\} \tag{G.29}$$

$$\delta M_j = \left[1 - G(\varphi_j^d)\right] M_j^e \qquad j \in \{S, M\} \tag{G.30}$$

$$\int_{\varphi_j^d}^{\infty} V_j(\varphi) g(\varphi) d\varphi = \phi_j \left[f_j^e + \xi \left(\exp\left(\frac{M_j^e - \overline{M}_j^e}{\overline{M}_j^e}\right) - 1\right)\right] \qquad j \in \{S, M\} \tag{G.31}$$

Appendix D.2.4 Aggregation

$$L_S^{prod} = M_S \int_{\varphi_S^d}^{\infty} l_S^d(\varphi) \mu_S(\varphi) d\varphi$$

$$L_M^{prod} = M_M \int_{\varphi_M^d}^{\infty} l_M^d(\varphi) \mu_M(\varphi) d\varphi + M_M \int_{\varphi_M^x}^{\infty} l_M^x(\varphi) \mu_M(\varphi) d\varphi$$

$$L_j^{entry} = M_j^e \cdot \nu(1 - \alpha_{1j}) \cdot \frac{\phi_j}{w} \left[f_j^e + \xi \left(\exp\left(\frac{M_j^e - \overline{M}_j^e}{\overline{M}_j^e}\right) - 1\right)\right] \qquad j \in \{S, M\}$$

$$L_j = L_j^{prod} + L_j^{entry} \qquad j \in \{S, M\}$$

$$\overline{L} = L_M + L_S \tag{G.32}$$

$$K_S^{prod} = M_S \in_{\varphi_S^d}^{\infty} k_S^d(\varphi) \mu_S(\varphi) d\varphi$$

$$K_M^{prod} = M_M \int_{\varphi_M^d}^{\infty} k_M^d(\varphi) \mu_M(\varphi) d\varphi + M_M \int_{\varphi_M^x}^{\infty} k_M^x(\varphi) \mu_M(\varphi) d\varphi$$

$$K_j^{entry} = M_j^e \cdot \nu \alpha_{1j} \cdot \frac{\phi_j}{r^k} \left[f_j^e + \xi \left(\exp\left(\frac{M_j^e - \overline{M}_j^e}{\overline{M}_j^e}\right) - 1\right)\right] \qquad j \in \{S, M\}$$

$$K_j = K_j^{prod} + K_j^{entry} \qquad j \in \{S, M\}$$

$$K = K_M + K_S \tag{G.33}$$

Appendix D.3 Markets Clear

$$P_S C_S = M_S \int_{\varphi_S^d}^{\infty} p_S(\varphi) q_S^d(\varphi) \mu_S(\varphi) d\varphi \tag{G.34}$$

$$P_M^D C_M^D = M_M \int_{\varphi_M^d}^{\infty} p_M(\varphi) q_M^d(\varphi) \mu_M(\varphi) d\varphi \tag{G.35}$$

$$X_M = M_M \int_{\varphi_M^x}^{\infty} p_M(\varphi) q_M^x(\varphi) \mu_M(\varphi) d\varphi \tag{G.36}$$

$$B = -\frac{TB}{(r - \tau)} \tag{G.37}$$

$$TB = X_M - C_M^F - \delta^k K \tag{G.38}$$

$$TBY \equiv TB/Y \tag{G.39}$$

$$Y \equiv PC + \delta K + TB = P_S C_S + P_M^D C_M^D + X_M \tag{G.40}$$

Appendix E Dynamic System

$$
\begin{aligned}
Endogenous(42) &= \{P, P_S, P_M, P_M^D, w, r^k, r, \Lambda, \lambda, \phi_j\} = 10 \\
&= \{C, C_S, C_M, C_M^D, C_M^F, B, TB, K, X_M, Y, TBY\} = 11 \\
&= \{M_j, M_j^e, \varphi_S^d, \varphi_M^d, \varphi_M^x\} = 5 \\
&= \{c_j(\varphi), p_j(\varphi), q_S^d(\varphi), q_M^d(\varphi), q_M^x(\varphi), \pi_j^d(\varphi), \pi_M^x(\varphi), V_S(\varphi), V_M(\varphi), V_M^d(\varphi), V_M^x(\varphi), \mu_j(\varphi)\} = 12 \\
&= \{k_j^d(\varphi), k_M^x(\varphi), l_j^d(\varphi), l_M^x(\varphi)\} = 4
\end{aligned}
$$

