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International financial openness and manufacturing productivity: A services trade perspective

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Abstract

We investigate the relationship between manufacturing sector productivity and two new measures proxying for barriers to trade in services – restrictions affecting payment for cross-border imports of services and receipts for inward investment. Our services trade policy proxies span the 1965-2018 period, a much longer time span than extant services trade restrictiveness indicators, allowing analysis of the pre-hyper globalisation period as well as the post-global financial crisis years that has been the focus of the services trade literature. We find that (i) lower restrictions on services trade and cross-border investment are associated with higher productivity in manufacturing industries that rely more intensely on service inputs; and (ii) that international services payment restrictions and inward investment restrictions are complements: manufacturing productivity is higher when both are simultaneously liberalised. The relationship between international payment restrictions and manufacturing sector performance is heterogeneous, varying across time and countries with differing per capita incomes and governance quality.

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Non-Technical Summary

Trade in services can occur through direct cross-border exchange involving either provision over telecommunications networks and the internet or through inward foreign direct investment (FDI), with companies establishing a commercial presence abroad to serve the market. One important potential barrier to trade in services is restrictions on the ability of agents to make international payments for imports of services (invisibles in the balance of payments terminology) and policies that constrain the ability of foreign suppliers to purchase real and financial assets – i.e., transactions associated with inward FDI activities, mergers and acquisitions, and purchases of equity stakes in companies.

In this paper, we investigate the relationship between productivity in manufacturing sectors and restrictions affecting the ability to pay for cross-border imports of services and inward investment. We hypothesise that more restrictive international payment policies will have a disproportionately greater negative effect on the productivity performance of manufacturing sectors that use services inputs relatively more intensively. Manufacturing sectors make use of many services as inputs, ranging from professional services to transport to finance, with substantial variation across sectors in the intensity with which services are used. Both country studies and cross-country analyses have found that productivity in more services-intensive manufacturing sectors is more affected by national barriers to trade in services than in sectors that are relatively less services-intensive. The intuition for this is that higher services trade restrictions attenuate competition on domestic services markets, reducing variety and/or increasing the prices of domestically available services.

The policy measures used in our analysis cover 94 countries for the 1965-2018 period, a much longer time span than has been the focus of the recent scholarship investigating the economic effects of services trade policies. This research has been based on services trade restrictiveness indicators compiled by the OECD and the World Bank and WTO, which are limited to the post global financial crisis (2009) period. The absence of a valid and reliable time-series measure of services trade regulation for a large cross-section of countries has been a significant constraint on empirical analyses of the relationship between services trade policy and economic performance.

We find that lower restrictions on services trade and cross-border investment are associated with higher productivity in manufacturing industries that rely more intensely on service inputs. We also find that international restrictions on payment for services and inward investment are complements: manufacturing productivity is higher when both are simultaneously liberalised. The relationship between international payment restrictions and manufacturing sector performance is heterogeneous, varying across time and countries with differing per capita incomes and governance quality. We do not find evidence of complementarity in the first two decades of our sample, when levels of international economic integration and specialisation were lower. Moreover, the hypothesised relationship is much stronger for the high-income countries in the sample. This suggests complementarity is associated with the increase in cross-hauling of FDI and associated supply chain trade specialisation that characterises the more recent decades in our sample. This is consistent with the extensive literature on the relationship between FDI and trade, and research finding that global value chain production is influenced by the costs of contracting and the presence of high quality institutions.

International financial openness and manufacturing productivity: A services trade perspective[*]

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Abstract: We investigate the relationship between manufacturing sector productivity and two new measures proxying for barriers to trade in services – restrictions affecting payment for cross-border imports of services and receipts for inward investment. Our services trade policy proxies span the 1965-2018 period, a much longer time span than extant services trade restrictiveness indicators, allowing analysis of the pre-hyper globalization period as well as the post-global financial crisis years that has been the focus of the services trade literature. We find that (i) lower restrictions on services trade and cross-border investment are associated with higher productivity in manufacturing industries that rely more intensely on service inputs; and (ii) that international services payment restrictions and inward investment restrictions are complements: manufacturing productivity is higher when both are simultaneously liberalized. The relationship between international payment restrictions and manufacturing sector performance is heterogeneous, varying across time and countries with differing per capita incomes and governance quality.

Keywords: financial openness, liberalization, services input intensity, services trade policy, manufacturing productivity

JEL Codes: F13, F15, F21, F23, L60, L80

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1. Introduction

In this paper, we investigate the relationship between policies that affect the ability and cost of making and receiving international financial payments, a proxy for barriers to trade in services, and productivity in manufacturing sectors. The hypothesized mechanism linking restrictions on international payments and manufacturing productivity centers on the role of services as inputs in production. Manufacturing sectors make use of many services as inputs, ranging from professional services to transport to finance, with substantial variation across sectors in the intensity with which services are used. Both country studies and cross-country analyses have found that productivity in more services-intensive manufacturing sectors is more affected by national barriers to trade in services than in sectors that are relatively less services-intensive (Arnold et al. 2011, 2016; Fernandes and Paunov, 2011; Beverelli et al. 2017). The intuition for this is that higher services trade restrictions attenuate competition on domestic services markets, reducing variety and/or increasing the prices of domestically available services.

Foreign competition (services provision) can occur through direct cross-border exchange involving either provision over telecommunications networks and the internet (so-called mode 1 trade in services in WTO jargon); the temporary cross-border movement of foreign services suppliers (mode 4); or decisions by companies to engage in inward foreign direct investment (FDI) and establish a commercial presence abroad (mode 3).[1] National services trade barriers may vary across these different modes or affect all modes. Such barriers will also vary across countries and over time. One important potential barrier to trade in services is restrictions on the ability of agents to make international payments for imports of services (invisibles in the balance of payments terminology) and policies that constrain the ability of foreign suppliers to purchase real and financial assets – i.e., transactions associated with inward FDI activities, mergers and acquisitions, and purchases of equity stakes in companies. The first type of international payment restriction affects trade in services occurring through modes 1 or 4. The second type affects mode 3 trade. All other things equal, we expect that more restrictive international payment policies will have a disproportionately greater negative effect on the productivity performance of manufacturing sectors that use services inputs relatively more intensively.

We test this hypothesis using panel data for up to 18 manufacturing sectors in 94 countries over the period 1965-2018. An important contribution to the literature is the use of a new annual measure of services trade policy that spans our sample period. The time coverage of extant services trade restrictiveness indicators (STRI) compiled by the OECD and the World Bank/WTO is limited to the post global financial crisis period, with data starting in the late 2000s or mid-2010s. They also have less broad country coverage than do our measures.[2] We, therefore, cover the pre-hyper globalization period as well as the post-global financial crisis years that have been the focus of the services trade literature. The absence of a valid and reliable time-series cross-sectional measure of services trade regulation has been a significant constraint on empirical analyses of the relationship between services trade policy and economic performance.

