Non-traded goods, factor market frictions, and international capital flows*

Jacek Rothert — U.S. Naval Academy

Jacob Short† — Bank of Canada‡

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Abstract

The canonical one-sector model over predicts international capital flows by a factor of ten. We show that introducing a non-traded goods sector can reconcile the differences between the theoretical predictions and the observed flows. We analyze the quantitative impact of the non-traded sector using a calibrated model of a small open economy, in which non-traded goods are used in consumption and investment, and need capital and labor to be produced. The model features international frictions directly affecting international borrowing and lending, as well as domestic frictions that limit the scope of inter-sectoral reallocation of capital and labor. We find that: (1) the impact of domestic frictions on the size of international capital flows is similar to the impact of international frictions, and (2) the median elasticity of capital flows with respect to international frictions in the two-sector model with costly inter-sectoral reallocation is about 50-60% lower than that same elasticity in the one-sector model.

Keywords: non-traded sector, capital flows, savings wedge, allocation puzzle
JEL Codes: F21, F43, O41;

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†Corresponding author: Financial Stability Department, Bank of Canada, 234 Wellington St. W, Ottawa, Ontario K1A 0G9, Canada; email: jshort@bank-banque-canada.ca; phone: +1 613 782 1433.

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1 Introduction

The international flows of capital have long been a focal point of open economy macroeconomics. However, the canonical one-sector neoclassical growth model, often used to study growth and dynamics of a closed economy, when applied to open economies produced several irregularities with observations on international capital flows in the post war period. Contrary to the one-sector model's predictions, domestic savings and investment rates in the data are highly correlated (Feldstein and Horioka, 1980), capital has not flown to countries where it is scarce (Lucas, 1990), and the correlation between total net capital inflows and productivity growth has been negative (Gourinchas and Jeanne, 2013).[1] Finally, the overall size of net capital flows in the data is 10 times smaller than the one-sector model predicts (Gourinchas and Jeanne (2013), Rothert (2016), and Figure 1 on page 8).

The first three puzzles have been extensively studied in the literature. Our focus in this paper is on the fourth one — the discrepancy between the size of net flows observed in the data and the size predicted by the one-sector growth model. The very nature of the discrepancy is quantitative and as such is our paper. More specifically, we want to measure the relative importance of domestic vs. international frictions in accounting for the size discrepancy. In order to do so, we add two features into the standard neo-classical one-sector model. First, we add a non-traded sector with frictions to inter-sectoral reallocation of capital and labor. Second, we add a distortion into the international borrowing and lending, in the form of a debt price wedge, similar to Gourinchas and Jeanne (2013), but only operating in the international markets. We calibrate the country-specific parameters of the model using a sample of 54 developing and developed economies so that the model captures the size of capital flows exactly. We then remove the domestic and international

[1] Aguiar and Amador (2011) point out that this correlation is largely driven by changes in government financial assets, and that private inflows are indeed positively correlated with productivity growth.

distortions, and evaluate how their absence impacts the predicted capital flows.

We find that domestic reallocation frictions matter a lot. While international frictions are essential in accounting for a low (or negative) correlation between capital inflows and the real gross domestic product (GDP) growth, the domestic reallocation frictions have a very large impact on the magnitude of net flows. First, for a median country in our sample, the removal of domestic reallocation frictions has almost the same impact on that magnitude (measured as the squared error between the data and the model generated long-run net inflows over the period of 30+ years) as does the removal of international frictions. Second, removing international frictions in the two-sector model with costly inter-sectoral reallocation has a much smaller impact on capital flows than does the same experiment in the one-sector model - the median squared error is forty percent lower. Effectively, the elasticity of capital flows with respect to financial frictions is much smaller in the two-sector model with domestic frictions (about one third of that same elasticity in the one-sector model). We find that the degree of complementarity between traded and non-traded goods in consumption is the key parameter affecting that elasticity. However, even with fairly substitutable tradeables and non-tradeables (when the elasticity of substitution between them equals two), capital flows in the two-sector model are still only half as sensitive to international frictions as they are in the one-sector model.

The intuition behind our results relies on two empirical features of the non-traded sector that we include in the model. First, some goods that are used for either consumption or investment purposes are non-tradeable and cannot be imported. Second, the reallocation of both capital and labor between different sectors takes time. The first feature is quite apparent - certain services must be consumed domestically (a hotel stay) and construction accounts for a large part of investment expenditures.[2] The second feature is an empirical

[2] Bems (2008) provides a comprehensive study of both the expenditure shares and the elasticity of sub-

phenomenon that we document in this paper.

How do these two features combined affect the size of capital flows? In the one-sector model, there are two main forces that generate large capital inflows to a fast growing economy: consumption smoothing motive and rising marginal product of capital. In the two-sector model these forces may not be as strong. With under-developed non-traded sector, the marginal utility from tradeables is smaller, and hence the incentive to import them is smaller. Similarly, the return from buying tradeable capital goods is not as large, if investment also requires a substantial non-tradeable component. However, factor mobility implies that a fast-growing economy could simply put all the resources into a non-tradeable sector and import everything else. Reallocation frictions prevent that from happening, effectively reducing the incentive to finance higher consumption and investment expenditures via borrowing. Our main contribution is the quantitative evaluation of this channel, and we find that for many countries it is just as important as international frictions in shaping capital flows.

1.1 Literature review

The main focus of our paper is to understand how the existence of the non-traded sector in an open economy affects the international capital flows. The dynamics of capital accumulation in such framework was studied theoretically in Murphy (1986), Engel and Kletzer (1989), or Brock and Turnovsky (1994). Those early papers were interested in explaining the Feldstein-Horioka puzzle. They showed that with sufficiently large share of non-traded sector in expenditures, and sufficiently large capital-intensity of the non-traded sector, a two-sector model can explain the positive correlation between savings and investment rates. In a sense, our paper is a quantitative exploration of those ideas. First, we find the the mere existence of

stitution between tradeable and non-tradeable goods in investment expenditures.

the non-traded sector cannot account for the puzzle, once we calibrate the fundamental model parameters to match the sectoral income shares of capital and labor, as well as the share of non-tradables in consumption and investment expenditures - correlation between savings and investment rates in the frictionless two-sector model is -0.40, not much different from the -0.28 correlation present in the calibrated one-sector model. Second, while reallocation costs alone are not sufficient to account for that positive correlation, they can close about one third of the gap between the frictionless two-sector model and the data.

In general, our paper is related to numerous studies that try to account for puzzles in international capital flows. Those studies can be broadly categorized as either: (i) relying on fundamentals, or (ii) relying on capital markets imperfections. The first group focuses on problems such as: omitted factors of production, government policies, different productivities across sectors, or difference in sizes of countries (see e.g. Causa et al. (2006), Hsieh and Klenow (2007), Baxter and Crucini (1993)). The latter group explored problems of sovereign risk (Reinhart and Rogoff (2004)), asymmetric information (Portes and Rey (2005)), poor institutional quality (Alfaro et al. (2008)), or incomplete markets (Bai and Zhang (2010)). Our study adds quantitatively important pieces to both sides. We add to the story based on fundamentals by introducing the non-tradeable sector, and exploring the role of complementarity between traded and non-traded goods in consumption. We add to the story based on market imperfections by accounting for the slow reallocation of labor between sectors. We are closely related to Causa et al. (2006), who argue that the existence of non-traded sector helps to account for the Lucas Puzzle. We show that the introduction of a non-traded sector, along with domestic distortions that limit the reallocation of resources between sectors, drastically reduce the size of international capital flows. Most importantly, we find that the slow inter-sectoral reallocation of capital and labor, and the international financial frictions, have a quantitatively similar impact on international capital flows.

Understanding why and the degree to which the standard model fails to have consistent predictions for goods/capital flows is important for understanding whether there is a role and/or the impact of potential policy which could improve the efficiency of outcomes and increase global income. Many important studies have been motivated by the understanding the reasons for the inconsistencies and apparent low degree of international capital mobility (Caselli (2007), Baxter and Crucini (1993) are among many). Our paper suggests that the tempered reallocation of labor from the tradable to the non-tradable sector could be an important factor behind the small size of capital flows. In spirit, our results are similar to those in Ohanian et al. (2018) who find that, in Latin America, the quantitative impact of domestic distortions on international capital flows is just as large (or even larger, depending on the time period) as the impact of international distortions.

We are also closely related to studies that address the Allocation Puzzle (Reinhardt (2010), Aguiar and Amador (2011), or Benhima (2013) are only a few examples from a very long list). Similarly to Gourinchas and Jeanne (2013), we find that the international friction in a form of a debt price wedge is necessary to fully account for the lack of a positive correlation between capital inflows and real GDP growth.

Our paper is one of many on capital flows to fast-growing, emerging economies. In the last 10 years, the major focus in the literature has been on the current account surpluses of East Asian countries, and the role of financial markets imperfections, or government policies driving them. This idea was explored in Song et al. (2011), Mendoza et al. (2009), Buera and Shin (2009), Carroll and Jeanne (2009), Caballero et al. (2008), Chamon and Prasad (2010), and Michaud and Rothert (2014). We differ along two dimensions. First, in addition to international frictions, we introduce domestic reallocation frictions, orthogonal to international markets, and evaluate the impact of both types of frictions on capital flows. We do so in a fully deterministic, laissez-faire economy without externalities. That way we can measure the extent to which reallocation frictions alone can limit the flows into the fast growing economies. Second, we do not focus on a few (albeit important) economies, but instead account for a more general pattern observed in a wider set of countries.

Finally, our paper is related to a large literature on structural change (Baumol, 1967; Ngai and Pissarides, 2007; Uy et al., 2013). Typically, the focus in the literature is on understanding the reallocation of labor across sectors during the country's economic development. Such reallocation can be driven by non-homotheticity in preferences (Stefanski, 2014), differential productivity growth, or even education policies (Ferreira et al., 2014). Our goal, however, is not to understand the forces that drive the dynamics of the structural change, but to make sure that our two-sector model quantitatively matches the reallocation of labor between tradable and non-tradable sector. Thus, unlike much of the literature on structural change, we impose that reallocation in our paper, rather than attempt to generate it endogenously.

2 Empirical Motivation

We start by documenting empirical regularities on international capital flows and the movement of labor between the traded and non-traded sectors. First, we compare the magnitudes of net capital flows observed in the data with the predicted flows from a standard one-sector model. The one-sector model is quite well established in the literature (see, e.g. Gourinchas and Jeanne (2013)), so we move its detailed description to the appendix. Second, we examine the direction and rate at which labor moves between the two sectors.

