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 – allow us to assess two channels of resource reallocation, an input-cost channel and a consumption channel. We provide evidence for these two channels using firm-level census data from the financial liberalization in Hungary. We show that, 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, and use it to assess the shortand long-run effects of a financial liberalization. We show that the model's short-run implications for within sector and cross sector allocations are consistent with the firm-level evidence. We show that in the long-run, in order to service the steady-state debt, resources must re-allocate to the manufacturing sector, particularly to exporters. In addition, we find a trade-off between the speed of convergence and the long-run capital stock, which has implications for welfare. Financial liberalization allows an economy to reach its steady state faster, but at the cost of a lower long-run capital stock. This trade-off opens the door to welfare-enhancing policy.

Keywords: firm dynamics, financial liberalization, reallocation, capital flows, welfare, 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. Fourth, we use our model to study the welfare implications of capital inflows and the potential role of welfare-improving optimal policy.

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 heterogeneous 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 current account dynamics affect the country's external foreign debt position during the transition and, potentially, the long-run steady state.

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 level of capital controls is initially sufficiently high that the real return to capital is lower than the domestic real interest rate; thus, there are no capital inflows, and the economy is in financial autarky. When this economy is at 60% of its steady-state capital stock, we introduce a full financial liberalization. Through the lens of the model, we then investigate how the unexpected decrease in capital controls affects the firm-level, within sector and cross sector allocation of resources, as well as the evolution of the macroeconomic variables, during the economy's new transition to its new steady-state.

In the calibrated model, the liberalization produces rich short-term adjustments that match the Hungarian experience. In particular, the domestic interest rate drops on impact and capital inflows occur. Financial openness breaks the trade-off between investment and consumption, and 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. Whether production reallocates resources towards manufacturing or services depends on the strength of the relative input-cost and consumption channels. In the short run, 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. The short-term dynamics from the model confirm our empirical findings of the reallocation toward services and movements along the extensive margins.

We then go beyond the time horizon of our empirical analysis, and leverage the calibrated model to investigate the financial liberalization's long-run implications. The long-run implications are closely tied to the short-term capital inflows, because the inflows lead to external debt and repayment obligations. The external debt associated with a negative long-run net foreign asset position implies that the economy must run a permanent trade surplus. At the sectoral level, the long-run trade surplus necessitates resources and production shifting from non-traded services towards tradable manufacturing. In parallel, there is reallocation within the manufacturing sector towards exporting firms. The external debt implies lower domestic consumption and induces a real exchange depreciation, which, in turn, reduces the productivity cut-off for exporting, and promotes exports.

The timing of the financial liberalization matters for the long-run resource levels and allocations within and across sectors. An economy that liberalizes earlier in its transition path is more capital scarce; hence, it experiences larger inflows at the onset of the liberalization. These larger inflows imply a larger long-run debt and higher debt repayment, i.e., a larger long-run trade surplus, compared to an economy that liberalizes later in its transition path. Therefore, an economy with large capital inflows at the time of liberalization has a steady-state more tilted towards manufacturing production and exporting firms. This economy also has a more depreciated real exchange rate and higher aggregate productivity compared to an economy that liberalizes later. In addition, this economy has a lower long-run capital stock. Thus, our model generates a trade-off between the speed of convergence and long-run capital. Finally, consumption is lower in the long-run, as well.

How are long-run capital, consumption, and the real exchange rate linked? In our model, (goods, sectoral, and aggregate) prices are endogenous. An early liberalizing economy with lower long-run consumption will have lower long-run prices in both sectors, and, hence, a lower long-run real exchange rate. These lower prices decrease the return of capital (or, equivalently, raise the required marginal product of capital), which lowers long-run investment and the long-run capital stock.

We employ our model to study the welfare implications of capital inflows. We find a small welfare loss of -0.03%, which contrasts with the welfare gain result from Gourinchas and Jeanne (2006). To understand our welfare results better, we calibrate a representative firm model with endogenous prices and a representative firm model with exogenous prices. The latter is similar to Gourinchas and Jeanne (2006) and also yields welfare gains from a financial liberalization. However, the former model has welfare losses as in our model. The endogenous prices, as discussed above, play a critical role in this welfare result. It turns out that the representative firm model with endogenous prices has a larger welfare loss than our model. This is because of selection effects. In our model, under liberalization there are fewer firms in the long-run, compared to financial autarky. All else equal, this implies a higher price level (and hence, a higher capital stock and consumption).

The trade-off between the timing of liberalization, on the one hand, and the long-run capital stock and welfare, on the other hand, opens the door to welfare-improving policy. We consider a simple parametric, but flexible, class of liberalizations. Within this class, we find that a protracted financial liberalization could have generated welfare gains of 0.21%, rather than the 0.03% welfare loss from our baseline model. 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 credit (in the form of bank loans, trade credit and credit with owners), and to controlling for different measures of industry's dependence on external finance. 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, and trade and foreign direct investment (FDI) flows remained constant around the reform.

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; Coeurdacier, Rey, and Winant 2020; Levchenko, Ranciere, and Thoenig 2009; Tille and van Wincoop 2010, Hoxha, Kalemli-Ozcan, and Vollrath 2013; Broner and Ventura 2015). Our paper is closely related to Gourinchas and Jeanne (2006), which studies the welfare implications of international financial integration in an open economy version of the neoclassical growth model; to Hoxha, Kalemli-Ozcan, and Vollrath (2013), which includes imperfect substitutability between domestic and foreign capital goods; and to Coeurdacier, Rey, and Winant (2020), which revisits the neoclassical framework in a two-country model with aggregate uncertainty. Our paper departs from these studies in that our heterogeneous-firm two-sector model can reverse the welfare gains from international integration, and lead welfare losses triggered by a decrease in the level of long-term capital.

Our paper also relates to the cross-country studies documenting that expansions owing to capital inflows lead to resources shifting away from tradable activities towards services (see, for example, Tornell and Westermann 2005; Reis 2013; Benigno, Converse, and Fornaro 2015). Our paper contributes to this literature by using – for the first time – firm-level data on the universe of firms (including services) and a policy reform leading to capital inflows to assess empirically and quantitatively a (consumption) channel reallocating resources towards services. There is a recent literature assessing the impact of capital flows on misallocation within the manufacturing sector (Gopinath, Kalemli-Ozcan, Karabarbounis, and Villegas-Sanchez 2017 and Varela 2018). Our paper extends the above firm-level research by focusing on services firms, 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

¹See 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.

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. Furthermore, our model allows us to show that capital inflows can lead to welfare gains or losses, and to assess the optimal timing of the deregulation of capital controls.

Our paper relates to Acemoglu and Guerrieri (2008), which investigates capital accumulation and sectoral reallocation in a framework with different capital elasticities across sectors. 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 relates 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, which – 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 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 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

²Our 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.

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

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 6). 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



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

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

³There were additional regulations that prevented domestically-owned firms from borrowing from abroad, by banning them from holding bank accounts in foreign currency (see Varela 2018 for more details).

⁴This 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.

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 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 reestimate 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 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

⁶Although 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).

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 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 $1 = \left[\sum_{j} \theta_{j}^{\frac{1}{p}} C_{t}^{\frac{e_j-\eta}{\eta}} C_{j,t}^{\frac{n-\eta}{\eta}}\right]$, 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 heterogeneous 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 $\phi_{j,t} \equiv \left(\frac{r_t^k}{\alpha_j}\right)^{\alpha_j}(\frac{m}{\beta_j}\right)^{\beta_j}$ 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

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

⁷Table 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.

Replacing the sectoral price level P_{jt} and applying logs, we can write a firm's optimal production as⁸

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

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 $(r^k \text{ and, thus, } \phi_{j,t})$ 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

⁸Note that the log of the sector price level is given by $\log(P_{jt}) = \frac{1}{1-\sigma} \log \left[\int_{\varphi_{jt}^*} p_{jt(\varphi)}^{1-\sigma} \mu(\varphi) d\varphi \right]$, 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 or expenditure elasticity correlates 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 total exports in 2001 (Figures C.3 and C.4). It is worth mentioning that the patterns of capital inflows

⁹It 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.

¹⁰During 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).

¹¹Major 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).

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

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

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 (FL_t = 1 if year $\geq 2001, 0$ 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_{φ_i} .

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:

¹²The 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.

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

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. Columns add the covariates sequentially: column 1 includes only the capital elasticity as a regressor, column 2 adds the change in the sectoral aggregate productivity and column 3 controls the returns to scale of the sector. The estimated coefficients are positive and statistically significant in all specifications, and indicate that sectors with higher capital elasticity increase their value added relatively more after the financial liberalization. After the inclusion of all controls in column 3, the coefficient implies that one standard deviation increase in the capital elasticity (0.045) 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 on 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

		A Volue Add	ad		A Capital			V Employmen	
					∠ Employmen		10		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
				Panel	A. Capital El	asticity			
Capital elasticity	0.728^{**} (0.351)	0.701^{**} (0.343)	0.656^{*} (0.342)	1.048^{***} (0.340)	1.026^{***} (0.343)	1.030^{***} (0.331)	0.492 (0.349)	0.429 (0.347)	0.410 (0.322)
Average sectoral productivity		0.025 (0.037)	$\begin{array}{c} 0.022 \\ (0.038) \end{array}$		0.021 (0.022)	0.021 (0.025)		0.061^{***} (0.018)	0.059^{***} (0.021)
Returns to scale			-0.122 (0.142)			$\begin{array}{c} 0.011 \\ (0.162) \end{array}$			-0.050 (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^{*} (0.051)	0.091^{*} (0.052)	0.102^{**} (0.051)	-0.086 (0.070)	-0.088 (0.070)	-0.088 (0.069)	0.117^{***} (0.042)	0.112^{***} (0.041)	0.123^{***} (0.037)
Average sectoral productivity		$\begin{array}{c} 0.034 \\ (0.036) \end{array}$	$\begin{array}{c} 0.026 \\ (0.039) \end{array}$		0.028 (0.019)	0.028 (0.022)		0.060^{***} (0.014)	0.055^{***} (0.017)
Returns to scale			-0.242 (0.148)			0.004 (0.152)			-0.153 (0.121)
R^2	0.001	0.001	0.002	0.001	0.001	0.001	0.003	0.005	0.005
			Pa	nel C. Capita	l and Expend	liture Elastici	ties		
Capital elasticity	0.752^{**} (0.361)	0.725^{**} (0.354)	0.687^{*} (0.353)	1.033^{***} (0.364)	1.008^{***} (0.369)	1.030^{***} (0.354)	0.516 (0.317)	0.456 (0.315)	0.408 (0.295)
Expenditure elasticity	0.079^{*} (0.044)	0.077^{*} (0.045)	0.079^{*} (0.042)	-0.083 (0.064)	-0.085 (0.064)	-0.088 (0.061)	0.119^{***} (0.040)	0.114^{***} (0.038)	0.123^{***} (0.035)
Average sectoral productivity		$\begin{array}{c} 0.025 \\ (0.034) \end{array}$	-0.008 (0.020)		0.023 (0.019)	0.024 (0.023)		0.058^{***} (0.015)	0.054^{***} (0.018)
Returns to scale			-0.185 (0.141)			0.058 (0.151)			-0.130 (0.112)
R^2	0.002	0.002	0.002	0.002	0.002	0.002	0.004	0.006	0.006
Ν	56,525	56,525	56,525	53,987	53,987	53,987	54,251	54,251	54,251

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

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.

4.2.2 Robustness Tests

We next conduct two set of exercises to evaluate the validity of our results. In a first set of exercises, we study whether our results could be affected by a relaxation of financial frictions upon the financial liberalization. In a second set of exercises, we conduct a full set of robustness tests that include estimating panel regressions and the effect of the liberalization by year, controlling for exporters and foreign firms, and using different methodologies to estimate the capital and expenditure elasticities.

-Financial frictions. Research has linked capital inflows to a relaxation of financial frictions (Reis 2013 and Gopinath, Kalemli-Ozcan, Karabarbounis, and Villegas-Sanchez 2017). If the ease of financial frictions was correlated with the capital or expenditure elasticities, it could create omitted variable bias and challenge our results.¹³ In particular, the estimated coefficients could be confounding the relative input-cost and consumption channels with a relaxation of the financial constraints after the financial liberalization. To assess this possibility, we conduct exercises based on different measures of industry dependence on external finance, and on firms' debt obligations around the time of the reform.