Appendix E.1 Household

$$P_{Mt} = \left[\theta_D (P_{Mt}^D)^{1-\eta_M} + \theta_F (P_{Mt}^F = 1)^{1-\eta_M}\right]^{\frac{1}{1-\eta_M}} \tag{G.1}$$

$$P_t = \left[\theta_M P_{Mt}^{1-\eta} C_t^{e_M - 1} + \theta_S P_{St}^{1-\eta} C_t^{e_S - 1}\right]^{\frac{1}{1-\eta}} \tag{G.2}$$

$$C_{St} = \left(\frac{P_{St}}{P_t}\right)^{-\eta} \theta_S C_t^{e_S} \tag{G.3}$$

$$C_{Mt} = \left(\frac{P_{Mt}}{P_t}\right)^{-\eta} \theta_M C_t^{e_M} \tag{G.4}$$

$$C_{Mt}^D = \left(\frac{P_{Mt}^D}{P_{Mt}}\right)^{-\eta_M} \theta_D C_{Mt} \tag{G.5}$$

$$C_{Mt}^F = \left(\frac{P_{Mt}^F = 1}{P_{Mt}}\right)^{-\eta_M} \theta_F C_{Mt} \tag{G.6}$$

$$\lambda_t = \frac{C_t^{-\gamma}}{P_t} \left[\frac{1-\eta}{\epsilon_M \theta_M^{\frac{1}{\eta}} C_t^{\frac{\epsilon_M - \eta}{\eta}} C_{Mt}^{\frac{\eta-1}{\eta}} + \epsilon_S \theta_S^{\frac{1}{\eta}} C_t^{\frac{\epsilon_S - \eta}{\eta}} C_{St}^{\frac{\eta-1}{\eta}} - \eta}\right] \tag{G.7}$$

$$\Lambda_{t,t+1} = \beta \frac{\lambda_{t+1}}{\lambda_t} \tag{G.8}$$

$$1 = \Lambda_{t,t+1}(1 - \delta^k + r_{t+1}^k) \tag{G.9}$$

$$1 = \Lambda_{t,t+1}\left(1 + r_{t+1}\right) \tag{G.10}$$

$$r_{t+1} = r^* + \tau \tag{G.11}$$

Appendix E.2 Production

Appendix E.2.1 Composite price, costs, prices, demands, profits, inputs demands

$$\phi_{jt} = \left(\frac{r_t^k}{\alpha_j}\right)^{\alpha_j} \left(\frac{w_t}{1-\alpha_j}\right)^{(1-\alpha_j)} \qquad j \in \{S, M\} \tag{G.12}$$

$$c_{jt}(\varphi) = \frac{\phi_{jt}}{\varphi} \qquad j \in \{S, M\} \tag{G.13}$$

$$p_{jt}(\varphi) = \frac{1}{\rho} c_{jt}(\varphi) \qquad j \in \{S, M\} \tag{G.14}$$

$$q_{St}^d(\varphi) = C_{St} \left(\frac{p_{St}(\varphi)}{P_{St}}\right)^{-\sigma} \tag{G.15}$$

$$q_{Mt}^d(\varphi) = C_{Mt}^D \left(\frac{p_{Mt}(\varphi)}{P_{Mt}^D}\right)^{-\sigma} \tag{G.16}$$

$$q_{Mt}^x(\varphi) = A\left(p_{Mt}(\varphi)\right)^{-\sigma} \tag{G.17}$$

$$\pi_{jt}^d(\varphi) = \Big[p_{jt}(\varphi) - c_{jt}(\varphi)\Big] q_{jt}^d(\varphi) - \phi_{jt} f_j^d \qquad j \in \{S, M\} \tag{G.18}$$

$$\pi_{Mt}^x(\varphi) = \Big[p_{Mt}(\varphi) - c_{Mt}(\varphi)\Big] q_{Mt}^x(\varphi) - \phi_{Mt} f_M^x \tag{G.19}$$

$$k_{jt}^d(\varphi) = \alpha_j \frac{\phi_{jt}}{r_t^k} \left[\frac{q_{jt}^d(\varphi)}{\varphi} + f_j^d\right] \qquad j \in \{S, M\} \tag{G.20}$$

$$k_{Mt}^x(\varphi) = \alpha_M \frac{\phi_{Mt}}{r_t^k} \left[\frac{q_{Mt}^x(\varphi)}{\varphi} + f_M^x\right] \tag{G.21}$$

$$l_{jt}^d(\varphi) = (1-\alpha_j) \frac{\phi_{jt}}{w_t} \left[\frac{q_{jt}^d(\varphi)}{\varphi} + f_j^d\right] \qquad j \in \{S, M\} \tag{G.22}$$

$$l_{Mt}^x(\varphi) = (1-\alpha_M) \frac{\phi_{Mt}}{w_t} \left[\frac{q_{Mt}^x(\varphi)}{\varphi} + f_M^x\right] \tag{G.23}$$

