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Into the Allocation Puzzle – A sectoral analysis

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Abstract

This paper assesses whether the allocation puzzle - the tendency for capital to flow to countries with relatively low productivity growth - is observed for foreign direct investment (FDI) flows, which should be particularly sensitive to productivity prospects. We look both at aggregate FDI flows and, using a new data set, at FDI flows into the main economic sectors. We make three points. First, we do not find evidence of an allocation puzzle for aggregate FDI flows. Second, we refine the aggregate result and document substantial sectoral heterogeneity. An allocation puzzle is observed in the agriculture, construction, mining/petroleum/utilities and tourism sector. By contrast, we show that countries with faster productivity growth in manufacturing attract more investment in that sector. The link is even stronger for service sectors. Third, we document a role for financial openness: a country with fast productivity growth draws in more FDI into its service sectors only when it is financially open. We conclude with a discussion of some tentative explanations for the results.

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1 Introduction

Do countries with strong productivity growth attract foreign capital? According to the neoclassical growth model (Ramsey-Cass-Koopmans) the answer is yes. Small open economies with a marginal return to capital (MPK) that is higher than the world interest rate should attract foreign capital to finance domestic investment. An increase in the MPK can be driven by strong productivity growth: it makes investing domestically more profitable. Furthermore, strong productivity growth increases future incomes and, hence, current consumption (through the consumption smoothing effect). Therefore, capital inflows and productivity growth should be positively related.

Gourinchas and Jeanne (2009) challenge this prediction by showing that the allocation of capital flows across developing countries and emerging markets does not follow the predictions of the neoclassical growth model - thus casting doubt on the complementarity between foreign finance and growth. The allocation puzzle is the observation that countries with faster productivity growth attract less capital inflows - specifically, they demonstrate a negative, statistically significant relation between overall capital inflows in percent of initial output (using data on current account deficits) and productivity development.[1]

In scrutinizing the allocation puzzle - and, hence, the complementarity between foreign finance and growth - this paper makes three main contributions. First, we refine the result for overall capital inflows by disaggregating these into their different components. The main focus is on FDI inflows, which should be particularly sensitive to productivity prospects. Second, we build a data base of FDI inflows by sector for 72 emerging market economies and developing countries that allows us to analyze the allocation of FDI inflows across the different sectors of these economies and, hence, to assess the allocation puzzle also on the sectoral level.[2] Third, we analyze whether financial openness impacts the relation between productivity growth and FDI inflows and whether financial openness plays a different role across sectors.

We focus on FDI inflows because these should display the strongest link with investment opportunities. By contrast, aid and debt flows tend to be shaped by government decisions to a greater extent.[3] Furthermore, reserve flows are to a great extent a reflection of deliberate macroeconomic policies and thus unlikely to be responsive to productivity growth as well; consider the case of China holding vast amounts of low-return U.S. treasury bills. Instead, FDI and private equity flows are the types of capital that should comply most with the predictions of the standard neoclassical model.[4] Against this backdrop, we would ideally like to analyze the joint allocation of FDI and portfolio equity across sectors - however, disaggregated data is only available for FDI flows. Still, this study captures a sizable part of "private" capital flows: FDI flows into emerging markets are not only far larger than portfolio equity flows; but they have also overtaken debt flows as the most important form of "private" international financing for emerging market economies in recent years (Kose et al. (2006)).

[1] Note, with regard to the nature of the link between capital flows and productivity, that the standard neoclassical model assumes technological progress to follow an exogenous process; the model implicitly assumes that the causality goes from productivity to capital flows. This underpins Gourinchas and Jeanne's (2009) understanding of the allocation puzzle, as countries with faster productivity growth attracting relatively less capital inflows (as opposed to capital inflows not having a positive effect on productivity growth). They do not attempt to discriminate between the two possibilities in the data (neither does the evidence we present in section 5 and 6). Empirically speaking, the allocation puzzle should therefore be interpreted broadly: as a missing complementarity between foreign finance and productivity growth.

[2] See Appendix B2 for time and country coverage.

[3] "Other Investment" flows of the BOP can be attributed to banks, other sectors, government and monetary authorities. Naturally, we would expect the latter two to reflect government policy rather than productivity prospects.

[4] When comparing FDI with Portfolio Investment flows it is less clear which flow can be expected to be more linked to productivity development. A wide literature shows the role of FDI in gaining market access, tariff jumping and lowering production costs.

We focus on financial openness because it is an underlying assumption of the open-economy neoclassical model; a certain degree of financial openness is required for capital to flow according to its predictions. If countries/sectors were financially closed, it would come as no surprise if (sectoral) capital inflows were not linked to (sectoral) productivity development. Hence, a "failure" of the neoclassical model might be driven by a violation of the underlying assumption of financial openness and not by flaws in its other key mechanisms that lead, combined with financial openness, to the prediction that capital should flow to countries with strong productivity growth. Figure 1 displays the median of the Quinn (1997) index on financial openness for the sectoral sample (see Appendix B2). It illustrates that financial openness is indeed a restrictive assumption: despite sharp increases in financial openness - the median increased from 0.375 in 1990 to 0.75 in 2006 - there is still sizable cross-country variation and many countries retain financial restrictions (the median of financial openness is 0.625 across the sample period).

We arrive at three main results. First, we show at the aggregate level that FDI inflows and productivity development are tightly linked across countries. Thus, the allocation puzzle - the violation of the neoclassical growth model - does not hold for (aggregate) FDI flows, which should, indeed, comply most with the predictions of the model.

However, second, through refining the result observed on the aggregate level and documenting substantial sectoral heterogeneity we establish a new set of allocation puzzles for FDI inflows into some important sectors of the economy - i.e. the complementarity between foreign finance and productivity growth depends strongly on the sector in question. Specifically, in a cross-section of countries' agriculture, construction, tourism and mining/utility sectors, sectors with a stronger productivity development received less capital inflows.[5] These sector-level allocation puzzles constitute an even starker violation of the neoclassical growth model than the allocation puzzle for overall capital flows as they are observed for FDI inflows, which should comply most with the model's predictions. By contrast, we show that countries with faster productivity growth in manufacturing attract more investment in that sector. The link is even stronger for most of the service sectors: foreign finance and productivity growth are strongly complementary in business, finance, trade and transport sectors.

Third, we show that financial openness plays an important role in the relation between FDI inflows and productivity growth: a country with fast productivity growth draws in more capital the higher its degree of financial openness. This holds for FDI inflows into the whole economy and for FDI inflows into the service sectors, but notably not for FDI inflows into the manufacturing sector (as well as for FDI inflows into the agriculture, mining/utilities and construction sector). We discuss interesting explanations for these results, such as the importance of special investment regimes for FDI inflows into the manufacturing sector, and the fact that a (broad) opening up of the capital account is often associated with the lifting of investment restrictions for sectors that are traditionally shielded from foreign competition (i.e. most of the service sectors). Furthermore, as shown by Gourinchas and Jeanne (2009), financial openness does not significantly impact the relation between overall net capital flows and productivity growth.[6] The contrast with the result for aggregate FDI flows (and for FDI into the service sectors) is conceptually interesting. Theory tells us that the model should match the data more closely for financially open countries; this is indeed the case, but only when we focus on "private" components of overall capital flows, i.e. FDI inflows. This result is in line with the observation that the model holds better for FDI flows in general.

[5]Note that mining and quarrying (Sector C according to the ISIC Rev.3.1 classification) includes the petroleum sector

[6]They use the Chinn and Ito (2007) index, but the result holds also when using our preferred measure of financial openness (i.e. the Quinn index (1997, updated)

Finally, we discuss potential explanations for the sector-level results and how a sectoral perspective can shed light on the aggregate level. With regard to the former, potential explanations include the importance of resource endowment and the role for FDI flows of tariff-jumping, market access, transportation costs and outsourcing.[7] With regard to the latter, we discuss two channels through which a sectoral analysis can help to understand results documented at the aggregate level. First, it follows directly from the observed differences between sectors that the sectoral composition of economies matters for the link between foreign finance and productivity growth on the aggregate level: countries with a higher share of sectors for which we document an allocation puzzle (resource dependent industries and construction) will, in general, also not contribute to a strong link between productivity growth and capital inflows on the aggregate level. Second, we discuss a potential role for sector-level financial openness: if productivity growth and financial openness differ across sectors, then the aggregate allocation puzzle might be driven by countries receiving capital flows into a few financially open, high-growth sectors, whereas capital outflows from the remaining low-growth sectors do not materialize due to financial frictions. Again, this indicates that it is worthwhile to take a closer look at the sectoral setup of economies to understand results documented at the aggregate level.

The rest of the paper is organized as follows. Section 2 briefly discusses the literature. Section 3 presents the modeling framework underlying the empirical analysis and discusses important conceptual issues. Section 4 describes the data. Section 5 scrutinizes the allocation puzzle on the level of the aggregate economy. In Section 6, FDI flows are disaggregated to the sectoral level and analyzed both within a sector-by-sector setup and a country/sector panel. Section 7 concludes and discusses the results.

2 Literature

This paper relates to the literature on the role of financial openness and the determinants of capital flows, and their impact on economic development. Through establishing the allocation puzzle, Gourinchas and Jeanne (2009) cast doubt on the complementarity between foreign capital and economic growth. In doing so, they offer a conclusion similar to Aizenman et al. (2007) and Prasad et al. (2007), who find that developing countries that rely less on foreign finance grow faster. This establishes a positive relation between domestic savings and growth, which links these papers to the literature on savings, growth and investment and their interrelations (Feldstein and Horioka (1980), Carroll and Weil (1994)). Rodrik and Subramanian (2008) argue that capital inflows only have a positive effect in saving-constrained economies; in investment-constrained economies foreign savings have less beneficial effects as they mainly drive up the real effective exchange rate (RER), which reduces the competitiveness of tradables and is bad for growth (Rodrik (2008) provides evidence that an overvalued RER reduces growth).

With regard to this literature, we show that the complementarity between foreign finance and growth depends on the type of capital flows, with the complementarity being strongest for (aggregate-level) FDI inflows. This weakens the allocation puzzle. However, through analyzing the allocation of FDI inflows into the different sectors of the economy, this paper establishes a new set of sector-level allocation puzzles.

Furthermore, this paper relates to the growth accounting literature. Hall and Jones (1999) and Caselli (2004) document the importance of total factor productivity (TFP) as the main source of cross-country income differences and, consequently, the importance of TFP growth for economic convergence. Caselli and

[7] Those are discussed in the concluding section. However, to explore them theoretically or to empirically discriminate between them is subject to future research.

Feyrer (2007) demonstrate that the marginal product of capital is actually quite similar for advanced and developing countries once all factors of production are properly accounted for. Against this background, Gourinchas and Jeanne (2009) argue that observed rates of returns - which are equalized by capital flows - cannot be a good predictor of capital flows and that a focus on underlying productivity growth in a basic open-economy neoclassical growth model is, therefore, the right approach to explain capital flows. This approach is also adopted in this paper.

The literature offers several potential explanations for the allocation puzzle. One strand focuses on the role of aggregate and idiosyncratic risk. With regard to the former, it is often emphasized that high saving rates in Asian emerging markets are a reflection of precautionary reserves built up to insure against aggregate risks. With regard to idiosyncratic risks, Chamon and Prasad (2008) explain China's rising household savings through increases in idiosyncratic risks associated with the transition to a market economy. Benhima (2009) finds that the allocation puzzle can be explained through introducing idiosyncratic investment risk in the neoclassical growth model (similarly, Sandri (2009) and Carroll and Jeanne (2008)). Aguiar and Amador (2009) focus on political factors: in a model featuring political economy frictions and a lack of commitment regarding foreign debt they show that the allocation puzzle can be rationalized as capital will not be invested in an economy with high debt due to the risk of expropriation; hence, governments have an incentive to pay down debt along a high-growth transition path.

Further studies focus on the role of domestic financial development. Buera and Shin (2010) demonstrate that capital outflows and high TFP growth go hand in hand in a situation where the government introduces widespread reforms that both open up the capital account and remove domestic distortions, but leave financial market distortions in place - entrepreneurs then send their savings abroad to self finance their future investments. Similarly, Caballero, Farhi and Gourinchas (2008) show that, in the absence of a reliable store of value, financially underdeveloped countries have to export capital when they grow fast.

By taking a sectoral perspective, this paper offers a so far unexplored avenue of analyzing the (aggregate) allocation puzzle. First, explanations for the sector-level results (resource endowment, trade- and production related factors) can potentially inform studies that aim at explaining the aggregate allocation puzzle established by Gourinchas and Jeanne (2009). Second, the sectoral analysis indicates that the sectoral composition of economies - for example the importance of high-growth, financially open sectors - is an important factor for understanding the aggregate allocation puzzle.

3 Conceptual issues

This section discusses the theoretical setup and an important conceptual issue with regard to the nature of the complementarity between capital flows and productivity growth.

3.1 Theoretical Setup

We illustrate that capital flows and productivity growth should be positively related in a simple neoclassical framework. The following classical production function is assumed:

$$Y_t = K_t^{\alpha} \left(A_t L_t\right)^{1-\alpha} \tag{1}$$

where K_t is the stock of domestic physical capital, L_t the supply of labour, α the capital share and A_t the productivity level.

Consider N countries (indexed by c) with technology given by (1), identical capital shares (i.e. $\alpha = \alpha_1 = \alpha_2 = ... = \alpha_N$),[8] and a constant labour ratio normalized to 1 ($L_{1,t} = L_{2,t} = ... = L_{N,t} = 1$). Assuming a sufficient degree of financial openness, so that capital can flow across borders without significant transaction costs,[9] the marginal products of capital are equal:

$$\alpha A_{1,t}^{1-\alpha} \left(K_{1,t}\right)^{\alpha-1} = \alpha A_{2,t}^{1-\alpha} \left(K_{2,t}\right)^{\alpha-1} = ... = \alpha A_{N,t}^{1-\alpha} \left(K_{N,t}\right)^{\alpha-1} \tag{2}$$

This implies that the relative capital stock per capita between any two countries is equal to the relative TFP level:

$$\forall c : \ln\left(\frac{K_{c,t}}{K_{1,t}}\right) = \ln\left(\frac{A_{c,t}}{A_{1,t}}\right)$$

It follows that for all countries (c) the percent change of the capital stock equals the percent change of TFP plus a term that refers to some reference country $c = 1$:

$$\forall c : \Delta k_c = \Delta a_c + \varphi$$

where lower letters denote logs and $\varphi = \Delta k_1 - \Delta a_1$. If a country experiences stronger productivity growth than another country, it will experience a relatively stronger increase in its capital stock.[10] For simplicity suppose that the link between capital inflows and Δk_c is linear. Specifically, that capital inflows (scaled by initial Y) are a linear function of the percent change in the capital stock:

$$\forall c : \frac{\text{Inflows}_{c,t_1-t_0}}{Y_{c,t_0}} = a + b\Delta k_c \tag{3}$$

where b is positive and between 0 and 1 and is the same across countries. A country receives more capital inflows (scaled by its size) the larger the percent increase in its capital stock.[11]

This motivates the following (cross-sectional) regression equation on which (or variations of which) we will base our empirical analysis:

$$\frac{\text{Inflows}_{c,t_1-t_0}}{Y_{c,t_0}} = \alpha + \beta\Delta a_c + \varepsilon_c \tag{4}$$

where $\alpha = a + b\varphi$ and $\beta = b$ in case the theoretical prediction would hold exactly in the data. The theoretical prediction is that β is positive - i.e. stronger productivity growth is associated with stronger capital inflows. In terms of terminology, we refer to a negative statistically significant relation between capital inflows and productivity growth as a "strong" allocation puzzle; a non-significant relation between

[8] We show the effect of allowing the capital share to vary across countries below

[9] A bold assumption; i.e. a typical RBC model relies on sufficient adjustment costs to fit the data.