Data sources and construction of empirical statistics Our sample consists of 54 countries, both developed and developing, for the period 1980 to 2016.[3] Following Gourinchas and Jeanne (2013), the data on National Income and Product Accounts is from Penn World Tables, version 10.0.[4] Current Account data used to compute cumulative capital flows is from the Balance of Payments of the International Monetary Fund (IMF). The value of the initial net external debt is taken from Lane and Milesi-Ferretti (2007). The main statistic of interest is the ratio of the cumulative capital inflows to the GDP in the initial year. We follow Gourinchas and Jeanne (2013) and construct this statistic as the present value of the sum of the negative of the current account, purchasing power parity (PPP)-adjusted.[5]

Our analysis includes all countries for which we can observe employment shares in agriculture, industry and services. Unfortunately, the data on employment shares does not allow us to decompose the categories further, therefore, we assign agriculture and industry to the tradable sector and services to the non-tradable sector.[6] The data on employment shares comes from the the World Bank's World Development Indicators (WDI).

2.1 Magnitudes of Capital Flows

The standard one-sector growth model vastly over predicts the magnitudes of net capital flows. Over the time period 1980-2016, the cumulative sum of net capital inflows (relative to a country's initial year GDP) varied between -21.7 and 5.8 (see figure 1). Excluding Singapore which has a large negative inflow, the range is only between -8.6 and 5.8. In

[3]For many countries the time period spans 1980 to 2016, however, the initial and final year varies by country depending on data availability. For ease of exposition, we will present in terms of the full period 1980 to 2016.

[4]Gourinchas and Jeanne (2013) use PWT 6.3, however, we extend the sample period from 1980 to 2016, and therefore, use PWT 10.0.

[5]See Appendix B in Gourinchas and Jeanne (2013).

[6]As in Gervais and Jensen (2013) which uses detailed data from the United States, or Duarte and Restuccia (2015) which uses cross-country input-output and expenditure data, but not employment.

comparison, the range for the same statistic implied by a one-sector model with total factor productivity (TFP) paths imputed from the data, is about 9 times larger, and varies between -20 and 220 times initial GDP. Specifically, for high growth countries such as Korea, China, and India, the model predicts capital inflows (relative to initial year GDP) of 104, 42, and 33, respectively (see table 1). These predicted flows are an order of magnitude greater than the data; and similarly, for low growth countries, the model predicts capital outflows which are much greater in absolute value (e.g. the predicted capital inflow for Honduras is -13 relative to initial GDP, whereas the data shows an inflow of 3.44).

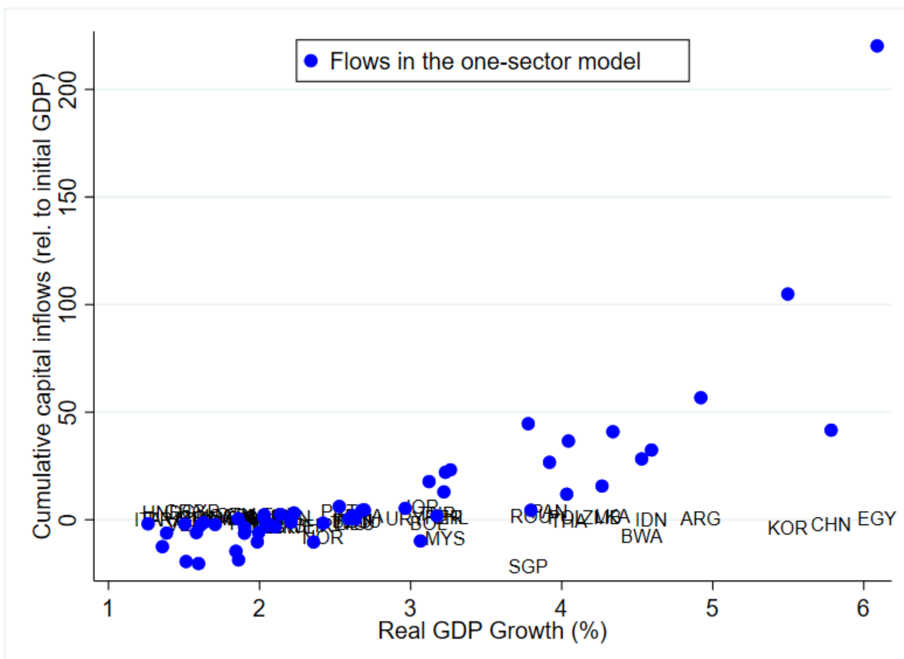

Figure 1: Predicted and Observed Capital Flows, 1980-2016

Notes: Real GDP growth for country i is measured in per capita terms, $\left(\frac{\text{RGDP}^i_{2016}}{\text{RGDP}^i_{1980}}\right)^{\frac{1}{37}} - 1$. Model predictions are under the assumption that each country starts with its 1980 net external debt (different for each country), and with the calibrated level of capital stock that may differ from the steady-state value.

Furthermore, the large differences between the data and the model predictions persists when international foreign aid, as well as when government net savings components are

Table 1: Actual vs. predicted size of flows

	Growth (%)	Capital Inflows Data	One-Sector Model
Korea	5.5	-1.29	104
China	5.8	-0.80	42
India	4.6	0.02	33
Honduras	1.4	3.44	-13
Italy	1.3	0.01	-1.9

Notes: Growth is the average growth of real GDP per capita from 1980 to 2016. Capital inflows are measured relative to initial year real GDP.

removed from the data series. Figure 2 shows the net capital inflows without foreign aid and government net savings plotted against real GDP growth.[7] The magnitudes of the private sector inflows are quite similar to the total inflows, and the significant discrepancy between the data and the model remain. The capital flows associated with the government and foreign aid alone cannot account for the over prediction of capital flows from the one-sector model.

The primary motives driving capital flows in a standard one-sector model where growth is driven by productivity, are well known and twofold: First, rising TFP implies higher marginal product of capital in the future, which increases today's investment expenditures (investment margin). Second, rising TFP implies higher income in the future. Under usual assumptions where consumption smoothing is desirable, rising income will imply more borrowing and less saving by the households (saving margin). Therefore, rising income implies capital inflows, and larger TFP growth implies larger capital inflows. As figure 1 shows, these motives are quite strong in the one-sector model and leads to large predicted inflows among rapidly growing countries and large predicted outflows among slowly growing countries.

[7]The sample of countries is reduced to 29 for which we can observe the private capital flows.

Figure 2: Total and Private Capital Flows, 1980-2016

Notes: Private capital flows are total flows less net foreign aid and government savings. Private capital flows are only observed for 29 of the 54 countries in our sample.

2.2 Capital flows and the non-traded sector

The extent to which the non-traded sector shapes a country's capital flows depends on three factors: first, the complementarity of tradable and non-tradable goods in aggregate consumption. Second, the requirement of non-tradable inputs in aggregate consumption and investment. And third, the ability to reallocate factors of production between producing tradable and non-tradable goods. Each of these factors influence the savings and investment margins and can operate to reduce the strong investment and consumption smoothing motives of the one-sector model.

A central feature of the data is the slow reallocation of labor from the tradable sector (industry and agriculture) into the non-traded sector (services). Table 2 show the average long-run change (in percentage points) of the shares of employment and value added in non-tradables over the period 1980 to 2016. Long-run changes for each country are measured as the average annual change from the initial year to the final year, $\Delta s = \frac{s^i_{2016} - s^i_{1980}}{37}$. While there are some countries which experienced a movement of labor away from the non-tradable sector, for most countries in the sample there was a gradual movement of labor into the non-tradable sector and a gradual rise in the share of non-tradables in value added. The maximum average annual changes in the non-tradable share of employment and value added are 0.01 and 0.014, respectively, and the median change are 0.005 and 0.004.

Table 2: Labor reallocation

Long-run changes:			
	Median	Minimum	Maximum
Δ employment share	0.0047	-0.006	0.011
Δ value added share	0.0035	-0.008	0.014
Year-to-year changes:			
	Median	90^{th} Percentile	99^{th} Percentile
$\lvert\Delta$ employment share$\rvert$	0.0073	0.021	0.049
$\lvert\Delta$ value added share$\rvert$	0.0074	0.025	0.063

The slow reallocation between sectors is also present at the yearly level. The bottom half of table 2 shows the distribution of the absolute value of the year-to-year changes across all countries. The median year-to-year change across all country-year observations is 0.007 percentage points for both employment and value-added shares. The 99^{th} percentile of year-to-year changes is 0.049 for the share of employment in non-tradables and 0.063 for the share of non-tradables in value-added. While the 99^{th} percentile shows there are some country-years which experienced relatively large changes, the vast majority of country-year observations had changes in employment and value-added shares below 0.025 percentage points.

As we will discuss below, the implications on capital flows of this reallocation depend strongly on how quickly a country can respond to changes in productivities and expand the supply of non-tradable goods by reallocating factors. Table 2 shows that this reallocation is a slow and gradual process in the data.[8] We interpret this gradual change as indication that there are frictions in the factor markets which limit the ability for a country to quickly reallocate factors between sectors. For example, it takes time to re-train or replace manufacturing workers with health care or education providers, as well as re-purpose capital equipment and structures. Our ultimate goal is to measure the extent to which the existence of a non-tradable sector and slow adjustments in factor markets (domestic factor market frictions) can account for that small size of capital flows. Therefore, in the following sections we develop a two-sector model of a small open economy where we introduce domestic frictions in factor markets to capture the observed reallocation of labor and capital and evaluate the quantitative impact of such reallocation on the size of capital flows.

3 Model

Our benchmark framework is the neo-classical small open economy model with a traded and a non-traded sector. The firms in each sector produce both consumption and investment goods, and employ both capital and labor. The model features three types of frictions: first, there are factor markets frictions that limit the speed of capital and labor reallocation between sectors. Second, there are domestic investment frictions that create a wedge between the marginal product of capital in each sector and the gross rate of return on that capital. Finally, there are international financial frictions that create a wedge between the world gross real interest rate and the amount that is earned on foreign assets or needs to be repaid

[8] The sense in which the reallocation is slow will be highlighted below when we compare the observed movement of labor with the implied labor reallocation from the model.

on debt issued abroad. We will first lay out the general structure of the frictionless version of the model, and then describe how the three types of frictions modify the setup.

3.1 General structure

Production The production technologies in each sector are the following:

$$
\begin{aligned}
Y_t^N &= \left(K_t^N\right)^{\alpha^N} \left(A_t^N N_t\right)^{1-\alpha^N} \cdot \ell_t^{N\,1-\alpha^N-\epsilon} \\
Y_t^T &= \left(K_t^T\right)^{\alpha^T} \left(A_t^T N_t\right)^{1-\alpha^T} \cdot \ell_t^{T\,1-\alpha^T-\epsilon},
\end{aligned}
$$

where N_t is the size of labor force, ℓ^N is fraction of labor force employed in the non-tradable sector, $\ell_t^T = 1 - \ell_t^N$ is the fraction of the labor force employed in the tradable sector, K_t^T and K_t^N are capital stocks installed in each sector, A^T and A^N are sector-specific total factor productivities, and α^T and α^N are sector-specific output elasticities of capital. We assume that each sector features slightly decreasing returns to scale (hence ϵ in the exponent on ℓ). We do so to avoid corner solutions along the transition path of fast growing economies that would want to shift all resources into the non-tradable sector.[9] We set ϵ to be very small (0.03). Along the balanced growth path, both A_t^N and A_t^T will grow at a constant rate g^*, which is the growth rate of the world's technology frontier. All factor and goods markets are perfectly competitive: absent any frictions, both capital and labor would be paid the value of their marginal products.