Appendix E.2.2 Value Functions and Cut-Offs

$$V_{St}(\varphi) = \max\Big\{0, \pi_{St}^d(\varphi) + (1-\delta)\Lambda_{t,t+1} V_{S,t+1}(\varphi)\Big\} \tag{G.24}$$

$$V_{Mt}(\varphi) = \max\Big\{V_{Mt}^d(\varphi), V_{Mt}^x(\varphi)\Big\} \tag{G.25}$$

$$V_{Mt}^d(\varphi) = \max\Big\{0, \pi_{Mt}^d(\varphi) + (1-\delta)\Lambda_{t,t+1} V_{M,t+1}(\varphi)\Big\} \tag{G.26}$$

$$V^x_{Mt}(\varphi) = \max\left\{0, \pi^d_{Mt}(\varphi) + \pi^x_{Mt}(\varphi) + (1-\delta)\Lambda_{t,t+1}V_{M,t+1}(\varphi)\right\} \tag{G.27}$$

$$V_{St}(\varphi^d_{St}) = 0 \tag{G.28}$$

$$V^d_{Mt}(\varphi^d_{Mt}) = 0 \tag{G.29}$$

$$V^x_{Mt}(\varphi^x_{Mt}) = 0 \quad \Leftrightarrow \quad \pi^x_{Mt}(\varphi^x_{Mt}) = 0 \tag{G.30}$$

Appendix E.2.3 Stationary distribution, mass of firms, and free-entry condition

$$M_{j,t+1}\mu_{j,t+1}(\varphi) = \begin{cases} (1-\delta)M_{jt}\mu_{jt}(\varphi) + M^e_{j,t+1}g(\varphi) & \text{if} \quad \varphi \geq \varphi^d_{j,t+1} \\ 0 & \text{otherwise} \end{cases} \qquad j \in \{S, M\} \tag{G.31}$$

$$M_{j,t+1} = (1-\delta)M_{jt}\int_{\varphi^d_{j,t+1}}^{\infty} \mu_{jt}(\varphi)d\varphi + M^e_{j,t+1}\int_{\varphi^d_{j,t+1}}^{\infty} g(\varphi)d\varphi \qquad j \in \{S, M\} \tag{G.32}$$

$$\int_{\varphi^d_{jt}}^{\infty} V_{jt}(\varphi)g(\varphi)d\varphi = \phi_{jt}\left[f^e_j + \xi\left(\exp\left(\frac{M^e_{jt} - \overline{M}^e_j}{\overline{M}^e_j}\right) - 1\right)\right] \qquad j \in \{S, M\} \tag{G.33}$$

Appendix E.2.4 Aggregation

$$L^{prod}_{St} = M_{St}\int_{\varphi^d_{St}}^{\infty} l^d_{St}(\varphi)\mu_{St}(\varphi)d\varphi$$

$$L^{prod}_{Mt} = M_{Mt}\int_{\varphi^d_{Mt}}^{\infty} l^d_{Mt}(\varphi)\mu_{Mt}(\varphi)d\varphi + M_{Mt}\int_{\varphi^x_{Mt}}^{\infty} l^x_{Mt}(\varphi)\mu_{Mt}(\varphi)d\varphi$$

$$L^{entry}_{jt} = M^e_{jt}\cdot(1-\alpha_j)\cdot\frac{\phi_{jt}}{w_t}\left[f^e_j + \xi\left(\exp\left(\frac{M^e_{jt} - \overline{M}^e_j}{\overline{M}^e_j}\right) - 1\right)\right] \qquad j \in \{S, M\}$$

$$L_{jt} = L^{prod}_{jt} + L^{entry}_{jt} \qquad j \in \{S, M\}$$

$$\overline{L} = L_{Mt} + L_{St} \tag{G.34}$$

$$K^{prod}_{St} = M_{St}\int_{\varphi^d_{St}}^{\infty} k^d_{St}(\varphi)\mu_{St}(\varphi)d\varphi$$

$$K^{prod}_{Mt} = M_{Mt}\int_{\varphi^d_{Mt}}^{\infty} k^d_{Mt}(\varphi)\mu_{Mt}(\varphi)d\varphi + M_{Mt}\int_{\varphi^x_{Mt}}^{\infty} k^x_{Mt}(\varphi)\mu_{Mt}(\varphi)d\varphi$$

$$K_{jt}^{entry} = M_{jt}^{e} \cdot \alpha_j \cdot \frac{\phi_{jt}}{r_t^k} \left[f_j^e + \xi \left(\exp\left(\frac{M_{jt}^e - \overline{M}_j^e}{\overline{M}_j^e} \right) - 1 \right) \right] \qquad j \in \{S, M\}$$