[10] If we allow capital shares to vary across countries equation (3) becomes $\Delta k_c - \frac{1-\alpha_2}{1-\alpha_1}\Delta k_1 = \Delta a_c - \frac{1-\alpha_2}{1-\alpha_1}\Delta a_1$. Estimates by Gollin (2002) suggest that the capital share is roughly constant within countries and varies between 0.2 and 0.35 across countries. This implies that the maximum value for $\frac{1-\alpha_2}{1-\alpha_1}$ is 1.23 ($\frac{0.8}{0.65}$) (if we assume country 1 to have the higher capital share). To assess the potential bias, assume that both countries display a productivity growth rate of 1% and that the capital stock of counry 2 remains unchanged; then the condition would imply that the capital stock of country 1 decreases by 0.23 percent (despite equal productivity growth rates across the two countries). However, we argue that our theoretical prediction is robust to differences in the capital share across countries for two reasons. First, the differences in capital share are generally much lower than the maximum difference of 0.15 (see Gollin (2002)); the bias term is accordingly much lower than 1.23 for most country-pairs. Second, in the empirical section we analyze the link between capital flows and productivitiy growth across countries for a long time period. Hence, the differences in productivity growth across countries are generally very large (up to 300 percentage points). It follows that the differences in capital shares are too small to change the direction of the theoretical prediction.

[11] A special case of this assumption would be to assume that the world capital stock is fixed (i.e. $K = K_1 + K_2 + ... + K_N$), which would imply a one to one link between capital inflows and changes in the capital stock.

capital inflows and productivity development - which implies that the coefficient is statistically speaking zero - is called a "weak" allocation puzzle.

Note that the theoretical prediction derived above holds without further assumptions when extending the framework to the sectoral level. Importantly, we do not need to assume that all capital is sector-specific and that sectors are independent units. First, technological spillovers between sectors - though entirely possible - do not change the prediction that capital flows are attracted by underlying productivity trends (which may or may not be influenced by spillovers). Second, because equation (2) holds across all countries and sectors it is not essential for the theoretical prediction whether all capital is sector-specific: whereas the share of capital that is not sector-specific will be simply drawn into the highest-growth sectors (across all different sectors and countries), it remains true for one specific sector that low-growth sectors across countries receive fewer inflows than high-growth sectors. The crucial assumption for this to be true is that equation (3) holds for every sector. We believe this to be generally the case because FDI is by its nature a direct capital flow - which is especially true for greenfield investments.[12]

The model of Gourinchas and Jeanne (2009) has very similar implications than the simple framework outlined above. Starting from the production function given in equation (1), they build a standard small open economy model in the tradition of Ramsey, Cass and Koopmans and derive a closed-form expression for the ratio of cumulated capital inflows (ΔD) to initial GDP (Y_0):

$$\frac{\Delta D}{Y_0} = \underbrace{\frac{\Delta D^c}{Y_0}}_{\text{Convergence Term}} + \underbrace{\frac{\Delta D^t}{Y_0}}_{\text{Trend (initial debt)}} + \underbrace{\frac{\Delta D^i}{Y_0}}_{\text{Impact of } \pi \text{ on domestic } I} + \underbrace{\frac{\Delta D^s}{Y_0}}_{\text{Impact of } \pi \text{ on domestic } S}$$

where π stands for the development of domestic TFP relative to the world technology frontier; specifically, $\pi_t \equiv \frac{A_t}{A_0 g^{*t}} - 1$ where g^* is the growth rate of productivity at the frontier (USA) - i.e. if π is positive a country caught up relative to the United States in terms of TFP.

Net capital flows (in percent of initial GDP) depend on a convergence term that captures the - in the absence of frictions - instantaneous convergence to the steady state from initial capital scarcity ($\frac{\Delta D^c}{Y_o}$),[13] a trend term capturing capital inflows needed to hold external debt at the initial level in the absence of productivity growth ($\frac{\Delta D^t}{Y_o}$) and two terms that capture the impact of productivity growth/catch-up (π). The first of the latter two terms represents the positive impact of productivity growth/catch-up on domestic investment ($\frac{\Delta D^i}{Y_o}$); the second term captures the impact of productivity growth on savings ($\frac{\Delta D^s}{Y_0}$) - i.e. higher productivity growth increases future income and raises, hence, current consumption. Overall, it follows that countries with a higher productivity catch-up should have, ceteris paribus, higher capital inflows.

As the focus of this paper is on FDI inflows we regard the investment channel, that we derived formally above, as relevant for our analysis; the savings channel captures the saving decision of households rather than the investment/saving decision of firms.[14] Countries with stronger productivity growth experience

[12] It is, however, conceivable that the domestic banking system intermediates a share of the FDI inflows - especially if direct investment restrictions prevent investors from investing directly in their target sector.

[13] Contrary to what one might expect, the convergence term does not play a crucial role in determining capital flows (according to their calibrations) as the regions are not far away from their steady state capital stocks (in 1980). This is because they calibrate the capital stock based on a distortion τ that depends on observed average investment rates. The result is that, for example, Africa, with low average investment rates and hence huge distortions, is capital-abundant and capital should flow out of the region. This "circular" reasoning should open up quite some scope for critique. Supportive, and especially relevant in the current context, are, however, the results by Alfaro et al. (2008) who provide evidence for the importance of institutions for FDI and portfolio inflows (which can be subsumed under τ).

[14] Furthermore, even when focusing on overall capital flows, the investment channel is arguably the key channel with regard

stronger FDI inflows financing domestic investment; similarily, FDI will flow into a sector if the sector catches up in terms of relative productivity towards the world technology frontier for that sector. This implies the same regression as we derived in equation (4).

3.2 Interpretation of regression coefficients

The standard neoclassical model assumes technological progress to follow an exogenous process and, hence, implicitly assumes that the causality goes from productivity to capital flows. This underpins Gourinchas and Jeanne's (2009) interpretation of the allocation puzzle, as countries with faster productivity growth attracting relatively less capital inflows (rather than capital not having a positive effect on productivity growth). They do not attempt to discriminate between the two possibilities in the data - neither does the evidence we present in section 5 and 6. Empirically speaking, the allocation puzzle should therefore be interpreted broadly, as a missing complementarity between foreign finance and productivity growth. This is also the focus of this paper. Regression coefficients - in this paper we will typically regress FDI inflows on productivity development - should therefore be interpreted accordingly, as capturing this complementarity.

However, it is interesting to consult the literature to assess which side of the complementarity is likely to be more important. For overall inflows, the evidence seems to support Gourinchas and Jeanne (2009)'s interpretation because empirical studies could not establish a convincing positive effect of net capital inflows on (per capita) growth (Prasad et al. (2007) and Kose et al. (2006)).

This is less clear for FDI, however: if the effect of FDI inflows on productivity growth is stronger than for other types of capital inflows, then positive and significant regression coefficients could be either interpreted as capturing the productivity impacts of FDI inflows or as the pull effect of productivity growth on FDI inflows. What interpretation should we believe in; i.e. does FDI cause growth? The answer is not clear-cut. In a survey of the literature, Kose et al. (2006) summarize the major findings as follows: although earlier studies have found mixed results, recent studies using more sophisticated methodologies and micro-level data sets, have been more successful in finding favorable evidence of the benefits from FDI.[15] Herzer et al. (2008) find in a sample of 28 developing countries, using cointegration techniques, that there is neither a long-term nor a short-term effect of FDI on growth. According to Aykut and Sayek (2007) one should note with regard to studies on the macro level that they only identify a positive growth effect of FDI in combination with other factors (such as "absorption capacity", trade openness (Balasubramanyam, et al. (1996)) and domestic financial market development (Alfaro et al. (2004)). But also this is not without criticism: Rodrik (1999) and Carkovic and Levine (2003) argue that the effect of FDI on growth is weak[16] and that most of the studies showing an effect of FDI based on initial conditions suffer from reverse causality (which emphasizes causality from productivity to capital flows). Aykut and Sayek (2007) show that the sectoral composition of FDI flows matters. If flows get skewed towards the manufacturing sector, there are more positive spillovers to the rest of the economy and the effect on growth is positive. Overall the results for macro data appear inconclusive, but seem to

to the impact of productivity growth. Gourinchas and Jeanne (2009) argue that, because the predictions of the neoclassical model for savings are at odds with the data, one should focus on the other channels when looking at the quantitative predictions of the model. Through introducing uncertainty, they hence shut down the saving channel, which relies on the assumption of perfect foresight (see their proposition 2).

[15] See Lipsey (2004) and Moran (2005) for further literature surveys.

[16] Carkovic and Levine (2003) use a dynamic GMM specification to account for endogeneity and claim that the exogenous component of FDI does not have a causal impact on economic growth.

favour the "pull" interpretation of our coefficients - i.e. productivity growth pulling in FDI inflows.

It is more important for the present study to have a look at results from more disaggregated studies focusing on the sectoral level: a differential impact of sectoral FDI on sectoral productivity growth across sectors can impact the results and their interpretation as the degree of endogeneity would vary across sectors. Furthermore, evidence of the impact of sectoral FDI on the productivity growth rates of other sectors should be taken into account. With regard to productivity spillovers from foreign firms to domestic firms in the same sector, the evidence is again inconclusive with various studies finding a positive effect and other studies only a very small effect (Kose et al. (2006)). Interestingly, Görg and Greenaway (2004) argue that those studies (using cross section data) cannot establish causality because of reverse causality: for example (borrowing their argument), if productivity in the oil sector is higher than in the food sector, foreign companies may be attracted to the former. The results of a cross-sectional study would then be biased in favor of a positive impact of FDI on productivity. Furthermore, Kose et al. (2006) give a potentially important reason for the weak results on horizontal spillovers: foreign firms might try to protect their firm-specific advantages.

Overall, the results for the sectoral level are inconclusive, but seem to, again, favour the assumption of our underlying model - i.e. that causality runs from productivity growth to FDI inflows.[17]

4 Data

We build one data set for the aggregate level and three data sets for the sector-level analysis: namely a data set covering the three main sectors of the economy, a 7-sector and a 10-sector data set.[18] This section provides a brief description; further details and an overview are provided in Appendix A; an overview on the sample coverage can be found in Appendix B. As the focus is on long-run trends, we collapse the time dimension: "growth/development" refers to a ratio of the last year's value to the first year's value of the respective variable - i.e. if it is 1 the variable did not change; "in % of initial GDP" implies that the respective variable (i.e. capital flows) is summed up over the respective years and divided by the GDP of the first year of available data; other variables are averaged over the range of available years.

4.1 Capital Flows

Aggregate-level data on the different types of capital flows is taken from the IMF's International Financial Statistics. The overall net inflows are divided in four categories: Net FDI; Net portfolio investment equity securities; Portfolio debt and other investment; and Reserve Assets.[19] From this, three other series are derived through subtracting from overall net capital inflows (1) net reserve flows, (2) aid flows and (3) both net reserves and aid flows. The last measure is especially interesting as it takes out large parts of official flows. Neglecting potentially important official elements of debt flows, we refer to these as "private"

[17] However, vertical productivity spillovers might play an important role and will be harder to deal with: Javorcik (2004) finds that a 10% increase in the foreign presence in downstream sectors is associated with a 0.38 percent increase in output of firms in the supplying industry. If those vertical linkages are across sectors and if they are quantitatively important one should control for their effect.

[18] Sectors are classified according to ISIC Rev. 3.1. The 3-sector data set includes agriculture (sectors A and B, according to ISIC Rev. 3.1), industry (CDEF) and services (GHIJKLMNOPQ). The 7-sector data set splits this into agriculture (AB), mining and utilities (CE), manufacturing (D), construction (F), trade and tourism (GH), transport, storage and communication (I), finance and business, and other services (JKLMNOPQ). Finally, the 10-sector data set disaggregates the following sectors further: first, CE into mining (C) and utilities (E); second, GH into trade (G) and tourism; third, JKLMNOP into finance and business (JK), and other services (LMNOP).

[19] All variables are defined such that a positive sign corresponds to a net inflow

inflows in the tables.
Sectoral FDI inflows stem from several sources including UNCTAD, International Trade Center (ITC), ASEAN, OECD and various country sources. Appendix A1 gives more details; Appendix B2 and B3 give an overview of the sample.

All net capital flows series are divided by a deflator and the price of investment goods given in the 6.3 PENN World tables (PWT 6.3), to get a measure of real flows in purchasing power parity (PPP).[20] Following the model presented in section 2.1., this measure is first summed up over all available years and then scaled by the initial output/value-added of the respective country/sector (e.g. 1980) - where initial output is taken from PWT 6.3 (Real GDP per capita (Constant Prices: Chain Series)) and value-added from the United Nations Statistics Division.[21].
Table 1.1 presents summary statistics for raw FDI inflows in millions of USD into the main sectors (using the ISIC Rev. 3.1 classification). Manufacturing (In ISIC Rev. 3.1.: Sector D) received, on average, most of the FDI inflows followed by the real estate/business sector (K) and financial intermediation (J). Average FDI flows into mining sectors (C), transport and communication (I) and trade (G) are also sizeable. Flows to agriculture, tourism and construction are, on average, smaller. However, there is sizable cross-country variation in the amount of FDI flows received for all the sectors. Table 1.2 gives the summary statistics for FDI inflows (in PPP) as a fraction of initial value added. Interestingly, in % of value added, mining and quarrying, utilities, transport storage and communication as well as finance and business industries received more FDI than manufacturing, whereas agriculture received about 10 times less and construction 3 times less FDI.