[9]This will not be an issue in our benchmark calibration with reallocation frictions where the corner solutions will be, by construction, impossible. It would become an issue, however, in the counterfactual simulations with free inter-sectoral mobility of capital and labor.

Consumption The aggregate consumption good is a constant elasticity of substitution (CES) composite of tradeables and non-tradeables:

$$C_t = \left[\omega_c {C_t^T}^{\frac{\theta-1}{\theta}} + (1-\omega_c){C_t^N}^{\frac{\theta-1}{\theta}}\right]^{\frac{\theta}{\theta-1}}, \qquad \omega_c \in (0,1), \quad \theta > 0 \tag{3.1}$$

where θ is the elasticity of substitution between tradables (C^T) and non-tradables (C^N), and ω_c determines the expenditure shares of tradeable and non-tradable goods in aggregate consumption. The complementarity between tradables and non-tradables in consumption is greater as θ approaches zero.

Investment Aggregate investment is a Cobb-Douglas[10] composite good of non-tradeable and tradeable goods:

$$X_t = \left(X_t^T\right)^{\omega_x}\left(X_t^N\right)^{1-\omega_x}, \tag{3.2}$$

where $1-\omega_x$ is the share of non-tradable goods in aggregate investment expenditures. The new capital goods can be installed in either the tradeable or the non-tradeable sector, yielding the following laws of motion:

$$\begin{aligned} K_{t+1}^N &= (1-\delta)K_t^N + I_t^N \\ K_{t+1}^T &= (1-\delta)K_t^T + I_t^T \\ X_t &= I_t^N + I_t^T \end{aligned}$$

where I_t^T and I_t^N are the sector-specific investments.

[10]Bems (2008) argues the elasticity of substitution between tradeable and non-tradeable goods in investment expenditures is one, thus favoring the Cobb-Douglas functional form.

Household A stand-in household has preferences over the aggregate per-capita consumption of the following form:

$$\sum_t \beta^t \frac{c_t^{1-\sigma}}{1-\sigma} N_t, \tag{3.3}$$

where $c_t \equiv C_t/N_t$. The price of tradables is normalized to 1. The household owns the capital stock, inelastically supplies one unit of labor each period, and is able to borrow from and lend to the rest of the world at a fixed gross real interest rate R^* (measured in units of the tradable good). Without any frictions, the household's sequential budget constraint (in per-capita terms) is:

$$p_t^N c_t^N + c_t^T + q_t(1+n_t)\left(k_{t+1}^N + k_{t+1}^T\right) \leq w_t + \pi_t + R_t^T k_t^T + R_t^N k_t^N - R^* d_t + (1+n_t)d_{t+1} \tag{3.4}$$

where $n_t \equiv \frac{N_{t+1}}{N_t} - 1$ is the growth rate of population in period t, w is the wage, π are profits of firms from each sector, p^N is the price of non-tradable goods, q is the price of investment goods, $R^i := (1-\delta)q + r^i$ is the gross return on capital in sector $i = T, N$ with r^i being the rental rate. The initial capital stocks k_0^T and k_0^N, and debt d_0 are given. Lastly, the household's borrowing is limited by the no-Ponzi condition:

$$\sum_{t=\tau}^{\infty} \frac{d_{t+1}(1+n_t) - R^* d_t}{{R^*}^{t-\tau}} \leq 0$$

Market clearing The output of tradable goods is divided into consumption of tradables (C^T), investment (X^T), and the trade balance (NX):

$$C_t^T + X_t^T + NX_t = Y_t^T. \tag{3.5}$$

The output of non-tradable goods is used for consumption (C^N) and investment (X^N):

$$C_t^N + X_t^N = Y_t^N. \tag{3.6}$$

Lastly, the share of employment demanded in the traded and the non-traded sector must equal the labor supplied by the household:

$$\ell_t^T + \ell_t^N = 1.$$

Rest of the World Since the total factor productivity in the rest of the world grows at a constant rate g^*, and preferences are given by (3.3), the world gross interest rate is:

$$R^* = \frac{(1+g^*)^\sigma}{\beta}$$

3.2 Frictions

We will now describe how the three types of frictions are introduced into the model. We introduce many of these frictions in the model as reduced-form wedges (similar to Chari et al. (2007) and Gourinchas and Jeanne (2013)). The underlying source of these frictions can be driven by market imperfections, government policy, and/or preferences, such as habit formation, among many other sources, all of which could affect these margins individually or jointly.

Reallocation frictions — putty-clay and labor allocation wedge We explore the role of domestic reallocation frictions by introducing them into both labor and capital markets.

The reallocation friction in the capital markets takes the putty-clay form: capital, once installed, can only depreciate. Formally this means that the law of motion for capital stock in each sector has an additional constraint:

$$I_t^N \geq 0, \quad \text{and} \quad I_t^T \geq 0. \tag{3.7}$$

This automatically adds two constraints into household's utility maximization problem:

$$(1+n)k_{t+1}^i - (1-\delta)k_t^i \geq 0, \quad i = T, N. \tag{3.8}$$

We chose this formulation (rather than adjustment costs with specific functional forms and with calibrated parameters), because for most of the countries in our sample we do not have data on sector specific investment expenditures that would allow us to discipline an alternative specification. Instead, we will explore the impact that the domestic inter-sectoral capital mobility has on international capital flows using counterfactual simulations from the model without constraints (3.7) - (3.8).

The reallocation frictions in the labor markets are introduced by adding a time-varying *labor allocation wedge*, τ_t^L, in the spirit of Chari et al. (2007).[11] The wedge creates an additional cost/benefit of employing labor in the non-tradable sector, yielding the following profit maximization problem:

$$\max_{K_t^N, \ell_t^N} p_t^N \left(K_t^N\right)^{\alpha^N} \left(A_t^N N_t\right)^{1-\alpha^N} \cdot \ell_t^{N\, 1-\alpha^N-\epsilon} - (1+\tau_t^L) w_t \ell_t^N - r_t^N K_t^N.$$

A positive value of τ_t^L may indicate a number of things. Mechanically, it is equivalent to a tax on employment in non-traded sector. However, it can be a manifestation of various policies that either hinder employment in the non-tradable sector, or encourage employment

[11] We use the term labor allocation wedge, so as not to confuse it with a wedge between intra-temporal condition equating marginal product of labor with marginal rate of substitution between consumption and leisure, usually referred to as the labor wedge (leisure does not enter the utility function in our model)

in the tradable sector. Finally, it can be a manifestation of either market imperfections or "deep" frictions that make hiring labor in the non-tradable sector disproportionately more costly than in the traded sector. We do not attempt to understand the specific sources behind those frictions. Instead, for each country, we recover the path of (potentially time-varying) labor allocation wedge, $\left(\tau_t^L\right)_{t=1}^T$ so that the model replicates the *observed* long-run reallocation of labor between sectors. We will evaluate the role of labor reallocation frictions using counterfactual simulations that keeps $\tau_t^L = \tau_1^L$ for all t.

Domestic investment frictions We allow for the gross domestic return to physical capital stock to differ from its marginal product by introducing a capital wedge, τ^K. Given the the price of investment good, q_t, in period t, and the rental rate on capital, r_t^i, paid by firms in sector $i = T, N$, the gross return earned by households will now be $(1 - \tau^K) \cdot R_t^i = (1 - \tau^K)((1 - \delta)q_t + r_t^i)$. We will evaluate the role of labor reallocation frictions using counterfactual simulations in which we set $\tau^K = 0$.

International frictions Finally, we introduce frictions in the international capital markets, by introducing a wedge between the world gross real interest rate R^* and the real interest the country earns/pays on foreign assets/debt - for each unit borrowed in period t, $(1 - \tau_t^D)R^*$ must be repaid in the next period. We will refer to τ^D as the debt price wedge. A positive value of τ^D means the country will save less than it otherwise would, a negative value of τ^D means the country will borrow less than it otherwise would. To ensure the existence of a well defined balanced growth path for a small open economy, we have to assume there exists T^* such that for all $t > T^*$ we have $\tau_t^D = 0$. In our calibration we will follow Gourinchas and Jeanne (2013) and assume that along the transition path (for $t = 1, ..., T$) we have $\tau_t^D = \tau^D$, and for every $t > T$ we have $\tau_t^D = 0$ (so for each country we will calibrate only one number — τ^D). We will evaluate the role of the debt price wedge using counterfactual simulations that set $\tau^D = 0$.

Impact on the household's budget constraint In order to focus only on the distortionary aspect of the labor allocation, capital, and debt price wedges, we follow Chari et al. (2007) and assume that the proceeds from the three "taxes" are rebated in a lump-sum fashion to households as transfer payments z_t:

$$z_t = \tau_t^L w_t \ell_t^N + \tau_t^D R^* d_t + \tau^K \left(R_t^T k_t^T + R_t^N k_t^N \right)$$

A country in the model is characterized by its initial per-capita capital stocks k_0^T and k_0^N, initial per-capita stock of net external debt d_0, sequences of TFPs $(A_t^i)_{t=0}^{\infty}$ for each sector $i \in \{T, N\}$, the sequence of labor allocation wedges $\left(\tau_t^L\right)_{t=0}^{\infty}$, the debt price wedge τ^D, the capital wedge τ^K, and the growth rate of the population n.

The tuple $\left(k_0^T, k_0^N, d_0, (A_t^i)_{t=0}^{\infty}, \left(\tau_t^L\right)_{t=0}^{\infty}, \tau^D, \tau^K\right)$ will be calibrated for each country. Details of the calibration are described in the next section.

4 Quantitative Analysis

We study the dynamics of the model over a finite transition path, $[0, T]$, with a sample of 54 economies. The sample of countries is determined by the availability of the data on employment shares by sectors. We include all of the countries for which we observe the employment shares in agriculture, manufactures and services. For each country, we set $t = 0$ to be the year 1980 or the first available observation, and we set $t = T$ to be the year 2016, or the last available observation.[12] The final year is chosen to be 2016 due to changes in the

[12]The post 1980 period is often considered to be a period in which countries in our sample are open to the rest of the world in terms of trade and capital flows.

WDI series on employment shares in 2017 which would have limited the available time series prior to 1991. The details are listed in Appendix B.

4.1 Imposed parameters

A number of parameters are identical across countries. We set their values following the relevant literature. Table 3 presents details of our choices. Following Gourinchas and Jeanne (2013) we set the inter-temporal elasticity of substitution, σ, to one, and the depreciation to 0.06. Following Valentinyi and Herrendorf (2008), we set the capital intensity of the tradable sector to $\alpha^T = 0.37$ and of the non-tradable sector to $\alpha^N = 0.32$. A period in the model is assumed to be one year and the discount factor is $\beta = 0.96$. The world gross interest rate is set to $R^* = (1 + g^*)^\gamma/\beta$, to ensure the existence of a balanced growth path. We set $g^* = 0.0256$ which is equal to the GDP-weighted cross-country average growth of real GDP per capita for our sample of countries. The initial level of TFP in the tradable sector is set to one.