$$K_{jt} = K_{jt}^{prod} + K_{jt}^{entry} \qquad j \in \{S, M\}$$

$$K_t = K_{Mt} + K_{St} \tag{G.35}$$

Appendix E.3 Markets Clear

$$P_{St}C_{St} = M_{St} \int_{\varphi_{St}^d}^{\infty} p_{St}(\varphi) q_{St}^d(\varphi) \mu_{St}(\varphi) d\varphi \tag{G.36}$$

$$P_{Mt}^D C_{Mt}^D = M_{Mt} \int_{\varphi_{Mt}^d}^{\infty} p_{Mt}(\varphi) q_{Mt}^d(\varphi) \mu_{Mt}(\varphi) d\varphi \tag{G.37}$$

$$X_{Mt} = M_{Mt} \int_{\varphi_{Mt}^x}^{\infty} p_{Mt}(\varphi) q_{Mt}^x(\varphi) \mu_{Mt}(\varphi) d\varphi \tag{G.38}$$

$$B_{t+1} = (1 + r_t - \tau) B_t + TB_t \tag{G.39}$$

$$TB_t = X_{Mt} - C_{Mt}^F - (K_{t+1} - (1 - \delta^k) K_t) \tag{G.40}$$

$$TBY_t \equiv TB_t / Y_t \tag{G.41}$$

$$Y_t \equiv P_t C_t + (K_{t+1} - (1 - \delta^k) K_t) + TB_t = P_{St}C_{St} + P_{Mt}^D C_{Mt}^D + X_{Mt} \tag{G.42}$$

Appendix F Risk Premium

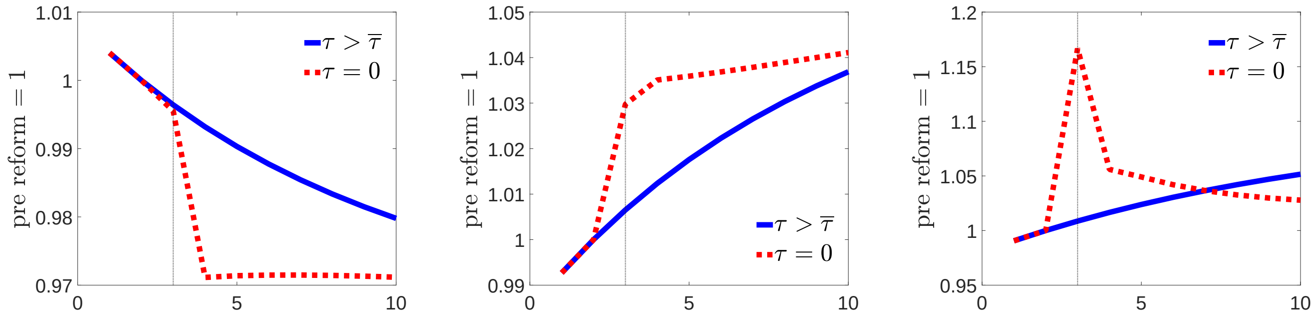
Economies are typically subject to risk premiums as higher debt levels increase their borrowing costs. We study the robustness of our results in the context of a risk premium consistent with Schmitt-Grohe and Uribe (2003). In particular, the domestic interest rate r_t is endogenously determined and depends on the foreign interest rate (r^*), the level of capital controls, and the local risk premium:

$$r_t = r^* + \tau \{B_t < 0\} - \tau \{B_t > 0\} + \psi \left(\exp(-B_t) - 1 \right). \tag{G.43}$$

We use the same calibration but set a slightly lower $\beta = 0.95 < \frac{1}{1+r^*}$ to allow for different long-run levels of debt depending on the magnitude of capital controls. In fact, under a risk-premium set-up, the long-run of the economy is independent of the initial condition (K_0), therefore, the timing of the reform is immaterial for the long-run. Nevertheless, the long-run does depend on the level of capital controls (τ) as long as $\beta =< \frac{1}{1+r^*}$.