Finally, we take the log of FDI inflows (in % of initial value added) as our dependent variable ($logFDI$) to dampen the impact of extreme observations.[22]

4.2 Productivity

Data on productivity stem from various sources. For the aggregate-level analysis, we construct TFP (A_t) with the perpetual inventory method using data from PWT 6.3 on investment and output together with the production function (1) - details are given in Appendix A2. In order to focus on long-run trends, the TFP series is smoothed by applying an HP filter with a high smoothing parameter.[23]

With regard to sectoral productivity development ($ProdDev$), it is important to note that the analysis relies on labour productivity due to data limitations with respect to sectoral capital stocks. Three different data sets of varying degrees of disaggregation are built: A 3-sector, a 7 sector and a 10 sector database.[24] Labour productivity is calculated as the ratio of value-added and the number of workers in the respective sector; value added is from the United Nations Statistics Division and employment from the ILO (see Appendix A3 for data sources and further details).

In order to focus only on sectors that play a significant role in the respective countries, we exclude sectors that both have a value-added below USD 100 million and a share in total value-added that is

[20] The results are robust to using the price of output instead.
[21] Value-added data is scaled by the price of output from PWT 6.3 to get a measure of value added in PPP
[22] Specifically, we add one to the ratio of FDI inflows over initial value added as this transformation is neutral for small x, which gives a natural fix point (compare the discussion in Yeyati et al. (2007). Results are broadly robust to not taking logs and are available on request.
[23] Specifically, λ is set to 27.2, so that the gain of the filter is equal to 70 % at the frequency corresponding to an eight-year cycle. The results are robust to the choice of the smoothing parameter.
[24] The corresponding sectoral FDI inflows data is quite disaggregated and can be adjusted to the data sets described in this section through aggregating the smaller sectors.

below 1%.[25]

4.3 Financial openness and other variables

We employ two measures of financial openness. The first measure ("Openness (CAL)") captures the overall openness of the capital account and is taken from Quinn (1997)[26]. The index ranges from 0 to 1, with most OECD countries having a value of 1 for fully open capital accounts - it takes an average value of 0.625 for the countries of the sectoral sample. The second measure ("FDI Openness") captures openness of a country to FDI inflows and is taken from Schindler (2009); we use the 0/1 dummy variable "direct investment inflow restrictions", which is 1 if a country maintains restrictions to FDI.[27] A detailed description of other controls is provided in Appendix A4. All variables are averaged over the time-period in question.

4.4 Comparability of the aggregate and sectoral data

Before moving to the aggregate analysis two concerns with regard to the comparability of the aggregate and sectoral data need to be addressed. First, the comparability of the sectoral flows data with aggregate IFS data and, second, substituting TFP with labour productivity in the sectoral analysis due to reasons of data availability.

Ideally, total flows from the sectoral sample should match total net flows from IFS one to one. This is not the case. Differences to the aggregate IFS data might have several reasons: subsequent updates of the data (incorporated in IFS but not in older sectoral data sets), different data issuers, differences between approved and realized FDI, the lack of sectoral outflows data, and finally to the fact that for some countries FDI inflows had to be backed out from stock data (where valuation effects might play a role). Encouragingly, a comparison between the total flows from the sectoral data set and IFS data shows that the differences are quantitatively small. The correlation between IFS FDI Inflows (scaled by initial GDP) and FDI Inflows from our data set is 91%. The correlation falls to 70% when including outflows (hence, using net FDI from IFS); a drop that is driven by big outflows for Hong Kong and Korea.

Following the production function (1), TFP (A_t) can be written as a function of labour productivity $\frac{Y}{L}$ and capital deepening $\frac{K}{L}$:

$$A_t = \left(\frac{Y_t}{L_t}\right)^{\frac{1}{1-\alpha}} \left(\frac{K_t}{L_t}\right)^{-\frac{\alpha}{1-\alpha}}$$

The sectoral analysis uses labour productivity as a proxy for TFP growth (due to missing data on the capital stock for the different sectors). In this regard, it is encouraging to note that TFP and labour productivity move largely in line when looking at aggregate data: the correlation coefficient between TFP growth and growth in real GDP per capita (rgdpch from PWT 6.3) is 84% for 1995-2006 using the sectoral sample (88% for the full sample (from 1980-2006)).

[25] This exclusion is of practical relevance only for the 10 sector regression - and mainly for the mining sector (C), which is very small in some of the countries.

[26] The updated index is available until 2006

[27] Note that data on sectoral openness to FDI flows is not available. It is work in progress to build such a database based on the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER).

5 The Allocation Puzzle - Aggregate Level

The regressions are performed on different samples. The "full" sample has the biggest country coverage, capturing a broad range of up to 95 developing countries and emerging markets.[28] The "Gourinchas and Jeanne" sample (up to 67 countries) replicates, as closely as possible, the one used by Gourinchas and Jeanne (2009) in order to relate to their analysis. The sectoral sample captures those countries for which we were able to gather sectoral FDI flows data (up to 64 countries).[29] The focus is on the latter sample in order pave the way for the sectoral analysis.

The following equation is estimated:

$$NetFlows_c = \alpha_c + \gamma_1 TFPGrowth_c + \beta X_c + \varepsilon_c$$

where $TFPGrowth$ is the ratio of TFP in the last year to TFP in the first year of available data (i.e. if $TFPGrowth$ is 1, then TFP did not change over the time frame). $NetFlows$ captures the different types of net inflows (scaled by initial GDP). The regression is performed over two time frames: first, from 1980 to 2007, which extends the analysis by Gourinchas and Jeanne (2009). Second, focus is laid on the period 1995-2007 as this matches the period for which the data on sectoral capital flows is, on average, available. In a first step, we abstract from the role of controls (X) and look at unconditional relations in the data. Tables 2.1 to 2.2 show the results for the period 1980-2007 for the full sample and the one used by Gourinchas and Jeanne (2009); they are broadly consistent across the samples. Column (1) demonstrates the "allocation puzzle": countries with higher productivity growth received significantly (at the 5% level) less capital inflows; column (7) shows that the result is robust to excluding aid flows.

The sectoral analysis relies on one component of overall capital flows - namely FDI flows. Hence, it is important to further scrutinize the allocation puzzle on the aggregate level by looking at different types of capital flows. This is done in column (2) through column (8). Three results are noteworthy. First, there is no allocation puzzle for FDI: net FDI inflows are significantly positively related with TFP growth - FDI follows the predictions of the standard neoclassical model.[30] Second, the allocation puzzle is strongest for reserves: the coefficient is negative and strongly significant - countries with a high-level of productivity growth had a stronger growth in their reserve holdings than countries with a low productivity growth.[31] Consequently, third, excluding reserve flows from the current account weakens the allocation puzzle: the coefficient on TFP growth is negative and insignificant (column (6)). Overall, the results points to the potential importance of export-led growth strategies in explaining the allocation puzzle: high-growth countries attract FDI into the productive export industries (which can be seen in the sectoral analysis) and amass reserves to weaken the exchange rate.

In a next step, the focus is shifted to the period 1995 to 2007 and the sectoral sample. Table 3 and figure 2 show that the "allocation puzzle" for overall net flows is weaker for this group of countries: the coefficient on TFP growth is now negative, but insignificant.[32] On the contrary, the coefficient for net

[28] See Appendix B1. The following high-income Countries (according to the 2006 World Bank classification) are kept in the sample: Taiwan, Singapore, Hong Kong, Israel and Repulic of Korea

[29] From the 72 countries of the sectoral sample Bosnia and Herzegovina, Brunei Darussalam, Russia, Serbia and Tajikistan drop because the initial capital stock cannot be constructed from PWT 6.3 (The series are too short). Iceland is excluded as an outlier for FDI and debt flows (the results stay qualitatively robust). There is no IFS data for Taiwan and not enough FDI data for Guyana.

[30] The coefficients are insignificant for the other two components of total net inflows - portfolio investment in equity and net debt flows. Hence, we observe a "weak allocation puzzle" for those two types of flows.

[31] This result is robust to excluding China with regards to its significance; point estimates are markedly lower.

[32] Note that the share of EU accession countries is higher for the sectoral sample than for the full sample and that the

FDI inflows is again positive and significant (at the 1% level).

Finally, to pave the way for the sectoral analysis, we zoom in on (gross) FDI inflows. Column (1) of table 4 demonstrates that the results for gross FDI inflows are similar to the results for net FDI inflows (table 3): Gross FDI inflows and productivity growth are significantly positively related. In column (3) we add a dummy for EU accession countries and a dummy for financial centers to the regression. As expected, significantly more FDI is flowing into EU accession countries. The point estimate on TFP growth is slightly smaller than for the unconditional regression (column (2)). Column (4) adds initial income, financial development (private credit), an institutional variable directly relevant for FDI (Investment Profile), aid flows, the average government balance, and population growth to the regression. The coefficient on TFP growth falls further in size, but it is still significant at the 1 % level. With regard to the additional controls we make the following observations: richer countries imported more FDI; a higher degree of financial development lowers the amount of FDI inflows; a good investment profile attracts, indeed, FDI inflows; aid flows "attract" more FDI inflows. The latter observation is interesting: a high amount of aid flows might signal to investors that the international community is committed to the country and that risks to investment are subsequently lower. Column (5) retains only the significant controls; the results are similar: there is no allocation puzzle for aggregate FDI inflows.[33] In section 6, we will explore the sectoral composition of this result - the positive and significant relation for aggregate FDI flows masks interesting sectoral differences.

To conclude the analysis on the aggregate level, we explore the impact of financial openness on the relation between productivity growth and FDI inflows (see table 5 for results). Regressing FDI inflows on TFP growth, financial openness and an interaction term between the two, shows that the marginal effect of TFP growth on inflows depends on the degree of financial openness (column (2)): more open countries that grow a lot attract significantly (at the 5% level) more FDI inflows whereas the coefficient for the financially most closed economies is zero.[34] In Column (4) controls are added to the regression and the results are even stronger. The interaction term (TFPxCAL(Quinn)) grows in size and significance: the more financially open a country is, the tighter is the link between FDI inflows and productivity growth. Furthermore, we arrive at evidence for an allocation puzzle for financially closed countries: the coefficient on TFP growth for the financially most closed countries is negative and strongly significant. The sectoral analysis sheds light on whether this result is driven by certain sectors or whether financial openness has a similar impact across sectors.

6 Into the Allocation Puzzle - A Sectoral Analysis

We assess the relation between FDI inflows and productivity development using both sector-by-sector regressions and a country/sector panel framework. This section is divided into five parts, which include the results for four different estimation frameworks and an analysis of the role of financial openness. First, sector-by-sector regressions allow analyzing unconditional relations in the data. Second, we use

number of EU accession countries included in the sample has an impact on the strength of the allocation puzzle as this group of countries did receive sizable inflows while growing strongly.

[33] As can already be seen from figure 2, Trinidad and Tobago and Estonia, two rather small countries, are important for the strength of the link between FDI inflows and TFP growth. Dropping those countries from the regression in column (5) lowers the point estimate to 0.211. The point estimate is, however, significant at the 10% level and we still do not observe an allocation puzzle for FDI inflows.

[34] This result is robust to using the full sample (10% significance on TFPxCAL(Quinn)) or the sample used by Gourinchas and Jeanne (2009) (5% significance on TFPxCAL(Quinn)).

a country/sector panel framework to assess the relative importance of the different dimensions of the panel data. Third, a country/sector panel that includes interaction terms between sector dummies and sectoral productivity growth allows estimating the slope parameter for each of the sectors separately while controlling for country fixed effects. This improves the efficiency of the estimation and alleviates endogeneity concerns stemming from slow-moving unobserved explanatory variables, but "changes" the interpretation of the coefficients. Hence, fourth, we use the same setup, but control for various country-specific variables instead of country-fixed effects. Finally, fifth, we explore the role of financial openness using both the sector-by-sector and a country/sector panel framework.

All regressions are performed on the 3, 7 and 10-sector database.[35] When comparing results on the same coefficient, we prefer the results based on the 7-sector data base over the results based on the 10-sector data base as the data is more reliable, the country coverage better and the panel more balanced.

The nature of the analysis - the fact that we are mainly interested in the relation between two variables (FDI inflows and productivity growth) - allows us to be very transparent with regard to the sample choice since we can present the data (and the results of the sector-by-sector regressions) graphically. In figures 3 to 5, a few "large" observations and (two) outliers can be spotted directly by comparing graphs with the titles "Focusing in" (for "large" observations) and "excl. outliers" with the original graphs, which display all the data. We choose to present the results excluding the two outliers for Armenia (for construction and industry), but including the "large" observations - the regressions controlling for country fixed effects or important variables are expected to sufficiently account for the "large" observations.[36]

6.1 Sector-by-Sector Analysis

We estimate the following equation for each of the sectors:

$$logFDI_c = \alpha + \gamma_1 ProdDev_c + \varepsilon_c$$

where $ProdDev$ stands for the ratio of labour productivity in the last year to labour productivity in the first year of available data (i.e. if $ProdDev$ is equal to 1, then labour productivity did not change over the time frame) and $logFDI$ refers to the natural logarithm of FDI inflows (in % of initial value-added).

Table 6.1 and figures 3.1 and 3.2 present the results for the 3-sector data set. For the agricultural sector, FDI inflows and productivity development are unrelated - a "weak" allocation puzzle. The same holds for the industry sector although the correlation is stronger than for agriculture. For the service sector, FDI inflows and productivity flows are strongly related (significant at the 5 % level). The results are qualitatively robust to excluding "large" observations along the lines of figure 3.1 and 3.2. They are in fact stronger: the coefficient is negative for agriculture and rises in size and significance for the service sector. The point estimate implies big effects: A 10 percentage point increase in productivity development in the service sector increases FDI inflows (in % of initial GDP) by 4.5% (5.2% when excluding "large" observations).

However, industry as well as services conflate the effect of very different industries (e.g. resource extraction vs. manufacturing and transport vs. financial intermediation and business). Hence, we move to the 7-sector and 10-sector analysis to shed more light on the different subcomponents of the three main

[35] See Appendix A3 for a list of sectors

[36] Results are generally robust to estimating without "large" observations. We will notify in due course if regression results without including those observations deviate significantly from the results given in this paper. All results are available on request.

sectors. Table 6.2 and figure 4 present the results for the 7-sector data set. Splitting up the industry sector into its components reveals that the lack of a positive significant relation between FDI inflows and productivity is driven by a significant, negative relation for construction industries and a negative, but insignificant relation for mining and utilities (note that mining includes the petroleum sector). For manufacturing, the coefficient on productivity development is positive and significant at the 1 % level. For the services sector, the positive impact of productivity on FDI inflows carries over to the trade/tourism (GH) and transport/communication (I) industries (both coefficients are significant at the 5 % level), whereas the estimate is not significant for "Other Services" (JKLMNOP).