(i) Industry measures. Previous studies have shown that industries differ in characteristics that could imply heterogeneous needs for external finance and, hence, exposure to financial frictions. To measure them, studies created proxies that capture needs for external finance arising from heterogeneous requirement for investment or liquidity across sectors. Focusing on investment needs, Rajan and Zingales (1998) create an index on dependence on external finance that measures the amount of investment that cannot be financed through internal cash flows. Centering on liquidity needs, Raddatz (2006) builds two alternative proxies to measure dependence on external finance: inventories to sales – that captures the fraction of inventory investment that can be financed with sales – and cash conversion cycle – that estimates the length in days between the moment a firm pays for its raw materials and the moment it obtain the receivables from its sales. To assess whether our results could be capturing the effect of a relaxation of financial frictions instead of the input-cost and consumption channels, we employ these three measures as proxies for sectors' *technological* needs for external finance.¹⁴ More

¹³It is important to remark that any variable not correlated with the capital or expenditure elasticities would not bias the estimated coefficients. Econometrically, for the coefficient to be biased, the covariance between the omitted variable and the corresponding elasticity needs to be different than zero.

¹⁴We follow the literature and estimate these three indexes at four-digit NACE industries for the U.S. using Compustat data. As in the literature, we use the U.S. as a benchmark because capital markets are largely advanced in the U.S. and listed firms are less likely to be credit constrained and, hence, these indexes could be considered to capture the *technical* needs for external finance in a sector. Furthermore, using indexes estimated for U.S. firms avoids endogeneity concerns that could arise from financial frictions in Hungary. The Rajan and Zingales (1998) index is constructed as the median ratio of capital expenditure minus sales over capital expenditure in each four-digit NACE industry. The inventories to sales ratio is the median ratio of total inventories to annual sales in each industry. The cash conversion cycle is defined

precisely, we re-estimate equation (4) and add these three measures as controls. If the expansion observed after the liberalization was driven by a relaxation of credit constraints instead of the inputcost and consumption channels, the coefficients for the capital and expenditure elasticities would be smaller and could potentially become insignificant. We report the results of these exercises in Table C.12 in Appendix C. Columns 1-3 present the results for value added, capital and employment where the Rajan and Zingales (1998) index is included as a control. The estimated coefficient of this index for value added is positive and statistically significant, but it does not overpower the relative input-cost and consumption channels (column 1). The coefficients for both capital and expenditure elasticities remain statistically significant and similar in size than in our main specification. The results on employment and capital remain unchanged when we control for the Rajan and Zingales (1998) (columns 2 and 3). Columns 4-6 report the results for the inventories to sales index and columns 7-9 for the cash conversion cycle. As shown in these columns, both indexes reflecting liquidity needs are not statistically significant, but – most importantly – they do not affect the size or significance of the capital and expenditure elasticities.

These results show that the standard measures used in the literature to control for industry dependence on external finance do not affect our estimates for the capital and expenditure elasticities. Yet it could be argued that these measures might not be reflecting all the extend of financial frictions and could be omitting some firm/sector characteristics that imply heterogeneous access to external finance across sectors. For example, smaller firms might not require large amount of investment or might have a short cash conversion cycle, but they could still be subject to other type of financial constraints, as for example earning-based collateral constraints.¹⁵ If smaller firms were distributed in sectors that correlated with our elasticities, our estimated coefficients could be biased. Section 3 has shown that firms in high expenditure elasticity sectors are indeed smaller and, thus, could be more affected by this type of financial frictions. Hence, other type of unobserved financial frictions could be affecting the identification of the consumption channel. To assess that the observed effect on sectors with high expenditure elasticity corresponds to the consumption channel and is not driven by an ease of financial frictions to smaller firms, we then conduct another set of exercises based on firms' debt.

(*ii*) Firms' debt obligations. As mentioned above, smaller firms in high expenditure elasticity industries could still be subject to financial frictions not captured by indexes on dependence on external finance. To test that our estimates on the expenditure elasticity are capturing the consumption channel and not other type of financial frictions, we conduct a full set of additional exercises. In these exercises, we employ credit registry and balance sheet data to remove from our sample firms that have any type of obligations with financial institutions in Hungary, trade credit or debt with owners at any point in time over the period 1995-2008. In this way, our estimates for the expenditure elasticity are based on firms that do not ever report any type of credit and, hence, cannot be attributed to an ease of financial

¹⁵See for example Lian and Ma (2020), Ivashina, Laeven, and Moral-Benito (2020), Baskaya, di Giovanni, Kalemli-Ozcan, and Ulu (2017), Drechsel (2020), among others.

as the median inventories $365/\cos t$ of goods sold + account receivables 365/t total sales- account payables $365/\cos t$ goods sold, in each industry. Note that, for the three measures, the higher the index, the higher the industry's reliance on external finance. The correlation of the Rajan and Zingales (1998) index and the capital is positive but small reaching 8%, and it is -5.7% with the expenditure elasticity. The correlation of the inventories to sales is 7.9% and -49% with the capital and expenditure elasticities, respectively. The correlation of the cash conversion cycle is 11% and -13% with the capital and expenditure elasticities, respectively.

frictions after the financial liberalization. We conduct seven empirical exercises that we report in Table C.13 in Appendix C.

In our first exercise, we employ credit registry data that provides information on each loan agreement (on a monthly basis) with financial institutions in Hungary since 2005.¹⁶ We use this data to remove firms that report any type of loan since 2005 and re-estimate equation (4) only for firms without this type of credit. Column 1 in Panel A reports the results for value added and shows that the estimated coefficient for the expenditure elasticity remains positive and statistically significant after we remove firms reporting credit with financial institutions.

An important caveat of this exercise is that firms might take debt obligations with agents other than financial institutions. For example, firms can borrow from suppliers or owners, and this information would not be reported in the credit registry data. Hence, if credit conditions improved after the financial liberalization for suppliers/owners and they provide more credit to firms in high expenditure elasticity sectors, one could be confounding the consumption channel with this ease of financing conditions. To assess this possibility, we employ firms' balance sheet statements to tax authorities. This balance sheet data contains information on all type of financial obligations to any agent in the economy and, thus, it provides a comprehensive picture of firms' financial obligations. Furthermore, this data is reported for all the period 1995-2008 and we use it to remove firms that have obligations at any point in time over these years. We analyse this data sequentially by type of obligation and maturity. In column 2, we focus on firms that do not report long-term obligations in their balance sheets and show that the coefficient for the expenditure elasticity remains positive and statistically significant.¹⁷ Columns 3-6 focus on short-term obligations. Column 3 removes firms that report debt with owners, column 4 removes firms that have trade credit, column 5 removes firms that report short-term loans with banks, and column 6 removes firms that have any type of these short-term obligations. All across specifications in columns 3-6, the coefficient for the expenditure elasticity remains positive and statistically significant. Finally, in column 7, we combine these exercises and remove firms that do not report any type of loan contract in the credit registry data and/or any short/long term obligation in their balance sheet. Importantly, the coefficient on the expenditure elasticity remains positive and is highly statistically significant. In Panel C, we report the estimates for employment and show that the coefficients are positive and statistically significant all across the different specifications in columns 1-7.

In sum, we have conducted highly demanding exercises – by restricting our analysis to firms that do not report any type of financial obligations in their balance sheet statements or banks in any year – and show that firms in high expenditure elasticity sectors expand their value added and employment, even in the absence of credit with banks, owners or trade credit.¹⁸

¹⁶This data reports information on loans with banks, investment firms, banks' subsidiaries, bank cooperatives and other financial firms. Unfortunately, the credit registry data only exists since 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).

¹⁷Unfortunately, long-term obligations are not disaggregated by type of counterparty (owners, trade credit, banks) and are only reported on aggregate basis.

¹⁸In Table C.13, we also present results for the estimated coefficient on the capital elasticity. The effects on value-added and on capital continue to be largely positive, although few coefficients are statistically significant. However, these weaker coefficient estimates should not be interpreted as evidence against the input-cost channel. Within the set of financially unconstrained firms, as long as they are more likely to borrow the higher the capital elasticity, then removing such firms

The exercises presented in this section provide support for the input-cost and consumption channels and argue for a theory in which these channels operate after the financial liberalization. It is worth remarking that these exercises do not suggest that financial frictions do not matter. Indeed, the literature has demonstrated the important role of financial frictions (Reis 2013 and Gopinath, Kalemli-Ozcan, Karabarbounis, and Villegas-Sanchez 2017). Instead, our empirical analysis indicates that other forces are also at play upon capital inflows. Our empirical analysis has shown that these forces are not perfectly correlated with financial frictions and, hence, even when we undertake highly demanding exercises to control for financial frictions, the input-cost and consumption channels remain valid in the data.

-Additional robustness tests. We now turn to conduct a five additional robustness tests for Table 1. 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.14 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 existing all along the period 1995 to 2008 (Table C.15).¹⁹

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 (3) 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.²⁰

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.17 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.²¹

Fourth, we show that our results are robust to estimating the capital and expenditure elasticities

from the analysis will necessarily weaken our results for the input-cost channel. Firms with higher capital elasticity will have a greater increase in demand for capital for a given reduction in the cost of capital, all else equal, so the increased likelihood of borrowing is plausible.

¹⁹These 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.15, the estimated coefficients for both capital and expenditure elasticities remain significant and similar in size to the main specification.

²⁰As an additional test of the parallel trend assumption, we conduct a second exercise, in which we create dummies for high/low capital and expenditure elasticities (below/above median) and interact them with yearly dummies. In particular, we regress for the capital elasticity: $\log q_{ijt} = \sum_{t=1995}^{2007} \gamma_{1t} \operatorname{year}_t + \sum_{t=1995}^{2007} \gamma_{2t} (\operatorname{High}_j \times \operatorname{year}_t) + \tilde{\mu}_{jt} + \mu_i + \varepsilon_{ijt}$, where $\tilde{\mu}_{jt}$ is sector time-varying controls. The coefficient γ_{1t} captures the yearly evolution of sectors with low elasticity, and γ_{2t} captures the differential effect of sectors with high elasticity. As shown in column 1 of Table C.16 in Appendix C, before the financial liberalization, the value added was evolving at a similar pace in sectors with high and low capital elasticity but, after the reform, it started growing much faster in sectors with high capital elasticity. We conduct a similar analysis for the expenditure elasticity and confirm the differential pattern of growth for sectors with high elasticity after the reform.

²¹Table C.18 shows that our results are robust to controlling for firms' imports.

using different methodologies. Columns 1-3 in Table C.19 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).

Finally, equation (4) could also be estimated using the sectoral price index instead of the average productivity of the sector. In Table C.20, we report the results of this exercise and show that the estimated coefficients remain unaltered when using the sectoral price index.

4.3 Industry-Level Analysis and Extensive Margin

Last section studied the impact of the liberalization within firms across sectors with different capital and expenditure elasticities. We now assess its impact at the industry level and on the extensive margin.

To evaluate the impact of the reform at the industry level, 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 $y_j = \{$ net entrants, entrants, firm size, industry RTFP, producer price index $\}$, where *net entrants* and *entrant* is the number of net entry (entry-exit) and entrants within each four-digit industry, *firm* size is the average value added per firm in the industry, *industry RTFP* is the total RTFP of the industry, and *producer price index* is the industry producer price index.²² We cluster the standard errors at four-digit NACE industries.

Table 2 presents the results. Column 1 shows that the financial liberalization in Hungary associates with an increase in net entry in sectors with high expenditure elasticity. The estimated coefficient is not only statistically, but it also economically significant. It implies that a one standard deviation increase in the expenditure elasticity correlates with a 17% increase in the number of net entrants. In other terms, a sector in the p75 of the expenditure elasticity would experience 20% higher net entry than a sector in the p25.²³ Column 2 shows that this expansion in net entry is mainly explained by an increase in entrants. Consistent with this expansion in the extensive margin, column 3 shows that the average size of firms drops and column 4 reports a decrease in RTFP in industries with high expenditure elasticity. As a result, the producer price index increases in these industries (column 5). To evaluate the characteristics of new entrants, we restrict our analysis to entrant firms and test whether – upon the financial liberalization – they differ in observable characteristics, such as RTFP and value added. Columns 6 and 7 in Table 2 show that, in sectors with high expenditure elasticity, entrants were less productive and smaller.

Interestingly, industries with high capital elasticity tend to show the mirror image of these patterns. Column 2 shows that entrants decrease in an industry's capital elasticity, and columns 6 and 7 indicate that entrants tend to be larger and more productive after the reform.

 $^{^{22}}$ 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.

 $^{^{23}}$ Table C.21 in Appendix C presents the standardized beta coefficients of these regressions and shows that the expansion in sectors with high capital elasticity is larger.