[1] There is also a "mode 2" that comprises the temporary movement of consumers to a foreign country where services are purchased. This mostly consists of tourism expenditures.

[2] OECD STRI data are available annually starting in 2014, those of the World Bank/WTO cover one year in the late 2000s (mostly 2008) and one subsequent year, mostly 2016. Both initiatives have more limited country coverage than the continuous measures used in this paper.

In addition to investigating the sectoral productivity effects of the two types of international payments policies, we study the relationship between the two policy instruments by undertaking an indirect test of the complementarity between different modes of services trade. Different modes of trading services may not be independent of each other. As has been observed in the services trade literature, there may be complementarities between modes or between regulatory measures affecting trade (Francois and Hoekman, 2010). For example, a foreign affiliate (mode 3) may source services inputs from its headquarters location or the rest of the world via mode 1 or mode 4. An implication of such complementarity is that low barriers to mode 1 and mode 4 services imports may have a greater positive performance effect if policy restrictions to mode 3 trade are also low. The testable hypothesis that follows is that the productivity premium displayed by relatively more services-intensive manufacturing sectors in countries with fewer restrictions on payments for invisibles (relevant for mode 1 and mode 4 services imports) will be higher in countries with lower restrictions on the ability of residents to receive payments for assets from nonresidents (relevant for mode 3 services) and vice versa.

Our analysis provides conditional support for the hypothesis, with the data suggesting that complementarity is a function of threshold effects. We do not find evidence of complementarity in the first two decades of our sample, when levels of international economic integration and specialization were lower. We find that the hypothesized relationship is much stronger for the high-income countries in the sample. This suggests complementarity is associated with the increase in cross-hauling of FDI and associated supply chain trade specialization that characterizes the more recent decades in our sample. This is consistent with the extensive literature on the relationship between FDI and trade, which concludes that the two are complements in policy environments where incentives for tariff-jumping FDI are low because of trade liberalization (Helpman and Krugman, 1985; Venables, 1999; Egger and Pfaffermayr, 2004). It is also consistent with findings that GVC trade is influenced by the costs of contracting and the presence of high quality institutions (e.g., Nunn, 2007; Antràs and Chor, 2013).

2. Related Literature

Our analysis builds on three strands of related research investigating the consequences of financial openness, the economic effects of services trade policies, and the relationship between different modes of contesting international markets.

The first strand of research focuses on the effects of financial liberalization, which comprises an extensive literature spanning both economics and political science. Research on this subject has focused on the linkages between financial openness and economic growth, the channels through which financial opening may affect aggregate economic performance, and the political and economic variables that are associated with policy decisions to liberalize cross-border financial flows (e.g., Quinn, 1997; Levine, 2001; Chinn and Ito, 2006; Henry, 2007). A feature of much of this research is an absence of consistent findings on the economic effects of financial liberalization. To some extent this reflects the use of different indicators of financial openness and integration, differences in the dependent variable of interest and whether and how studies control for differences in the quality of domestic governance, political institutions, and the investment climate. In their review, for example, Kose et al. (2010) point to the importance of such controls – e.g., the role of sound macroeconomic policies as a prerequisite for financial liberalization to be positively associated with subsequent growth performance.

Quinn and Toyoda (2008) argue that measurement error, differences in time periods used, and collinearity among independent variables account for the conflicting results in the literature. Using pooled time-series, cross-sectional OLS and system GMM estimators, they find that capital account liberalization had a positive association with growth in both developed and developing countries in the 1955-2004 period. In addition, they find that equity market liberalization has an independent effect on economic growth.[3] Bumann et al. (2013) conduct a meta-analysis of the empirical literature on the relationship between financial liberalization and economic growth, based on 441 t-statistics reported in 60 empirical studies. On average, they find a positive, but only weakly significant, effect of financial liberalization on growth. Most variables hypothesized to help explain the heterogeneity in the relationship between financial openness and economic growth are not significant. The two exceptions are for financial reform policies undertaken in the 1970s, which are found to have a stronger negative association with growth, and studies that consider the level of financial development, which tend to report lower t-statistics for the estimated relationship between liberalization and growth.

Other papers decompose the impact of financial openness on economic growth into factor productivity and capital growth. For example, Bonfiglioli (2008) concludes financial integration has a positive direct effect on productivity but does not directly affect capital accumulation. Bekaert et al. (2011) also find that factor productivity is more important than capital growth, and that financial openness promotes both stock market and banking sector development as well as changes in the quality of institutions, with more financially developed countries and those with higher quality of institutions experiencing larger productivity growth responses to reforms.[4] Kose et al. (2009) contrast the ambiguous findings on the macroeconomic growth benefits of broad capital account liberalization with research using firm- or industry-level data, which tends to find more robust evidence of benefits of financial integration and the distortionary effects of capital controls. They argue that the catalytic and indirect benefits of financial opening on financial sector development, institutions, governance, and macroeconomic stability are likely to be far more important than direct impacts via capital accumulation or portfolio diversification.

The second strand of related research to which we contribute pertains to the economic effects of policies affecting trade in services. We focus on a specific indirect channel through which international liberalization of trade in services may affect economic performance: by enhancing the productivity performance of manufacturing sectors in a country. Empirical studies analyzing the linkages between services trade policies and productivity have identified sizable positive effects of liberalizing services trade on the productivity and export performance of firms or industries (notably manufacturing) that are "downstream" in the supply chain. Barone and Cingano (2011), Arnold et al. (2011), Fernandes and Paunov (2011), Bourlès et al. (2013), Duggan et al. (2013), Arnold et al. (2016), Hoekman and Shepherd (2017)

[3] The positive association between liberalization of equity markets and growth is one of the more robust results in the empirical literature.

[4] Many of these studies also consider the effect of liberalization on crises. For example, Ranciere et al. (2006) decompose the effects of financial liberalization on economic growth and on the incidence of crises, finding that the direct effect of financial liberalization on growth is substantially greater than the indirect effect via a higher propensity to crisis. Bekaert et al. (2011) conclude that the growth boost from openness outweighs the detrimental loss in growth from subsequent global or regional banking crises, supporting the finding of Bonfiglioli (2008) that the net overall effect of financial liberalization, considering the impact of liberalization on the probability of crisis, remains positive for productivity and is negligible for investment.

and Beverelli et al. (2017) all analyze the effect of services trade policies (mostly focusing on measures pertaining to inward FDI) as well as broader economic reforms, and find positive impacts on the TFP and export performance of manufacturing industries.[5]

The literature analyzing services trade policies and their effects on economic activity has been severely impeded by data limitations. As mentioned, comparable cross-country information on services trade restrictions only began to be collected in the mid-to-late 2000s, and is limited in country coverage. Long time series information on services trade restrictions for a broad cross-section of countries is not available, and data on lower-income countries are particularly limited.[6] A contribution of this paper is the use of international financial payment openness indicators for many countries, including developing economies, spanning the period 1965-2018. Our focus on policy complements recent research on the relationship between the intensity of use of services as inputs into production and productivity (Bamieh et al., 2020) and work establishing that embodied foreign services inputs have a positive effect on export competitiveness of manufacturing sectors (Liu et al., 2020).[7]