We disaggregate the data further to 10 sectors: table 6.3 and figure 5 present the results.[37] Splitting up the mining and utilities (CE) sector into its two components shows that the relation between productivity and FDI inflows is stronger for mining than for utilities. However, we still observe a "weak" allocation puzzle for both sectors, as both coefficients are insignificant (though positive).[38] Focusing in on trade and tourism (GH) gives an interesting result (which is however based on a very small sample): the positive correlation for trade and tourism (GH) appears to be only driven by trade (G); for tourism (H), we observe a negative relation between productivity growth and FDI inflows - a "weak" allocation puzzle. Finally, distinguishing between finance and business (JK) and government and social services (LMNOPQ) gives a very strong, positive coefficient - significant at the 5% level - on productivity development for the finance and business sectors: a 10 percentage point increase in productivity growth is associated with a 6.6% increase in FDI inflows (in % of initial value added) - the effect is even larger (9%) and significant at the 1% level when excluding large observations along the lines of figure 5.

Though not in the focus of this paper, table 6.4 demonstrates that the results are robust to including 22 further OECD economies (see Appendix B3 for a list countries that are added to the sectoral sample).

To conclude, we find a "strong" allocation puzzle for the construction (F) sector. For agriculture (AB), mining/utilities (C) and tourism (H) we find a "weak" allocation puzzle. The evidence speaks against an allocation puzzle for countries' manufacturing (D), trade (G), transport/communication (I) and business/finance (JK) sectors; the point estimates are from 60 % (for transport/communication) to nearly 300 % (business/finance) higher for the service sectors than for the manufacturing sector. In sections 6.3 and 6.4 we explore the robustness of these results using a country/sector panel framework. The latter is also used in the next section, but we first estimate one slope parameter for all sectors in order to assess the relative importance of the different dimensions of the panel data.

6.2 Panel framework

We estimate the following country/sector(c,s) panel:

$$logFDI_{c,s} = \alpha + \gamma_1 ProdDev_{c,s} + \eta_c + \theta_s + \varepsilon_{c,s}$$

where θ_s and η_c are sector and country specific effects that are potentially correlated with the regressor and need to be eliminated through the appropriate transformation.
Table 7 presents the results of four regressions that aim at exploiting the different dimensions of the panel data, specifically the pooled regression (Column (1)), the regression with country fixed effects (Column

[37] As noted above, the results are not strictly comparable as the 7 sector data set is in constant 1990 Dollars whereas the 10 sector data set is in constant 2000 Dollars.

[38] Note however, that the sample size drops to 29 for C and 32 for E. We, hence, prefer the results of the 7-sector regression.

(2)), sector fixed effects (Column (3)) and the between regression (4).

Column (2) and column (3) perform two different types of within transformation: First, $V_{c,s} - V_{c,\cdot}$ for the within transformation with country fixed effects (column (2)) - where V stands either for $logFDI$ or $ProdDev$ (note that the transformation applies to all variables) and "$\cdot$" denotes that the observations have been averaged across the values of the respective index[39]. Second, $V_{c,s} - V_{\cdot,s}$ for the within transformation with sector fixed effects (column (3)). To illustrate, consider 3 sectors (agriculture, industry and services) and 3 countries A, B and C. When including country fixed effects, the regression coefficient on $ProdDev$ captures whether for one specific country (A, B or C) FDI inflows into the service sector are bigger than the average FDI inflows into the agricultural and industrial sector, if its productivity growth is higher than the average productivity growth across agriculture and industry - in other words, whether FDI flows into the highest-productivity-growth sector within one country. When including industry fixed effects, the coefficient captures whether for one specific sector (for example the service sector) FDI inflows into country A's service sector are higher than average FDI inflows into country B's and C's service sector, if productivity growth in country A's service sectors is higher than the average productivity growth in the service sectors of countries B and C - in other words whether FDI flows into the highest-productivity-growth service sectors across all countries. Finally, in column(4) the coefficients relates to whether countries with a stronger average (averaged across all sectors) productivity growth receive more FDI inflows on average (averaged across all sectors) than countries with relatively lower productivity growth.

The results are interesting: column (1) confirms the result of the aggregate analysis: productivity growth and FDI inflows are positively related across all sectors. Column (4) demonstrates that this result is mainly driven by the between dimension: investors invest in the countries that display the highest productivity growth (averaged across all sectors). The regression including sector fixed effects (column (3)) shows that that investors invest to a lesser extent in the most productive sector across countries when looking at one specific sector (column 3). There is, however, cautious evidence for investors investing in the most productive sector within a given country (column (2)). Taking the results at face-value, investors are able to choose a country with fast productivity growth for their investments and, to a lesser extent, a high-growth sector within a given country. However, investors that want to invest in a certain sector are not able to invest in the most productive sector across all countries. A possible explanation is that sector-specific restrictions on investment limit the choice of investors between and within countries.

6.3 Panel framework with sector-specific slope parameters and fixed effects

The simple panel framework employed in the last section does not allow for differences in the slope parameters across sectors - which are in the main interest of this paper. Those can be estimated using the following panel setup:

$$\begin{aligned} logFDI_{c,s} = \alpha_1 Sector_1 + ... + \alpha_7 Sector_7 + \gamma_1 ProdDev_{c,s} \cdot Sector_1 + \\ ... + \gamma_N ProdDev_{c,s} \cdot Sector_N + \beta X_{c,s} + \theta_s + \varepsilon_{c,s} \end{aligned}$$

where θ_s is a country specific effects that is potentially correlated with the regressor. Sectoral FDI inflows are regressed on sector dummies (sector fixed effects) and an interaction term between the productivity

[39] For example: a typical observation for $ProdDev_{c,\cdot}$ is average productivity growth across all sectors for one specific country.

measure and the sector dummies. We use robust standard errors and include country fixed effects.[40] In this (sub)section we do not include controls (X). Note that the results of the sector-by-sector regression can be reproduced in the panel framework of this section by simply running a pooled regression (i.e. not including random or fixed effects). The main advantage of the methodology used in this section is that it improves the efficiency of the estimation by accounting for the variance that stems from country-specific effects. These account for all country specific variables that do not change across sectors (for example, it is likely that the effect of broad aspects of institutional quality - such as law enforcement or bureaucratic quality - is similar across manufacturing and transport sectors). Furthermore, purging fixed effects can account for potential omitted variable bias in case the fixed effects are correlated with sectoral productivity development (as is likely when thinking about the effect of institutional variables).

The results presented in table 8.1 are similar to the results of the sector-by-sector regressions presented in section 6.1. However, some interesting differences emerge. For the 3-sector framework, the results of the sector-by-sector regressions for the industry and service sector are robust to including country fixed effects: the point estimates shown in column(1) of table 8.1 are similar to the ones presented in table 6.1 (for the sector-by-sector regressions). On the contrary, a "strong" allocation puzzle emerges for agriculture. The point estimate is negative and significant at the 10% level. This result is confirmed by the 7-sector regression (column (2)).

Disaggregating the industry sector shows an important change: the manufacturing sector's positive and significant correlation breaks down - it is now positive, but insignificant for the 7-sector regression (column (2)).[41] For the mining and utilities (CE) sectors we get again similar results to the sector-by-sector regressions: the coefficient on productivity growth is negative but insignificant ("weak" allocation puzzle), whereas the relation is positive, but not significant for both sectors, when splitting the sector.[42]

With regard to the services sectors, we confirm the strong relation between productivity growth and FDI inflows for the finance and business sector (JK), transport, storage and communication (I) and trade (G): a 10 percentage point increase in productivity growth increases FDI inflows (in % of GDP) by 5.9% (1% significance level) in the JK sector, by 1.9% (1% significance level) in the I sector and by 3.1% in the G sector. Furthermore, "Other Services" does now display a significantly positive correlation (at the 10% level). On the contrary, the coefficient for the aggregate trade and tourism (GH) sector is still positive but loses its significance.

To summarize: including country fixed effects reveals a "strong" allocation puzzle for the agricultural sector, which displayed a "weak" allocation puzzle in the sector-by-sector analysis. For manufacturing, the evidence is mixed, but our preferred results point to a "weak" allocation puzzle. For mining and utilities, the evidence remains in favour of a "weak" allocation puzzle. For services sectors, the fixed effect results confirm the results of the sector-by-sector regressions: FDI inflows and productivity growth are strongly complementarity for finance and business, transport and trade.

[40] With regard to the model specification, we choose the fixed effects framework (over the random effects framework), as the Hausman test rejects the random effects model for the 7-sector (at the 1% level). For the 3-sector data set and 10-sector data set the p-value of the Hausman test is 0.28 (0.25 respectively) and random effects cannot be rejected convincingly. For the sake of comparability we still prefer to focus on the fixed effects regression also for the 3-sector and 10-sector data set. Furthermore, the Breusch-Pagan Lagrangian multiplier test, which tests whether the variance of the intercept component in random effects is zero, i.e. if the fixed effects are all the same, rejects its null hypothesis at the 1 % level for all three data sets.

[41] By contrast, the coefficient remains significant in the 10-sector regression (at the 1% level). However, as argued above, we prefer the results of the 7-sector regression.

[42] However, note again that the 10-sector data set is quite limited with regard to data on those two sectors. We hence prefer the results of the 7-sector framework

When comparing these results with the results of the sector-by-sector regression, it is important to note that including fixed effects does have an impact on the interpretation of the regression coefficients. The within transformation (see above) tells us that we are now looking at whether countries receive above-average (compared to other sectors in the same country) flows in one sector when this sector displays an above-average productivity development. Essentially, the fixed effects regression wipes out the variation that stems from between countries.[43] By contrast, the sector-by-sector analysis retains this dimension as it does not control for the overall level of FDI inflows into a country. This is not to say that the sector-by-sector regressions are preferred: the fixed effects framework offers a good way to control for country specific effects, that might bias the coefficients of the sector-by-sector regressions (omitted variable bias if they are related to productivity development), and improve the precision of the estimates; but this comes at the cost of wiping out the between country dimension.

Hence, in a final step, we attempt to manually control for important country specific effects in order to account for potential endogeneity, while keeping the between country dimension of the data.

6.4 Panel framework with sector-specific slope parameters and controls

In the following, we add several country-level controls (X_c) to the panel framework used in the last section. Tables 9.1 through 9.3 present the results; the sector-by-sector regression are reproduced in column (1); in column (2), we add financial openness; in column (3), we add a dummy for EU Accession countries and a dummy for financial centers to the regression; finally, in column (4), we add investment profile, the general government balance, private credit, initial income and aid flows.

As expected, controlling for some key variables moves the results of the sector-by-sector analysis (displayed in column (1)) to some extent towards the results of the fixed effects regression. For the agricultural sector the coefficient on productivity growth is negative, but not significant. The coefficient for the industry sector falls in size when putting in controls, whereas it stays roughly constant (positive and significant) for the service sector. Table 9.2 shows - for the 7-sector data set - that, similar to the fixed effects regression, the coefficient on manufacturing sector productivity development loses its significance (when putting the full set of controls). Contrary to the results of the fixed effects regression, the "strong" allocation puzzle for construction is robust to adding controls. With regard to the 10-sector regression, the only qualitative change is that tourism now displays a "strong" allocation puzzle as opposed to merely a "weak" allocation puzzle. Believing that this analysis does alleviate concerns with regard to omitted variable bias and endogeneity stemming from slowing moving unobservables in the error term, we prefer these results over the fixed effects regression, as they the advantage that the between dimension of the data is retained.[44]

With regard to the controls themselves, column (2) of tables 9.1 to 9.3 shows that country level financial openness has a strong and positive effect on sectoral capital inflows; the importance of financial openness for sectoral FDI flows raises interesting questions that will be discussed in the next section.

[43] For example, a country that receives very high FDI inflows into all its sectors would not contribute much to the overall variance.

[44] The results are qualitatively robust to excluding "large" observations along the lines of figures 3 to 5

6.5 The role of financial openness

In this section we assess - within the 3- and 7-sector setup - the impact of financial openness both on the level of sectoral FDI inflows and on the relation between productivity growth and sectoral FDI inflows.

That financial openness impacts (positively) the level of (sectoral) FDI inflows can be already seen in tables 9.1 to 9.3. Table 10.1 demonstrates that this impact differs across sectors. Specifically, we add the Quinn index of capital account liberalization - a proxy for financial openness - to the sector-by-sector regressions. The results show that financial openness has a positive and significant impact on FDI inflows into the agricultural (AB), trade and tourism (GH) and transport, storage and communication (I) sector.

In a next step, we assess the impact of financial openness on the marginal effect of productivity growth on FDI inflows. For this purpose, an interaction term between financial openness and productivity development ("CAL*ProdDev") is added to the sector-by-sector and country/sector panel regressions. Tables 10.2.1 to 10.3.2 demonstrate the results: the interaction term is significantly positive for the three sectors that displayed no allocation puzzle - namely in trade and tourism (GH); transport, storage and communication (I) (10.3.1); and the aggregate service sector (10.2.1/10.2.2).)[45] Hence, the impact of productivity growth on FDI inflows is more positive for more financially open countries. Interestingly, for the panel framework, the corresponding coefficient for the financially most closed countries ("Sector*ProdDev") is negative and significant for trade and tourism (GH) and the aggregate service sector - i.e. the countries with the highest degree of capital account restrictions display a "strong" allocation puzzle.

Tables 10.4 and 10.5 show that the results are largely robust to using a different, more FDI-specific measure of financial openness - specifically, the index on FDI inflow restrictions developed by Schindler (2009). The main qualitative change is that the countries with the highest degree of capital account restrictions do not display an allocation puzzle anymore. However, financial openness has still a significantly positive effect on the marginal effect of productivity growth on FDI inflows for the aggregate service sector, trade/tourism (GH) and transport, storage and communication (I).

We conclude that financial openness has an impact on the level of FDI inflows in the agriculture and the service sectors, whereas it impacts the relation between productivity growth and FDI inflows only for the service sectors; financial openness does not play a role in the remaining sectors of the economy.

Insofar as investment in agriculture (AB) and mining/utilities (CE) is less driven by market incentives but more by resource security considerations and special contracts between the source and the host countries - i.e. special investment regimes - the results fit to prior expectations.