	Industry-Level Analysis					Entrants		
	Δ Net Entrants	Δ Entrants	Δ Firm Size (VA x firm)	Δ Industry RTFP	Δ Producer Price Index	Log RTFP	Log VA	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	
	Capital and Expenditure Elasticities							
Capital elasticity	-0.984 (0.724)	-1.481^{**} (0.593)	0.645 (0.570)	0.552 (0.518)	-0.149 (0.098)			
Expenditure elasticity	0.420^{***} (0.112)	0.325^{***} (0.117)	-0.138* (0.076)	-0.144^{*} (0.079)	0.048^{***} (0.012)			
FL * Capital Elasticity						1.327^{***} (0.323)	0.404^{**} (0.205)	
FL * Expenditure Elasticity						-0.090^{**} (0.040)	-0.038^{*} (0.023)	
Year FE Sector FE B^2	0.042	0.039	0.015	0.014	0.040	Yes Yes 0.096	Yes Yes 0 127	
N	348	348	348	348	348	95,576	185,609	

Table 2: INDUSTRY-LEVEL ANALYSIS AND EXTENSIVE MARGIN

Notes: *, **, *** significant at 10, 5, and 1 percent. Standard errors are clustered at four-digit industries in columns 1-5, and at time and four-digit industries in columns 6 and 7. 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 compute the number of net entrants and entrants per year in each industry before and after the reform. In particular, we estimate a regression: $y_{m,t} = \gamma_1(e_m \ge FL_t) + \gamma_2 e_m + \gamma_3(\alpha_m \ge FL_t) + \gamma_4 \alpha_m + \varepsilon_{m,t}$, where $y_{m,t}$ is net entry or entry, and plot the predicted values for these variables before and after the reform.²⁴ These values capture the relationship between entrants and expenditure elasticity, once 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).

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 3 the top fifteen sectors defined at four-digit NACE industries that experienced the highest number of net entrants in the post-liberalization period.

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

 $^{^{24}}$ FL_t is a dummy variable that equals to 1 for the post-reform period (FL_t ≥ 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 preliberalization period (i.e. when 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).



Figure 2: NET ENTRANTS

Table 3: 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.

(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.²⁵ 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).

4.4 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

 $^{^{25}\}mathrm{For}$ completeness, Table C.22 in Appendix C presents the top 30 sectors in net entry.

sectors and, in particular, towards sectors with high expenditure elasticity.

To assess this, 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

share_t =
$$\sum_{i=2001}^{2008} \beta_i D_i + \text{Time}_t + \varepsilon_{st},$$
 (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 C.14 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.



Figure 3: REALLOCATION ACROSS SECTORS: HIGH EXPENDITURE ELASTICITIES

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 and Table C.23 in Appendix C present the estimated coefficients and shows that, to the same exposure to capital elasticity, sectors with high expenditure elasticity grew more after the financial liberalization. These exercises suggest that – on the aggregate – the consumption channel dominates and that, after the liberalization, resources reallocated towards sectors with expenditure elasticity.²⁶

²⁶In an additional 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 re-estimate equation (6) for the share of services and show in Figure C.14 that upon the liberalization, the share of services in value added, employment and mass of firms increases and is statistically different from the pre-liberalization trend.

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. 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 extensive margin 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 within the few years after this reform resources shifted towards services. But, is this fact valid for the cross-section of countries? We assess this question by checking whether financial liberalization episodes correlate with increases in the share of value added in services across 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 two 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 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 both statistically and economically significant, and indicates that - for the average country - the value added share of services raises by 1.1 percentage points five years after the liberalization (Table A1, column 9).²⁷ In the next section, we build a heterogeneous firm dynamics model that rationalizes these findings and assess the short- and long-term implications of the financial liberalization.

5 Model

This section develops a small economy model to study the macroeconomic and microeconomic impact 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 and services are non-traded across borders. Capital controls might 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 patterns, current account imbalances, entry and exit of firms,

 $^{^{27}}$ 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.

and the reallocation of resources within and across sectors. For exposition simplicity, in this section, we present only the main relationships of the model; all derivations are in Appendix D and Appendix E.

5.1 Representative Household

The domestic household has the following intertemporal preferences:

$$U = \sum_{t=0}^{\infty} \beta^t \frac{(C_t^{1-\gamma} - 1)}{1-\gamma},$$
(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 is composed by manufacturing C_{Mt} and services C_{St} goods, defined implicitly by the following 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:

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

where w_t and r_t^k are the wage and rental rate of capital, L denotes the country's labor endowment, which is supplied inelastically, and Π_t 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.

$$r_t = r^* + \tau \{B_t < 0\} - \tau \{B_t > 0\}.$$
(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., $r^* = \frac{1}{\beta} - 1.^{28}$ 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 longrun 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:

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

$$C_{M,t}^{D} = \left(\frac{P_{M,t}^{D}}{P_{Mt}}\right)^{-\eta_{M}} \theta_{D} C_{Mt} \quad \text{and} \quad C_{M,t}^{F} = \left(\frac{1}{P_{Mt}}\right)^{-\eta_{M}} \theta_{F} C_{Mt}, \tag{14}$$

and the demands for individual varieties are given by:

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

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.²⁹ The household's maximization problem gives the following Euler equations:

$$1 = \Lambda_{t,t+1} (1 - \delta^k + r_{t+1}^k) \quad \text{and} \quad 1 = \Lambda_{t,t+1} (1 + r_{t+1}).$$
(16)

where the discount factor is given by $\Lambda_{t,t+1} = \beta \frac{\lambda_{t+1}}{\lambda_t}$.

²⁸The specific level of $\bar{\tau}$ depends on the capital stock at each point in time. As capital increases, $\bar{\tau}$ decreases.

²⁹Where
$$P_t = \left[\theta_M P_{Mt}^{1-\eta} C_t^{e_M-1} + \theta_S P_{St}^{1-\eta} C_t^{e_S-1}\right]^{\frac{1}{1-\eta}}, \quad P_{Mt} = \left[\theta_D (P_{Mt}^D)^{1-\eta_M} + \theta_F\right]^{\frac{1}{1-\eta_M}}, \quad P_{St} = \left[\int_{\omega \in \Omega_t} p_{St}(\omega)^{1-\sigma} d\omega\right]^{\frac{1}{1-\sigma}}, \text{ and } P_{Mt}^D = \left[\int_{\omega \in \Omega_t} p_{Mt}(\omega)^{1-\sigma} d\omega\right]^{\frac{1}{1-\sigma}}.$$

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 scale 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 functions of type- φ firms operating in services and in manufacturing are respectively:

$$V_{St}(\varphi) = \max\left\{0, \pi_{St}^d(\varphi) + (1-\delta)\Lambda_{t,t+1}V_{S,t+1}(\varphi)\right\} \quad \text{and} \quad V_{Mt}(\varphi) = \max\left\{V_{Mt}^d(\varphi), V_{Mt}^x(\varphi)\right\}, \quad (17)$$

where $V_{Mt}^d(\varphi) = \max\left\{0, \pi_{Mt}^d(\varphi) + (1-\delta)\Lambda_{t,t+1}V_{M,t+1}(\varphi)\right\}$ and $V_{Mt}^x(\varphi) = \max\left\{0, \pi_{Mt}^d(\varphi) + \pi_{Mt}^x(\varphi) + (1-\delta)\Lambda_{t,t+1}V_{M,t+1}(\varphi)\right\}$. Domestic profits are defined by $\pi_{jt}^d(\varphi) = \left[p_{jt}(\varphi) - c_{jt}(\varphi)\right]q_{jt}^d(\varphi) - \phi_{jt}f_j^d$ for $j \in \{S, M\}$. Exporting profits for manufacturing firms are defined by $\pi_{Mt}^x(\varphi) = \left[p_{Mt}(\varphi) - c_{Mt}(\varphi)\right]q_{Mt}^x(\varphi) - \phi_{Mt}f_M^x$. 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:

$$V_{S,t+1}(\varphi) = \begin{cases} V_{S,t+1} & \text{if } \varphi > \varphi_{S,t+1}^d \\ 0 & \text{otherwise,} \end{cases} \quad V_{M,t+1}(\varphi) = \begin{cases} V_{M,t+1}^d & \text{if } \varphi_{M,t+1}^d \le \varphi < \varphi_{M,t+1}^x \\ V_{M,t+1}^x & \text{if } \varphi \ge \varphi_{M,t+1}^x \\ 0 & \text{otherwise.} \end{cases}$$

The operational productivity cut-offs φ_{St}^d , φ_{Mt}^d , and φ_{Mt}^x are defined implicitly by the following marginal conditions: $V_{St}(\varphi_{St}^d) = 0$, $V_{Mt}^d(\varphi_{Mt}^d) = 0$, and $\pi_{Mt}^x(\varphi_{Mt}^x) = 0$.

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_{jt}^e 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.³⁰ In particular, in sector j, the entry cost is given by $f_{jt}^e = f_j^e + \xi \left(\exp(M_{jt}^e - \overline{M}_j^e) - 1 \right)$, where f_{ej} is the fixed entry cost and ξ is a constant governing the size of the variable cost. The parameters \overline{M}_j^e 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 $\int_{\varphi_{jt}^d}^{\infty} V_{jt}(\varphi)g_j(\varphi)d\varphi =$ $\phi_{jt} \left[f_j^e + \xi \left(e^{M_{jt}^e - \overline{M}_j^e} - 1\right)\right]$ for $j \in \{S, M\}$. 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,

$$M_{j,t+1}\mu_{j,t+1}(\varphi) = \begin{cases} (1-\delta)M_{jt}\mu_{jt}(\varphi) + M^{e}_{j,t+1}g_{j}(\varphi) & \text{if } \varphi \ge \varphi^{d}_{j,t+1} \\ 0 & \text{otherwise} \end{cases} \quad j \in \{S, M\}$$
(18)

The law of motion that characterizes the mass of producers in sector j and time t + 1 is $M_{j,t+1} = (1 - \delta)M_{jt} \int_{\varphi_{j,t+1}^d}^{\infty} \mu_{jt}(\varphi)d\varphi + M_{j,t+1}^e \int_{\varphi_{j,t+1}^d}^{\infty} g_j(\varphi)d\varphi$ for $j \in \{S, M\}$.

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 $L_{jt} = L_{jt}^{prod} + L_{jt}^{entry}$ and $j \in \{S, M\}$. Similarly, the equilibrium condition in the capital market is given by $K_t = K_{St} + K_{Mt}$, where $K_{jt} = K_{jt}^{prod} + K_{jt}^{entry}$ and $j \in \{S, M\}$, where the capital supply is time-varying and predetermined 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 services and manufacturing as $P_{St}C_{St} = M_{St}\int_{\varphi_{St}^d}^{\infty} p_{St}(\varphi)q_{St}^d(\varphi)\mu_{St}(\varphi)d\varphi$ and $P_{Mt}^D C_{Mt}^D = M_{Mt}\int_{\varphi_{Mt}^d}^{\infty} p_{Mt}(\varphi)q_{Mt}^d(\varphi)\mu_{Mt}(\varphi)d\varphi$.

Balance of Payments. The small open economy's net foreign assets position evolves according to:³¹

$$B_{t+1} = (1 + r_t - \tau)B_t + TB_t, \tag{19}$$

where the trade balance (TB_t) can be written as manufacturing exports (X_{Mt}) minus imports of final consumption goods (C_{Mt}^F) minus imports of new capital goods:

$$TB_t = X_{Mt} - C_{Mt}^F - (K_{t+1} - (1 - \delta^k)K_t).$$
(20)

³⁰The 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.

³¹Assuming $B_t \leq 0$ for all t.

6 QUANTITATIVE ANALYSIS

This section employs our quantitative model to study how the relative input-cost and consumption channels shape the macro dynamics of financial liberalization. Sections 6.1 and 6.2 present the calibration and check whether the model's non-targeted moments are consistent with the short-term patterns observed in Hungary after the reform. In Section 6.3, we present the short-term dynamics of capital flows and discuss their reallocation forces within and across sectors. Additionally, we conduct two counterfactual exercises to assess the contribution of the input-cost and consumption channels to the short-term dynamics of capital flows. In Section 6.4, we study the long-term impact of capital inflows and how the size of capital flows affects the open economy steady state. In Section 6.5, we study the welfare implications of capital flows and optimal policy. We present a novel trade-off between the speed of convergence to the open economy steady state and the steady state level of capital, and assess the optimal policy resulting from this trade-off.

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 4 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 $(\gamma, \eta, \eta_M, \sigma, \text{ and } \delta^k)$. The exogenous exit rates of each sector (δ_S, δ_M) are set to the firm-level sectoral exit rate observed in our micro data. We set the capital intensity of each sector (α_S, α_M) to the average elasticity estimated at the industry level.³² We set the fixed entry costs parameters in each sector (f_S^e, f_M^e) 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 variety (A) is set to unity.³³ We set the parameter governing the variable entry cost (ξ) to 2 in order to avoid corner solutions (without significant impact on the dynamics).³⁴ Consistent with a fully open economy calibration, we set the capital controls (τ) to zero.

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 5 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

³³Because we target the fraction of exporters, other values for A just change the level of entry cost into exporting.

 $^{^{32}}$ 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 4, 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.

³⁴The absolute value of the steady state mass of firms is low (see Table 5), so 2 is in fact a small fraction of the entry cost relative to $f_j^e = 1$.