The third strand of research this paper relates to concerns the relationship between trade and FDI. Starting with the seminal contributions by Mundell (1957) and Kojima (1975) on the relationship between trade and factor movements, a large body of work has investigated situations where trade and FDI can be substitutes or complements.[8] This has focused almost exclusively on trade and FDI in goods and/or the determinants of FDI flows and generally has not considered the potential interactions between modes of trading services or the relationship between trade policies that pertain to different modes.[9] We contribute to this strand of

[5] Scholars have often used data from a single country to explore the potential effects of services trade liberalization. See Ariu et al. (2019) for an examination of the question in a Belgian context. Gervais and Jensen (2019) use U.S. data on the concentration of services production to estimate the gains from services trade liberalization.

[6] Data collection initiatives by the OECD (Nordås and Rouzet, 2017; OECD, 2024), World Bank (Borchert et al., 2014) and WTO (WTO, 2019) characterize the restrictiveness of policies towards services trade and investment. The OECD services trade restrictiveness indicators (STRI) cover 50 countries (all OECD members as well as the major emerging economies), 22 sectors, and are available on an annual basis for the time period 2014-2024. Benz et al. (2023) provide a portfolio of empirical exercises investigating the effects of services trade policy using the OECD STRI database. The World Bank and WTO database covers a larger and diverse sample of 134 economies and 34 services sectors (Borchert et al. 2020). The most recent update covers two points in time, one for policies in 2016 to 2019 and the second from 2020 to 2023.

[7] Jin, Li and Yang (2022) analyze the relationship between the use of producer services inputs and manufacturing carbon intensity.

[8] The literature on this subject is vast. See, for example, Helpman and Krugman (1985), Egger and Pfaffermayr (2004), Venables (1999), Helpman et al. (2004), and Oberhofer and Pfaffermayr (2012).

[9] Exceptions include Fillat Castejón et al. (2008), Fiorini and Hoekman (2020), and Khachaturian and Oliver (2023). Khachaturian and Oliver (2023) use a sector-level structural gravity model to assess whether services trade via GATS Mode 3 (foreign affiliate sales) is a complement or substitute for cross-border services trade (GATS Modes 1, 2, and 4). In nine of the 13 sectors considered, they find a significant negative relationship between policies that limit foreign affiliate sales and cross-border trade, indicating a complementary relationship between the two types of trade flows. Bertho et al. (2016) discuss complementarity between cross-border trade and commercial presence in maritime shipping services. They conclude that when the services provision entails more complex commercial relationships – for instance, in liner shipping compared to tramp shipping or under 'door-to-door', multimodal delivery – commercial presence becomes important to facilitate activities that could be more difficult to carry out simply through cross-border arrangements.

the international economics literature by investigating whether financial payment policies affecting different modes of services trade are complementary in achieving improved productivity.

An important strand of research on FDI sees the efficacy of policy reforms for financial and economic outcomes depending on the quality of political and institutional governance. Alfaro (2017) highlights the role of good governance, among other factors, in inducing the economic benefits of FDI.[10] Goswami (2024) demonstrates, using Indian state-level data, that better governance is also important in FDI location decisions. Beverelli et al. (2017) show that the productivity benefits from services trade openness depend on domestic institutions. In our context, better governance might, therefore, moderate the impact of various types of financial liberalization on improved manufacturing productivity. Another consideration from the prior literature is that the effects of governance might vary over time (Magbondé et al. 2024).

3. International financial openness: data and descriptive evidence

We use time series data on two types of restrictions to international financial transactions that directly affect imports of services, one of which has not previously been used in published research. Our measures are intensity measures of the degree of regulatory restrictiveness or openness of a country's international financial transactions.[11] The measures are based on a coding of the laws and regulations governments used to govern international finance as reported in the text of the *International Monetary Fund's Annual Report on Exchange Arrangements and Exchange Restrictions*. The two indicators are constructed using a coding scheme developed by Quinn (1997). [12]

The first variable, denoted $PAYinv_{it}$ is a measure of the ability of residents of country i to make payments to nonresidents for purchases of foreign 'invisibles' in year t. This is a current account measure in that it affects payments for current transactions. $PAYinv_{it}$ is directly relevant for cross-border imports of services (i.e. using mode 1 or mode 4 services trade) as an obstruction to making payments is tantamount to a blockage of service imports.[13] The coding scheme used to construct $PAYinv_{it}$ is described below.[14]

The second variable, $RECcap_{it}$, measures the regulation of inward capital flows. $RECcap_{it}$ is a proxy for residents' ability in country i to receive funds for sales of domestic assets to nonresidents (e.g., inward foreign direct investment), and for the ability of nonresidents either to acquire assets from residents in country i or to invest directly in country i. $RECcap_{it}$ thus measures the openness of a country to transactions that are classified under the capital account of the balance of payments. $RECcap_{it}$ is directly relevant for mode 3 imports of services as it encompasses payments associated with greenfield FDI, acquisitions, and

[10] See also Alfaro et al. (2007) and Alfaro et al. (2008).

[11] Indicators of financial openness can be de jure or de facto, with the choice of measure used affecting the comparability of research finding in literature (Quinn, Schindler and Toyoda, 2011). Different indicators capture different and useful facets of financial openness. The variables used in this paper were chosen both because of their salience from a trade in services perspective and because data are available over a long time period for many countries.

[12] The IMF report has been published continually since 1950.