The remaining parameters which we choose are the elasticity of substitution between tradables and non-tradables in consumption, θ, and the non-tradable shares in consumption and investment, $1 - \omega_c$ and $1 - \omega_x$, respectively. These parameters play a relatively more important role in how the non-tradable sector might influence capital flows, therefore, we will later provide some sensitivity analysis regarding these parameters.

Estimates of the elasticity of substitution between tradable and non-tradable goods supports that these goods are complements in aggregate consumption. Recently, Herrendorf et al. (2013b) provides evidence from U.S. time series data on expenditure and consumption shares which supports preferences close to Leontief in agriculture, manufactures and services. Similarly, Garcia-Santana et al. (2015) find a very low elasticity of substitution of industry and services value added in consumption and investment when estimating a multi-sector model to match investment and structural change patterns from a large panel of countries. Older studies such as Stockman and Tesar (1995) also find strong complementarity between traded and non-traded goods using cross-sectional data from both developing and developed countries in which they estimate an elasticity of 0.44.[13] Overall, there is a broad support for the complementarity between tradables and non-tradables, or between domestic and foreign goods in consumption, therefore, we follow the more recent findings of Herrendorf et al. (2013b) and set the elasticity of substitution between tradables and non-tradables in consumption to $\theta = 0.10$.[14]

Bems (2008) and Burstein et al. (2004) provide evidence that non-traded goods are important to a country's aggregate investment. The latter study argues that among the OECD countries about 51 percent of aggregate investment comes from the construction sector and estimates that at most 32 percent of intermediate goods that the construction sector uses are tradable goods. More recently, Garcia-Santana et al. (2015) find that services make up 42 percent of the sectoral composition of aggregate investment for a large panel of countries. The industrial component, which includes construction, makes up most of the remain composition with agriculture contributing roughly 3 percent. As for consumption, Garcia-Santana et al. (2015) finds that services make up 80 percent of consumption goods. Therefore, we set the non-tradable share in investment, $1 - \omega_x = 0.40$; and, for the non-tradable share in consumption, we set $1 - \omega_c = 0.80$.

[13] Mendoza (1995) uses similar methodology and cross-sectional data from developed countries to estimate an elasticity of 0.74.

[14] Kehoe and Ruhl (2009) and Corsetti et al. (2008) in earlier studies used the values of 0.5 and 0.74, respectively.

Table 3: Model parametrization

Parameter description	Value	Source
Inter-temporal elasticity of substitution	$\sigma = 1.00$	GJ
Discount factor	$\beta = 0.96$	GJ
Capital depreciation	$\delta = 0.06$	GJ
Elasticity of substitution in aggregate consumption	$\theta = 0.10$	HRV
Non-tradables share in investment	$1 - \omega_x = 0.40$	BEMS
Non-tradables share in consumption	$1 - \omega_c = 0.80$	GPV
Capital share in tradable sector	$\alpha^T = 0.67$	HV
Capital share in non-tradable sector	$\alpha^N = 0.32$	HV

GJ: Gourinchas and Jeanne (2013); HRV: Herrendorf et al. (2013b); BEMS: Bems (2008); GPV: Garcia-Santana et al. (2015); HV: Valentinyi and Herrendorf (2008)

4.2 Calibrated country-specific parameters

4.2.1 Initial steady-state

The first country-specific parameter is the population growth n. We set it to the average annual growth rate of working age population, taken from the World Bank's World Development Indicators (WDI). Next, we calculate the initial steady-state and calibrate three country-specific parameters: initial relative TFP in the non-tradable sector — $a_0^N \equiv \frac{A_0^N}{A_0^T}$; initial level of effective net external debt per worker — d_0; initial level of labor allocation wedge — τ_0^ℓ. These three parameters are calibrated jointly to ensure that in the steady-state the model replicates the following statistics for each country: share of non-traded sector in GDP, $\frac{p^N \cdot y^N}{y^T + p^N \cdot y^N}$; the ratio of net external debt to GDP, $\frac{d_0}{y^T + p^N \cdot y^N}$; and fraction of labor employed in the non-tradable sector, ℓ_0^N. Due to lack of available data we cannot pin down initial values of capital stocks in each sector. However, given the tuple $\left(a_0^N, d_0, \ell_0^N\right)$, sector capital stocks k_0^N and k_0^T are determined in the steady-state. Therefore, we assume that initially, each country starts with k_0^T and k_0^N at their steady-state levels.

4.2.2 Transition path

We use the model-generated statistics along the transition path to calibrate the remaining country-specific parameters: (1) the paths of two sectoral TFPs — $\left(A_t^T\right)$ and $\left(A_t^N\right)$; (2) the path of the labor allocation wedge $\left(\tau_t^L\right)$; (3) the debt price wedge τ^D; and (4) the capital wedge τ^K. Since our model is deterministic, we can solve it by applying the simple Newton-Raphson method to the equilibrium conditions. In our computation we impose the economy reaches its balanced growth path at $t = T + 70$. [15]

Sectoral employment and labor allocation wedge We recover the labor allocation by making sure that the model captures the long-run changes in employment shares exactly. For each country, we construct exogenous paths of labor allocations $\{\ell_t^T\}$ and $\{\ell_t^N\}$. We set $\ell_0^N(model)$ to be the share of employment in services in the country's initial observation. For each $t > T$, we set ℓ_t^N to be the share of employment in services in the country's final observation. We then assume a linear transition between ℓ_0^N and ℓ_T^N in the model:

$$\ell_t^N = \ell_0^N + t \cdot \frac{\ell_T^N - \ell_0^N}{T}, \qquad 0 < t < T \tag{4.1}$$

The main reason behind this assumption (as opposed to trying to match the exact sequence of labor allocations in the data) is that for many countries we lack the complete time series for the allocation of labor across sectors (i.e. there are gaps in the data). Therefore, we simply take the earliest and the latest available date. Furthermore, we focus on long-run movements of factors of production and the year-to-year changes are relatively small.

We solve the model with those exogenous paths of labor, and recover the labor allocation

[15] We verified 70 periods were sufficient by allowing for a longer horizon and confirming the model converged to the balanced growth path within that horizon, and that the transition path to T was not affected by this choice.

wedge by equating the wages paid in the two sectors:

$$(1-\alpha^T-\epsilon)Y_t^T/\ell_t^T = \frac{1}{1+\tau_t^L} p_t^N (1-\alpha^N-\epsilon)Y_t^N/\ell_t^N \tag{4.2}$$

By construction, the labor allocation wedge that satisfies (4.2) generates long-run reallocation of labor identical with the data. This reallocation could be modeled using labor adjustment costs, as in Kehoe and Ruhl (2009), who introduce quadratic labor adjustment costs to match labor flows between tradable and non-tradable sectors for Mexico from 1994 to 1998. Alternatively, additional assumptions on technology (e.g. more complicated input-output structure, as in Kehoe et al. (2013)) and/or preferences, such as the non-homothetic preferences commonly used in the structural change literature (e.g. Herrendorf et al. (2013b)), could be used to model the reallocation of labor. However, the introduction of the labor allocation wedge allows us to match the observed reallocation in a parsimonious way while remaining relatively close to the assumptions of the canonical one-sector model.

Sectoral TFPs Similarly to Gourinchas and Jeanne (2013), we assume that between $t = 0$ and $t = T-1$ the two sectoral TFPs grow at fixed rates: $\frac{A_{t+1}^T}{A_t^T} = g^T$, and $\frac{A_{t+1}^N}{A_t^N} = g^N$. Thus, for each country we only need to calibrate two parameters associated with the average growth rates of sectoral TFP, rather than the whole path. For $t \geq T$, the two sectoral TFPs grow at the constant rate of g^* — the growth rate of the world's frontier. This ensures the existence of a well-defined balanced growth path.

Calibration Since labor paths are exogenous, we only have to calibrate four parameters for each country: g^T, g^N, τ^K, and τ^D. We calibrate them using four moments in the data: average annual growth rate of real GDP per capita, $\frac{1}{T}\sum_{t=0}^{T-1}(\log gdp_{t+1} - \log gdp_t)$, average annual appreciation of the real exchange rate, $\frac{1}{T}\sum_{t=0}^{T-1}(\log RER_{t+1} - \log RER_t)$, average ratio of nominal investment expenditures to nominal GDP, $\frac{1}{T+1}\sum_{t=0}^{T}\frac{INV_t}{GDP_t}$, and the change in net external debt relative to initial year GDP, $\frac{Debt_T - Debt_0}{GDP_0}$. We do so by solving, for each country, the following minimization problem:

$$\min_{g^T, g^N, \tau^D, \tau^K} \sum_{i=1}^{4} \left(\text{moment}_i^{DATA} - \text{moment}_i^{MODEL}\right)^2$$

Moments in the model The relevant moments in the model are computed as follows. The nominal GDP is simply $GDP_t = Y_t^T + p_t^N \cdot Y_t^N$, and nominal investment expenditures are $INV_t = X_t^T + p_t^N \cdot X_t^N$. The real GDP per capita, following Kehoe and Ruhl (2008) and Schmitt-Grohé and Uribe (2018) is computed using initial year prices:

$$gdp_t = \frac{1}{N_t} \cdot \left(Y_t^T + p_0^N \cdot Y_t^N\right). \tag{4.3}$$

The real exchange rate is the price of domestic aggregate consumption, p, divided by the price of aggregate consumption in the rest of the world, p^*: $rer \equiv \frac{p}{p^*}$. Since the rest of the world is assumed to be on a balanced growth path, p^* will be constant. Therefore, the change in real exchange rate is:

$$\frac{\Delta rer}{rer} = \frac{\Delta p}{p}. \tag{4.4}$$

Given the relative price of a non-tradable good p^N, the price of aggregate consumption is the minimum unit expenditure:

$$p = \min_{c^N, c^T} p^N c^N + c^T \quad \text{subject to: } \left[\omega_c {c_t^T}^{\frac{\theta-1}{\theta}} + (1-\omega_c) {c_t^N}^{\frac{\theta-1}{\theta}}\right]^{\frac{\theta}{\theta-1}} \geq 1$$

The solution to the above problem yields the following expression for the price of aggregate consumption good:

$$p = \left[\omega_c^\theta + (1-\omega_c)^\theta \cdot p^{N^{1-\theta}}\right]^{\frac{1}{1-\theta}}$$

4.2.3 Model fit

Figure 3 shows the fit of the model. Overall, the model fits all four data targets quite well with the exception of changes in RER, where it cannot quite generate a large enough long-run depreciation for a handful of countries. By construction, the model matches the long-run movement of labor across sectors perfectly.