Appendix F.1 Short-run Dynamics

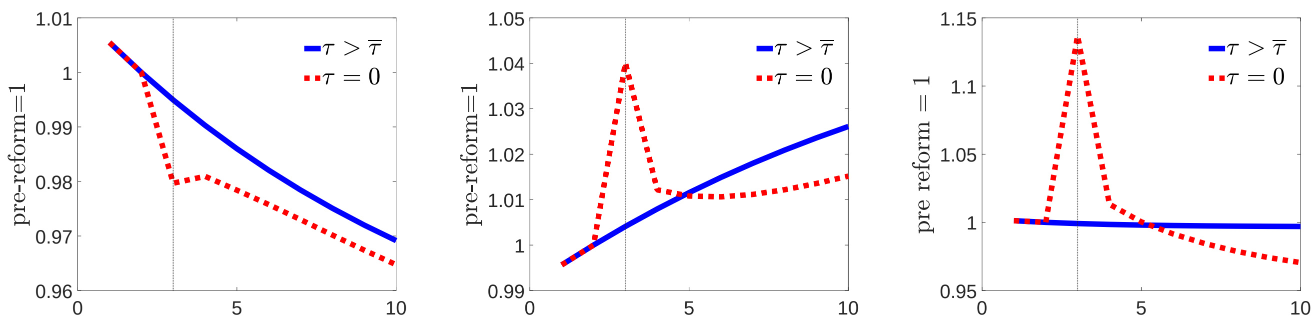
Figures C.14 and C.15 shows that the main short-run dynamics of the baseline economy are robust to this alternative model.



A) Relative Cost Ratio ($\frac{\phi_M}{\phi_S}$) B) Consumption share of Services $\left(\frac{P^S \times C^S}{P \times C}\right)$ C) Production share of Services $\left(\frac{P^S \times C^S}{P^S \times C^S + P_D^M \times C_M^D + XM}\right)$

Figure C.14: Reallocation across Sectors in the short term

Note: This figure shows the dynamics of the relative cost ratio (left), the consumption share of services (middle) and the production share of services (right). The blue and solid line corresponds to an economy in financial autarky and the red and dashed line corresponds to a financially open economy.



A) Relative Domestic Production Cut-off $\left(\frac{\varphi_S^d}{\varphi_M^d}\right)$ B) Relative Entry Rate ($\frac{S}{M}$) C) Relative Cut-offs within Manufacturing $\left(\frac{\varphi_M^x}{\varphi_M^d}\right)$

Figure C.15: Reallocation Within Sectors in the short term

Note: This figure shows the dynamics of the relative domestic production cut-offs (left), the relative entry rate (middle), the relative cut-offs in the manufacturing sector (right). The blue and solid line corresponds to an economy in financial autarky and the red and dashed line corresponds to a financially open economy.

Appendix F.2 Long-run Effects

The size of the reduction of capital controls has implications for the characterization of the transition path, as well as of the long-run steady state. A modest liberalization episode would induce an economy to accumulate foreign debt along the transition, but the economy will return to financial autarky in the long-run. However, a larger liberalization can result in long term foreign debt in the new steady-state.

To understand this point, consider an economy that has a tax on foreign financial transactions high enough such that the rental rate of capital net of depreciation is lower than the domestic interest rate at $t = 0$, i.e. $r_0^k - \delta < r = r^* + \tau$. Therefore, the cost of borrowing from abroad is higher than the return of capital; the optimal decision for the household is not to issue foreign debt. Because the household accumulates capital along the transition path, $r_0^k > r_t^k$, $\forall t > 0$. Thus, this economy follows a path of financial autarky and balanced trade until it reaches its steady state.

Now, consider two alternative levels of capital controls. First, define $\bar{\tau}$ to be the tax rate that makes the household marginally indifferent from issuing foreign bonds at $t = 0$ when $B_0 = 0$: $\bar{\tau} = r_0^k - \delta - r^*$. Note that the long-run return to capital in any long-run steady state has to satisfy $r_{ss}^k - \delta = \frac{1}{\beta} - 1$. Second, define $\underline{\tau}$ as the tax rate that makes the household marginally indifferent about holding debt in the long run; that is: $\underline{\tau} = \frac{1}{\beta} - 1 - r^* \leq \bar{\tau}$. Then, for any initial condition characterized by $r_0^k \left(K_0, M_{j0}, \mu_{j0}, B_0 = 0\right)$, we can define three potential types of transition paths:

1. **Financial Autarky**: $\forall \tau, \tau \geq \bar{\tau}$ the economy is closed to international financial markets. In this case, $\forall t > 0$, foreign bond holdings are $B_t = 0$.

2. **Transitional Debt (long-run financial autarky)**: $\forall \tau, \underline{\tau} \leq \tau < \bar{\tau}$ the economy is closed to international financial markets in the long-run. In this case, $\forall t$, $T > t > 0$, foreign bond holdings are $B_t < 0$, and $B_t = 0$ for $t \geq T$, with T being the final period of the transition.