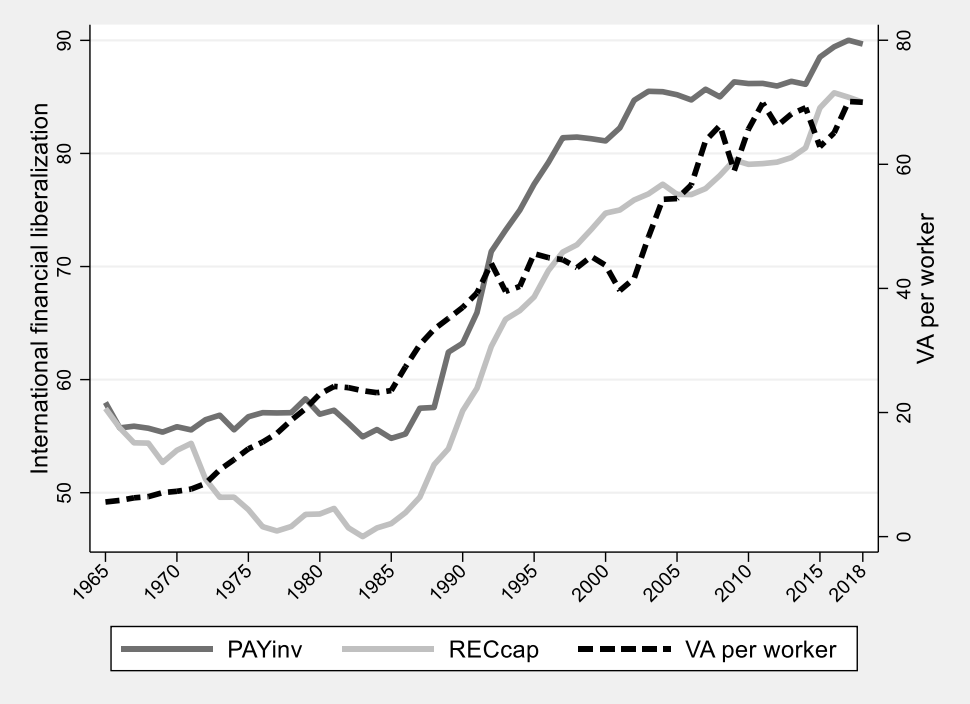
[13] A companion indicator, $PAYimp_{it}$, measures the governance of payments for goods imports.

[14] Where payments are forbidden or partly forbidden with tight regulatory approvals required, the score are 0 and 25 respectively. Regulations requiring non-automatic approvals or high levels of taxation are scored as 50. Where payments are taxed but not tightly regulated, the score is 75. The score of 100 denotes a regulatory context without restrictions. Further details on the coding methodology used to construct these and related variables can be found in Quinn (1997) and Quinn and Toyoda (2008). See also Alesina et al (2024).

purchases of equity. The variable also captures restrictions on other financial assets, such as portfolio investments, bank loans, and bonds.

Figure 1 plots the cross-country average of these two types of international financial liberalization and shows their evolution over time across the 94 countries for the period under analysis, 1965 to 2018. Both policy variables range between 0 (maximum restrictiveness) and 100 (maximum openness). Figure 1 also plots the average labor productivity measured as value added per worker across countries and manufacturing sectors. The data suggest a positive co-movement between higher international financial openness and manufacturing productivity. Whether part of this relationship reflects manufacturing industries benefiting from international financial openness through access to better/cheaper services inputs is the focus of the econometric analysis that follows.

FIGURE 1: INTERNATIONAL PAYMENTS RESTRICTIONS AND MANUFACTURING LABOR PRODUCTIVITY



Notes: VA per worker is expressed in thousands of U.S. Dollars. Simple averages are computed excluding country-sector-year observations with a value of VA per worker larger than or equal to the 99th percentile of the VA per worker distribution over country-sector-year observations.

4. Econometric framework

We empirically test the hypothesis that manufacturing sectors with relatively greater dependence on services inputs should have, other things equal, relatively higher productivity in policy regimes that are more open to the two types of international financial transfers considered here. Hence, we estimate the following specification for labor productivity Y in country i, manufacturing sector j, and time t:

$$Y_{ijt} = \beta PAYinv_{i(t-2)} \times w_{ij(t-2)} + \gamma RECcap_{i(t-2)} \times w_{ij(t-2)} + \\ + \delta x_{ij(t-2)} + \lambda w_{ij(t-2)} + \xi_{it} + \xi_{jt} + \varepsilon_{ijt} \quad (1)$$

The two regressors of interest comprise the interaction between: (i) the indicator for payments for current invisibles ($PAYinv_{it}$) and receipts for sales of assets and related capital inflows ($RECcap_{it}$), respectively, both of which vary at the country i and time t level; and (ii) a weighting coefficient (w_{ijt}) that captures the intensity of services input use by manufacturing sector j in country i at time t. This variable is calculated using the share of services in total intermediate consumption for each manufacturing sector.

To allow for a valid comparison across modes of supply of services, we focus on the intensity of use of two services that are, in principle, tradable in the sense that they do not require FDI (mode 3): financial and business services.[15] The model controls for the log of the capital-labor ratio of sector j in country i at time t, x_{ijt}, a relevant determinant of sectoral productivity that is potentially correlated with both $PAYinv_{it}$ and $RECcap_{it}$. ξ_{it} and ξ_{jt} are country-time and sector-time fixed effects, respectively, and ε_{ijt} is the error term.

As discussed, our hypothesis is that lower policy restrictions on international financial payments improve manufacturing sector access to services inputs, considering both modes of supplying services, i.e., recognizing that some services require FDI, which has a positive impact on productivity. Therefore, the productivity differential between two manufacturing sectors with different services input intensities should favor the more services-intensive (dependent) sector in countries where the policy environment is less restrictive towards international financial transactions. Thus, the productivity differential between two sectors with different dependence on services inputs is a function of the first derivative of log productivity with respect to services input intensity w ($\partial Y/\partial w$). If this first derivative is positive (negative), greater services input intensity would be associated with higher (lower) productivity.

Relevant for investigating how the productivity differential between two sectors that differ in their services input intensity (dependence on services inputs) varies with financial openness, equation (1) allows $\partial Y/\partial w$ to be a linear function of both types of international financial policies. The estimated coefficients $\hat{\beta}$ and $\hat{\gamma}$ are estimates for second derivatives of productivity with respect to services input intensity and each international financial policy:

$$\frac{\widehat{\partial Y\,\partial Y}}{\partial PAYinv\,\partial w} = \hat{\beta} \tag{2}$$

$$\frac{\widehat{\partial Y\,\partial Y}}{\partial RECcap\,\partial w} = \hat{\gamma} \tag{3}$$

If these second derivatives are greater than zero, the productivity differential between two sectors with differing services intensity is relatively in favor of the sector with greater services input dependence in policy environments that are less restrictive, irrespective of the nature of the relationship between log

[15] In practice, agents may decide to use mode 3 to contest a market instead of utilizing a cross-border trade mode for both financial and business services. The point is that both cross-border trade and commercial presence can be used in principle for these services. Liu et al. (2020) similarly focus on these two sectors.

productivity and services input intensity (given by the sign of the first derivative).[16] Our hypothesis implies $\hat{\beta}$ and $\hat{\gamma}$ should be positive and statistically significant.