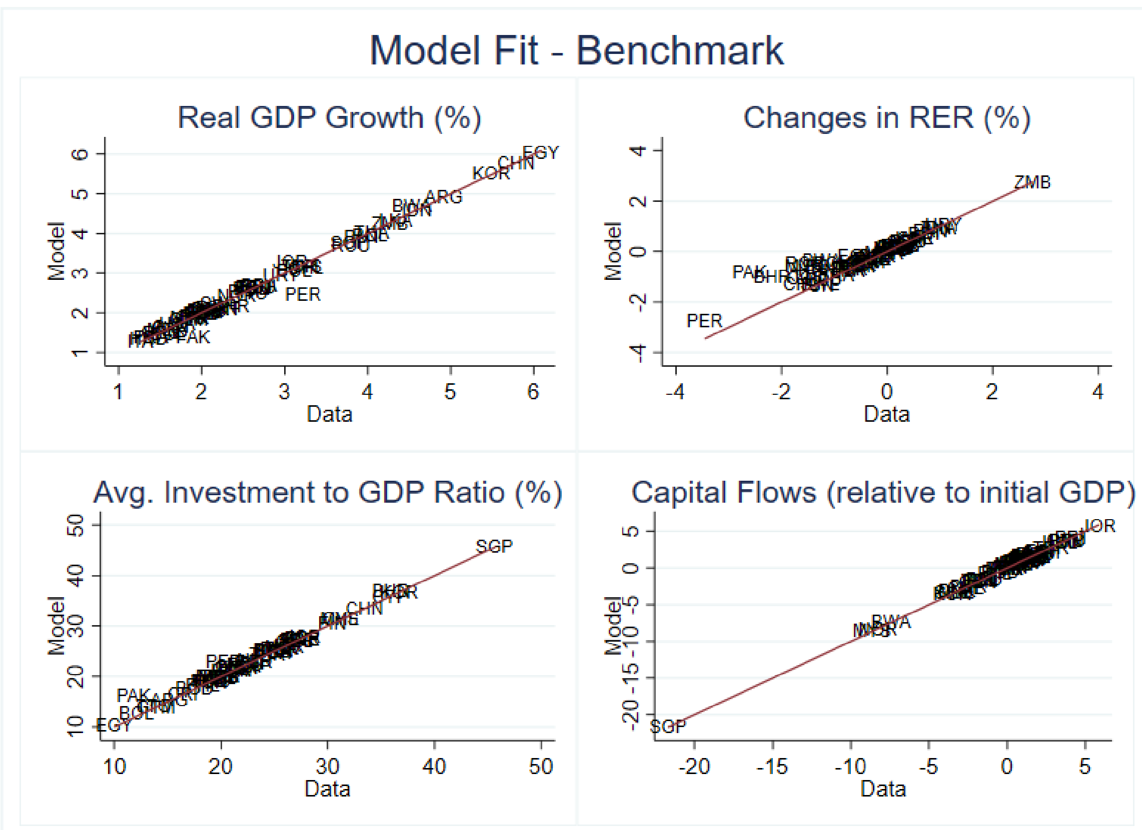

Figure 3: Model Fit (all moments)

Our calibrated growth rates for sectoral TFP are consistent with the broad findings in the literature that productivity growth in the tradable sector tends to be higher than the non-tradable sector.[16] For example, Duarte and Restuccia (2010) rank the relative growth rates for 29 developing and developed countries over the period 1956 to 2004. In their panel of countries, the average growth rates of agriculture, manufacturing, and services are 4.0%, 3.1%, and 1.5%. 18 of the 24 countries in our sample which overlap with theirs have a calibrated TFP growth in tradables which is greater than or equal to the TFP growth in non-tradables. On average, these 18 countries have 4.0% growth in the tradable sector TFP and 1.4% growth in the non-tradable TFP, both of which are quite close to the productivity growth rates measured by Duarte and Restuccia (2010). Similarly, Ferreira et al. (2014) find that, for Korea, labor productivity growth in manufacturing was 5.5% over the period 1960 to 2005, whereas services grew at a rate just under 2%.[17] Our calibrated relative growth rates for Korea show a similar difference, although they are slightly higher, at 7.9% for tradable goods and 3.7% for non-tradable goods. Lastly, comparing our calibrated TFP growth rates for the United States with those estimated by Kehoe et al. (2013), we find that our calibration for the United States is consistent with their growth accounting. For the period 1992 to 2011, Kehoe et al. (2013) measure labor productivity growth in goods, services and construction to be 4.6%, 1.4% and −1.3%, respectively.[18] Our calibrated TFP growth for the United States are similar with 4% TFP growth in the tradable sector and 0.7% in the non-tradable sector.

Overall, the model fits the average changes in the real exchange rate and GDP, the average investment to GDP ratio, and the cumulative capital inflows for each country, and

[16] See Herrendorf et al. (2013a), Ngai and Pissarides (2007), Duernecker and Herrendorf (2015), and Kehoe et al. (2013).

[17] Duarte and Restuccia (2010) report labor productivity growth in Korea of approximately 6% for industry and 2% for services over the same time period

[18] Duarte and Restuccia (2010) find similar growth rates for the United States.

is broadly consistent with the relative growth rates of the tradable and non-tradable sectors found in the literature.

4.3 Results

4.3.1 Cumulative flows: international vs. domestic frictions

Our main results are presented in figure 4 and in table 4. The left panel in figure 4 features three cross-country data sets of cumulative capital inflows. The first are the observed capital flows, denoted with country ISO codes. These flow are identical to those predicted by the calibrated two-sector model with reallocation frictions and inter-temporal wedges (described in Section 3), and by the calibrated one-sector model with inter-temporal wedges (described in Appendix A). The other two data sets are the counterfactual capital flows generated by the two-sector model (green diamonds) or the one-sector (blue dots), each with international frictions removed, i.e. with the debt price wedge set to zero. The right panel of figure 4 shows the counterfactual capital flows generated by the two-sector model when the domestic factor market frictions are removed (red x's) alongside the counterfactual flows predicted by the two-sector model when international frictions are removed (green diamonds). Table 4 presents statistics of the capital flows along with statistics on savings, investment and labor from the data, benchmark one-sector and two-sector models, and several counterfactuals within those models.

The cumulative capital inflows observed in the data over a 30+ year horizon range between -21.7 to 5.8 times the initial GDP. Their correlation with GDP growth is -0.18. The one-sector and two-sector benchmark models feature international and domestic frictions which are calibrated to match the the observed capital flows, therefore, our metric for evaluating the quantitative importance of the various frictions will be the distance of the predicted

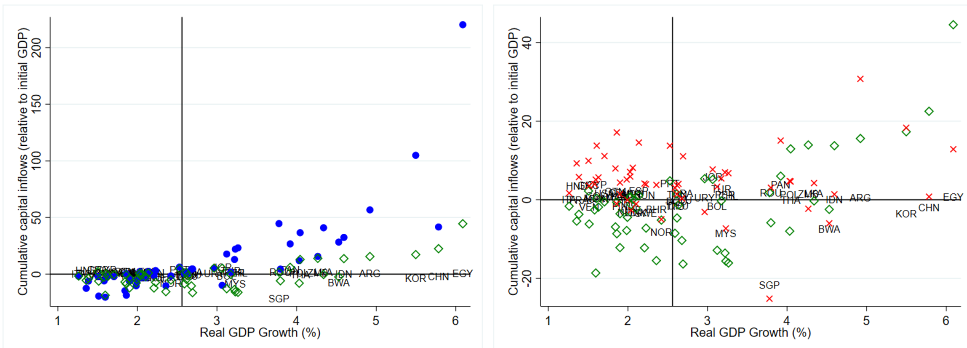

Figure 4: Capital flows and frictions: 1- vs. 2-sector (left); international vs. domestic (right)

Notes: observed data - country ISO codes;
one-sector model without τ^D - dots (blue);
two-sector model without τ^D - diamonds (green);
two-sector model without reallocation frictions - crosses (red).

flows to the empirical flows when the friction(s) are removed from the model. That is, the greater the distance from the data of the predicted flows absent the friction, the greater the quantitative importance of the friction in accounting for the observed capital flows.

First, consider the one-sector model without the debt price wedge, τ^D, the one-sector model capital flows which are an order of magnitude greater for many of the countries. The range of capital flows is -20 to 220 times the initial GDP, the average and median squared error are 1480 and 44.1, respectively. The one-sector model without the debt price wedge greatly over predicts the capital flows relative to the data. The left panel of figure 4 shows that this over prediction is quite pronounced for rapidly growing countries. Furthermore, the correlation between the capital flows and the growth rate of real GDP becomes positive and quite high, 0.82. Comparing these capital flows to the flows predicted by the model when the debt price wedge, τ^D, and the capital wedge, τ^K, are removed, we see very little change in the predicted capital flows implying that the debt price wedge is more important than the capital wedge in accounting for the observed capital flows. The greater importance of the debt price wedge is consistent with the findings in Gourinchas and Jeanne (2013)

Table 4: Capital inflows - data vs. model

	Capital Flows					Savings, Investment, & Labor	
Data	min $\frac{\Delta D}{Y_0}$	max $\frac{\Delta D}{Y_0}$	$\rho\left(\frac{\Delta D}{Y_0}, g_y\right)$	$\frac{\sum_n (err_n)^2}{N}$	median $(err_n)^2$	$\rho\left(\frac{S}{Y}, \frac{I}{Y}\right)$	max $\Delta\ell^N$
total	-21.7	5.83	-0.18	-	-	0.74	0.011
private	-8.01	7.36	-0.13	-	-	-	-
Model							
one-sector benchmark	-21.7	5.85	-0.20	$<$ 0.001	-	0.96	-
one-sector without τ^D	-20.3	220.3	0.82	1480.9	41.6	0.86	-
one-sector without τ^D & τ^K	-20.2	193.6	0.84	1248.7	44.1	-.28	-
two-sector benchmark	-21.7	5.77	-0.18	$<$ 0.001	-	0.92	0.011
counterfactual without τ^D	-18.6	44.5	0.84	129.2	24.5	0.45	0.011
counterfactual without τ^D & τ^K	-16.9	42.3	0.69	113.3	23.2	0.05	0.011
counterfactual with K & ℓ mobile	-25.2	30.8	-0.001	59.5	22.9	0.76	0.62
counterfactual with no frictions	-21.0	163.6	0.56	888.5	40.9	-0.40	0.57

Notes: Sample of countries consists of 54 developing and developing countries from 1980 to 2016. $\rho(x, y)$ denotes the correlation of x and y. g_y denotes the real GDP per capita growth. $err_n = (\frac{\Delta D}{Y_0})_{data,n} - (\frac{\Delta D}{Y_0})_{model,n}$.

which point out that their savings wedge (closely related to the debt price wedge) is more important in explaining the empirical flows than their capital wedge.