Interesting is the difference in the impact of financial openness between the manufacturing (D) sector and the service sectors. We see two potential explanations. First, the result might reflect the broad macroeconomic framework adopted by many countries. Consider governments maintaining regulations on capital account transactions while attempting to achieve a manufacturing based export-led growth strategy. FDI into the manufacturing sector is then actively encouraged and often targets special investment zones, which are used by countries to attract FDI while "circumventing" a generally high level of capital account and direct investment restrictions. By contrast, consider countries that broadly lift controls on the capital account. This is often associated with more extensive liberalizing measures, which include the reduction of investment restrictions in sectors that are traditionally shielded from foreign competition (i.e. the service sectors) - compare for example the experience of South Korea after the Asian crisis or the experience of the Eastern European accession countries. In this case, overall financial openness would,

[45] As shown in table 10.3.2, the coefficient for the transport sector (I) is not significant when including fixed effects

indeed, only have an impact on FDI flows into the service sectors.[46] A second potential explanation is that countries are generally more open to FDI inflows into their manufacturing sectors, but that there are big cross-country differences with regard to openness towards FDI inflows into sensitive industries (such as the financial sector). It will be up to future research to build a suitable index of financial openness by sector to refine this analysis.

7 Conclusion

This paper scrutinizes the allocation puzzle - the tendency for capital to flow to countries with relatively low productivity growth - by focusing on FDI inflows. We look both at aggregate FDI flows and, using a new data set, at FDI flows into the main economic sectors. The evidence we find speaks strongly against an allocation puzzle for aggregate FDI inflows. Thus, the allocation puzzle - the violation of the neoclassical growth model - does not hold for (aggregate) FDI flows, which should, indeed, comply most with the predictions of the model. However, through refining the results of the aggregate level and documenting substantial sectoral heterogeneity, we are able to establish a new set of (stronger) allocation puzzles for FDI inflows into some important sectors of the economy. Specifically, in a cross-section of countries' agricultural, construction, tourism and mining/utility sectors, sectors with a stronger productivity development received less capital inflows. These sector-level allocation puzzles constitute an even starker violation of the neoclassical growth model than the allocation puzzle for overall capital flows as they are observed for FDI inflows, which should comply most with the model's predictions. By contrast, we show that countries with faster productivity growth in manufacturing attract more investment in that sector. The link is even stronger for most of the service sectors: foreign finance and productivity growth are strongly complementary in business, finance, trade and transport sectors.

We also show that financial openness plays an important role in the relation between FDI inflows and productivity growth: a country with fast productivity growth draws in more capital only when it is financially open. This is true for FDI inflows into the whole economy and for sectoral FDI inflows into the service sectors, but notably not for FDI inflows into the manufacturing sector (as well as for FDI inflows into the agriculture, mining/utilities and construction sector). However, the aggregate indices that we used are quite crude measures of financial openness on a sectoral level. There are more investment restrictions in agriculture or financial industries than in manufacturing.[47] Future research should, therefore, aim at building a data set to capture financial openness on the sectoral level.

This paper focuses on establishing a new set of sector-level results. To discriminate - theoretically or empirically - between the variety of potential explanations is subject to future research. However, to conclude, we discuss some potential explanations for the sector-level results and finally, how these and a sector-level analysis can shed light on the aggregate level.

One important potential explanation is the role of resource endowment; it is likely to play a key role in all the sectors that display an allocation puzzle. Specifically, there are two channels through which resource endowment might have an effect. First, investment in e.g. the petroleum sector is characterized by very high fixed costs and its long-term nature. This limits the ability of foreign investors to reallocate flows to different countries; investors are likely to stay even in phases of low productivity growth. Second,

[46] This is, of course, subject to a more rigorous empirical analysis which is left to future research.

[47] This claim is based on the information on direct investment restrictions contained in the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER)

the output of agriculture and mining/petroleum sectors is of a high strategic importance. Consider for example FDI inflows into the agricultural sectors of many developing countries with the goal to achieve food security, or FDI into countries' mining/petroleum sectors to secure the resource inputs for the manufacturing industries of the foreign investor. In such cases, politics may play a more important role and might trump economic considerations such as productivity growth and the return of investment.

Further potential explanations include trade- and production-related factors: the role of tradability, market access, transportation costs, tariff-jumping and outsourcing. Consider for example an investor who decides between investing and exporting in a model that features a fixed cost to observe which country/sector is the best to invest in. In case tariff-barriers and transportation costs are not too high, a manufacturing sector investor will decide on saving the fixed cost and base her/his business model on exporting directly. FDI into manufacturing would then be driven by secondary considerations and it will not be worth for the investor to incur the fixed costs of finding the best investment opportunities. Furthermore, the manufacturing sector investor can always retreat to her/his domestic manufacturing base and keep on exporting to the country in case the investment does not turn out to be successful - the risks are then subsequently smaller. It follows that there is only a weak link between productivity growth and FDI inflows into manufacturing industries. On the contrary, given the intangibility and non-tradability of the goods, a service sector investor has to enter the market directly, incurring huge risks. Hence, paying the fixed costs of observing sectoral productivity developments and identifying the best investment opportunity is essential and carries much bigger benefits. It follows that a service sector investor would only invest in a country's service sector if (observed) productivity growth is strong. Consequently, the link between productivity and FDI inflows into the service sector would be stronger than for the manufacturing sector.

We see two potential channels through which a sectoral analysis can shed light on the aggregate level. First, it follows directly from the observed differences between sectors that the sectoral composition of economies matters for the link between foreign finance and productivity growth on the aggregate level: countries with a higher share of sectors for which we document an allocation puzzle (resource dependent industries and construction) will, in general, also not contribute to a strong link between productivity growth and capital inflows on the aggregate level.[48]

Second, we see a potential role for sector-level financial openness in addressing the aggregate allocation puzzle (which amplifies the need to build such a data set): if productivity growth and financial openness differs across sectors, then it is conceivable that the aggregate allocation puzzle is driven by countries receiving capital flows into a few financially open, high-growth sectors, whereas capital outflows from the remaining low-growth sectors do not materialize due to financial frictions. Consider a country that has an overall very meager productivity development and a high level of financial frictions, but a few productive, financially open sectors. These sectors receive quantitatively large capital inflows; in contrast, capital outflows from closed, unproductive sectors do not materialize due to capital account restrictions - we would, thus, observe capital flowing into a country that is falling behind in terms of relative productivity. On the contrary, consider a country that has an overall strong productivity development, but maintains financial restrictions across all (productive) sectors: the latter prevent sufficient amounts of capital to flow into the country. In both cases, it would be a violation of the underlying assumption of financial openness

[48]If other types of flows follow a sectoral pattern similar to FDI inflows, our results would also be helpful in "explaining" the allocation puzzle for overall capital flows (established by Gourinchas and Jeanne (2009)). Further data work should, hence, aim at obtaining information on the sectoral composition of other types of capital flows to explore this point further

and not flaws in the neoclassical model's other key mechanisms that drive the aggregate allocation puzzle.

To conclude, this paper sheds light on the allocation puzzle through showing that it does not hold for an important part of private capital flows (FDI) and through documenting some interesting sectoral variation. We briefly discuss several channels that might explain the sector-level results. Most of them - resource endowment, trade- and production related factors - require deviations from the neoclassical framework. On the contrary, the results on financial openness show that the data matches the predictions of the model more closely once capital is allowed to flow freely. Finally, the sector-level results indicate that it would be worthwhile to take a closer look at the sectoral setup of economies to understand results documented at the aggregate level.

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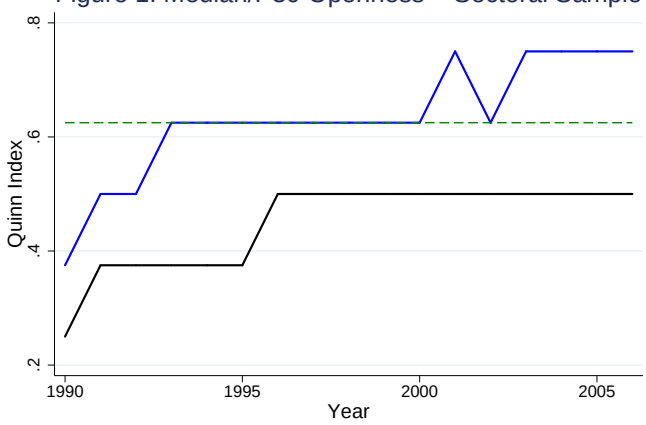
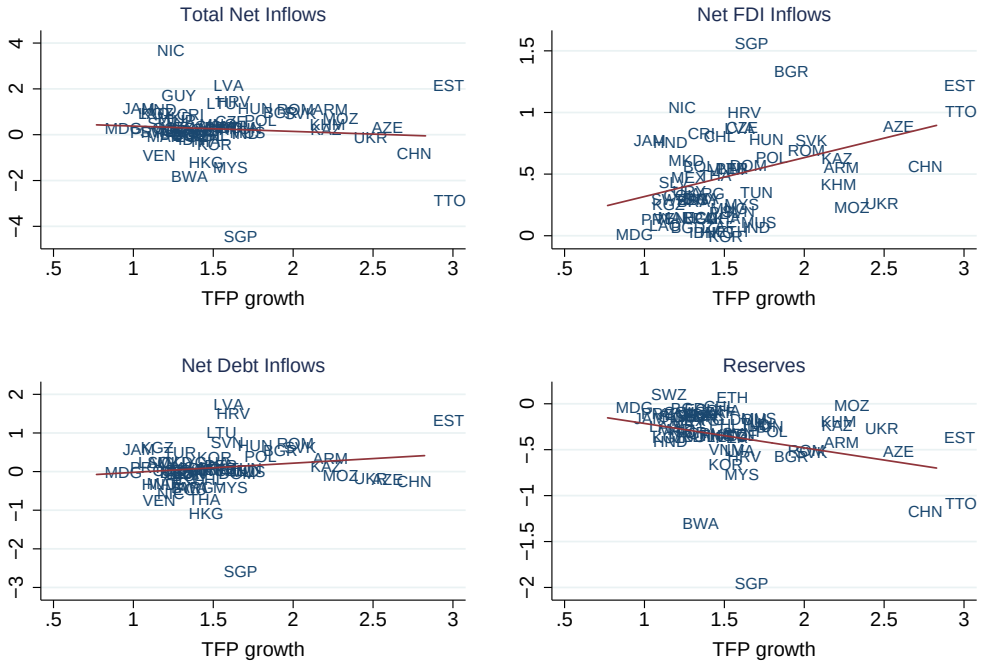
Figure 1: Median/P30 Openness − Sectoral Sample



Dashed horizontal line: Median openness across all countries for 1980-2006. Upper solid line: Median Openness for respective year. Lower solid line: 30th percentile of Openness for respective year. Openness is measured by the Quinn (1997) index.

Figure 2: Net Capital Inflows (% of Initial GDP) and TFP Growth − Sectoral Sample − 1995−2007



TFP growth stands for the ratio of TFP in the last year to TFP in the first year of available data - i.e. if TFP growth is 1, then TFP did not change over the time frame. Net Capital Inflows are in % of initial GDP - if they are 1 a country received capital inflows worth 100% of its initial GDP over the sample period.

Figure 3.1: 3 Main Sectors − Log FDI Infl. (% Initial GDP)/Prod. Development

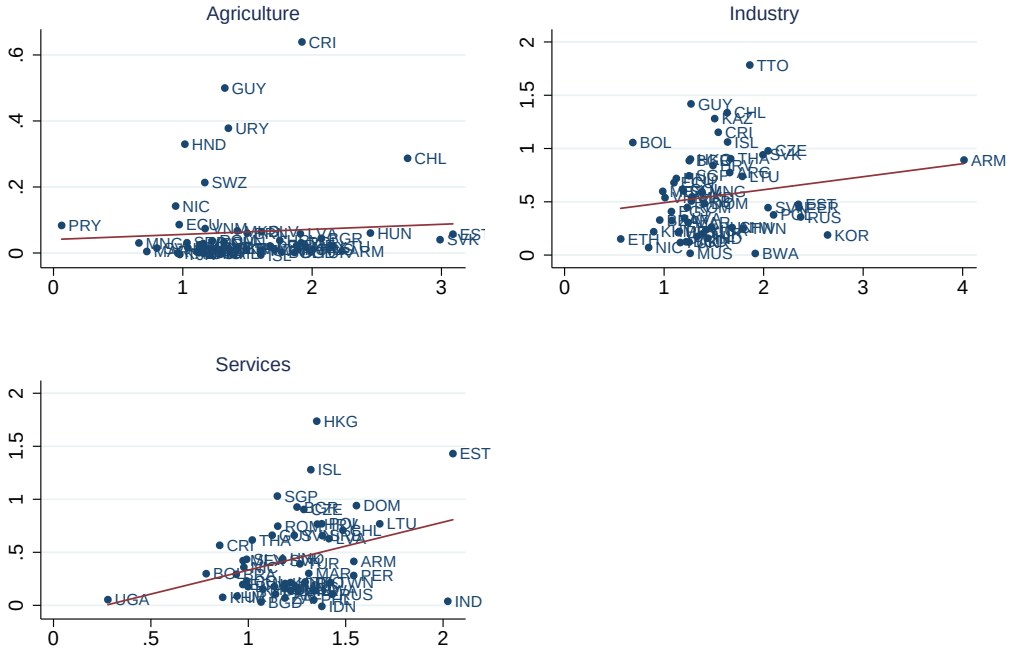
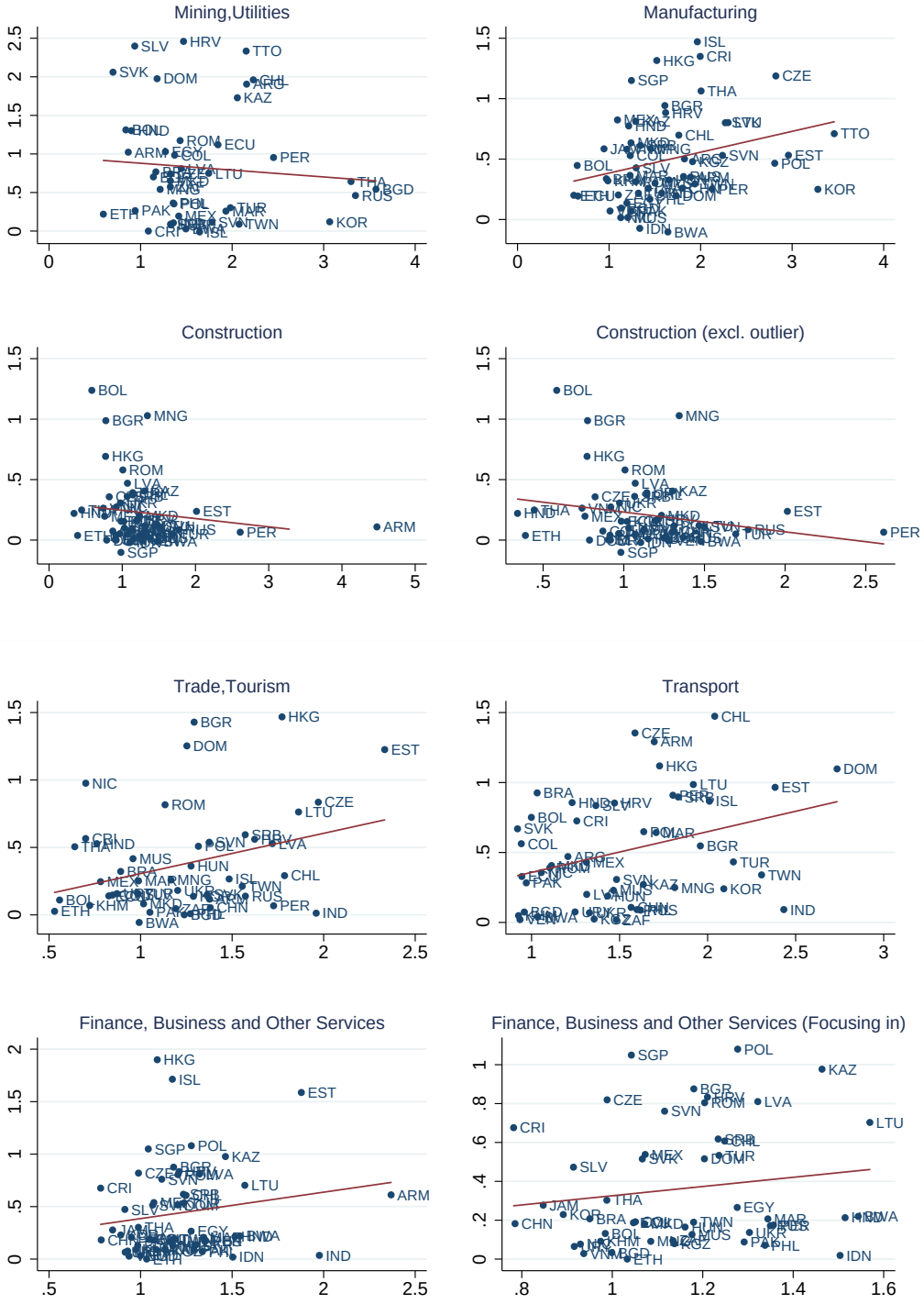