This framework can be extended to assess whether the two types of international financial payment policies complement or substitute each other. To do so, we augment equation (1) with a triple interaction between w, $PAYinv$ and $RECcap$:

$$\begin{gathered} Y_{ijt} = \beta PAYinv_{i(t-2)} \times w_{ij(t-2)} + \gamma RECcap_{i(t-2)} \times w_{ij(t-2)} + \\ +\mu PAYinv_{i(t-2)} \times RECcap_{i(t-2)} \times w_{ij(t-2)} + \delta x_{ij(t-2)} + \\ +\lambda w_{ij(t-2)} + \xi_{it} + \xi_{jt} + \varepsilon_{ijt} \end{gathered} \tag{4}$$

In this model, the estimated second derivative of log productivity with respect to w and $PAYinv$ ($RECcap$) is a function of $RECcap$ ($PAYinv$). Specifically, the expressions for the second derivatives become:

$$\frac{\widehat{\partial \mathrm{Y}\, \partial \mathrm{Y}}}{\partial PAYinv\, \partial w} = \hat{\beta} + \hat{\mu} RECcap \tag{5}$$

$$\frac{\widehat{\partial \mathrm{Y}\, \partial \mathrm{Y}}}{\partial RECcap\, \partial w} = \hat{\gamma} + \hat{\mu} PAYinv \tag{6}$$

As shown in equation 7, $\hat{\mu}$ is equal to the mixed third derivatives, and its sign determines how the productivity differential between two sectors that differ in their services input intensity varies with the degree of openness of $PAYinv$ ($RECcap$) at different levels of $RECcap$ ($PAYinv$).

$$\frac{\partial \widehat{\partial \mathrm{Y}\, \partial \mathrm{Y}}\, \partial \mathrm{Y}}{\partial RECcap\, \partial PAYinv\, \partial w} = \frac{\partial \mathrm{Y} \widehat{\partial \mathrm{Y}\, \partial \mathrm{Y}}}{\partial PAYinv\, \partial RECcap\, \partial w} = \hat{\mu} \tag{7}$$

If more open policy stances are effective in providing manufacturing sectors better access to services inputs and they do so in a complementary manner, we would not only expect the productivity differential between two sectors to favor the more services-intensive manufacturing industry in policy environments characterized by higher values of $PAYinv$ ($RECcap$) (positive second derivatives in equations 5 and 6), but also that this pattern will be more pronounced at higher values of $RECcap$ ($PAYinv$) (positive third derivative in equation 7). This would be reflected by $\hat{\mu} > 0$. If so, it would suggest a complementarity relationship between more liberal policies towards international payments for cross-border services imports (invisibles) and less restrictive policies towards international capital transfers.

[16] The sign of the first derivative of productivity with respect to services input intensity is not relevant for our analysis. To answer our research question, we only need to determine the sign of the second derivative. This methodology extends to a panel framework through application of the seminal difference-in-differences approach proposed by Rajan and Zingales (1998).

Identification issues

Estimating equations (1) and (4) is prone to identification issues, which need to be carefully addressed. One common concern with these types of diff-in-diff specifications is the potential endogeneity of the services input intensity coefficients, which might be directly affected by the policy variables of interest. This is a risk in our framework, given that changes in policy restrictions that affect services trade might affect the use of services as inputs in manufacturing sectors. We adopt the standard solution used in the literature since the seminal contribution by Rajan and Zingales (1998). That is, we use the input-output (IO) coefficients of U.S. sectors in the mid-1990s as a proxy for the long-run technological relationships between industries, including services input intensity, and apply these coefficients across the countries in our sample.

The choice of the U.S. as a reference country to define the linkages between upstream services and downstream manufacturing is motivated by three features characterizing the American economy in the mid-1990s: (i) sector-specific policies that did not distort decisions to use services as intermediate inputs; (ii) a business-friendly economic environment in which horizontal, cross-sectoral, regulation similarly did not affect services sourcing decisions; and (iii) a diversified economy in which the universe of manufacturing sectors was relatively well represented. Given the use of U.S. IO coefficients, we remove the U.S. from all estimation exercises. Thus, the w_{ijt} term in our models becomes $w_{US,j,1995}$ or just w_j.

Another threat to identification is the potential presence of observable and/or unobservable heterogeneity that might confound the estimated relationship between manufacturing productivity and the regressors of interest. Country-time and sector-time fixed effects control for any country- and/or sector-specific time contingent shock that affects both labor productivity and the regressors of interest or results in a chain of reverse causality from manufacturing productivity to international financial policies, e.g., national business cycles that affect productivity triggering changes in policy, or technological progress within a sector that shapes sectoral productivity and creates incentives for lobbying for changes in international financial policies. In addition to these fixed effects, we lag all right-hand side variables in our specifications by two years to reduce potential reverse causation. Finally, in order to control for changes in the capital-labor ratio (and for other country-sector-year idiosyncratic shocks reflected in the evolution of the capital-labor ratio) that could drive changes in international financial policies and affect productivity at the same time, our baseline specifications use two-year lagged capital to labor ratios varying across the country-sector-year dimension.

It is possible that the combination of geographic, endowment, or institutional features at the country level and sector-specific technological parameters might determine simultaneously the productivity performance of a manufacturing sector in a given county (the dependent variable) and shape services trade-related policy decisions at the country level (elements in the regressors of interest). As long as these omitted variables are stable over time, including country-sector fixed effects in our specifications will address the risk of this potential source of endogeneity. While we will report estimates that include country-sector fixed effects, doing so leave only a small fraction of the original variation in the data for identification. For this reason, our preferred specifications include country-time and sector-time fixed effects only. Analysis of the residuals from regressions with different batteries of fixed effects suggests that the combination of country-

year and sector-year fixed effects is most appropriate in balancing controlling for potential omitted heterogeneity and removing variation from the data.[17]

Other data and estimation sample

Data on labor productivity come from the UNIDO IndSTAT database. We measure labor productivity as the ratio between value added and total employed persons. Capital and labor measures used to construct the log of the capital-labor ratio come from the same database. IO weights w_j are given by IO technical coefficients computed on the US IO table for the mid-1990s sourced from the OECD Structural Analysis (STAN) database.[18] Data for $PAYinv$ and $RECcap$ are available for up to 126 countries from 1950 until 2018.

To maximize the quality of our data, we restrict the sample to those country-sector pairs for which we have at least five non-missing values of labor productivity since the mid-60s. We drop country-sector-year observations in the first and last percentiles of the distribution of labor productivity. The resulting estimation sample consists of 36,263 observations, with an unbalanced panel structure covering up to 18 manufacturing sectors for 94 countries from 1965-2018.

TABLE 1: SUMMARY STATISTICS

Variable	Mean	median	sd	min	max
VA per worker in \$k (Y_{ijt})	44.42	23.49	57.71	0.67	483.87
$PAYinv_{it}$	75.29	75	27.49	0	100
$RECcap_{it}$	68.13	75	27.50	0	100
w_j	0.04	0.03	0.01	0.02	0.06
log K/L (x_{ijt})	7.87	7.96	1.44	-2.56	18.80

Notes: Summary statistics are computed on the estimation sample of 36,263 observations, with an unbalanced panel structure covering up to 18 manufacturing sectors for 94 countries from 1965-2018.