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^e_S	Fixed entry cost S	1	normalization
$f_M^{\widetilde{e}}$	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

Table 4: EXTERNALLY-CALIBRATED PARAMETERS

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 (θ_D = $(1 - \theta_F)$ ³⁵ 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 interquantile 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.³⁶ 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 (L) is set so that nominal GDP equals unity in the steady state. The centrality parameters of the congestion externality in the entry cost $(\overline{M}_{S}^{e}, \overline{M}_{M}^{e})$ are set internally to the open economy entry levels so that there are no congestion externalities in the long-run absent any capital controls.

We solve for a baseline transition with a zero current account and balanced trade 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

³⁵Because there are 8 times more services firms than manufacturing firms, a small θ_S generates a large share of consumption by services.

³⁶The expenditure elasticity of sector *i* is given by $\eta + (1-\eta)\frac{e_i-\eta}{\bar{e}-\eta}$. \bar{e} is defined by $\omega_S \cdot e_S + \omega_M \cdot e_M$ where ω_j denotes the consumption share of the sector *j* good. Note that in the model, the sum of expenditure elasticities weighted by the sectoral consumption shares is one. As a result, we apply a transformation to the estimated sectoral elasticities from the data such that this is satisfied and the ratio in the two elasticities is preserved. In particular, the median income elasticities estimated from the data are 1.2 and 1.57 for manufacturing and services respectively. Conditional on the service consumption share of 0.59, the transformed expenditure elasticities are 0.85 and 1.10 for manufacturing and services respectively.

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	$\log(VA_M^{\tilde{p}50}) - \log(VA_S^{\tilde{p}50})$	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)	1.11	1.14
e_M	Expenditure Elasticity M	1.41	Bils, Klenow, and Malin (2013)	0.85	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}_{S}^{e}	Convex entry cost S	3.5e-4	Open SS Value	na	na
\overline{M}_{M}^{e}	Convex entry cost M	5.8e-4	Open SS Value	na	na

Table 5: Internally-Calibrated Parameters

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 postfinancial 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., $y_t = \alpha FL_t + T_t + \varepsilon_t$, where $FL_t = 1$ 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, and no other information from the Hungarian economy along its transition path. Table 6 compares the model and data along seven non-targeted dimensions.

	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)

 Table 6: NON TARGETED MOMENTS

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: $y_t = \alpha FL_t + T_t + \varepsilon_t$, where $FL_t = 1$ if year ≥ 2001 and 0 otherwise. Consumption data comes from OECD expenditure of households data.

Table 6 shows that model correctly captures the main qualitative features of the reallocation of resources at the onset of the transition. It replicates well the increase in the share of services in value added, employment and consumption, and captures the increase in the relative price of services. Due to the lack of adjustment frictions, the aggregate capital stock increases faster in the model.³⁷ The next section assess the micro and macro dynamics that a financial liberalization can trigger.

6.3 Macro and Micro Dynamics in the Short-Term

This section describes the short-term dynamics of capital flows on the aggregate economy and its effects on the reallocation of resources within and across sectors. We additionally present two counterfactual exercises to assess the importance of the input-cost and consumption channels in the short term.

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. 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 and 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 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.

These dynamics are plotted in Figure 4 for an economy that starts on the autarky transition path and, in the third year, implements a financial liberalization.³⁸ 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 (foreign debt as a share of GDP). The return of capital (r_k) 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).

The relative input-cost and consumption channels imply intricate dynamics at the micro level, and trigger reallocation effects across sectors. The removal of capital controls lowers the relative input cost of manufacturing goods, ϕ_M/ϕ_S (Panel A in Figure 5). This reduction 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

³⁷An 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.

³⁸There is an initial burning period for the autarky transition to allow for a stable path independent of the initial distribution of firms.



Figure 4: 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.

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 5 shows, in the short-term, the consumption channel dominates and resources reallocate towards services. Upon the liberalization, the consumption and production share of services increases (Panels B and C). This higher consumption of services raises the relative price of services and the ideal price index (Panel D), which induces a real exchange rate appreciation.

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 6 show, there is a decrease in the relative cut-off for producing $\left(\frac{\varphi_s^d}{\varphi_M^d}\right)$ and an increase in the relative entry rates in services. Conversely, in manufacturing, resources shift to large and productive firms. 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 6 shows, 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 the real exchange rate appreciation.

In sum, capital inflows lead to a short-term boost in capital accumulation and consumption. Because



Figure 5: 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.



Figure 6: 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.

the consumption channel dominates, resources reallocation towards services. There is also reallocation within sectors, as entry in services expands and manufacturing production shifts away from exports.

To assess the importance of heterogeneous expenditure and capital elasticities in the short-run term, we conduct two counterfactual exercises: i) an economy where preferences are homothetic ($\epsilon_M = \epsilon_S = 1$), and ii) a version of the non-homothetic economy without heterogeneous technologies ($\alpha_S = \alpha_M =$ 0.33).³⁹ Figure C.15 in Appendix D displays the short-run percentage difference of liberalized economy with respect to their autarky transition for the consumption and production share of services, the relative entry rate of services and the overall price index. In all these outcomes, the non-homothetic economy exhibits the largest deviations from the baseline economy. Thus, heterogeneous expenditure elasticities are key in the short-run dynamics of sector resource allocation and relative prices.

6.4 Permanent Effects of Financial Liberalization

In this section, we study the permanents effects of the financial liberalization in two steps. We first provide an overview of the permanent effects of the financial liberalization on macroeconomic aggregates, show that these effects depend on the level of capital stock at the moment of the liberalization and study their implications for resource allocation. Second, we conduct quantitative exercises to decompose the forces driving the permanent effects of capital inflows.

(i) Long-Term Impact of Financial Liberalization on Macroeconomic Aggregates

We now turn 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, an 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), a unique r_k implies a common long-run level of capital that is independent of the magnitude of capital inflows $(r_k = \frac{\partial F(K,L)}{\partial K})$. Larger capital inflows have 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 local good is not a perfect substitute for the foreign good, the relative price of these goods affects the mapping between the unique capital return and the level of capital in the long run. In fact, the level of capital is determined by $\frac{r_k}{P}$ where P is the long-run price level of the domestic good in units of the imported capital good. Therefore, if larger capital inflows affect long-run prices, the size of capital inflows also determines the long-run level of physical capital in the economy. The same logic carries to our two-sector heterogeneous firm model with monopolistic competition. Moreover, because only one sector can be exported, the longrun trade imbalance required to serve the debt also affects permanently the exchange rate and the allocation of resources between the two sectors. Permanent changes in the exchange rate level trigger permanent reallocation of resources within sectors, especially between exporter and non-exporter firms

³⁹In both counterfactual exercises, we adjust the supply of labor such that, in the long-run autarky steady state, these economies have the same level of output than the baseline economy (Y = 1) and we adjust the preference levels (θ_j) such that the three economies also feature the same consumption share across sectors in the autarky steady state. All other parameters are common between the economies.

in the manufacturing sector.



Figure 7: 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 right), the price level (bottom left), and aggregate capital (bottom right). 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 7 illustrates the medium- and long-term effect of capital inflows on the foreign debt-to-GDP ratio, return to capital, price level and capital stock. To assess how these effects depend on the timing of the liberalization, we study two alternative financial liberalizations: i) a liberalization entailing large capital inflows corresponding to a capital scarce economy (with capital at 55% of its autarky long-run level, similar to our benchmark economy), and ii) a liberalization entailing moderate capital inflows corresponding to 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. Larger repayment obligations are met with lower levels of long-run consumption, which – in turn– lowers the price level (Panel C). Panel D shows that the larger liberalization implies 2.76% less long-run capital than the smaller liberalization. In the long-run, the repayment obligations depress domestic absorption relative to the financial autarky steady state, increasing the required 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 and within sector reallocation, we compare long-run steady states of economies that liberalize at different moments in their financial autarky transition paths. This heterogeneous timing implies that economies receive different amount of capital inflows following the liberalization, where more capital scarce economies receive larger capital inflows. The results are shown in Figure 8. As stated above, to sustain long-run borrowing, economies with larger inflows (lower K_0) exhibit a larger long-run trade imbalance (Figure 8a) and lower long-run consumption (Figure 8b). 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 8c). Because only manufacturing output is tradable and the higher long-run debt is serviced by exporting, production is shifted further towards manufacturing (Figure 8d). Consequentially, an economy with larger debt holding must also have more firms in the manufacturing sector (Figure 8e). Importantly, the lower domestic demand reduces the ideal consumption price, inducing a real exchange depreciation (Figure 8f). A smaller service sector implies a higher relative price of services and, thus, its operational cutoff to produce (relative to manufacturing) decrease. (Figure 8g). 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 lead that the cutoff to export decreases. More manufacturing firms export, and existing exporting firms expand (Figure 8h). Both of these reallocation effects imply economy-wide long-run productivity gains (Figure 8i). These gains can be sizable. 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.⁴⁰

(ii) Decomposing the Permanent Effect on Capital of a Financial Liberalization

To understand how the baseline economy links capital inflows to permanent effects on the level of long-run physical capital, we develop and calibrate a set of twelve alternative economies (including our baseline economy). Appendix H shows a detailed description of each model.⁴¹ In our first exercise, we shut down firm-heterogeneity and endogenous pricing of the tradable-manufacturing good and assess an economy with a representative firm. That is, we consider a small economy with two sectors – manufacturing good to be exogenously determined. In a second exercise, we study the same two-sector economy, but we let the price of the tradable good be endogenously determined and given a global demand with a strictly negative slope. In a third exercise, we consider a heterogeneous firm model with two sectors and endogenous pricing of tradable goods as in Melitz (2003).⁴² Then, for each of the three models (representative firms with exogenous and endogenous pricing of the tradable good

⁴⁰Appendix I 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.

⁴¹Appendix H also discusses the calibration procedure and shows that it delivers a long-run autarky equilibrium consistent with the baseline economy.

⁴²When the tradable price is exogenous and there is long-run factor mobility between sectors, the non-tradable price also becomes exogenous and thus independent from the long-run level of debt (see Appendix H).



Figure 8: 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.

and our baseline economy), we consider four configurations where we explore different combinations of expenditure and capital elasticity heterogeneity: (i) same capital and expenditure elasticities across sectors; (ii) same capital and heterogeneous expenditure elasticities across sectors; (iii) heterogeneous capital and same expenditure elasticities across sectors; and (iv) heterogeneous capital and expenditure elasticities across sectors.

Table 7 shows the long-run capital of the liberalized path relative to the long-run level of capital under

financial autarky for each economy $\left(\frac{K_0}{K_{SSC}}\right)$. Column 1 presents the economy with representative firms and exogenous pricing of the manufacturing good. Column 2 reports the economy with representative firms and endogenous pricing. Column 3 presents the heterogeneous firms model with endogenous pricing of the manufacturing good as in Melitz (2003). The rows present the different combination of parameters for capital and expenditure elasticities. Our baseline economy is reported in row (iv) and column 3. As documented before, this economy converges to a level of capital equivalent to 96.3% than an identical economy that chooses to never to remove capital controls.

	Representative Firms	Representative Firms	Heterogeneous Firms
	with Exogenous Pricing	with Endogenous Pricing	with Endogenous Pricing
	of Manufacturing Good	of Manufacturing Good	of Manufacturing Good
	(1)	(2)	(3)
(i) Same α and e	1.000	0.911	0.956
(ii) Same α and Het. e	1.000	0.913	0.956
(iii) Same e and Het. α	1.007	0.914	0.965
(iv) Het. α and Het. e	1.009	0.913	0.963

Table 7: TERMINAL CAPITAL

NOTE: For each economy we report long-run capital of the liberalization (baseline capital scarcity of 55%) as a fraction of their long-run autarky level. The first column represents a model with two representative firms and an exogenous tradable price, the second column allows for an endogenous tradable price, and the third column has heterogeneous firms in both sectors. The first row features the same production and expenditure elaticities (homothetic CES preferences) for both sectors, while the second row allows for heterogeneous expenditure elasticities, the third row only features heterogeneity in production elasticities, while the last row has heterogeneity on both elasticity margins.