3. **Long-Run Debt (full financial openness)** $\forall \tau, 0 \leq \tau < \underline{\tau}$ the economy is open to international financial markets. In this case, $\forall t > 0$, foreign borrowing B_{t+1} adjusts to eliminate arbitrage opportunities. Hence, foreign borrowing is implicitly defined by:

$$1 + r_{t+1}^k - \delta^k = \left(1 + r^* + \tau + \psi \cdot (e^{-B_{t+1}} - 1) - \psi B_{t+1} \cdot e^{-B_{t+1}}\right) \tag{G.44}$$

   In particular, in the long-run bond holdings B_{ss} are given implicitly by:

$$\frac{1}{\beta} = \left(1 + r^* + \tau + \psi \cdot (e^{-B_{ss}} - 1) - \psi B_{ss} \cdot e^{-B_{ss}}\right) \tag{G.45}$$

   When $B_{ss} < 0$, trade is not balanced in the long-run steady-state, and the economy must run a trade surplus of $-r_{ss} B_{ss}$.

Figure C.16 illustrates the three regions in $(\tau - K_0)$ space for given initial firm distributions and no initial debt holding. The function $\bar{\tau}\left(K_0\right)$ maps the location of the level of capital control that leaves an economy with initial capital K_0 marginally indifferent between borrowing or not at the beginning of the transition. The figure also shows the level $\underline{\tau}$, independent of the initial conditions, above which no long-run debt can be supported. Note that as the initial capital approaches its steady state level, $\bar{\tau}\left(K_0\right)$ converges to $\underline{\tau}$. In addition, as capital approaches 0, $\bar{\tau}\left(K_0\right)$ increases to infinity and any level of capital control can support transitional debt.

To illustrate how these different regions imply heterogeneous transition paths and long-run equilibria, we study the macroeconomic dynamics for two types of unexpected financial reforms. First, we study a moderate financial liberalization that decreases capital control from $\tau > \bar{\tau}$ to $\tau = \underline{\tau}$. This reform

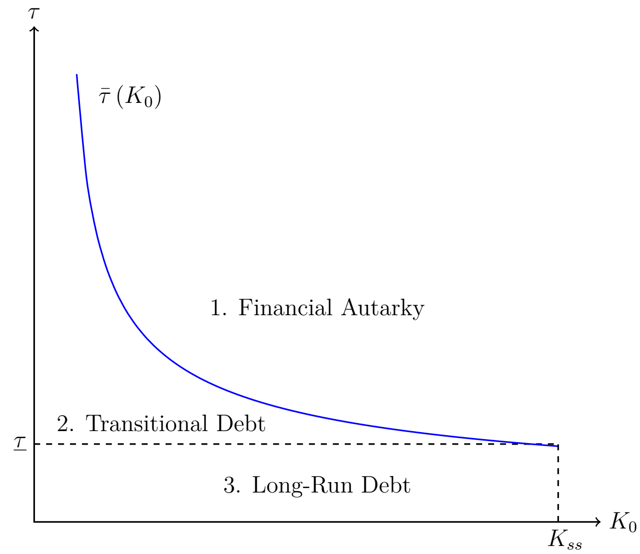
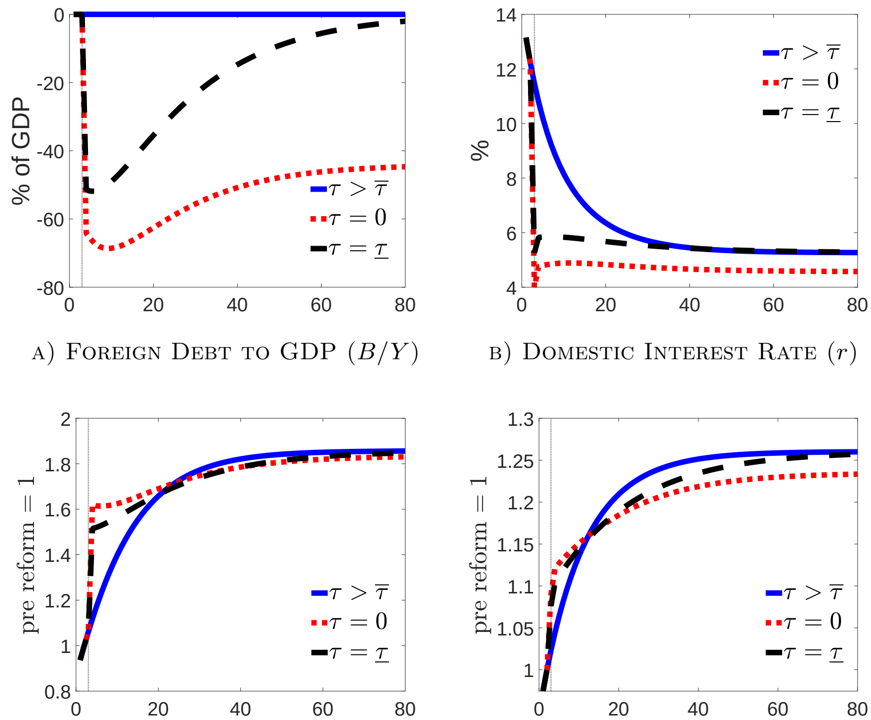