5. Results

Table 2 reports baseline results. In all estimations standard errors are clustered at the country-year level, which is the dimension of variability in the policy variables $PAYinv$ and $RECcap$. Baseline estimates strongly support the hypotheses of (i) a positive effect of removing restrictions to services trade on manufacturing productivity across modes (columns 1 to 3) and (ii) a complementarity relationship between the two modes of supplying services (column 4). The estimates in columns 1 to 3 reveal a stronger effect from mode 3 relevant international payments policy, reflected in larger coefficients for the interaction term $RECcap_{it} \times w_j$.

To quantify the economic significance of these estimates we compare, across different levels of financial openness, the (estimated) productivity differential $\Delta Y(.)$ between a sector with services dependence at the

[17] The results from the analysis of the residuals are summarized in the next section.

[18] UNIDO data were sourced from https://stat.unido.org/. The OECD STAN data can be obtained from http://www.oecd.org/sti/ind/stanstructuralanalysisdatabase.htm.

75th percentile – food products, beverages, and tobacco – and a sector at the 25th percentile, rubber and plastic products, i.e. $\Delta Y(\widehat{w_{p75} - w_{p25}})$. The estimates reported in column (3) of Table 2 imply that the productivity differential $\Delta Y(\widehat{w_{p75} - w_{p25}})$ would increase by 1.56 (6.48) units – US$1,560 ($6,480) per worker – if policies towards international financial transfers were to be liberalized by an amount corresponding to the difference in the value of $PAYinv$ ($RECcap$) from the 25th percentile to the 75th percentile.[19] These are economically sizable differences, and account for approximately 2.7% and 11.2% of a standard deviation of labor productivity in our sample. A concrete example of the policy change implied in this exercise for the case of $PAYinv$ would be given by moving from the policy regime prevailing in India in the 2000s (at the 25th percentile of $PAYinv$) to that of Japan during the same decade (the 75th percentile). For the case of $RECcap$, the hypothesized policy change would be equivalent to moving from the policy framework prevailing in New Zealand during the 1970s (25th percentile of $RECcap$) to that prevailing in New Zealand in the 2000s (75th percentile).

TABLE 2: BASELINE RESULTS

Dependent variable:	Log of Labor Productivity (VA per worker) in US$ thousand (Y_{ijt})			
	(1)	(2)	(3)	(4)
$PAYinv_{i(t-2)} \times w_j$	7.196***		2.085***	-5.154***
	(0.641)		(0.731)	(1.541)
$RECcap_{i(t-2)} \times w_j$		9.923***	8.662***	-2.164
		(0.728)	(0.859)	(1.755)
$PAYinv_{i(t-2)} \times RECcap_{i(t-2)} \times w_j$				0.136***
				(0.0247)
log K/L (x_{ijt})	7.294***	7.234***	7.241***	7.182***
	(0.367)	(0.365)	(0.365)	(0.363)
Observations	36263	36263	36263	36263
Adjusted R-squared	0.633	0.634	0.634	0.634
Country-Year FE	Yes	Yes	Yes	Yes
Sector-Year FE	Yes	Yes	Yes	Yes

Notes: Robust standard errors clustered at the country-time level reported in parentheses. Statistical significance: * p<0.1; ** p<0.05; *** p<0.01.

For convenience, we denote these "differential differentials" as $ddPAYinv$ and $ddRECcap$, where:

[19] Given the interpretation of the coefficients of the interaction term $PAYinv \times w$ as a second derivative (see equation 2 above), the change in the productivity differential $\Delta Y(\widehat{w_{p75} - w_{p25}})$ between the two policy regimes $PAYinv_{75}$ and $PAYinv_{25}$ can be computed as $\hat{\beta} \times (w_{p75} - w_{p25}) \times (PAYinv_{75} - PAYinv_{25})$. Substituting $\hat{\beta}$ with the point estimate of column 3 in Table 2 we obtain $2.085 \times 0.015 \times 50 = 1.56$. Similarly, the formula to compute the change in the productivity differential $\Delta Y(\widehat{w_{p75} - w_{p25}})$ between the two policy regimes $RECcap_{75}$ and $RECcap_{25}$ is $\hat{\gamma} \times (w_{p75} - w_{p25}) \times (RECcap_{75} - RECcap_{25}) = 8.66 \times 0.015 \times 50 = 6.48$.

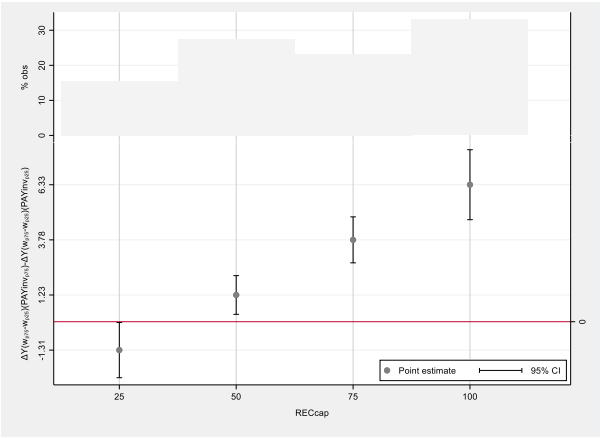
$$ddPAYinv = \Delta Y\left(w_{p75} - w_{p25}\right)(PAYinv_{75}) - \Delta Y\left(w_{p75} - w_{p25}\right)(PAYinv_{25}) \quad (8)$$

$$ddRECcap = \Delta Y\left(w_{p75} - w_{p25}\right)(RECcap_{75}) - \Delta Y\left(w_{p75} - w_{p25}\right)(RECcap_{25}) \quad (9)$$

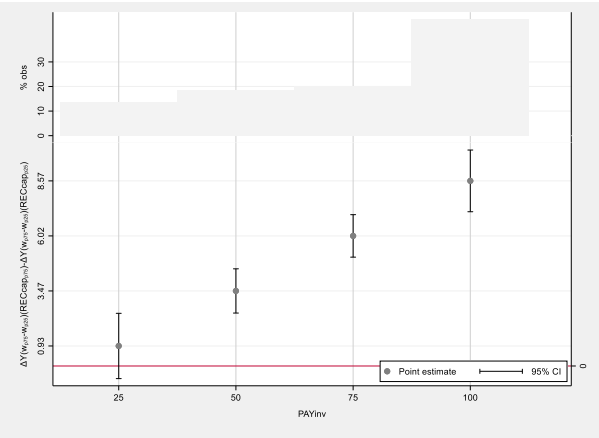
We can use these expressions to discuss the empirical relationship between liberalization across modes of services trade as implied by the estimation results reported in column (4). To assess the economic implication of these estimates, Panel A (Panel B) of Figure 2 reports $ddPAYinv$ ($ddRECcap$) as a function of $RECcap$ ($PAYinv$). The point estimate for the $PAYinv$ differential-differential productivity change (plotted in the bottom panel of Figure 2) is negative at the lowest values of $RECcap$ (whose sample distribution is plotted in the upper part of Panel A, Figure 2, becoming positive (with 95% confidence interval fully above the 0 line) for all other values. Turning to $ddRECcap$ as a function of $PAYinv$ (Panel B, Figure 2), the estimated $RECcap$ differential-differential productivity change is positive for any value of $PAYinv$ in our sample, and with the 95% confidence interval above the 0 line for all values of $PAYinv$ greater than 25.