Four observations stand out from the analysis of Table 7. First, the main long-run differences take place between columns and no within. Therefore, allowing for endogenous manufacturing prices and firm heterogeneity affects the long-run level of capital of an economy, whereas expenditure and production elasticity play a more muted role in the long-run. Second, exogenous prices and homogeneous capital elasticity are key to generate an invariant long-run level of capital (column 1, rows (i) and (ii)). In line with Gourinchas and Jeanne (2006), when the tradable price is exogenous and both sectors use the same production function, the liberalized economy has the same level of long-run capital than the one that slowly converges in financial autarky. Instead, when manufacturing production is allowed to be more capital intensive, the long-run shift of the economy towards manufacturing in order to serve the debt by exporting, materialized in a slightly higher capital stock (column 1, rows (iii) and (iv)). This is consistent with the classical theorem by Rybczynski (1955). Third, column 2 shows that the endogenous pricing of the manufacturing good affects significantly the long-term level of capital of the open economy. In the case where α and e are identical across sectors (row (i)), the long-run level of capital in the open economy is about 9% lower than the level of capital in autarky. This is purely a price effect as lower long-run prices push up the marginal product of capital in both sectors. A small Rybczynski effect is present when factor intensities differ across industries, but this force is clearly dominated by the endogenous price effect. Finally, in the baseline heterogeneous firm model, the long-run capital stock is larger than in the representative case with endogenous prices (Columns 3) vs 2). The differences between the heterogeneous firm model and the representative firm model with endogenous prices highlight the contribution of firm heterogeneity in shaping the permanent effects of liberalization. Heterogeneity triggers selection within sectors, lower demand for both sectors shifts the firm distribution towards more productive firms, alleviating part of the price effect and allowing for a higher level of long-run capital. In fact, comparing the last two columns of Table 7, firm heterogeneity decreases the long-run capital loss from 9% to 4.4%. This more muted response of the long-term level of capital comes from the love for variety implied in the heterogeneous firm model. Lower consumption decreases the mass of firms producing in the long-term, which lowers the number of varieties available and – in turn– reduces the drop in the domestic price. Therefore, although the lower consumption reduces the long-term aggregate price, this reduction is lower because the decreases in the number of varieties tends to rise the price level.

In sum, endogenous pricing of the manufacturing good lowers the long-term level of capital in an open economy and, hence, induces a loss. Interestingly, the heterogeneous firm model reduces this loss by reallocating resources towards the most productive firms in the economy. A natural question follows suit: what are the welfare implications of these models?

6.5 Welfare and Optimal Policy

As discussed in the previous section, because endogenous price responses decrease the long-run level of capital and, thus, the long-run production capacity of the economy, capital account openness can introduce a trade-off between the speed of convergence and the long-run equilibrium of the economy. This section studies the welfare consequences of a financial liberalization and shows that the long-run cost can dominate the short-run gains, which opens policy opportunities for pacing the financial liberalization. Because welfare analysis is not appropriate across models with different preferences, we focus our discussion on the welfare effects of a financial liberalization on the three models in the last row of Table 7 (row (iv) columns 1-3).



Figure 9: CEQ Welfare from Liberalization

NOTE: This figure shows the consumption-equivalent welfare gains for different initial capital conditions across the three models: baseline heterogeneous firm (solid), representative firm with endogenous prices (dotted), and representative firm with exogenous prices (dashed).

We measure welfare within each model as the consumption equivalent variation (CEQ) over the

transition path and the steady-state that would leave the representative household indifferent between experiencing the liberalization or remaining in financial autarky. A positive number implies the household prefers the liberalization.⁴³ Figure 11 displays the CEQ gains under the three models. The red-dashed line plots welfare of the representative firm model with exogenous pricing of the domestic manufactured good. The blue dotted line plots welfare of the representative firm model with endogenous pricing of the domestic manufactured good, and the black line gives plots welfare from our benchmark model with heterogeneous firms. The figure shows that for both the representative firm model with endogenous prices and our benchmark model, there are welfare losses from liberalization (relative to financial autarky). In addition, the welfare effects from our benchmark model are lower than in the representative firm model with exogenous prices, and higher than in the representative firm model with endogenous prices.

To understand this result, first consider the representative firm model with exogenous prices. With the exception of having two sectors instead of one, and having non-homothetic preferences instead of homothetic preferences, this model is essentially the same as that of Gourinchas and Jeanne (2006). In particularly, upon liberalization, the economy immediately borrows so that it reaches its steady-state capital stock in one period. Moreover, this steady-state capital stock is independent of the initial level of capital. Hence, there is an unambiguous gain in welfare and the welfare gain is larger the lower the initial capital stock. The latter is because the quicker the economy can reach its steady-state, the larger the gains.

Now consider the representative firm model with endogenous prices. Following the initial period of liberalization, households recognize that in order to service the long-run debt, consumption demand must decline (relative to GDP less investment). Alternatively, there must be a sufficiently large net export surplus in the manufacturing sector. From the consumption perspective, the lower long-run demand leads to a lower aggregate price level (relative to autarky), as well as lower sectoral prices. The lower long-run sectoral prices imply a lower long-run capital stock (as discussed previously in the context of the benchmark model). From the net export perspective, in order to run a large net export surplus in manufacturing, output in the sector must rise – indeed, capital used for manufacturing exports rises, even as total capital in manufacturing declines. The price effect – the lower long-run sectoral prices – leads to a lower terms of trade. Putting together these two perspectives, compared to the exogenous price model, liberalization in the representative firm model with endogenous prices implies a smaller short-run consumption gain, and a larger long-run consumption decline (relative to financial autarky).

Finally, let us turn to the welfare effects of the baseline model. This model has qualitatively the same force driving welfare relative to autarky as in the representative firm model with endogenous prices – namely, lower demand in the long-run, thus leading to a lower price level, and, ultimately, a lower long-run capital stock. However, as figure 11 shows, the welfare losses relative to autarky are smaller in

⁴³The consumption equivalent compensation (CEQ) welfare gain is the difference between the welfare gain of an economy exposed to the liberalization (W_{lib}) versus that of one that remains in financial autarky (W_0), that is

Consumption-Equivalent Welfare Gain = $\left(\frac{W_{\text{lib}}}{W_0}\right)^{\frac{1}{1-\gamma}} - 1.$

We compute the CEQ over the entire time horizon, including the transition path and steady-state, starting from the date of the liberalization.

our baseline model. There are two reasons for this. The first reason involves the short-run consumption response following the liberalization. The liberalization allows households to borrow to finance more capital, and to finance the creation of new firms via expenditures on sunk costs. Hence, relative to autarky, in which the transition to the steady-state is slowed by the need to finance the creation of new firms, consumption rises strongly. This consumption response is greater than in the representative firm model with endogenous prices in which the liberalization simply speeds up capital accumulation.

The second reason for the smaller welfare losses involves the evolution of prices over time. In the long-run, the price level in our baseline model under liberalization is only slightly lower than it is under financial autarky. This translates to a slightly smaller capital stock relative to autarky. By contrast, the representative firm model with endogenous prices has a larger fall in the price level, and a correspondingly smaller capital stock, relative to autarky. Why is the long-run price decline relatively small in our baseline model? It has to do with the heterogeneous firms and selection. In our baseline model there are fewer firms under liberalization compared to autarky. Fewer varieties, all else equal, implies a higher price level. Hence, the fall in prices relative to financial autarky is smaller (compared to the representative firm model with endogenous prices).

-Optimal Policy

An important result from the preceding discussion is the decline in the terms of trade that occurs while the economy generates a large enough manufacturing net export surplus to service the long-run debt. This decline is a key reason why welfare is lower following the liberalization. Importantly, the representative household does not take this into account when it chooses how much to borrow once liberalization occurs. Therefore, allowing for endogenous prices introduces a novel trade-off between the speed of convergence and the final steady state level of consumption. This trade-off can generate welfare losses even in a fully efficient model. The existence of these losses suggests avenues for welfare improving policies. Because the long-run steady state is affected by the level of long-run debt, a natural policy to consider is a gradual financial liberalization that reduces the long-run level of debt and, therefore, trades some convergence speed for a higher long-run capital stock. In particular, we study how a gradual reduction in the borrowing tax τ may contribute to welfare gains relative to the benchmark case where τ is reduced to zero upon liberalization. We use the following functional form for the borrowing tax schedule:

$$\tau_t = \max\left\{ \left(1 - \left(\frac{2t}{T}\right)^{\phi} \right) \cdot \bar{\tau}, 0 \right\},\tag{21}$$

where T is the length of the transition to the new steady state, $\bar{\tau}$ is the value of τ that makes households just indifferent between borrowing and not borrowing in the first period. The parameter $\phi \in [0, \infty)$ controls the shape of the borrowing tax schedule.

Figure 10 presents our exercises and illustrates how this policy allows us to balance the speed-level trade-off of a financial liberalization. Figure 10a shows how ϕ governs the speed of the decrease in capital controls. When $\phi = 0$, the borrowing tax is reduced to zero immediately, which coincides with our baseline analysis. When $\phi < 1$, the liberalization reform is front-loaded in the sense that the borrowing tax decreases quickly at first and then gradually approaches zero. With $\phi = 1$, the tax decreases linearly whereas $\phi > 1$ corresponds to a concave schedule where the tax remains high for a number

of periods and decreases at an increasing rate. In the limiting case as $\phi \to \infty$, the reform occurs in the period $\frac{T}{2} + 1$. Panel 10b shows how ϕ affects welfare. The hump shape pattern of the welfare gain as a function of ϕ shows the nature of the speed-level trade-off between consumption smoothing and lower long-term level of capital. We illustrate this trade-off in Panels 10c and 10d. Panel 10c shows that the final level of capital is increasing in ϕ . This pattern reflects that front-loaded financial liberalizations imply high long-run levels of debt and higher losses of long-run capital due to price effects. Panel 10d shows that the number of periods needed to reach half of the consumption transition increases in ϕ . The higher the speed of the liberalization, the faster the economy reaches half of the consumption level at the steady state level. For the calibrated baseline model, the optimal policy is given by $\phi = 0.15$. This implies that, if Hungary would have implemented this staggered financial liberalization, it would have secured welfare gains of 0.21% (instead of experiencing welfare loses of 0.03%).⁴⁴



Figure 10: BORROWING TAX POLICY AND WELFARE

NOTE: The first panel (top left) plots the borrowing tax schedule for a transition with length T = 70 and various values of ϕ . The second panel (top right) displays CEQ welfare gains as a function of ϕ . The third panel (bottom left) displays the final level of capital associated to each ϕ . The fourth panel (bottom right) shows the number of period needed for consumption to reach half of its final steady state level as a function of ϕ .

 $^{^{44}\}mathrm{Appendix}\;\mathrm{G}$ shows the dynamic path of several macro variables associated to the optimal policy and compares it to policies characterized by faster and slower liberalizations.

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 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 2015.⁴⁵

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:

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

⁴⁵The 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:

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

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

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 $s \ge 2$ 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 noserial 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:	А	CROSS-COUNTRY	ANALYSIS
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				Log	share in value	added			
		Agriculture			Manufacturir	ıg		Services	
	OLS	GI	MM	OLS	G	MM	OLS	G	MM
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
FL Index	-0.020^{***} (0.007)	-0.028^{*} (0.015)	-0.026^{***} (0.008)	0.007 (0.008)	0.032^{**} (0.015)	-0.000 (0.017)	0.010^{**} (0.004)	0.007^{**} (0.003)	0.014^{***} (0.005)
Trade Openness			-0.363^{**} (0.143)			-0.136 (0.315)			0.100^{***} (0.022)
Government Size			0.337^{***} (0.127)			$\begin{array}{c} 0.132 \\ (0.264) \end{array}$			-0.109^{***} (0.019)
Financial Depth			-0.041^{*} (0.021)			-0.017 (0.062)			0.032^{***} (0.006)
Financial Crisis			0.034^{**} (0.015)			-0.103^{**} (0.051)			0.033^{***} (0.006)
Lag Dep. Var.	1.006^{***} (0.009)	0.983^{***} (0.040)	1.004^{***} (0.027)	0.877^{***} (0.027)	0.827^{***} (0.047)	0.709^{***} (0.132)	0.817^{***} (0.037)	0.807^{***} (0.028)	0.704^{***} (0.023)
Year FE Country FE N Countries Sargan (pvalue)	Yes Yes 914 163	Yes Yes 914 163 0.410	Yes Yes 342 62 0.821	Yes Yes 914 163	Yes Yes 914 163 0.313	Yes Yes 342 62 0.220	Yes Yes 914 163	Yes Yes 914 163 0.208	Yes Yes 342 62 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.⁴⁶ 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

 46 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.⁴⁷

Table A2: FINANCIAL LIBERALIZATION: A CROSS-COUNTRY ANALYSIS-ROBUSTNESS

	Log VA Share (3 years)				IMF- Index of	FL
	Agriculture	Manufacturi	Manufacturing Services		Manufacturi	ing Services
	(1)	(2)	(3)	(4)	(5)	(6)
FL Index	-0.018 (0.015)	0.013 (0.015)	0.007^{*} (0.004)	-0.111^{***} (0.022)	0.000 (0.014)	0.014^{***} (0.005)
Trade Openness	-0.232 (0.171)	-0.021 (0.238)	-0.015 (0.054)	0.478^{***} (0.143)	0.049 (0.223)	-0.153^{**} (0.074)
Government Size	0.228 (0.176)	$\begin{array}{c} 0.036 \\ (0.211) \end{array}$	$\begin{array}{c} 0.007 \\ (0.052) \end{array}$	-0.388^{***} (0.086)	-0.052 (0.204)	0.112^{*} (0.064)
Financial Depth	-0.039 (0.031)	$\begin{array}{c} 0.024 \\ (0.049) \end{array}$	0.018^{*} (0.011)	-0.002 (0.015)	-0.001 (0.029)	0.038^{***} (0.009)
Financial Crisis	$\begin{array}{c} 0.03 \\ (0.031) \end{array}$	-0.003 (0.030)	$0.003 \\ (0.007)$	0.028 (0.036)	$\begin{array}{c} 0.001 \\ (0.054) \end{array}$	0.014^{*} (0.007)
Lag Dependent Variable	0.926^{***} (0.042)	0.842^{***} (0.127)	0.747^{***} (0.060)	0.991^{***} (0.013)	0.751^{***} (0.098)	0.795^{***} (0.052)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Ν	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).