Figure C.16: Initial Endowment, Capital Controls, and Borrowing
Note: This figure illustrates the function $\bar{\tau}(K_0)$ fixing the other initial states. It also depicts the level of capital control $\underline{\tau}$ below wish long-term borrowing is supported. These curves are used to show three regions: 1) financial autarky, 2) Transitional Debt, and 3) Long-run Debt.

maximizes transitional borrowing dynamics without sustaining borrowing in the long-run. Second, we study a large financial liberalization that sets $\tau = 0 < \underline{\tau}$. This last reform generates transitional and long-run borrowing dynamics, and results in a new steady state of the economy. The short-run consequences of this reform was what we studied in the previous sub-section.

Figure C.17 shows the net foreign asset to GDP ratio, the domestic interest rate, physical capital, and the consumption paths for these two alternative reforms and compares them with a transition under financial autarky (the solid blue line). Consistent with Figure C.16, the moderate liberalization – the dashed black dashed line – does not support long-run borrowing (Panel A). Therefore, this economy reaches exactly the same steady state as the financially closed economy. The moderate financial liberalization only accelerates the transition and allows for consumption to tilt towards the initial periods. Panel A also shows that the large liberalization (dotted red line) entails a new steady-state characterized by a sustainable level of debt. After the sharp increase in borrowing that finances capital and consumption growth, the debt level stabilizes at a new long-run level. At this new steady-state, the economy must transfer resources to the rest of the world, i.e., run a trade surplus; hence, consumption, in particular, and also capital, are lower than in the financial autarky steady state (Panels C and D).

The large liberalization (dotted red line) case above is the maximum liberalization that can occur ($\tau = 0$). More broadly, any reform that brings capital controls below $\underline{\tau}$ will lead to long-run debt. The lower the level of the post-liberalization capital control tax τ, the higher the long-run debt, as given by Equation (G.45). Servicing the long-run debt requires, of course, a positive trade balance in the long-run. Because exporting is only possible in the manufacturing sector, this implies that the manufacturing sector is larger in the long-run relative to that in an economy with no long-run debt (and balanced trade). In addition to this between-sector reallocation, long-run debt also has consequences for within-sector reallocation between firms. In particular, long-run debt reallocates resources towards



a) Foreign Debt to GDP (B/Y) b) Domestic Interest Rate (r)

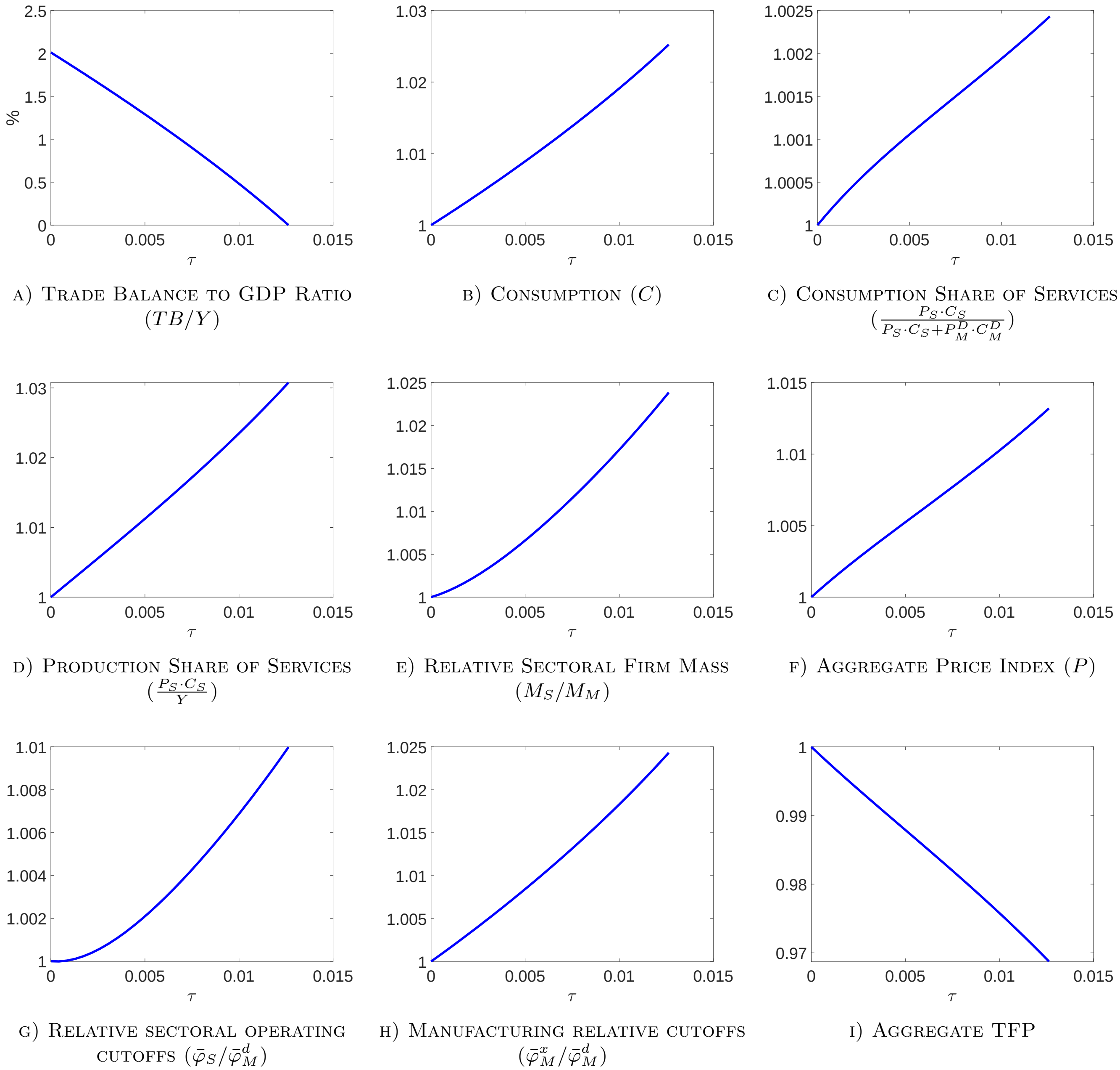
c) Capital (K) d) Consumption (C)