Figure 3.2: 3 Main Sectors − Log FDI Infl. (% Initial GDP)/Prod. Development (Excl. Outliers/Focusing in)

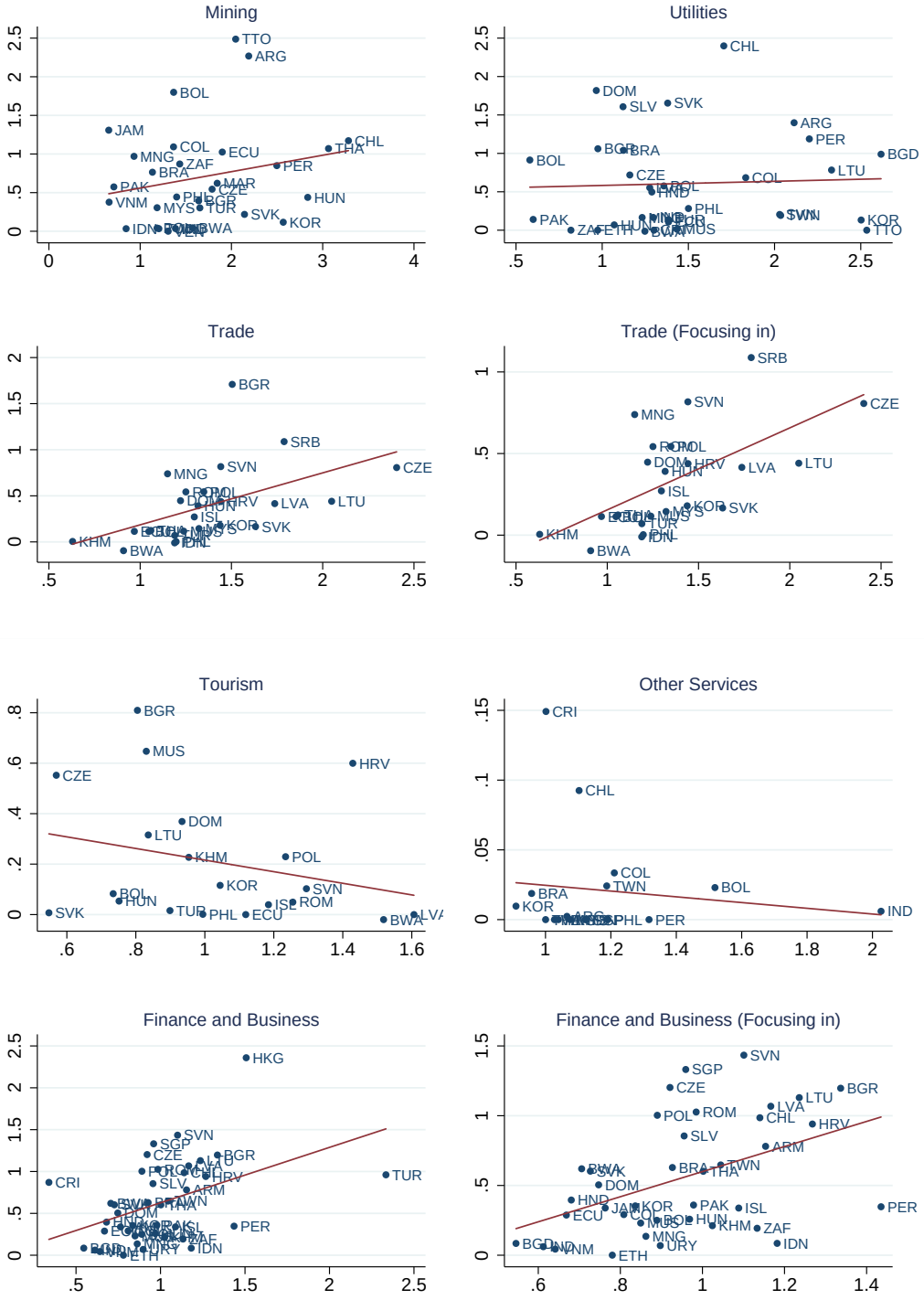
Productivity Development (X-Axis) stands for the ratio of labour productivity in the last year to labour productivity in the first year of available data - i.e. if Prod. Development is 1, then labour productivitiy did not change over the time frame.

Figure 4: 7 Sectors − Log FDI Inflows (% Initial GDP)/Prod. Development



Productivity Development (X-Axis) stands for the ratio of labour productivity in the last year to labour productivity in the first year of available data - i.e. if Prod. Development is 1, then labour productivitiy did not change over the time frame.

Figure 5: 10 Sectors (Additional Plots) − Log FDI Inflows (% Initial GDP)/Prod. Development



Productivity Development (X-Axis) stands for the ratio of labour productivity in the last year to labour productivity in the first year of available data - i.e. if Prod. Development is 1, then labour productivitiy did not change over the time frame.

Table 1.1 - Summary Statistics Sectoral FDI Flows

stats	AB	C	D	E	F	G	H	I	J	K	LMNOPQ
mean	47	434	1,262	178	98	354	62	301	712	809	86
sd	122	834	4,170	386	205	865	126	533	1,290	2,618	288
max	811	3,991	33,928	1,904	1,127	5,913	796	3,406	7,682	16,491	1,948
min	-5	-0	-780	-2	-63	-99	-1	0	0	-29	-0
N	64	65	70	52	63	63	50	58	61	50	48

Millions USD

The table presents average annual FDI inflows over the years of available data for the countries of the sectoral sample (see Appendix B2). Agriculture (AB), Mining and quarrying (C), Manufacturing (D), Utilities (E), Construction (F), Trade (G), Tourism (H), Transport, storage and communications (I), Finance (J), Business (K) and Services (LMNOPQ) according to the ISIC Rev.3.1 classification. Note that petroleum is included in mining and quarrying (C).

Table 1.2 - Summary Statistics Sectoral FDI Flows - Fraction of Initial Value-Added

stats	AB	CE	C	E	D	F	GH	I	JK	JKLMNOPQ
mean	0.07	2.03	1.17	0.97	0.75	0.28	0.58	0.78	0.81	0.70
sd	0.16	2.83	2.00	1.64	0.76	0.47	0.80	0.80	1.27	1.09
max	0.90	10.70	9.31	8.45	3.35	2.45	3.34	3.36	8.09	5.68
min	-0.01	-0.01	-0.00	-0.01	-0.10	-0.10	-0.05	0.02	-0.06	0.00
N	61	44	35	39	56	54	48	51	52	57

FDI Inflows (fraction of initial value added)

The table presents FDI inflows into the different sectors as a fraction of the initial value added in constant dollars of the respective sector (see Appendix B2 for sample coverage). Agriculture (AB), Mining and quarrying (C), Manufacturing (D), Utilities (E), Construction (F), Trade (G), Tourism (H), Transport, storage and communications (I), Finance (J), Business (K) and Services (LMNOPQ) according to the ISIC Rev.3.1 classification. Note that petroleum is included in mining and quarrying (C).

Table 2.1 - Net Capital Inflows (% of Initial GDP) and TFP Growth - Full Sample - 1980-2007

	Total Infl	FDI	PI Equity	Debt	Reserves	Excl. Res	Excl. Aid	Private
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
TFP growth	-.919**	.417***	-.177	-.402	-.651***	-.268	-.641*	.006
	(.415)	(.157)	(.203)	(.270)	(.235)	(.231)	(.328)	(.186)
Const.	1.993***	.056	.162	.474	.281	1.712***	.153	-.128
	(.507)	(.175)	(.229)	(.306)	(.268)	(.357)	(.383)	(.276)
Obs.	95	94	93	93	95	95	93	93
R^2	.122	.182	.045	.079	.239	.019	.081	.00002

Table 2.2 - Net Capital Inflows (% of Initial GDP) and TFP Growth - Sample of Gourinchas and Jeanne - 1980-2007

	Total Infl	FDI	PI Equity	Debt	Reserves	Excl. Res	Excl. Aid	Private
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
TFP growth	-1.093**	.554***	-.186	-.360	-.903***	-.190	-.943**	-.022
	(.486)	(.209)	(.210)	(.274)	(.217)	(.293)	(.475)	(.261)
Const.	1.916***	-.126	.174	.387	.631***	1.285***	.678	.030
	(.546)	(.244)	(.245)	(.312)	(.229)	(.367)	(.550)	(.346)
Obs.	67	67	67	67	67	67	66	66
R^2	.169	.238	.048	.065	.342	.014	.143	.0002

Table 3 - Net Capital Inflows (% of Initial GDP) and TFP Growth - Sectoral Sample - 1995-2007

	Total Infl	FDI	PI Equity	Debt	Reserves	Excl. Res	Excl. Aid	Private
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
TFP growth	-.233	.316***	-.019	.238	-.266***	.032	-.063	.194
	(.420)	(.078)	(.030)	(.179)	(.089)	(.363)	(.407)	(.352)
Const.	.610	.002	-.023	-.258	.051	.559	.036	-.005
	(.575)	(.116)	(.046)	(.242)	(.122)	(.507)	(.544)	(.472)
Obs.	64	63	62	61	64	64	63	63
R^2	.009	.165	.001	.027	.131	.0002	.0008	.01

Tables 2 to 3 - Dependent variable: Net Capital Inflows (% of Initial GDP). Debt also includes "Other Investment Assets". Column "Excl. Reserves" displays the results for taking total net inflows minus net reserve flows as the dependent variable. "Excl. Aid" takes total net inflows minus aid flows as the dependent variable. Column "Private" takes total net inflows minus aid and net reserve flows as the dependent variable. TFP growth stands for the ratio of TFP in the last year to TFP in the first year of available data - i.e. if TFP growth is 1, then TFP did not change over the time frame.

Table 4 - FDI Inflows and TFP Growth - Sectoral Sample- 1995-2007

	Base Full	Base	Dummies	All	All Sig.
	(1)	(2)	(3)	(4)	(5)
TFP growth	.471***	.644***	.488***	.413***	.445***
	(.140)	(.136)	(.166)	(.154)	(.127)
EU Accession			.391***	.149	
			(.143)	(.186)	
Financial Center			2.576***	2.141***	2.163***
			(.334)	(.336)	(.317)
Log Initial GDP (PPP per capita)				.276***	.302***
				(.091)	(.056)
Private Credit (% of GDP)				-.289*	-.335**
				(.169)	(.151)
Investment Profile				.090***	.110***
				(.032)	(.031)
Aid Flows (% of InitialGDP)				.341***	.338***
				(.086)	(.068)
GGB (% of GDP) #				1.492	
				(1.663)	
Population growth #				.319	
				(9.694)	
Const.	-.013	-.233	-.190	-1.190***	-1.395***
	(.196)	(.188)	(.215)	(.398)	(.239)
Obs.	64	54	54	54	54
R^2	.117	.159	.737	.835	.829

Dependent variable: FDI Inflows (% of Initial GDP). Variables marked with # are expressed in deviation from trading partners. GGB refers to the general government balance (from IFS). All variables are described in Appendix A4. In Column (2) we restrict the sample to countries for which we have data on all the controls that are used in column (4).

Table 5 - The role of financial openness - Sectoral Sample- 1995-2007

	Openness	Interaction	Sample	Interaction with Controls
	(1)	(2)	(3)	(4)
TFP growth	.596***	.0003	.135	-.535***
	(.101)	(.286)	(.375)	(.191)
CAL,Quinn (Average)	1.207***	-.077	.272	-1.727***
	(.344)	(.631)	(.765)	(.373)
TFPxCAL(Quinn)		.882**	.709	1.287***
		(.414)	(.504)	(.206)
Financial Center				2.135***
				(.290)
Log Initial GDP (PPP per capita)				.348***
				(.047)
Private Credit (% of GDP)				-.409**
				(.160)
Investment Profile				.118***
				(.033)
Aid Flows (% of InitialGDP)				.480***
				(.063)
Const.	-1.029***	-.147	-.398	-.207
	(.238)	(.425)	(.533)	(.292)
Obs.	57	57	50	50
R^2	.325	.351	.379	.895

Dependent variable: FDI Inflows (% of Initial GDP). Financial Openness/Capital Account Liberalization (CAL) is measured by the Quinn Index. All variables are described in Appendix A4.

Table 6.1: FDI inflows and productivity development - 3 Sectors (Sector-by-Sector)

	Agriculture	Industry	Services
	(1)	(2)	(3)
Const.	.04	.38**	-.12
	(.04)	(.17)	(.24)
ProdDev	.02	.11	.45**
	(.02)	(.12)	(.21)
Obs.	58	55	53
R^2	.005	.02	.11

Dependent Variable: Sectoral FDI Inflows (% of Initial GDP). Industry refers to the sectors mining and quarrying (C), manufacturing (D), utilities (E) and construction (F) according to the ISIC Rev. 3.1 classification. Services includes trade (G), tourism (H), transport, storage and communications (I), finance and business(JK) and other services (LMNOPQ).