FIGURE 2: COMPLEMENTARITY BETWEEN $PAYinv$ AND $RECcap$

Panel A: $ddPAYinv$ as function of $RECcap$



Panel B: $ddRECcap$ as function of $PAYinv$



Notes: The two panels plot estimates of $ddPAYinv$ as a function of $RECcap$ (Panel A) and of $ddRECcap$ as a function $PAYinv$ (Panel B). These estimates are computed using results reported in column (4) of Table 2 and the formulas: $\widehat{ddPAYinv} = (\hat{\beta} + \hat{\mu}RECcap)\left(w_{p75} - w_{p25}\right)\left(PAYinv_{p75} - PAYinv_{p25}\right)$; $\widehat{ddRECcap} = (\hat{\gamma} + \hat{\mu}PAYinv)\left(w_{p75} - w_{p25}\right)\left(RECcap_{p75} - RECcap_{p25}\right)$.

Figure 2 shows that, if restrictions on capital account inflows are large enough (as at the lowest level of $RECcap$ in our sample), an open regime for payments for invisibles no longer has the expected positive differential effect on productivity across manufacturing sectors. Similarly, if restrictions on payments for invisibles are high (at the lowest level of $PAYinv$), an open capital transfer regime has less of an effect. In cases where there are no restrictions on international financial transfers affecting mode 3 services trade (as captured by the highest value of $RECcap$ in our sample), there are significant productivity effects associated with liberalizing international financial payments for invisibles (i.e., cross-border, arms-length services trade). An increase in $PAYinv$ from the 25th to the 75 percentile results in a productivity differential

between a sector with services dependence at the 75th percentile and one at the 25th percentile of US$ 6,330 per worker. Analogously, if we focus on the potential productivity effects of increasing $RECcap$ from the 25th to the 75th percentile, conditional on $PAYinv$ being at its most open level, the highest productivity differential between a sector with services dependence at the 75th percentile and one at the 25th percentile is equal to US$8,570 per worker (15% of a standard deviation in the productivity distribution).

Robustness tests

We perform several robustness exercises to assess the sensitivity of our baseline results. First, as discussed in Section 4, we augment the specifications in (1) and (4) with country-sector fixed effects. The rationale here is to control for any potential source of confounding heterogeneity that is idiosyncratic to a country-sector pair and constant over time. While this strategy addresses the risk of omitted variable bias, a drawback is that it removes from each country-sector-year observation the country-sector mean. This substantially reduces the variation in our data, particularly in our regressors of interest. While the standard deviation of the residuals from a regression of labor productivity on country-year, sector-year, and country-sector fixed effects is still 45% of the standard deviation of the dependent variable, this falls to 12% for both the interaction $PAYinv_{i(t-2)} \times w_j$ and $RECcap_{i(t-2)} \times w_j$. The standard deviation of the residuals from regressing $PAYinv_{i(t-2)} \times w_j$ and $RECcap_{i(t-2)} \times w_j$ on country-year and sector-year fixed effects alone is almost twice as large, at 20% and 21%, respectively. Thus, specifications with the additional set of country-sector fixed effects are working with only slightly more than one tenth of the original variation in the regressors of interest, while the specifications with country-year and sector-year fixed effects use more than 20% of the original variability.

The results derived from the more demanding specification with country-sector fixed effects are reported in Table 3. They strongly confirm the positive sign of the estimated second derivative $\frac{\partial y\, \partial y}{\partial RECcap\, \partial w}$ (column 2 and 3). These estimates are less prone to be affected by potentially confounding variation at the country-sector level and support the hypothesis that financial openness affects services trade occurring through commercial presence within country-sector pairs. What changes in Table 3 is the coefficient of the interaction $PAYinv_{i(t-2)} \times w_j$ as estimated in column (3). According to that estimate, when looking at within country-sector pair variation, productivity is less positively (or more negatively) associated with services input intensity in environments with more liberal policies towards payments for invisibles, i.e. measures affecting cross-border services imports. This result seems to contradict our hypothesis that liberalizing cross-border services trade benefits downstream sectors that use services as intermediate inputs.[20]

However, similarly to the pattern suggested by our baseline findings reported in Table 2, if we allow the estimating equation to account for the interaction between $PAYinv$ and $RECcap$, the negative effect of $PAYinv$ on productivity differentials is observed only at low values of $RECcap$, i.e. when capital transfer restrictions are high enough. The strong complementarity result given by the positive estimated coefficient

[20] One possible explanation to rationalize this finding lies in the demonstrated negative effect of reforms that liberalize current account transactions during recessions (see for instance Alesina et al., 2020). This is likely to be captured more strongly when exploiting within country-sector pair variation in the data. This mechanism is further explored in Section 6 below.

for the triple interaction in column (4) of Table 3 supports the assumption of a positive effect of both $PAYinv$ and $RECcap$ on the productivity differentials between manufacturing sectors that vary in services input intensity. The positive effect of removing one type of restriction obtains only when the restrictiveness of the other policy is low, and this is particularly true when looking at within country-sector pair variation. Figure 3, which replicates Figure 2 using the estimates derived when adding country-sector fixed effects (column 4 in Table 3), illustrates this pattern.

TABLE 3: ESTIMATIONS WITH COUNTRY-SECTOR FIXED EFFECTS

Dependent variable:	Labor Productivity (VA per worker) in US$ thousand (Y_{ijt})			
	(1)	(2)	(3)	(4)
$PAYinv_{i(t-2)} \times w_j$	-1.952*		-4.489***	-18.81***
	(1.024)		(1.021)	(1.933)
$RECcap_{i(t-2)} \times w_j$		3.848***	5.828***	-13.29***
		(1.041)	(1.050)	(2.196)
$PAYinv_{i(t-2)} \times RECcap_{i(t-2)} \times w_j$				0.253***
				(0.0283)
log K/L ($x_{ij(t-2)}$)	3.618***	3.618***	3.606***	3.569***
	(0.313)	(0.312)	(0.312)	(0.311)
Observations	36260	36260	36260	36260
Adjusted R-squared	0.769	0.769	0.769	0.770
Country by Year FE	Yes	Yes	Yes	Yes
Sector by Year FE	Yes	Yes	Yes	Yes
Country by Sector FE	Yes	Yes	Yes	Yes

Notes: Robust standard errors clustered at the country-time level reported in parentheses. Statistical significance: * p<0.1; ** p<0.05; *** p<0.01.