Turning to the results from the two-sector model there are several points to be made: first, the two-sector model without frictions produces predicted flows which are similar to those of the one-sector model without frictions, although the over predictions are not as large (these flows are presented in the row labeled "counterfactual with no frictions"). Second, the international frictions in the two-sector model are important in reconciling the low magnitudes of the observed flows, however, the presence of costly inter-sectoral reallocation dampens their importance. That is, domestic frictions in the capital and labor market reduce the elasticity of capital flows to international financial frictions. The left panel in figure 4 illustrates this point. Comparing the predicted flows of the two-sector model when international frictions are removed (green diamonds) with the inflows predicted by the one-sector model without international frictions (blue dots) we see that the two-sector model predictions are significantly smaller. The corresponding rows in table 4 labeled "counterfactual without τ^D" and "one-sector without τ^D" also show the difference in magnitudes. The range of the two-sector predictions is -18.6 to 44.5 times the initial GDP, and the both the mean, 129.2, and median, 24.5, squared error are much smaller than those of the comparable one-sector model. Indicating that the presence of domestic frictions between the tradable and non-tradable sectors reduces the response of capital flows when international financial frictions are removed.

Third, domestic frictions in the capital and labor market have a significant impact on the magnitude of capital flows, and for some countries, they are as important as the international frictions. The right panel in figure 4 compares the impact that the international frictions versus domestic factor market frictions have on capital flows. The counterfactual flows from the two-sector model when domestic *factor market frictions are removed*, but *international frictions are present* (red crosses) are plotted along side the two-sector predictions when only international frictions are removed (green diamonds). We remove the domestic factor market frictions by (i) removing constraint (3.8) from the law of motion for sectoral capital stocks and (ii) setting $\tau_t^L = \tau_1^L$ for all t.

The first thing to notice from that figure, is that the ranges of cumulative capital flows (relative to initial GDP) generated by the two-sector model in both counterfactuals are quite similar - the range implied by the model without domestic factor market frictions is -25.2 to 30.8, which is the same order of magnitude as -18.6 to 44.5 implied by the model without the international frictions (see rows labeled "counterfactual with K & ℓ mobile" and "counterfactual without τ^D" in table 4). Second, there is a substantial heterogeneity across countries in terms of the relative impact of domestic vs. international frictions on capital flows. For example, for Korea that impact is almost identical, with domestic frictions appearing slightly more important. For Argentina, domestic reallocation frictions are twice as important as international frictions, while for Egypt the international frictions are about three times more important than domestic. Comparing the mean, 59.5, and median, 22.9, squared errors from the two-sector model without domestic frictions to those of the two-sector model without international frictions shows that, on average, factor market frictions are about half as important as the international frictions; and, for the median country, the domestic factor market frictions are just as important as the international frictions.

Lastly, from table 4 we see that the domestic factor market frictions are important in understanding the negative correlation between capital flows and real GDP growth. When domestic frictions are removed, the correlation between capital flows and GDP growth is zero. The reduction in the correlation (relative to the two-sector model without international frictions) is driven by the fact that among the slow-growing economies, the removal of *inter-sectoral reallocation frictions* increases the magnitude of their capital flows, but in the direction contrary to what one would expect based on their productivity growth - they became quite large net borrowers. The reason is that, in this counterfactual, all countries still have the international frictions present, in the form of the debt price wedge, that has previously been calibrated to match the empirical flows. For slow growing countries the calibrated values of τ^D tend to be positive, encouraging them to borrow more than they otherwise would. The inter-sectoral reallocation prevents them from doing that, by making it more difficult to move resources into the non-tradeable sector. Once that friction is removed, the high incentive to borrow generated by the positive debt-price wedge dominates the incentive to save stemming from low productivity growth.

4.3.2 Feldstein-Horioka puzzle

Our model naturally has predictions about the correlation between savings and investment rates, the focus of the well-known Feldstein-Horioka puzzle (Feldstein and Horioka, 1980).

The correlation of savings and investment rates is positive in the data: 0.74 in our sample. The one-sector model without frictions implies a negative correlation of -0.28 (see table 4). The two-sector model without any frictions generates an even more negative correlation of -0.40. Adding domestic reallocation frictions increases that correlation to 0.05, closing about one third of the gap. Adding capital wedge τ^K (but still keeping the international frictions at 0) increases it further to 0.45. With all frictions present, the two-sector model generates a correlation of 0.92 (slightly higher than its empirical counterpart), essentially the same as the calibrated one-sector model with two inter-temporal frictions. The quantitative impact of domestic factor markets frictions on the correlation between savings and investment rates is similar to the effect of each of the two financial frictions.

4.3.3 Factor Market Frictions

The benchmark model contains frictions in both the labor and capital markets which restrict the reallocation of factors between the tradable and non-tradable sectors. In the case of labor, frictions associated with labor adjustment costs, technology, and preferences are characterized by a labor allocation wedge which imposes additional costs of hiring a worker in the non-tradable sector. For capital, the friction lies in the inability to re-purpose capital investment from one sector to the other once it is installed. In this section we will explore the importance of these frictions in shaping the capital flows by removing each friction from the model. Our results are summarized in table 5.

Reallocation of capital First, we relax the assumption that capital, once installed, can only depreciate while maintaining the labor market frictions. Therefore, given the paths of productivities and the labor allocation, we ask how would the economy reallocate capital between the two sectors and how would this reallocation impact capital flows. The results

Table 5: Capital Flows and Factor Market Frictions

	Capital Flows				Labor Reallocation, $\|\|\Delta\ell^N\|\|$		
	min $\frac{\Delta D}{Y_0}$	max $\frac{\Delta D}{Y_0}$	$\frac{\sum_n (err_n)^2}{N}$	median $(err_n)^2$	long-run max	year-to-year $90^{th}\%$	year-to-year max
Data							
total	-21.7	5.83	-	-	0.011	0.021	0.078
Model							
two-sector benchmark	-21.7	5.77	< 0.001	-	0.011	0.009	0.011
counterfactual with mobile K	-21.8	6.50	0.54	0.002	0.011	0.009	0.011
counterfactual with mobile ℓ	-24.7	21.0	40.5	15.9	0.015	0.026	0.22
counterfactual with K & ℓ mobile	-25.2	30.8	59.5	22.9	0.012	0.05	0.62

Notes: Long-run changes in the employment share of non-tradables are measured as $\Delta\ell^N = \frac{\ell^N_{2016} - \ell^N_{1980}}{37}$. There are 54 countries in our sample and we have 1,782 country-year observations. Errors in the capital flows are measured as $err_n = (\frac{\Delta D}{Y_0})_{data,n} - (\frac{\Delta D}{Y_0})_{model,n}$.

are presented in the row labeled "counterfactual with mobile K" in table 5.

The results under the assumption of fully mobile capital are quite similar to the benchmark model. Capital flows range from -21.8 to 6.5 and the average squared error is greater, however, remains quite low. By construction, the labor flows remain unchanged. The counterfactual reveals two points: first, reducing frictions within the capital market impacts rapidly growing countries more so than slower growing countries. This can be seen in the relatively larger increase in the upper part of the capital flows from 5.77 to 6.50. Absent domestic capital market frictions, rapidly growing countries reallocate capital towards the non-traded sector to better smooth aggregate consumption which leads to greater capital inflows. Second, the domestic labor market frictions limit the reallocation of capital. Labor cannot move freely between sectors which constrains the desire to reallocate capital and limits the extent to which the removal of domestic capital market frictions impact capital flows.

Reallocation of labor Next, we look at the role of labor market frictions. We isolate the effect of labor market frictions by holding constant the labor allocation wedge at its initial value and allow labor to freely move between sectors each period until $w_t^T = (1+\tau_0^L)w_t^N$. In addition, we maintain the assumption that capital, once installed, can not be re-purposed into the other sector. The results of this counterfactual are reported in the row labeled "counterfactual with mobile ℓ" in table 5.

The impact on the size of capital flows absent labor market frictions is quite sizable. The range of the cumulative capital inflows relative to initial GDP increase to -24.7 to 21.0 in the counterfactual. Once again, we see a relatively large increase on the borrowing side (positive inflows) where capital inflows increase from 5.77 to 21.0 (compared to the decrease from −21.7 to −24.7 on the saving side). Considering the cross-country sample as a whole, the removal of domestic labor market frictions results in predictions of capital flows which look less like the capital flows in the data. The mean and median squared error between the predicted and observed capital flows in the sample both increase to 40.5 and 15.9, respectively. For comparison, the median squared error in the one-sector model without frictions is 44.1. In this sense, the domestic labor market frictions have a non-trivial impact on the aggregate capital flows of a country. Furthermore, comparing the predicted capital flows to those when only domestic capital market frictions shows that labor markets have a relatively more significant role in shaping capital flows.

The changes in the predicted capital flows are generated by a large reallocation of labor between the two sectors, as countries reallocate workers across sectors to better smooth aggregate consumption. The magnitudes of the long-run labor flows increase slightly, however, we see substantial increases in the magnitudes of the year-to-year flows. The 90^{th} percentile of year-to-year changes increases from 0.009 to 0.026 and the maximum year-to-year change increases to 0.22. This indicates that, absent domestic labor market frictions, countries would desire to reallocate large portions of their labor force across the two sectors which enables them to better smooth aggregate consumption (as seen in the counterfactual capital flows).

In spirit, our results are similar to those in Ohanian et al. (2018), who studied capital flows into and out of Latin America and Asia using a business cycle accounting methodology of Chari et al. (2007). They found that the domestic distortions, modeled as a labor wedge, were an important driver of capital flows, particularly in Latin America (their impact was quantitatively similar to the impact of international distortions). The main difference is in the interpretation of the wedge that is used to model the distortions. The labor wedge in the one-sector model introduced by Chari et al. (2007) captures various forms of policies and market imperfections that affect the link between households' marginal rate of substitution between consumption and leisure, and the marginal product of labor. The labor *allocation* wedge in our paper captures various forms of policies and market imperfections that favor one sector over the other (or make it costly to move between them).

Removal of domestic frictions and the speed of reallocation Lastly, we consider the removal of the domestic factor market frictions in both capital and labor. The results of this counterfactual are reported in the row labeled "counterfactual with K & ℓ mobile" in table 5. This counterfactual highlights the interdependence of capital and labor markets, as well as, the important role that the slow reallocation of capital and labor across sectors that we observe in the data has in shaping the capital inflows of a country.

Consistent with the above counterfactuals, we see an increase in the range of capital inflows, as well as, increases in the mean and median squared errors between the model and data capital flows. However, since the reallocation of capital and labor reinforce one another, the increase in capital flows with the removal of both factor market frictions is larger than either one alone. The lower bound of capital inflows decreases from -21.7 to -25.2 and the upper bound increases significantly from 5.77 to 30.8, relative to the benchmark. In addition, the mean and median squared error are both larger. Comparing the squared errors of the capital flows absent all factor market frictions to those absent labor market frictions alone, we see that the mean squared error increases from 40.5 to 59.5, and the median from 15.9 to 22.9.