⁴⁷Note 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.

	Log share	in value added	Log	share in em	ployment	
	Man	ufacturing	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	$0.735 \\ (1.018)$	0.862^{***} (0.328)	-0.292*** (0.087)	0.256 (0.169)	0.028 (0.026)	
Financial Depth	$\begin{array}{c} 0.018 \\ (0.077) \end{array}$	0.015 (0.075)	-0.214^{***} (0.010)	$\begin{array}{c} 0.043 \\ (0.029) \end{array}$	0.026^{***} (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	

Table A3: FINANCIAL LIBERALIZATION: A CROSS-COUNTRY ANALYSIS-EXTENSIONS

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:

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

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

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

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

$$\log(q_{jt}(\varphi)) = -\alpha_j \eta \log(r_t^k/w_t) + e_m \log(C_t) + (\sigma - \eta)\tilde{\varphi}_{jt}$$
(B.3)

$$\underbrace{-(\alpha_j + \beta_j)\eta \log(w_t)}_{\tilde{A}_{jt}:\text{sector time-varying}} + \underbrace{\eta \log(P_t)}_{\tilde{B}_t:\text{agg time-varying}} + \underbrace{\log(\theta_m) - \alpha_j\eta \log(\alpha_j) - \beta_j\eta \log(\beta_j)}_{\tilde{C}_j:\text{sector time-invariant}} + \underbrace{\sigma \log(\varphi) - \eta \log(\varphi)}_{\tilde{D}_i:\text{firm time-invariant}}$$

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

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

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}_i 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

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

In t = 0 when $FL_t = 0$, equation (B.4) becomes

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

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

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

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

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

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

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

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



Figure C.14: Reallocation across sectors: Services

	Before	After	Be	fore	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

Table C.1: FINANCIAL LIBERALIZATION AND NET CAPITAL INFLOWS

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, nunting and related services	0.44
2	Forestry, logging and related services	0.44
10	Future of coal and ngmite; extraction of peat	0.57
11	Extraction of crude petroleum and natural gas	0.57
12	Mining of metal area	0.57
13	Other mining and quarrying	0.57
14	Manufacture of food products and hoverages	0.57
16	Manufacture of tobacco products	0.44
17	Manufacture of toytales	1.1
18	Manufacture of wearing apparel: dressing and dueing 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
20	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).

	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

Table C.3: EXPENDITURE ELASTICITY (COMIN, LASHKARI, AND MESTIERI 2018)

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).

	Mean	Capital Elasticity	Expenditure Elasticity
	(1)	(2)	(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

Table C.5: FIRMS' CHARACTERISTICS ACROSS SECTORS

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.

		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 (0.148)	$0.135 \\ (0.114)$	-0.080 (0.078)				
Expenditure Elasticity				$\begin{array}{c} 0.003 \\ (0.014) \end{array}$	-0.022 (0.041)	-0.007 (0.005)	
R^2	0.002	0.001	0.002	0.001	0.000	0.001	
N Sector FE	274,591 Yes	256,947 Yes	242,221 Yes	274,591 Yes	256,947 Yes	242,221 Yes	
Ν	313,512	$313,\!512$	335,895	335,895	335,895	335,895	

Table C.6: GROWTH RATE IN THE PRE-REFORM PERIOD

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	$0.036 \\ (0.033)$	-0.064^{***} (0.007)
Ν	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.

	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

Table C.8: FIRMS' CHARACTERISTICS ACROSS SECTORS

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

	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

Table C.9: FIRMS' CHARACTERISTICS ACROSS SECTORS: DIFFERENCE IN MEANS

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.

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

Table C.11: ROBUSTNESS: STANDARDIZED BETA COEFFICIENT

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: FINANCIAL DEPENDENCE

	Rajan and Zingales				Inventories to Sales			Cash Conversion Cycle		
	Δ Value Added	Δ Capital	Δ Employment	Δ Value Added	Δ Capital	Δ Employment	Δ Value Added	Δ Capital	Δ Employment	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	
Capital elasticity	0.701^{*} (0.361)	1.322^{***} (0.394)	0.666^{**} (0.285)	0.729^{**} (0.366)	1.205^{***} (0.360)	0.580^{**} (0.284)	0.681^{*} (0.391)	1.245^{***} (0.356)	0.589^{**} (0.283)	
Expenditure elasticity	0.077^{*} (0.041)	-0.096 (0.074)	0.105^{***} (0.039)	0.114^{*} (0.064)	-0.120 (0.074)	0.071^{*} (0.042)	0.106^{*} (0.062)	-0.103 (0.072)	0.103^{***} (0.039)	
Financial Dependence	0.011^{**} (0.005)	-0.008 (0.007)	-0.003 (0.005)	$\begin{array}{c} 0.136 \\ (0.201) \end{array}$	-0.255 (0.177)	-0.334^{**} (0.155)	$\begin{array}{c} 0.025 \\ (0.028) \end{array}$	-0.022 (0.021)	-0.005 (0.003)	
Average sectoral productivity	0.073 (0.056)	0.018 (0.044)	$\begin{array}{c} 0.036 \\ (0.037) \end{array}$	0.084 (0.056)	0.027 (0.045)	$ \begin{array}{c} 0.043 \\ (0.032) \end{array} $	0.087 (0.059)	0.023 (0.042)	$0.038 \\ (0.035)$	
Returns to scale	-0.444^{**} (0.172)	$0.185 \\ (0.223)$	-0.134 (0.165)	-0.411^{**} (0.182)	$\begin{array}{c} 0.090 \\ (0.185) \end{array}$	-0.207 (0.131)	-0.411^{**} (0.176)	0.113 (0.180)	-0.172 (0.134)	
$\frac{R^2}{N}$	$0.005 \\ 47,549$	$0.003 \\ 45,723$	$0.005 \\ 46,163$	$0.005 \\ 46,723$	$0.003 \\ 44,652$	$0.005 \\ 45,020$	$0.006 \\ 46,831$	$0.003 \\ 44,754$	$0.004 \\ 45,127$	

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). Columns 1-3 include as a control the Rajan and Zingales (1998) index. Columns 4-6 controls for the inventories to sales index and columns 7-9 controls for the cash conversion cycle, both estimated as in Raddatz (2006). The three financial dependence measures are estimated at four-digit NACE industries. Source: APEH.

	Credit Registry			Balance Shee	et Data		Credit Registry + BS Data
	No ST or LT	No LT		ST	Obligations		No Credit or LT/ST
	Credit	Obligations	w/ Owners	Trade Credit	w/ Banks	All	Obligation
						=(3)+(4)+(5)	=(1)+(2)+(6)
				Panel A- V	alue Added		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Capital elasticity	$0.126 \\ (0.397)$	-0.193 (0.508)	0.416 (0.509)	0.107 (0.754)	0.064 (0.492)	-0.209 (1.151)	-0.854 (1.400)
Expenditure elasticity	0.152^{**} (0.063)	0.232^{**} (0.103)	0.232^{**} (0.091)	0.350^{**} (0.141)	0.186^{*} (0.100)	0.608^{***} (0.193)	0.737^{***} (0.217)
Average sectoral productivity	$0.039 \\ (0.036)$	$\begin{array}{c} 0.029 \\ (0.037) \end{array}$	$\begin{array}{c} 0.022 \\ (0.046) \end{array}$	-0.027 (0.039)	$\begin{array}{c} 0.017 \\ (0.040) \end{array}$	-0.093 (0.057)	-0.073 (0.060)
Returns to scale	-0.144 (0.181)	-0.371 (0.249)	-0.358 (0.260)	-0.943** (0.467)	-0.426^{*} (0.249)	-1.364^{**} (0.633)	-1.326^{*} (0.705)
R^2	0.003	0.007	0.008	0.024	0.006	0.066	0.081
Ν	27,790	23,358	20,989	8,420	22,583	4,410	2,508
				Panel B-	- Capital		
Capital elasticity	0.419 (0.304)	0.387 (0.303)	1.107^{**} (0.520)	-0.364 (0.377)	0.543^{**} (0.233)	0.013 (0.469)	0.209 (0.636)
Expenditure elasticity	-0.003 (0.037)	-0.113^{***} (0.041)	-0.080 (0.077)	-0.024 (0.057)	-0.096 (0.061)	-0.046 (0.060)	0.021 (0.065)
Average sectoral productivity	0.028^{**} (0.013)	0.050^{***} (0.016)	-0.005 (0.036)	$\begin{array}{c} 0.002 \\ (0.029) \end{array}$	$\begin{array}{c} 0.021 \\ (0.016) \end{array}$	-0.010 (0.045)	-0.088^{*} (0.050)
Returns to scale	0.118 (0.119)	$\begin{array}{c} 0.161 \\ (0.134) \end{array}$	-0.004 (0.227)	-0.048 (0.205)	$\begin{array}{c} 0.132 \\ (0.193) \end{array}$	$0.025 \\ (0.236)$	-0.040 (0.234)
R^2	0.001	0.002	0.002	0.000	0.001	0.000	0.002
Ν	25,712	$21,\!369$	19,405	7,127	20,739	3,391	1,736
				Panel C- E	mployment		
Capital elasticity	-0.125 (0.328)	0.067 (0.276)	0.181 (0.401)	-0.299 (0.319)	0.344 (0.261)	-0.636 (0.395)	-0.794 (0.527)
Expenditure elasticity	0.157^{***} (0.042)	0.081^{**} (0.041)	0.150^{***} (0.045)	0.109^{***} (0.033)	0.094^{**} (0.041)	0.097^{**} (0.047)	0.158^{***} (0.058)
Average sectoral productivity	0.067^{***} (0.017)	0.069^{***} (0.016)	0.060^{**} (0.026)	0.060^{***} (0.022)	0.044^{***} (0.014)	$0.027 \\ (0.029)$	0.039 (0.030)
Returns to scale	-0.039 (0.118)	-0.085 (0.115)	-0.101 (0.159)	-0.191 (0.138)	-0.135 (0.099)	-0.114 (0.174)	0.062 (0.211)
R^2	0.007	0.005	0.007	0.006	0.004	0.004	0.008
Ν	25,578	21,188	19,532	6,557	20,531	3,175	1,535

Table C.13: ROBUSTNESS: FIRMS WITHOUT DEBT

Notes: *, ***, **** significant at 10, 5, and 1 percent. Std. errors are clustered at four-digit NACE industries. Column 1 excludes firms reporting short term (ST) and/or long term (LT) credit in the credit registry data. Columns 2 to 6 consider liabilities obligations reported in balance sheet data. Column 2 excludes firms reporting long-term obligations. Column 3 excludes firms reporting short-term loans with owners, column 4 excludes firms reporting short-term trade credit, column 5 excludes firms reporting short-term credit with financial institutions, and column 6 excludes firms reporting all short-term obligations. Column 7 excludes firms reporting any type of short or long term obligation or credit reported either in the credit registry or balance sheet data. Source: APEH and credit registry.

	Log Value Added	Log Capital	Log Employment
	(1)	(2)	(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)	$0.130 \\ (0.144)$	-0.099 (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

Table C.14: ROBUSTNESS: PANEL REGRESSION

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.

	$\begin{array}{c} \Delta \text{ Value Added} \\ (1) \end{array}$	$\begin{array}{c} \Delta \text{ Capital} \\ (2) \end{array}$	$\begin{array}{c} \Delta \text{ Employment} \\ (3) \end{array}$
Capital elasticity	0.665^{*} (0.368)	$ \begin{array}{c} 1.121^{***} \\ (0.375) \end{array} $	$\begin{array}{c} 0.376 \\ (0.353) \end{array}$
Expenditure elasticity	0.094^{*} (0.048)	-0.037 (0.052)	0.107^{***} (0.038)
Average sectoral productivity	0.024 (0.028)	0.027 (0.023)	0.060^{***} (0.021)
Returns to scale	-0.287^{*} (0.159)	-0.024 (0.155)	-0.097 (0.133)
R^2	0.004	0.003	0.006
Ν	20,936	20,936	20,936

Table C.15: ROBUSTNESS: CONTINUING FIRMS

Notes: *, ***, *** significant at 10, 5, and 1 percent. Std. errors are clustered at four-digit sector level. These regressions only consider firms 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. Source: APEH.