Table 6.2: FDI inflows and productivity development - 7 Sectors (Sector-by-Sector)

	AB	CE	D	F	GH	I	JKLMNOP
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Const.	.04	.97***	.21*	.40***	.008	.07	.13
	(.04)	(.25)	(.11)	(.13)	(.17)	(.17)	(.25)
ProdDev	.02	-.09	.17**	-.16*	.30**	.29**	.25
	(.02)	(.13)	(.07)	(.10)	(.14)	(.12)	(.22)
Obs.	58	43	56	50	47	49	54
R^2	.005	.007	.08	.05	.1	.11	.03

Table 6.3: FDI inflows and productivity development - 10 Sectors (Sector-by-Sector)

	AB	C	D	E	F	G	H	I	JK	LMNOP
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Const.	.04	.35	.18	.53*	.37**	-.38**	.45*	-.05	-.04	.05
	(.04)	(.23)	(.11)	(.29)	(.15)	(.17)	(.23)	(.17)	(.27)	(.04)
ProdDev	.03	.21	.23***	.05	-.13	.56***	-.23	.37***	.66**	-.02
	(.03)	(.14)	(.07)	(.18)	(.11)	(.15)	(.20)	(.12)	(.30)	(.02)
Obs.	58	29	56	32	50	25	20	49	41	17
R^2	.01	.05	.14	.002	.03	.26	.07	.18	.19	.02

Table 6.4: Including all OECD countries - 7 Sectors (Sector-by-Sector)

	AB	CE	D	F	GH	I	JKLMNOP
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Const.	.04	.85***	.18*	.29***	-.02	.04	.18
	(.03)	(.22)	(.10)	(.11)	(.14)	(.16)	(.24)
ProdDev	.007	-.06	.20***	-.10	.30**	.30***	.23
	(.02)	(.12)	(.06)	(.08)	(.12)	(.11)	(.21)
Obs.	74	58	75	66	63	67	73
e(N-g)							
R^2	.001	.003	.11	.02	.11	.11	.02
F statistic	.13	.25	10.23	1.51	6.61	8.01	1.21

Tables 6.2 to 6.4 - Dependent Variable: Sectoral FDI Inflows (% of Initial GDP). According to the ISIC Rev.3.1 classification: Agriculture (AB), Mining and quarrying (C), Manufacturing (D), Utilities (E), Construction (F), Trade and Tourism (GH), Transport, storage and communications (I), Finance and business (JK) and other services (LMNOPQ).

Table 7: Different Dimensions of the Panel Data (Country/Sector-Panel)

	Pooled	Country FE	Sector FE	Between
	(1)	(2)	(3)	(4)
ProdDev	.14***	.11*	.07	.28***
	(.05)	(.06)	(.07)	(.09)
Obs.	347	347	347	347
e(N-g)		66	7	66
R^2	.03	.02	.009	.13

Dependent Variable: Sectoral FDI Inflows (% of Initial GDP). Column (2) includes country fixed effects. Column (3) includes industry fixed effects. Column (4) gives the results of the between regression.

Table 8.1: FDI inflows and productivity development - 3, 7 and 10 Sectors (Country/Sector-Panel)

	3 Sectors	7 Sectors	10 Sectors
	(1)	(2)	(2)
Agriculture*ProdDev	-.11*	-.12**	-.05
	(.06)	(.06)	(.06)
Industry*ProdDev	.09		
	(.12)		
CE*ProdDev		-.04	
		(.12)	
C*ProdDev			.11
			(.11)
E*ProdDev			.04
			(.19)
D*ProdDev		.05	.18***
		(.07)	(.07)
F*ProdDev		-.03	-.008
		(.11)	(.11)
Services*ProdDev	.49**		
	(.20)		
GH*ProdDev		.11	
		(.11)	
G*ProdDev			.31***
			(.10)
H*ProdDev			-.12
			(.20)
I*ProdDev		.19***	.32***
		(.07)	(.08)
JKLMNOPQ*ProdDev		.31*	
		(.17)	
JK*ProdDev			.59***
			(.03)
LMNOPQ*ProdDev			.28
			(.22)
Obs.	166	357	377
e(N-g)	64	67	67
R^2	.51	.32	.36
F statistic	24.25	12.16	12.89

Dependent Variable: Sectoral FDI Inflows (% of Initial GDP). Country Fixed Effects, Sector Dummies and a Constant are included (results not shown). According to the ISIC Rev.3.1 classification: Agriculture (AB), Mining and quarrying (C), Manufacturing (D), Utilities (E), Construction (F), Trade and Tourism (GH), Transport, storage and communications (I), Finance and business (JK) and other services (LMNOPQ). Industry refers to sectors CDEF and services to sectors GHIJKLMNOPQ.

Table 8.2: Including all OECD countries - 3 and 7 Sectors (Country/Sector-Panel)

	3 Sectors	7 Sectors
	(1)	(2)
Agriculture*ProdDev	-.09	-.10*
	(.05)	(.05)
Industry*ProdDev	.16	
	(.12)	
CE*ProdDev		-.009
		(.11)
D*ProdDev		.09
		(.07)
F*ProdDev		-.02
		(.09)
Services*ProdDev	.44**	
	(.19)	
GH*ProdDev		.13
		(.09)
I*ProdDev		.18***
		(.07)
JKLMNOPQ*ProdDev		.23
		(.16)
Obs.	216	476
e(N-g)	82	86
R^2	.52	.32
F statistic	35.06	16.8

Dependent Variable: Sectoral FDI Inflows (% of Initial GDP). Country Fixed Effects, Sector Dummies and a constant are included (results not shown). According to the ISIC Rev.3.1 classification: Agriculture (AB), Mining and quarrying (C), Manufacturing (D), Utilities (E), Construction (F), Trade and Tourism (GH), Transport, storage and communications (I), Finance and business (JK) and other services (LMNOPQ). Industry refers to sectors CDEF and services to sectors GHIJKLMNOPQ.

Table 9.1: FDI inflows and productivity development - 3 Sectors (Country/Sector-Panel with controls)

	Base	Openness	incl.Dummies	incl.Controls
	(1)	(2)	(3)	(4)
Openness (CAL)		.35**	.19	.12
		(.16)	(.16)	(.15)
EU Accession			.12	.10
			(.09)	(.12)
Financial Center			.62***	.33
			(.16)	(.27)
Investment Profile				-.006
				(.03)
GGB (% of GDP) #				.02
				(.01)
Private Credit (% of GDP)				.006
				(.17)
Log Initial GDP (PPP per capita)				.14**
				(.05)
Aid Flows (% of InitialGDP)				1.03
				(.66)
Agriculture*ProdDev	.02	-.009	-.04	-.06
	(.03)	(.03)	(.06)	(.05)
Industry*ProdDev	.12	.10	.10	.02
	(.13)	(.13)	(.13)	(.12)
Services*ProdDev	.43*	.44**	.37*	.38**
	(.23)	(.21)	(.21)	(.19)
Obs.	124	124	124	124
Countries	47	47	47	47
R^2	.64	.66	.7	.72

Dependent Variable: Sectoral FDI Inflows (% of Initial GDP). Sector Dummies are included (results not shown). Industry refers to the sectors mining and quarrying (C), manufacturing (D), utilities (E) and construction (F) according to the ISIC Rev. 3.1 classification. Services includes trade (G), tourism (H), transport, storage and communications (I), finance and business (JK) and other services (LMNOPQ).

Table 9.2: FDI inflows and productivity development - 7 Sectors (Country/Sector-Panel with controls)

	Base	Openness	incl.Dummies	incl.Controls
	(1)	(2)	(3)	(4)
Openness (CAL)		.43**	.24	.14
		(.17)	(.16)	(.15)
EU Accession			.16*	.13
			(.09)	(.12)
Financial Center			.66***	.48*
			(.18)	(.29)
Investment Profile				-.006
				(.04)
GGB (% of GDP) #				.01
				(.01)
Private Credit (% of GDP)				-.06
				(.16)
Log Initial GDP (PPP per capita)				.15**
				(.07)
Aid Flows (% of InitialGDP)				1.77*
				(.96)
AB*ProdDev	.02	-.01	-.06	-.05
	(.03)	(.04)	(.06)	(.05)
CE*ProdDev	-.07	-.04	-.03	-.06
	(.14)	(.13)	(.13)	(.13)
D*ProdDev	.16**	.14*	.12*	.10
	(.07)	(.07)	(.07)	(.06)
F*ProdDev	-.18*	-.22**	-.18*	-.19*
	(.10)	(.09)	(.10)	(.10)
GH*ProdDev	.31*	.27*	.16	.18
	(.16)	(.14)	(.13)	(.12)
I*ProdDev	.27**	.29**	.24*	.28**
	(.14)	(.13)	(.13)	(.12)
JKLMNOPQ*ProdDev	.25	.27	.27	.34
	(.34)	(.30)	(.29)	(.26)
Obs.	271	271	271	271
Countries	49	49	49	49
R^2	.6	.62	.65	.67

Dependent Variable: Sectoral FDI Inflows (% of Initial GDP). Sector Dummies are included (results not shown). According to the ISIC Rev.3.1 classification: Agriculture (AB), Mining and quarrying (C), Manufacturing (D), Utilities (E), Construction (F), Trade and Tourism (GH), Transport, storage and communications (I), Finance and business (JK) and other services (LMNOPQ).

Table 9.3: FDI inflows and productivity development - 10 Sectors (Country/Sector-Panel with controls)

	Base	Openness	incl.Dummies	incl.Controls
	(1)	(2)	(3)	(4)
Openness (CAL)		.32**	.19	.08
		(.13)	(.14)	(.13)
EU Accession			.11	.05
			(.09)	(.12)
Financial Center			.42***	.30
			(.12)	(.25)
Investment Profile				.01
				(.04)
GGB (% of GDP) #				.02
				(.02)
Private Credit (% of GDP)				-.11
				(.15)
Log Initial GDP (PPP per capita)				.09
				(.08)
Aid Flows (% of InitialGDP)				1.53
				(.98)
AB*ProdDev	.03	.007	-.02	-.01
	(.03)	(.03)	(.05)	(.05)
C*ProdDev	.22	.18	.19	.17
	(.14)	(.14)	(.15)	(.14)
D*ProdDev	.22***	.20***	.19***	.18***
	(.07)	(.07)	(.07)	(.06)
E*ProdDev	.10	.10	.11	.09
	(.20)	(.20)	(.20)	(.20)
F*ProdDev	-.15	-.18*	-.16	-.17
	(.12)	(.11)	(.11)	(.11)
G*ProdDev	.51***	.50***	.41***	.42***
	(.12)	(.14)	(.11)	(.12)
H*ProdDev	-.31*	-.34*	-.31*	-.36**
	(.16)	(.18)	(.16)	(.18)
I*ProdDev	.31**	.32**	.30**	.32***
	(.14)	(.13)	(.14)	(.12)
JK*ProdDev	.62**	.59**	.53**	.57***
	(.31)	(.28)	(.23)	(.22)
LMNOPQ*ProdDev	-.02	-.01	.05	.22
	(.02)	(.07)	(.08)	(.17)
Obs.	297	297	297	297
Countries	49	49	49	49
R^2	.61	.62	.63	.64

Dependent Variable: Sectoral FDI Inflows (% of Initial GDP). Sector Dummies are included (results not shown). According to the ISIC Rev.3.1 classification: Agriculture (AB), Mining and quarrying (C), Manufacturing (D), Utilities (E), Construction (F), Trade and Tourism (GH), Transport, storage and communications (I), Finance and business (JK) and other services (LMNOPQ).

Table 10.1: The impact of financial openness on the level of FDI inflows - 7 Sectors

	AB	CE	D	F	GH	I	JKLMNOP
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Const.	-.08	.48	.06	.24**	-.33*	-.36*	-.27
	(.06)	(.45)	(.16)	(.11)	(.20)	(.20)	(.36)
ProdDev	.005	-.02	.17**	-.21**	.25*	.33***	.28
	(.03)	(.13)	(.08)	(.10)	(.13)	(.12)	(.28)
Openness (CAL)	.19**	.59	.20	.27	.59***	.50**	.52*
	(.09)	(.50)	(.25)	(.18)	(.22)	(.20)	(.29)
Obs.	47	36	49	44	40	42	47
R^2	.14	.04	.11	.14	.2	.21	.1

Dependent Variable: Sectoral FDI Inflows (% of Initial GDP). According to the ISIC Rev.3.1 classification: Agriculture (AB), Mining and quarrying (C), Manufacturing (D), Utilities (E), Construction (F), Trade and Tourism (GH), Transport, storage and communications (I), Finance and business (JK) and other services (LMNOPQ).

Table 10.2.1: The role of financial openness - 3 Sectors (Sector-by-Sector)

	Agriculture	Industry	Services
	(1)	(2)	(3)
Const.	-.11	-.29	.74
	(.12)	(.38)	(.63)
ProdDev	.02	.50	-.63
	(.10)	(.34)	(.55)
Openness (CAL)	.23	.89*	-1.08
	(.15)	(.52)	(.76)
CAL*ProdDev	-.03	-.50	1.42**
	(.13)	(.42)	(.67)
Obs.	47	48	45
R^2	.15	.06	.29

Dependent Variable: Sectoral FDI Inflows (% of Initial GDP).

Table 10.2.2: The role of financial openness - 3 Sectors (Country/Sector-Panel)

	Agriculture	Industry	Services
	(1)	(2)	(3)
Sector*ProdDev	.07	.24	-.82**
	(.39)	(.35)	(.38)
Sector*ProdDev*CAL	-.22	-.12	1.67***
	(.49)	(.52)	(.56)
Obs.	140		
Countries	53		
R^2.	0.53		
Fixed Effects	Included		

Dependent Variable: Sectoral FDI Inflows (% of Initial GDP). The table is based on a regression of sectoral FDI Inflows on sector dummies (not shown), sector dummies interacted with openness (not shown), sector dummies interacted with productivity development and sector dummies interacted with productivity development and openness. The latter two terms assess whether the marginal effect of sectoral productivity on FDI inflows depends on the level of financial openness.