To understand the importance of the slow reallocation of labor (observed in the data) in shaping capital flows, it is informative to look at the reallocation of labor absent domestic factor market frictions. The increase in the capital flows seen in the counterfactual is associated with a sudden and rapid reallocation of labor between the tradable and non-tradable sectors. Figure 5 presents the reallocation of labor in the model without factor market frictions and the associated capital flows. The top left panel of the figure plots the counterfactual non-tradable employment in the initial period (relative to the data, $\frac{\text{counterfactual } \ell^N}{\text{data } \ell^N}$) against the relative productivity growth ($\frac{g^T}{g^N}$).[19] The ratio of the counterfactual non-tradable labor relative to the data measures the extent to which the country reallocates labor in the initial period once factor market frictions are removed. Nearly all countries immediately shift labor into the non-tradable sector and these movements of labor are quite large. The median ratio is 1.32 which means that half of the countries in our sample allocate 32 percent or more labor to the non-tradable sector in the counterfactual without domestic factor market frictions than the labor allocated in the data (or benchmark model). For example, Korea, absent factor market frictions, would allocate 62 percent of labor to the non-tradable sector, compared to the benchmark allocation of 37 percent. This is a significant and sudden flow of labor from the tradable to non-tradable sector.

The sudden and large reallocation of labor into the non-tradable sector has two important impacts on the path of the economy. First, it implies long-run flows of labor reallocation

[19] Note that the benchmark model matches the labor allocation in the data, therefore, this ratio is the same if using the counterfactual and benchmark model employment.

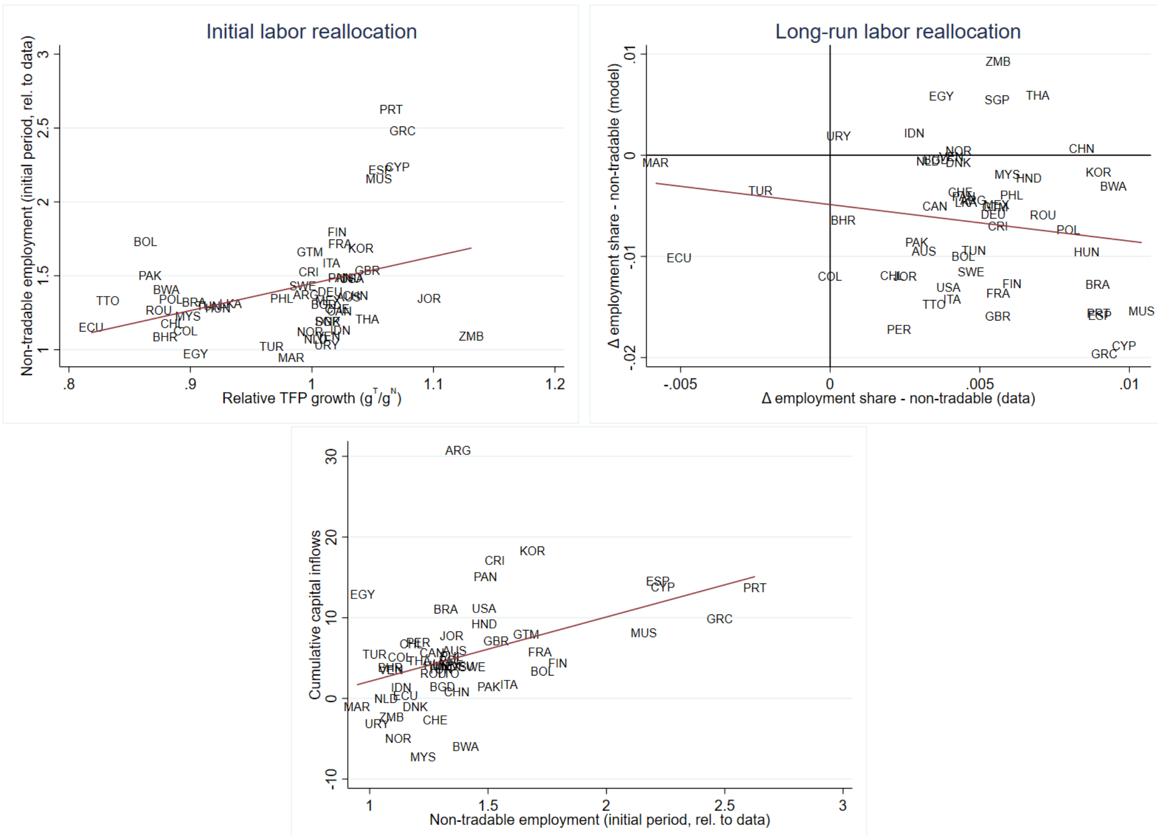

Figure 5: Counterfactual reallocation of labor and capital flows

NOTE: Top two and bottom panel - counterfactual model simulations with flexible movement of capital and labor across sectors.

which are in the opposite direction of the observed flows. Second, and more importantly, it implies large counterfactual capital flows as the reallocation of labor enables countries to better smooth aggregate consumption. The top right panel in figure 5 shows the long-run annual changes in the employment share of non-tradables against the observed long-run changes. In the data (the horizontal axis), we see that the majority of countries experience a long-run shift of labor into the non-tradable sector. However, in the counterfactual (the vertical axis), we see the opposite. Following the large initial allocation to the non-tradable sector, most countries have counterfactual flows of labor away from the non-tradable sector.

The bottom panel of figure 5 plots the counterfactual cumulative capital inflows against the initial counterfactual labor allocation. The positive relationships between the cumulative capital inflows and initial labor allocation highlights the influence that labor allocations can have on capital flows. Countries desire to smooth aggregate consumption and invest in capital, both of which require tradable and non-tradable goods. Therefore, expansion of the supply of non-tradable goods is needed and countries move labor and capital immediately into the non-tradable sector. The extent to which a country is willing to or able to reallocate labor and capital is positively related to their desire to smooth consumption and capital inflows. The large reallocation of labor and capital is what drives the large counterfactual capital flow seen in figure 5.

Overall, our results indicate that the non-traded sector matters a lot for international capital flows. When factor market frictions are removed, in particular labor market frictions, we see large increases in the magnitudes of capital inflows. From the perspective of our model, the slow reallocation of labor in the data suggests there are underlying domestic factor market frictions and these factor market frictions help explain the small magnitudes of the observed capital flows.

4.3.4 Elasticity of capital flows w.r.t. international frictions: sensitivity analysis

Our main result in the left panel of figure 4 indicated that the removal of international financial frictions in the one-sector model had a much bigger impact on international capital flows than the same counter-factual experiment had in the two-sector model. That experiment in each model was conducted by setting the debt price wedge, τ^D, to zero. However, it is important to note that the calibrated values of τ^D in the two models are not the same. Figure 6 shows the comparison between them.

There are two important things to note in the figure. First, the negative correlation

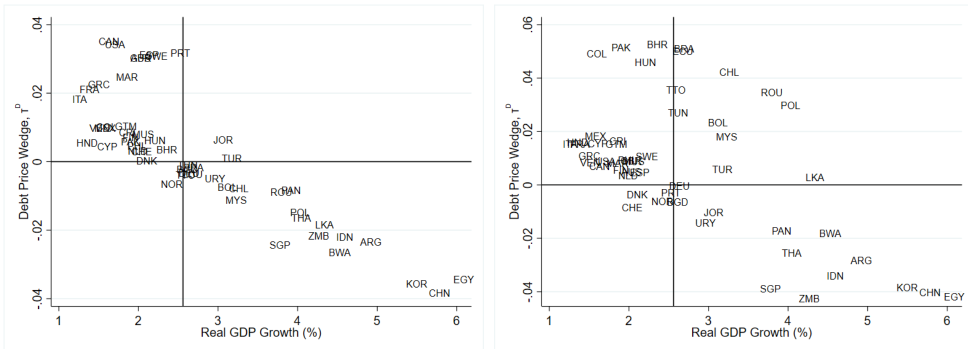

Figure 6: Calibrated debt price wedges: 1- vs. 2-sector models

NOTES: Left - one-sector model; Right - two-sector model

between calibrated value of τ^D and real GDP growth is much stronger in the one-sector model. That is because the inter-temporal distortion in the one-sector model is, practically, the only thing that impacts capital flows (the impact of capital wedge, τ^K, is very small). In the two-sector model there are other factors that impact the incentive to borrow and save — the availability of non-traded goods and the ability to reallocate resources between the two sectors.

Second, the range of calibrated values of τ^D is larger in the two-sector model — [-0.045,0.063] vs. [-0.039,0.035]. At first glance, this may seem to suggest that the international financial frictions are larger in the two-sector model. However, this is not the correct interpretation. The reason why τ^D is larger in the two-sector model is precisely because its impact on international capital flows is smaller. A natural way to express this is to calculate the median elasticity of cumulative capital inflows w.r.t. international frictions in the two-sector model, and compare it to that same elasticity in the one-sector model. We compute those elasticities for each country as $\frac{\partial \frac{\Delta D}{Y_0}}{\partial \tau^D}$, evaluated locally at the empirical level of cumulative inflows. The median elasticity in our benchmark model is about one third of the median elasticity in the one-sector model. That is, the presence of the non-tradable sector and factor market frictions associated with that sector reduce the response of capital inflows to international financial frictions.

Table 6 reports the elasticity from the benchmark model together with sensitivity analysis around key parameters associated with the non-tradable sector. These key parameters are the elasticity of substitution between tradable and non-tradables in consumption and the non-tradable share in consumption.[20] Complementarity of tradable and non-tradable goods in aggregate consumption implies that the marginal utility of tradable goods depends on the supply of non-tradable goods. Households facing higher future income would desire to smooth consumption, however, the complementarity and the inability to import the non-traded goods can limit the ability to increase current aggregate consumption with the importation of tradable goods and reduces the household's motives to smooth aggregate consumption.[21] Table 6 illustrates the importance of the elasticity of substitution between tradable and non-tradable goods in affecting the elasticity of international capital flows w.r.t. international frictions (in the direction one would expect). As the complementarity falls capital flows respond more strongly to changes in international frictions, however, even with a fairly high value of $\theta = 2$, the median elasticity of capital flows w.r.t. international frictions is still less than a half of the median value in the one-sector model. Changes in the non-tradable share of consumption have much less impact on the responsiveness of capital flows, as moving from the benchmark value of $1-\omega_c = 0.80$ to $1-\omega_c = 0.50$ has a negligible effect on the elasticity of capital flows with respect to τ^D.

[20]The intuition and sensitivity analysis around the comparable parameters in investment are similar, therefore, we focus on the consumption side for brevity.

[21]In the case that aggregate consumption is a Leontief aggregation of tradable and non-tradable goods, the marginal contribution of tradable goods to aggregate consumption can be zero.