		Log Value Added
	Capital Elasticity	Expenditure
		Elasticity
	(1)	(2)
$v1995 \times High Elasticity$	-0.035	-0.055
Jibbo A Ingi Elasticity	(0.028)	(0.044)
y1996 \times High Elasticity	-0.002	-0.019
	(0.027)	(0.048)
y 1997 \times High Elasticity	-0.014	0.054
	(0.021)	(0.047)
$y1998 \times High Elasticity$	-0.013	0.078
1000 v High Flagtisity	(0.025)	(0.051)
y1999 × Ingli Elasticity	(0.021)	(0.074)
$v2000 \times High Elasticity$	0.015	0.056
<u>, </u>	(0.017)	(0.043)
y2001 \times High Elasticity	0.055***	0.121***
	(0.013)	(0.025)
y2002 \times High Elasticity	0.050^{***}	0.073***
	(0.011)	(0.018)
$y2003 \times High Elasticity$	0.032**	0.059**
	(0.015)	(0.026)
y2004 × High Elasticity	(0.001)	$(0.042)^{-1}$
$v2005 \times High Elasticity$	0.040***	0.046***
<u>, </u>	(0.011)	(0.013)
y2006 \times High Elasticity	0.029**	0.019
	(0.012)	(0.011)
y2007 \times High Elasticity	0.016^{*}	0.049^{***}
	(0.009)	(0.008)
y1995	-0.925***	-1.592***
w1006	(0.203)	(0.180) 1.400***
y1990	-0.955	(0.151)
v1997	-0.854***	-1.356***
-	(0.120)	(0.125)
y1998	-0.731***	-1.195***
	(0.106)	(0.111)
y1999	-0.654***	-1.056***
2000	(0.089)	(0.100)
y2000	-0.592^{+++}	$-0.900^{-0.00}$
v2001	-0 499***	-0.762***
92001	(0.067)	(0.079)
y2002	-0.455***	-0.669***
	(0.055)	(0.066)
y2003	-0.411***	-0.579***
	(0.043)	(0.058)
y2004	-0.300***	-0.445***
2005	(0.038)	(0.047)
y2005	$-0.340^{-0.0}$	-0.445
v2006	-0 177***	-0.235***
5=000	(0.021)	(0.021)
y2007	-0.068***	-0.113***
-	(0.008)	(0.008)
Firm Fixed-Effects	Yes	Yes
Sectoral controls	Yes	Yes
R^2	0.802	0.793
N	905,635	905,635

Table C.16: Effect by Year

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.

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

Table C.17: ROBUSTNESS: NON-EXPORTERS AND DOMESTICALLY-OWNED FIRMS

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.

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

Table C.18: ROBUSTNESS: CONTROLLING FOR IMPORTS

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

Table C.19: ROBUSTNESS: CAPITAL AND EXPENDITURE ELASTICITIES

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.

	$\begin{array}{c} \Delta \text{ Value Added} \\ (1) \end{array}$	$\begin{array}{c} \Delta \text{ Capital} \\ (2) \end{array}$	$\begin{array}{c} \Delta \text{ Employment} \\ (3) \end{array}$
Capital elasticity	0.671^{*} (0.365)	$\begin{array}{c} 1.135^{***} \\ (0.350) \end{array}$	0.603** (0.280)
Expenditure elasticity	0.080^{*} (0.047)	-0.103 (0.063)	0.101^{***} (0.034)
Sectoral price index	-0.024 (0.312)	$\begin{array}{c} 0.182^{***} \\ (0.069) \end{array}$	0.315^{***} (0.069)
Returns to scale	-0.175 (0.137)	$\begin{array}{c} 0.007 \\ (0.135) \end{array}$	-0.226^{**} (0.096)
\mathbb{R}^2	0.002	0.003	0.008
Ν	56,525	53,987	54,251

Table C.20: ROBUSTNESS: PRICE INDEX

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.21: 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		
Ν	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.22: TOP 30 SECTORS:	Net Entry ((2001 - 2007))
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Activity	Broad sector	Sector	Description	Expenditure	Net entry	Number of	Share agg.
-	(II digits)	(IV digits)	-	elasticity	per year	employees	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	505 490	კ ე	0.21
Service	notels and restau-	9990	Restaurants	1.80	480	3	0.13
Service	Other business activ-	7414	Business and management consultancy activities	1.35	446	2	0.08
	ities						
Service	Other business activ-	7487	Other business activities n.e.c.	1.35	439	3	0.10
	ities						
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 activ-	7420	Architectural and engineering activities and related techni-	1.35	363	2	0.06
G	Ities	7000	cal consultancy	0.00	007	4	0.02
Service	Real estate activities	7020	Letting of own property Retail cale in non-specialized stores with food, however, or	2.02	297	4	0.03
Service	Retail trade	3211	tobacco predominating	0.85	271	4	0.11
Service	Sale. maintenance	5010	Sale of motor vehicles	0.85	250	2	0.06
	and repair of motor			0.00		-	0.00
	vehicles						
Service	Hotels and restau-	5540	Bars	1.80	248	2	0.04
	rants						
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 activ-	7411	Legal activities	1.35	211	2	0.04
Comrise	ities Datail trada	5949	Detail cale of elething	0.02	901	9	0.06
Service	Computer and ro	0242 7999	Other software consultancy and supply	0.00	201	2	0.00
Service	lated activities	1222	Other software consultancy and suppry	1.55	155	2	0.04
Service	Construction	4533	Plumbing	0.89	197	3	0.04
Service	Sale, maintenance	5020	Maintenance and repair of motor vehicles	0.85	189	2	0.03
	and repair of motor						
	vehicles						
Service	Activities auxiliary	6720	Activities auxiliary to insurance and pension funding	1.44	182	1	0.02
a .	to financial inter	8011		0.00	1 = 0	2	0.01
Service	Real estate activities	7011	Development and selling of real estate	2.02	176	2	0.01
Service	Other business activ-	7400	Investigation and security activities	1.35	170	0	0.11
Service	Other services activ-	9302	Hairdressing and other beauty treatment	1.18	151	9	0.02
5011100	ities	0002	Handrossing and other boardy troublient	1110	101	-	0.02
Service	Retail trade	5246	Retail sale of hardware, paints and glass	0.83	143	2	0.03
Service	Other business activ-	7440	Advertising	1.35	141	2	0.03
	ities						
Service	Recreational, cul-	9262	Other sporting activities	1.79	131	2	0.01
	tural and sporting						
G	activities	0719		1.44	109	0	0.01
Service	to financial inter	0713	Activities auxiliary to financial intermediation n.e.c.	1.44	123	2	0.01
Service	Computer and re-	7220	Software consultancy and supply	1.35	121	9	0.03
001 1100	lated activities		solution constitution and suppry	1.00		-	0.00
Service	Other business activ-	7470	Industrial cleaning	1.35	121	7	0.08
	ities		-				
Service	Construction	4544	Painting and glazing	0.89	112	2	0.03
Total					8109		1.68

	High E	Expenditure I	Elasticity	High I	Expenditure	Elasticity	Low E	xpenditure	Elasticity	Low E	xpenditure E	lasticity
	& Hig	gh Capital El	lasticity	& Lo	ow Capital E	lasticity	& High Capital Elasticity		& Low Capital Elasticity			
	Value	Empl.	Number	Value	Empl.	Number	Value	Empl.	Number	Value	Empl.	Number
	Added		of Firms	Added		of Firms	Added		of Firms	Added		of Firms
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(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	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
trend												
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
Ν	17	17	17	17	17	17	17	17	17	17	17	17

Table C.23: Aggregate Trends

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.

	RI	RTFP		Labor Productivity (VA per worker)		Added
	(1)	(2)	(3)	(4)	(5)	(6)
FL	-0.151^{***} (0.029)	-0.077^{***} (0.019)	-0.221^{***} (0.028)	-0.138*** (0.023)	-0.784^{***} (0.044)	-0.619^{***} (0.021)
Sector FE		Yes		Yes		Yes
R^2	0.003	0.095	0.005	0.096	0.035	0.134
Ν	95,689	$95,\!687$	$143,\!427$	143,314	211,241	211,163

Table C.24: Characteristics of Entrants Before and After the Financial Liberalization

Notes: *, ***, *** significant at 10, 5, and 1 percent. Std. errors are clustered at four-digit NACE industries. Sector fixed effects are estimated at four-digit NACE industries. Period: 1995-2008. Source: APEH.

Theory Appendices

APPENDIX D STEADY STATE SYSTEM

$$Endogenous(39) = \{P, P_S, P_M, P_M^D, w, r^k, r, \phi_j\} = 8$$

$$= \{C, C_S, C_M, C_M^D, C_M^F, B, TB, K, X_M, Y, TBY\} = 11$$

$$= \{M_j, M_j^e, \varphi_S^d, \varphi_M^d, \varphi_M^x\} = 5$$

$$= \{c_j(\varphi), p_j(\varphi), q_j^d(\varphi), q_M^x(\varphi), \pi_j^d(\varphi), \pi_M^x(\varphi), V_S(\varphi), V_M(\varphi), V_M^d(\varphi), V_M^x(\varphi), \mu_j(\varphi)\} = 11$$

$$= \{k_j^d(\varphi), k_M^x(\varphi), l_j^d(\varphi), l_M^x(\varphi)\} = 4$$

Appendix D.1 Household

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

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

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

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

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

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

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

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

$$r = r^* + \tau \{B_t < 0\} - \tau \{B_t > 0\}$$
(G.9)

Appendix D.2 Production

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

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

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

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

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

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

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

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

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

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

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

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

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

Appendix D.2.2 Value Functions and Cut-Offs

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

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

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

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

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

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

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

Appendix D.2.4 Aggregation

$$L_{S}^{prod} = M_{S} \int_{\varphi_{S}^{d}}^{\infty} l_{S}^{d}(\varphi) \mu_{S}(\varphi) d\varphi$$

$$L_{M}^{prod} = M_{M} \int_{\varphi_{M}^{d}}^{\infty} l_{M}^{d}(\varphi) \mu_{M}(\varphi) d\varphi + M_{M} \int_{\varphi_{M}^{x}}^{\infty} l_{M}^{x}(\varphi) \mu_{M}(\varphi) d\varphi$$

$$L_{j}^{entry} = M_{j}^{e} \cdot \nu(1 - \alpha_{1j}) \cdot \frac{\phi_{j}}{w} \left[f_{j}^{e} + \xi \left(\exp\left(\frac{M_{j}^{e} - \overline{M}_{j}^{e}}{\overline{M}_{j}^{e}}\right) - 1 \right) \right] \qquad j \in \{S, M\}$$

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

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

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

$$\begin{split} K_{S}^{prod} &= M_{S} \in_{\varphi_{S}^{d}}^{\infty} k_{S}^{d}(\varphi) \mu_{S}(\varphi) d\varphi \\ K_{M}^{prod} &= M_{M} \int_{\varphi_{M}^{d}}^{\infty} k_{M}^{d}(\varphi) \mu_{M}(\varphi) d\varphi + M_{M} \int_{\varphi_{M}^{x}}^{\infty} k_{M}^{x}(\varphi) \mu_{M}(\varphi) d\varphi \\ K_{j}^{entry} &= M_{j}^{e} \cdot \nu \alpha_{1j} \cdot \frac{\phi_{j}}{r^{k}} \left[f_{j}^{e} + \xi \left(\exp \left(\frac{M_{j}^{e} - \overline{M}_{j}^{e}}{\overline{M}_{j}^{e}} \right) - 1 \right) \right] \qquad j \in \{S, M\} \end{split}$$

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

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

Appendix D.3 Markets Clear

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

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

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

$$Endogenous(42) = \{P, P_S, P_M, P_M^D, w, r^k, r, \Lambda, \lambda, \phi_j\} = 10$$

$$= \{C, C_S, C_M, C_M^D, C_M^F, B, TB, K, X_M, Y, TBY\} = 11$$

$$= \{M_j, M_j^e, \varphi_S^d, \varphi_M^d, \varphi_M^x\} = 5$$

$$= \{c_j(\varphi), p_j(\varphi), q_S^d(\varphi), q_M^d(\varphi), q_M^x(\varphi), \pi_j^d(\varphi), \pi_M^x(\varphi), V_S(\varphi), V_M(\varphi), V_M^d(\varphi), V_M^x(\varphi), \mu_j(\varphi)\} = 12$$

$$= \{k_j^d(\varphi), k_M^x(\varphi), l_j^d(\varphi), l_M^x(\varphi)\} = 4$$

Appendix E.1 Household

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

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

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

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

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

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

$$\lambda_{t} = \frac{C_{t}^{-\gamma}}{P_{t}} \left[\frac{1 - \eta}{\epsilon_{M} \theta_{M}^{\frac{1}{\eta}} C_{t}^{\frac{\epsilon_{M} - \eta}{\eta}} C_{Mt}^{\frac{\eta - 1}{\eta}} + \epsilon_{S} \theta_{S}^{\frac{1}{\eta}} C_{t}^{\frac{\epsilon_{S} - \eta}{\eta}} C_{St}^{\frac{\eta - 1}{\eta}} - \eta} \right]$$
(G.7)