Table 10.3.1: The role of financial openness -7 Sectors (Sector-by-Sector)

	AB	CE	D	F	GH	I	JKLMNOP
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Const.	-.11	.12	.05	-.007	.52	.40	.14
	(.12)	(.61)	(.39)	(.22)	(.36)	(.53)	(.87)
ProdDev	.02	.19	.18	.02	-.49	-.20	-.06
	(.10)	(.26)	(.32)	(.18)	(.31)	(.36)	(.79)
Openness (CAL)	.23	1.23	.21	.59	-.52	-.60	-.05
	(.15)	(1.16)	(.52)	(.41)	(.52)	(.68)	(1.32)
CAL*ProdDev	-.03	-.40	-.006	-.29	.95**	.78*	.48
	(.13)	(.60)	(.39)	(.29)	(.44)	(.46)	(1.16)
Obs.	47	36	49	44	40	42	47
R^2	.15	.05	.11	.15	.26	.24	.1

Dependent Variable: Sectoral FDI Inflows (% of Initial GDP). According to the ISIC Rev.3.1 classification: Agriculture (AB), Mining and quarrying (C), Manufacturing (D), Utilities (E), Construction (F), Trade and Tourism (GH), Transport, storage and communications (I), Finance and business (JK) and other services (LMNOPQ).

Table 10.3.2: The role of financial openness -7 Sectors (Country/Sector-Panel)

	AB	CE	D	F	GH	I	JKLMNOPQ
Sector*ProdDev	.035	.13	-.032	-.05	-.47*	.27	-.33
	(.31)	(.25)	(.30)	(.19)	(.28)	(.28)	(.45)
Sector*ProdDev*CAL	-.17	-.24	.16	.06	.78**	.68	1.07
	(.39)	(.62)	(.42)	(.31)	(.38)	(.44)	(.69)
Obs.	305						
Countries	56						
R^2.	0.35						
Fixed Effects	Included						

Dependent Variable: Sectoral FDI Inflows (% of Initial GDP). The table is based on a regression of FDI Inflows on sector dummies (not shown), sector dummies interacted with openness (not shown), sector dummies interacted with productivity development and sector dummies interacted with productivity development and openness. The latter two terms assess whether the marginal effect of sectoral productivity on FDI inflows depends on openness.

Table 10.4: Openness to FDI (Schindler (2009)) - 3 Sectors (Sector-by-Sector)

	Agriculture	Industry	Services
	(1)	(2)	(3)
Const.	.03	.50*	-.26
	(.06)	(.28)	(.23)
ProdDev	.04	.06	.70***
	(.05)	(.20)	(.24)
FDI Openness	.15	.47	-.77**
	(.13)	(.45)	(.33)
FDI Openness*ProdDev	-.04	-.17	.95***
	(.11)	(.31)	(.28)
Obs.	37	37	35
R^2	.11	.07	.28

Dependent Variable: Sectoral FDI Inflows (% of Initial GDP). Industry refers to the sectors mining and quarrying (C), manufacturing (D), utilities (E) and construction (F) according to the ISIC Rev. 3.1 classification. Services includes trade (G), tourism (H), transport, storage and communications (I), finance and business (JK) and other services (LMNOPQ).

Table 10.5: Openness to FDI (Schindler (2009)) - 7 Sectors (Sector-by-Sector)

	AB	CE	D	F	GH	I	JKLMNOP
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Const.	.03	1.06**	.24	.66**	.14	-.15	.19
	(.06)	(.51)	(.25)	(.27)	(.30)	(.21)	(.48)
ProdDev	.04	-.14	.21	-.34	.34	.46***	.32
	(.05)	(.31)	(.18)	(.21)	(.25)	(.13)	(.42)
FDI Openness	.15	.42	.66	.54	-.29	-.52	-.23
	(.13)	(.72)	(.55)	(.35)	(.41)	(.34)	(.54)
FDI Openness*ProdDev	-.04	-.14	-.27	-.28	.61*	.50**	.50
	(.11)	(.32)	(.39)	(.27)	(.33)	(.21)	(.45)
Obs.	37	29	39	35	31	34	37
R^2	.11	.02	.17	.24	.27	.2	.12

Dependent Variable: Sectoral FDI Inflows (% of Initial GDP). According to the ISIC Rev.3.1 classification: Agriculture (AB), Mining and quarrying (C), Manufacturing (D), Utilities (E), Construction (F), Trade and Tourism (GH), Transport, storage and communications (I), Finance and business (JK) and other services (LMNOPQ).

Appendices

A. Data Description and Sources

A1. Sectoral FDI Inflows

Sector-level data on FDI inflows come from several sources. The UNCTAD FDI country profiles include data on various countries; the level of sectoral disaggregation is quite high (data is present for most of the ISIC Rev. 3.1 or ISIC Rev. 2. level-two sub-sectors). This data are extended with data from the International Trade Center (ITC), which provides data for more recent years. The Association of Southeast Asian Nations (ASEAN) provides statistics for some Asian countries starting in 1999. The Organisation for Economic Co-operation and Development (OECD) gives detailed data for its member states of which the Czech Republic, Iceland, Korea (Republic of), Mexico, Poland, and Turkey are included in the sectoral sample; 22 OECD countries are not included in the sectoral sample (see Appendix B3). Various country sources are used to increase the country coverage, fill the gaps, and increase the length of the data base. Overall, sectoral capital flows data of different degrees of aggregation between 1990 and 2008 is obtained for 72 countries from Latin America, Asia, Africa and Eastern and Central Europe (see Appendix B2 for the exact sample coverage).

While building the data set various issues had to be confronted. First, if data is indicated as "missing" for one sector, but there is information for total flows that complies with IFS data and unspecified flows are small or zero: then inflows for this sector are set to zero. If unspecified flows are large and it cannot be excluded whether unspecified contains data for the sector in question: inflows are set to missing for this sector.

Second, for various countries flows data is missing but stock data is available; in those cases flows are backed out from stocks. Data is (mainly or partly) based on stocks for the following countries: Bangladesh, Botswana, Cambodia, Macedonia, Madagascar, Peru, Russia, Slovenia, South Africa, Swaziland, Tajikistan and Ukraine. Due to the potential impact of valuation effects the regressions are estimated without these countries in a robustness check (results are robust and available on request). Furthermore, note that the method yields negative inflows for some observations (when the stock of FDI declines) - though, also data, which are based on inflows only, contain negative numbers due to profit repatriation etc.

Third, for conversion into dollars the average annual dollar exchange rate from IFS is used. Fourth, the data for Mongolia, Mozambique, Russia and Taiwan refers to approved investment and, consequently, the data for these countries diverges from the IFS data, which captures realized investment.

A2. Aggregate Level: Productivity Data

To construct TFP (A_t) we first derive the capital stock K_t with the perpetual inventory method using data from the 6.3 PENN World tables (PWT 6.3, Heston et. al (2006)) on investment and output (compare Caselli (2004)). The perpetual inventory method determines the initial capital stock with the formula for the capital stock in the steady state of the Solow model: $K_0 = \frac{I_0}{\delta+g}$ where g is the geometric average of investment growth rates for the first years of data and δ is the depreciation rate. Following the literature, we assume a δ of 6 percent, a capital share α of 0.3, and calculate g using the first 15 years of data. Having calculated the initial capital stock, one can derive the whole path of the capital stock using data on investment flows from PWT 6.3. The production function (1) is then used to back out the level of technology and consequently TFP growth.

A decision has to be taken with regard to whether using the capital stock per worker, per capita or per working-age capita. Following Gourinchas and Jeanne (2009) we use capital stock per working-age capita. (For Taiwan and Seychelles capital per worker from PWT 6.3. is used due to missing WDI data.)

The results are qualitatively and quantitatively robust to choosing the other measure.

A3. Sectoral Level: Productivity Data

Sectoral labour productivity data is constructed by dividing the value-added of the respective sector by the numbers of workers.

Employment data are taken from the International Labour Organisation (ILO) - they are available for most countries for all level-two ISIC Rev. 3. or ISIC Rev. 2. sub-sectors.

Disaggregated value-added data are taken from two data bases of the United Nations Statistics Division. The first database contains estimates of value-added in constant 1990 Dollars for 6 sectors of the economy. As it contains information on value-added for mining, manufacturing and utilities (CDE) as well as separate data on manufacturing (D), it is possible to derive a 7-sector database that contains value-added for mining and utilities (CE) and Manufacturing (D) separately. The second database collects official national accounts country data on all ISIC level-two subsectors of the economy. From this we obtain disaggregated data for mining (C), utilities (E), business and finance (JK), trade (G) and tourism (H). Data for the other sectors are taken from the first database (rescaled to constant 2000 Dollars) as we prefer the data based on estimates over official national accounts data. This gives a database in constant 2000 Dollars for 10 sectors of the economy. With regard to the base year note, that the official country data is too short for many countries to obtain data in constant 1990 Dollars; differences in base years should be kept in mind when comparing the results of the 7-sector and 10-sector regressions. The employment and productivity data are complemented with data from the World Development Indicators (mainly for agricultural productivity which is directly supplied by this database) and data from the Groningen Growth and Development Center's (GGDC) 10-sector database (Timmer and Vries (2007)).

The following table gives an overview on the sub-sectors covered by the 3 data sets used in the analysis:

Data Set	**Sub-Sectors**
3 sectors	Agriculture (AB), Industry (CDEF) and Services (GHIJKLMNOPQ)
7 sectors	AB, CE, D, F, GH, I, JKLMNOP
10 sectors	AB, C, D, E, F, G, H, I, JK, LMNOP

According to the ISIC Rev.3.1 classification: Agriculture (AB), Mining and quarrying (C), Manufacturing (D), Utilities (E), Construction (F), Trade (G), Tourism (H), Transport, storage and communications (I), Finance (J), Business (K) and Other Services (LMNOPQ).

A4. Other variables

Openness (CAL): This measure for the overall openness of the capital account is taken from Quinn (1997) - the updated index is available until 2006. The index ranges from 0 to 1 with most OECD countries having a value of 1 for fully open capital accounts - it takes an average value of 0.625 for the countries of the sectoral sample.

FDI Openness: Openness to FDI inflows data are taken from Schindler (2009). Specifically, we use the 0/1 dummy variable "direct investment inflow restrictions", which is 1 if a country maintains restrictions to FDI inflows.

Private Credit (% of GDP): "Private Credit by Deposit Money Banks and Other Financial Institutions" scaled by GDP. It is taken from the World Bank's Database on Financial Development and Structure

(Beck et al. (2000)).

Investment profile: This measure stems from International Country Risk Guide (ICRG) and has three subcomponents: (Risks to) Contract Viability/Expropriation, Profits Repatriation and Payment Delays. The indicator ranges from 0 to 12; higher values stand for a better Investment Profile.

Aid flows (scaled by initial GDP): Aid flows are taken from Roodman (2006): He subtracts debt forgiveness grants and offsetting entries from total net aid flows at current prices taken from the Overseas Development Assistance (ODA).

GGB (% of GDP): The general government balance (in % of GDP) is taken from the IMF (WEO). It is expressed in deviations from trading partners.

Population growth: Growth (in percent) of total population is taken from the World Bank's World Bank Development Indicators (WDI). It is expressed in deviations from trading partners.

Log Initial GDP (PPP per capita): Real GDP per capita (Constant Prices: Chain Series) from the PENN World Tables 6.3 (Heston et al. (2006)).

Financial Center: Dummy that is equal to 1 if a country is a financial center. For the sectoral sample, only Hong Kong and Singapore are financial centers.

EU Accession: Dummy that is equal to 1 if a country had (at some point in the sample period) the status of an official EU accession candidate.

The weighting matrix is used to place variables in deviations from trading partners. It is constructed using data from the IMF's Department of Trade Statistics'(DOTS) database. Specifically, for every country, the trade partner's share in exports is calculated for 1980 and 2006, which gives two matrices; these are interpolated between 1980 and 2006.

B. Samples

B1. Full Sample

The sample includes all countries with a population larger than one million people. A few countries are dropped given substantial lack of data or very poor data quality. Overall, 119 non-high-income countries are included in the database - due to data limitations with respect to net capital flows and TFP (build from PWT 6.3), the final sample size is 95.

B2. Sectoral Sample

Sectoral FDI Inflows - 72 countries: Emerging Markets and Developing Countries Sample (including 6 OECD countries)

Argentina	1992-2007	Kyrgyz Republic	1995-2008
Armenia	1998-2007	Lao PDR	1999-2005
Azerbaijan	1995-2007	Macedonia	1998-2008
Bangladesh	1998-2008	Madagascar	2003-2008
Bolivia	1990-2008	Malaysia	1999-2008
Bosnia & Herzegovina	2004-2008	Mauritius	1990-2008
Botswana	1998-2007	Mexico	1985-2008
Brazil	1996-2008	Mongolia	1995-2002
Brunei Darussalam	1999-2005	Morocco	1996-2008
Bulgaria	1998-2008	Mozambique	1986-1999
Cambodia	1999-2008	Myanmar	1999-2005
Chile	1985-2008	Nicaragua	1991-2008
China	1997-2007	Pakistan	2001-2008
Colombia	1994-2008	Paraguay	1990-2008
Costa Rica	1992-2008	Peru	1992-2008
Croatia	1993-2008	Philippines	1999-2008
Czech Republic	1993-2008	Poland	1994-2008
Dominican Republic	1993-2008	Romania	2005-2008
Ecuador	1992-2008	Russia	1998-2008
Egypt	2001-2008	Serbia	2004-2008
El Salvador	1998-2008	Singapore	1999-2005
Estonia	1994-2008	Slovak Republic	1998-2007
Ethiopia	1992-2000	Slovenia	1995-2007
Ghana	2005-2008	South Africa	1996-2007
Guyana	1992-1999	Swaziland	2001-2007
Honduras	1993-2007	Taiwan	1980-2007
Hong Kong	1998-2008	Tajikistan	2004-2008
Hungary	1999-2008	Thailand	1990-2008
Iceland	1988-2007	Trinidad and Tobago	1990-2007
India	1991-2008	Tunisia	1990-2007
Indonesia	1999-2005	Turkey	1992-2007
Jamaica	2001-2007	Uganda	1993-2002
Kazakhstan	1993-2008	Uruguay	2001-2005
Korea	1985-2006	Ukraine	2003-2007
Latvia	2000-2008	Venezuela	1990-2008
Lithuania	1997-2008	Vietnam	1999-2005

B3. Other OECD countries

Sectoral FDI Inflows - 22 countries:

Australia	1985-2007	Ireland	2003-2007
Austria	1998-2007	Italy	1985-2006
Belgium	2002-2007	Japan	1985-2007
Canada	1985-2007	Netherlands	1985-2007
Denmark	1985-2007	Norway	1994-2007
Finland	1985-2007	Portugal	1985-2007
France	1985-2007	Spain	1985-2006
Germany	1985-2007	Sweden	1989-2006
Greece	1987-1992	Switzerland	1993-2007
Greece	2001-2007	United Kingdom	1985-2007
Ireland	1985-1997	United States	1985-2007