Table 6: Elasticity of capital flows - sensitivity analysis

Median elasticity of ΔD w.r.t. τ^D (one-sector model = 1)			
Benchmark	$\theta = 0.5$	$\theta = 2$	$\omega_C = 0.5$
0.36	0.41	0.44	0.36

Notes: For each of the chosen parameter values the model is re-calibrated for each country.

5 Conclusions

In this paper we analyze the quantitative impact of the non-traded sector on international capital flows. We do so within a small open economy framework with a tradable and non-tradable sector in which we introduce international financial frictions on external debt and domestic factor market frictions in capital and labor markets. These frictions are calibrated such that the model captures the long-run empirical features of international capital flows and the slow reallocation of labor between the tradable and non-tradable sectors. We measure the quantitative importance of the international and domestic frictions in shaping capital flows by removing the frictions, both separately and jointly, from the model and measure the impact their removal has on the predicted capital flows.

We find that domestic factor market frictions are often just as important as the international financial frictions in shaping capital flows and accounting for the small size of capital flows observed in the data. There are two features of the non-tradable sector which are central to its impact on capital flows. The first is the complementarity between tradable and non-tradable goods in aggregate consumption. The second is the slow reallocation of capital and labor between the tradable and non-tradable sectors. The slow reallocation, which we document empirically and interpret as the result of unobserved factor market frictions, coupled with the complementarity in consumption reduces the incentive and ability to smooth aggregate consumption when facing changes in total factor productivity. For the median country in our sample, the factor market frictions have a similarly sized impact on the size of capital flows as international financial frictions which impact external capital flows directly.

This leads us to a similar conclusion to Ohanian et al. (2018): *domestic* frictions can be an important factor affecting *international* capital flows. Of course, any policy response to these frictions depends on the underlying source of the factor market frictions. Cross-country variation in the response of international capital flows to domestic factor market frictions may be a potential source for understanding these frictions further, as some countries may be able to reallocate capital and workers more easily due to country specific features in their factor markets and/or their current stage of development. However, we leave this for further studies to determine.

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A One-sector model with capital and debt price wedges

The one-sector model with capital and debt price wedges is very similar to the one in Gourinchas and Jeanne (2013). A representative household solves:

$$\max \sum_t \beta^t u\left(c_t\right) N_t$$

subject to:

$$c_t + (1+n)k_{t+1} + R^*(1-\tau_t^D)d_t \leq w_t + R_t k_t + (1+n)d_{t+1}$$

The resource constraint for the aggregate economy is:

$$N_t c_t + N_t\left((1+n)k_{t+1} - (1-\delta)k_t\right) + N_t\left(R^* d_t - (1+n)d_{t+1}\right) = \left(A_t N_t k_t\right)^\alpha N_t^{1-\alpha}$$

For each country the path for (A_t) is:

$$\frac{A_{t+1}}{A_t} = \begin{cases} 1+g & \text{, if } t < T \\ 1+g^* & \text{, if } t \geq T, \end{cases}$$

where g and T are country specific. Similarly to Gourinchas and Jeanne (2013), we assume that the debt-price wedge is $\tau_t^D = \tau^D$ if $t < T$ and $\tau_t^D = 0$ if $t \geq T$. For each country we set n and T to be the same as in the two-sector model (based on country statistics in Appendix B). We then jointly calibrate the tuple (g, τ^K, τ^D) to match: (1) average growth rate of real GDP per capita, (2) average investment over GDP ratio, and (3) cumulative capital inflows relative to initial GDP.

B Summary Statistics

Table 7: Cross-Country Summary Statistics

iso	n (%)	t = 0	t = T	ΔY (%)	ΔRER (%)	$\frac{D_0}{Y_0}$	$\frac{\Delta D}{Y_0}$	$\frac{S}{GDP}$	$\frac{INV}{GDP}$	ℓ_0^N	ℓ_T^N	max $\lvert\Delta\ell^N\rvert$
ARG	2.04	1982	2013	4.92	0.07	0.32	0.49	0.18	0.15	0.60	0.75	0.03
AUS	1.61	1990	2016	2.03	0.18	0.45	1.35	0.28	0.27	0.69	0.78	0.02
BGD	2.57	1986	2010	2.61	0.41	0.33	-0.42	0.15	0.18	0.26	0.35	0.02
BHR	5.27	1981	2010	2.36	-2.18	-0.73	-2.47	0.35	0.36	0.61	0.62	0.00
BOL	2.35	1980	2014	3.12	-1.05	0.72	-1.68	0.12	0.12	0.33	0.49	0.03
BRA	2.07	1981	2015	2.69	-0.97	0.40	1.58	0.20	0.20	0.46	0.77	0.03
BWA	3.29	1985	2010	4.53	-1.24	0.23	-7.43	0.30	0.25	0.31	0.56	0.03
CAN	1.44	1980	2013	1.63	0.16	0.37	0.16	0.27	0.25	0.66	0.78	0.02
CHE	0.88	1990	2015	2.04	0.54	-0.73	-2.63	0.40	0.31	0.64	0.75	0.03
CHL	2.53	1980	2015	3.26	-1.63	0.43	0.97	0.22	0.21	0.60	0.67	0.05
CHN	1.02	1986	2015	5.78	0.15	0.00	-1.90	0.35	0.33	0.17	0.42	0.02
COL	2.81	1980	2015	1.60	-1.56	0.01	1.00	0.14	0.21	0.65	0.65	0.02
CRI	2.87	1980	2016	1.86	-0.59	0.52	1.85	0.11	0.16	0.48	0.69	0.04
CYP	1.78	1980	2014	1.61	-0.46	-0.07	3.77	0.23	0.36	0.45	0.79	0.02
DEU	0.34	1983	2014	2.64	-0.28	-0.06	-1.44	0.27	0.25	0.53	0.71	0.02
DNK	0.41	1981	2016	2.10	0.25	0.34	-3.21	0.29	0.25	0.63	0.78	0.03
ECU	3.51	1988	2014	2.68	-1.20	0.75	-0.17	0.21	0.22	0.69	0.55	0.02
EGY	2.42	1980	2015	6.09	-0.58	0.64	0.72	0.08	0.10	0.36	0.49	0.04
ESP	0.98	1980	2014	2.14	0.15	0.07	2.29	0.23	0.28	0.45	0.76	0.03
FIN	0.19	1980	2014	1.90	-0.42	0.17	-1.69	0.33	0.30	0.52	0.74	0.02
FRA	0.53	1980	2014	1.38	-0.57	-0.03	-0.13	0.24	0.25	0.56	0.76	0.02
GBR	0.64	1990	2015	2.03	-0.19	0.03	1.26	0.18	0.23	0.65	0.80	0.02
GRC	0.13	1981	2014	1.50	0.25	0.15	3.73	0.15	0.27	0.40	0.71	0.03
GTM	2.37	1981	2015	1.84	-0.41	0.15	2.13	0.05	0.14	0.30	0.49	0.06
HND	3.43	1980	2015	1.36	0.11	0.45	3.44	0.13	0.19	0.25	0.48	0.07
HUN	-0.66	1982	2015	2.21	-1.33	0.29	1.18	0.18	0.21	0.36	0.65	0.06
IDN	2.20	1987	2015	4.59	0.94	0.49	0.03	0.26	0.23	0.37	0.45	0.05
ITA	0.24	1990	2014	1.26	-0.70	0.12	0.01	0.26	0.26	0.59	0.69	0.02
JOR	4.75	1983	2014	3.06	0.34	0.25	5.83	0.06	0.28	0.72	0.80	0.03
KOR	1.77	1980	2016	5.50	0.53	0.36	-3.48	0.39	0.37	0.37	0.70	0.02
LKA	1.58	1981	2015	4.34	-0.74	0.37	1.61	0.17	0.22	0.29	0.45	0.05
MAR	1.60	1990	2014	1.86	-0.05	0.54	0.75	0.25	0.27	0.59	0.45	0.05
MEX	2.26	1990	2016	1.58	-0.56	0.34	0.44	0.17	0.20	0.46	0.61	0.04
MUS	1.29	1990	2015	2.06	0.24	0.09	1.56	0.21	0.20	0.40	0.67	0.03
MYS	2.98	1980	2015	3.23	-1.57	0.17	-8.62	0.35	0.31	0.39	0.60	0.06
NLD	1.06	1980	2014	1.99	-0.20	-0.13	-3.26	0.30	0.23	0.64	0.75	0.05
NOR	0.91	1980	2016	2.42	-0.29	0.34	-8.26	0.46	0.26	0.62	0.78	0.03
PAK	2.60	1980	2008	1.90	-2.60	0.32	0.79	0.09	0.12	0.27	0.35	0.04
PAN	3.34	1982	2016	3.92	0.82	0.93	3.76	0.26	0.21	0.51	0.67	0.04
PER	2.76	1986	2015	3.22	-3.45	0.50	1.38	0.19	0.20	0.69	0.76	0.04

Table 7 – continued from previous page

iso	n (%)	t = 0	t = T	ΔY (%)	ΔRER (%)	$\frac{D_0}{Y_0}$	$\frac{\Delta D}{Y_0}$	$\frac{S}{GDP}$	$\frac{INV}{GDP}$	ℓ_0^N	ℓ_T^N	max $\lvert\Delta \ell^N\rvert$
PHL	2.48	1980	2015	1.98	-0.28	0.33	-0.79	0.17	0.18	0.33	0.55	0.02
POL	-0.02	1985	2015	4.03	-1.21	0.48	1.35	0.18	0.19	0.33	0.58	0.02
PRT	0.45	1980	2014	2.53	0.72	0.23	4.15	0.17	0.27	0.36	0.67	0.07
ROU	-0.94	1990	2015	3.80	-1.57	-0.06	1.81	0.15	0.19	0.27	0.46	0.03
SGP	3.49	1980	2015	3.78	0.34	-0.12	-21.66	0.48	0.46	0.63	0.83	0.08
SWE	0.31	1980	2015	2.23	-1.26	0.10	-3.36	0.29	0.27	0.62	0.79	0.02
THA	1.75	1980	2015	4.04	0.96	0.21	-0.17	0.29	0.26	0.19	0.44	0.04
TTO	1.51	1984	2008	2.59	-1.48	0.20	-1.70	0.25	0.14	0.55	0.64	0.03
TUN	1.87	1989	2013	2.62	-1.34	1.04	1.32	0.19	0.19	0.39	0.51	0.01
TUR	1.84	1982	2015	3.17	-0.71	0.18	2.79	0.27	0.24	0.60	0.52	0.04
URY	1.13	1984	2015	2.96	1.08	0.42	0.45	0.17	0.19	0.70	0.71	0.01
USA	1.05	1980	2015	1.71	0.11	-0.05	1.58	0.22	0.25	0.66	0.80	0.02
VEN	3.03	1980	2013	1.51	0.10	0.04	-1.79	0.32	0.22	0.57	0.71	0.05
ZMB	2.33	1990	2012	4.27	2.76	2.13	1.42	0.13	0.20	0.21	0.34	0.03