Figure C.17: Medium and Long-Term Adjustments of Macroeconomic Aggregates

Note: This figure shows the long-term dynamics of the domestic interest rate (top left), the net foreign asset position over GDP (top right), the consumption level (left bottom), and the capital level (right bottom). The solid blue corresponds to an economy in financial autarky; The dashed black line corresponds to the moderate liberalization economy, and the dotted red line corresponds to the large liberalization economy.

exporters within manufacturing.

To further explore the between-sector and within-sector reallocation, we compare long-run steady states with different sizes of capital control tax τ. The results are shown in Figure C.18. As stated above, to sustain long-run borrowing, economies with larger reforms (lower τ) exhibit a larger long-run trade balance (Figure C.18a) and lower long-run consumption (Figure C.18b). The lower expenditure elasticity in manufacturing, coupled with the slight decrease in long-run consumption, implies a modest shift of the consumption basket towards manufacturing goods (Figure C.18c). Because only manufacturing output is tradable and the higher long-run debt is serviced by exporting, production is shifted further towards manufacturing (Figure C.18d). Consequentially, an economy with larger debt holding must also have more firms in the manufacturing sector (Figure C.18e). Importantly, the lower domestic demand reduces the ideal consumption price, inducing a real exchange depreciation (Figure C.18f). Smaller services sectors in more open economies imply a larger services price index relative to manufacturing, which in turn implies the services cutoff shifts left (relative to manufacturing) (Figure C.18g). Along with the reallocation towards manufacturing goods, there is reallocation within this sector towards exports. The reduction in the domestic demand relative to the foreign demand, and the real exchange depreciation, imply the export cutoff shifts left. More manufacturing firms export, and



A) Trade Balance to GDP Ratio (TB/Y)

B) Consumption (C)

C) Consumption Share of Services ($\frac{P_S \cdot C_S}{P_S \cdot C_S + P_M^D \cdot C_M^D}$)

D) Production Share of Services ($\frac{P_S \cdot C_S}{Y}$)

E) Relative Sectoral Firm Mass (M_S/M_M)

F) Aggregate Price Index (P)

G) Relative sectoral operating cutoffs ($\bar{\varphi}_S/\bar{\varphi}_M^d$)

H) Manufacturing relative cutoffs ($\bar{\varphi}_M^x/\bar{\varphi}_M^d$)

I) Aggregate TFP

Figure C.18: Comparison of Long-Run Steady States

Note: In figures (b)-(i), the values in the open steady state with no capital control tax are normalized to 1.

existing exporting firms expand. (Figure C.18h). Both of these reallocation exporting effects imply economy-wide long-run productivity gains (Figure C.18i). These gains can be sizable, as the fully open economy ends has 3% higher aggregate productivity in the long run when compared to an economy with no long-run borrowing.