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

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

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

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

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

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

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

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

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

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

$$k_{jt}^{d}(\varphi) = \alpha_{j} \frac{\phi_{jt}}{r_{t}^{k}} \left[\frac{q_{jt}^{d}(\varphi)}{\varphi} + f_{j}^{d} \right] \quad j \in \{S, M\}$$
(G.20)

$$k_{Mt}^{x}(\varphi) = \alpha_{M} \frac{\phi_{Mt}}{r_{t}^{k}} \left[\frac{q_{Mt}^{x}(\varphi)}{\varphi} + f_{M}^{x} \right]$$
(G.21)

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

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

Appendix E.2.2 Value Functions and Cut-Offs

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

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

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

$$V_{Mt}^x(\varphi) = \max\left\{0, \pi_{Mt}^d(\varphi) + \pi_{Mt}^x(\varphi) + (1-\delta)\Lambda_{t,t+1}V_{M,t+1}(\varphi)\right\}$$
(G.27)

$$V_{St}(\varphi_{St}^d) = 0 \tag{G.28}$$

$$V_{Mt}^d(\varphi_{Mt}^d) = 0 \tag{G.29}$$

$$V_{Mt}^x(\varphi_{Mt}^x) = 0 \quad \Leftrightarrow \quad \pi_{Mt}^x(\varphi_{Mt}^x) = 0 \tag{G.30}$$

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

$$M_{j,t+1}\mu_{j,t+1}(\varphi) = \begin{cases} (1-\delta)M_{jt}\mu_{jt}(\varphi) + M^{e}_{j,t+1}g(\varphi) & \text{if } \varphi \ge \varphi^{d}_{j,t+1} \\ 0 & \text{otherwise} \end{cases} \quad j \in \{S, M\} \quad (G.31)$$

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

$$\int_{\varphi_{jt}^d}^{\infty} V_{jt}(\varphi) g(\varphi) d\varphi = \phi_{jt} \left[f_j^e + \xi \left(\exp\left(\frac{M_{jt}^e - \overline{M}_j^e}{\overline{M}_j^e}\right) - 1 \right) \right] \qquad \qquad j \in \{S, M\}$$
(G.33)

Appendix E.2.4 Aggregation

$$L_{St}^{prod} = M_{St} \int_{\varphi_{St}^d}^{\infty} l_{St}^d(\varphi) \mu_{St}(\varphi) d\varphi$$
$$L_{Mt}^{prod} = M_{Mt} \int_{\varphi_{Mt}^d}^{\infty} l_{Mt}^d(\varphi) \mu_{Mt}(\varphi) d\varphi + M_{Mt} \int_{\varphi_{Mt}^x}^{\infty} l_{Mt}^x(\varphi) \mu_{Mt}(\varphi) d\varphi$$

$$L_{jt}^{entry} = M_{jt}^{e} \cdot (1 - \alpha_{j}) \cdot \frac{\phi_{jt}}{w_{t}} \left[f_{j}^{e} + \xi \left(\exp \left(\frac{M_{jt}^{e} - \overline{M}_{j}^{e}}{\overline{M}_{j}^{e}} \right) - 1 \right) \right] \qquad j \in \{S, M\}$$
$$L_{jt} = L_{jt}^{prod} + L_{jt}^{entry} \qquad j \in \{S, M\}$$
$$\overline{L} = L_{Mt} + L_{St} \qquad (G.34)$$

$$K_{St}^{prod} = M_{St} \int_{\varphi_{St}^d}^{\infty} k_{St}^d(\varphi) \mu_{St}(\varphi) d\varphi$$
$$K_{Mt}^{prod} = M_{Mt} \int_{\varphi_{Mt}^d}^{\infty} k_{Mt}^d(\varphi) \mu_{Mt}(\varphi) d\varphi + M_{Mt} \int_{\varphi_{Mt}^x}^{\infty} k_{Mt}^x(\varphi) \mu_{Mt}(\varphi) d\varphi$$

$$K_{jt}^{entry} = M_{jt}^{e} \cdot \alpha_{j} \cdot \frac{\phi_{jt}}{r_{t}^{k}} \left[f_{j}^{e} + \xi \left(\exp \left(\frac{M_{jt}^{e} - \overline{M}_{j}^{e}}{\overline{M}_{j}^{e}} \right) - 1 \right) \right] \qquad j \in \{S, M\}$$

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

$$K_{t} = K_{Mt} + K_{St} \qquad (G.35)$$

Appendix E.3 Markets Clear

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

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

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

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

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

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

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

Appendix F Short-Term Dynamics: Counterfactual Exercises (Additional Figures)



Figure C.15: Counterfactual Economies in the short term

APPENDIX G OPTIMAL POLICY: ADDITIONAL FIGURES

Figure (C.16) plot the transition paths of aggregate variables under different levels of ϕ which governs the speed of decrease in the borrowing tax. With a larger value of ϕ , the effective interest rate inclusive of the borrowing tax decreases at a slower rate (Figure C.16a). As such, a larger ϕ reduces the net foreign assets position of the economy. Compared to an immediate removal of capital controls as studied in the baseline model which leads to a terminal debt to GDP ratio of 140%, we find that the optimal policy results in a steady state debt to GDP ratio of only 60% (Figure C.16c). With less borrowing along the transition path, the increase in consumption and capital stock upon liberalization is also dampened (Figure C.16b and C.16d). By mediating the spike in consumption upon liberalization, a more gradual reduction in the borrowing tax also smooths the effects of liberalization on the aggregate price index (Figure C.16e).

Figure (C.17) plots the terminal level of borrowing, capital, and aggregate price associated with different values of ϕ . A faster liberalization (lower ϕ) results in larger transitional borrowing and therefore a larger steady state level of debt to GDP ratio (Figure C.17a). As mentioned, there is a trade-off between the speed of convergence and the terminal steady state of the open economy. An economy can reach the terminal steady state faster by borrowing more along the transition, but a larger terminal level of debt also reduces the terminal level of consumption due to larger debt burden in the steady state. Figures (C.17b and C.17c) show that the same pattern also holds for capital and aggregate prices.



Figure C.16: Full Transition for different values of ϕ



Figure C.17: Long run aggregates for different values of ϕ

APPENDIX H REPRESENTATIVE FIRM MODEL

Appendix H.1 Model Description

We consider a representative firm version of the model, where each sector $j \in \{S, M\}$ is populated by a representative firm. The household block of the model is identical to the baseline heterogeneous firm model.

The representative firm in sector $j \in \{S, M\}$ has the following production function:

$$Y_{j,t} = A_j K_{j,t}^{\alpha_j} L_{j,t}^{1-\alpha_j}$$
(G.43)

Optimality requires setting the marginal product of labor and capital equal to their respective prices:

$$w_t = \alpha_j A_j K_{j,t}^{\alpha_j - 1} L_{j,t}^{1 - \alpha_j} \tag{G.44}$$

$$r_t^k = \alpha_j A_j K_{j,t}^{\alpha_j} L_{j,t}^{-\alpha_j} \tag{G.45}$$

Prices of the sectoral output $Y_{j,t}$ are related to factor prices through the zero profit condition:

$$P_{j,t} = \frac{1}{A_j} \left(\frac{r_t^k}{\alpha_j}\right)^{\alpha_j} \left(\frac{w_t}{1-\alpha_j}\right)^{1-\alpha_j}$$
(G.46)

We consider two versions of the model: one where the manufacturing price is fixed and one where the manufacturing price responds endogenously to demand.

(i) Exogenous Tradable Price Version

The manufacturing firm takes its price $P_{M,t}^D = P_{M,t}^X$ as given. All manufacturing production in excess of domestic demand are exported:

$$X_{t} = P_{M,t}^{X} \left(Y_{M,t} - C_{M,t}^{D} \right)$$
 (G.47)

(ii) Endogenous Tradable Price Version

The manufacturing firm faces a downward sloping export demand schedule:

$$C_{M,t}^X = \zeta_X \left(P_{M,t}^X \right)^{-\eta_M} \tag{G.48}$$

From equation (G.46), one can see that a given tradable price and rental rate of capital imply the labor wage. Therefore, when tradable price is exogenously given, the nontradable price also becomes exogenous in the steady state as the rental rate of capital is pinned down by the Euler equation.

Appendix H.2 Model Calibration

The calibration strategy of the representative firm version of the model is close to that of the baseline heterogeneous firm model. Externally calibrated parameters are taken from the baseline heterogeneous firm model and summarized in Table (C.25). We internally calibrate the steady state of the endogenous price version to obtain the remaining parameters. Relative to the baseline heterogeneous firm model, there are three new parmeters to be calibrated, which are the TFP in each sector (A_S, A_M) and the demand shifter for foreign import demand ζ_M . We normalize $A_S = 1$ and internally calibrate A_M to match the employment share of the manufacturing sector in the Hungarian data. We choose ζ_M to match the export share of GDP in the baseline heterogeneous firm model. All remaining parameters are calibrated to Hungarian data in 2008 using target moments from the baseline model. The internally calibrated parameters and the corresponding moments are reported in Table (C.26).

In the exogenous price version, we set the tradable price $P_M^D = D_M^X$ equal to its steady state value in the endogenous price model.

Parameter	Description	Value	Source
r^*	World interest rate	0.05	Macro Data
β	Discount Rate	0.95	$\frac{1}{1+r^*}$
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)
δ^k	Depreciation of capital	0.12	Macro Data
$lpha_S$	Capital Share S Sector	0.30	Micro data
α_M	Capital Share M Sector	0.36	Micro data
A_S	Service Sector TFP	1	Normalization
au	Capital control tax	0	na

Table C.25: EXTERNALLY-CALIBRATED PARAMETERS

Table C.26: INTERNALLY-CALIBRATED PARAMETERS

Parameter	Description	Value	Target	Data	Model
A_M	Share L_M in L	0.44	$L_M/(L_S + L_M)$	0.53	0.53
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
ζ_X	Foreign Import Demand	0.34	$(P_M^X \cdot C_M^X)/Y$	0.34	0.34
e_S	Expenditure Elasticity S	1.76	Bils, Klenow, and Malin (2013)	1.11	1.11
e_M	Expenditure Elasticity M	1.22	Bils, Klenow, and Malin (2013)	0.85	0.85
\overline{L}	Labor supply	0.53	Nominal GDP Y	1	1

APPENDIX I 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:

$$r_t = r^* + \tau \{B_t < 0\} - \tau \{B_t > 0\} + \psi \left(\exp(-B_t) - 1\right).$$
(G.49)

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 I.1 Short-run Dynamics

Figures C.18 and C.19 shows that the main short-run dynamics of the baseline economy are robust to this alternative model.



Figure C.18: 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.

Appendix I.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.



Figure C.19: 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.

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 $r_0^k (K_0, M_{j0}, \mu_{j0}, B_0 = 0)$, we can define three potential types of transition paths:

- 1. Financial Autarky: $\forall \tau, \tau \geq \overline{\tau}$ 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): $\forall \tau, \underline{\tau} \leq \tau < \overline{\tau}$ 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:

$$1 + r_{t+1}^k - \delta^k = \left(1 + r^* + \tau + \psi \cdot (e^{-B_{t+1}} - 1) - \psi B_{t+1} \cdot e^{-B_{t+1}}\right)$$
(G.50)

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

$$\frac{1}{\beta} = \left(1 + r^* + \tau + \psi \cdot (e^{-B_{ss}} - 1) - \psi B_{ss} \cdot e^{-B_{ss}}\right)$$
(G.51)

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.20: 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.

Figure C.20 illustrates the three regions in $(\tau - K_0)$ space for given initial firm distributions and no initial debt holding. The function $\bar{\tau}(K_0)$ 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, $\bar{\tau}(K_0)$ converges to $\underline{\tau}$. In addition, as capital approaches 0, $\bar{\tau}(K_0)$ 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 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.21 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.20, the moderate liberalization



Figure C.21: 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.

- 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.51). 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

exporters within manufacturing.



Figure C.22: 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.

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.22. As stated above, to sustain long-run borrowing, economies with larger reforms (lower τ) exhibit a larger long-run trade balance (Figure C.22a) and lower long-run consumption (Figure C.22b). 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.22c). Because only manufacturing output is tradable and the higher long-run debt is serviced by exporting, production is shifted further towards manufacturing (Figure C.22d). Consequentially, an economy with larger debt holding must also have more firms in the manufacturing sector (Figure C.22e). Importantly, the lower domestic demand reduces the ideal consumption price, inducing a real exchange depreciation (Figure C.22f). 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.22g). 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 existing exporting firms expand. (Figure C.22h). Both of these reallocation exporting effects imply economy-wide long-run productivity gains (Figure C.22i). 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.