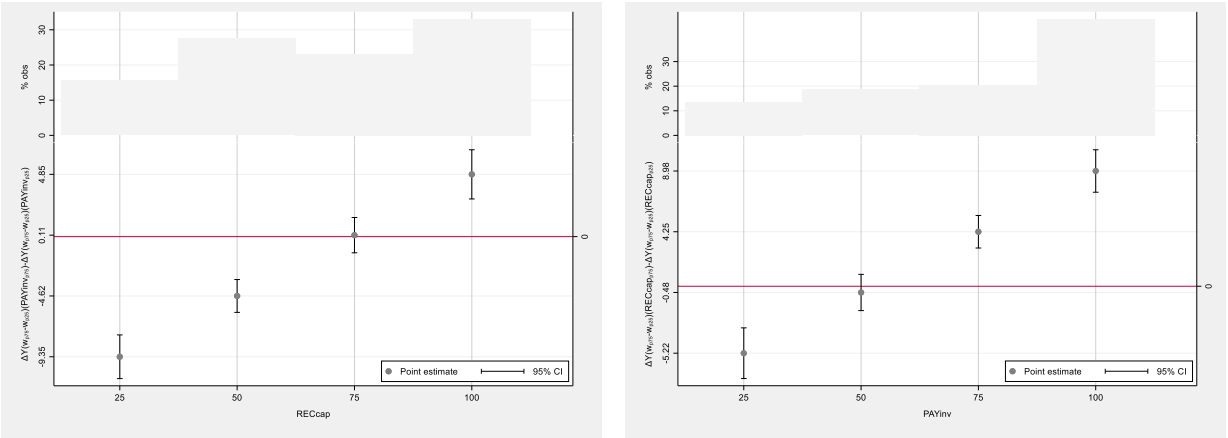
Panel A of Figure 3 shows that removing restrictions to payments for invisibles (raising $PAYinv$ from the 25th to the 75th percentile) shifts the productivity differential between the two sectors at the 25th and 75th percentile of services input intensity significantly towards the latter only when restrictions to capital accounts receipts are at their minimum level ($RECcap = 100$). Similarly, more open capital account regimes (increasing $RECcap$ from the 25th to the 75th percentile) makes the productivity differential between a sector at the 25th percentile of services input intensity and one at the 75th percentile more favorable to the latter only when $PAYinv$ is in the 75th percentile or higher, i.e. when restrictions to payments for invisibles are low.

We conclude that limiting our focus to the within-country-sector pair variation does not alter the main qualitative patterns found in our baseline estimations and suggests an even stronger role of complementarity

between the two types of financial transfer policies affecting different types of services trade.[21] We, therefore, retain the models without country-sector fixed effects as our preferred specifications as they allow identification on a larger share of the original variability in the data.[22] Where the analysis of within-country-sector variation delivers new insights is on the role of liberalization of international payment for services as captured by changes in $PAYinv$. Factors that may help explain the negative estimate for $PAYinv$ reforms are explored in Section 6 below.

FIGURE 3: COMPLEMENTARITY BETWEEN $PAYinv$ AND $RECcap$ WITH COUNTRY-SECTOR FIXED EFFECTS

Panel A: $ddPAYinv$ as function of $RECcap$ **Panel B**: $ddRECcap$ as function of $PAYinv$



Notes: The two panels plot estimates of $ddPAYinv$ as a function of $RECcap$ (Panel A) and of $ddRECcap$ as a function $PAYinv$ (Panel B). These estimates are computed using results reported in column (4) of Table 3 and the formulas: $\widehat{ddPAYinv} = (\hat{\beta} + \hat{\mu}RECcap)\left(w_{p75} - w_{p25}\right)\left(PAYinv_{p75} - PAYinv_{p25}\right)$; $\widehat{ddRECcap} = (\hat{\gamma} + \hat{\mu}PAYinv)\left(w_{p75} - w_{p25}\right)\left(RECcap_{p75} - RECcap_{p25}\right)$.

The second robustness test of the baseline findings concerns the time lag between labor productivity and the policy variables in the regressors of interest. We replicate the estimations in columns (3) and (4) of Table 2 using different time lags of 1, 3, 4, and 5 years. The results of this exercise are reported in Table 4 and reveal high robustness in both the magnitude and statistical significance of the baseline estimates. Within a 5-year time window, there is strong stability of the estimated relationships between labor productivity and international financial policies and between the two policy measures.

[21] These patterns are also confirmed across less demanding specifications including (i) models with no fixed effects; (ii) with country and year fixed effects (not interacted); (iii) with country, sector and year fixed effects (not interacted). Estimates from these models are available upon request.

[22] Another reason to prefer the specifications without country-sector fixed effects is that country-sector averages over time (used to demean country-sector-time observations in the specification with country-sector fixed effects) are computed differently depending on how many years a country-sector pair is observed in the data. As this is not a constant parameter in our sample it may be a source of measurement bias.

TABLE 4: DIFFERENT TIME LAGS

Dependent variable:	Labor Productivity (VA per worker) in \$k (Y_{ijt})							
Lag in number of years (n):	$n = 1$		$n = 3$		$n = 4$		$n = 5$	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$PAYinv_{i(t-n)} \times w_j$	1.934***	-5.482***	2.299***	-3.423**	2.145***	-2.925*	2.137***	-3.147*
	(0.727)	(1.549)	(0.754)	(1.628)	(0.774)	(1.679)	(0.826)	(1.759)
$RECcap_{i(t-n)} \times w_j$	8.399***	-2.713	8.529***	-0.00842	8.721***	1.146	9.105***	1.189
	(0.877)	(1.741)	(0.890)	(1.838)	(0.915)	(1.898)	(0.942)	(1.916)
$PAYinv_{i(t-n)} \times RECcap_{i(t-n)} \times w_j$		0.139***		0.108***		0.0955***		0.0998***
		(0.0245)		(0.0258)		(0.0264)		(0.0269)
log K/L ($x_{ij(t-n)}$)	7.500***	7.440***	6.976***	6.933***	6.730***	6.692***	6.425***	6.384***
	(0.372)	(0.371)	(0.385)	(0.383)	(0.393)	(0.392)	(0.406)	(0.405)
Observations	37450	37450	35109	35109	33863	33863	32661	32661
Adjusted R-squared	0.633	0.634	0.631	0.631	0.630	0.630	0.625	0.625
Country-Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector-Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Robust standard errors clustered at the country-time level reported in parentheses. Statistical significance: * p<0.1; ** p<0.05; *** p<0.01.

Taken together, the baseline estimates and the robustness tests presented in this section allow us to establish the following results: (i) openness to international financial transactions helps explain productivity premia for sectors that use (financial and business) services inputs more intensively; (ii) this is the case both for policy measures that affect imports of services via cross-border transactions, and for those policies that are relevant for services imports through commercial presence (FDI); (iii) these effects are strongly complementary, in the sense that policy openness for one type of international transactions works as above if and only if the policy environment for the other type of activity is open enough; and (iv) these patterns are stable over time within 5-year windows. This evidence confirms the hypothesized positive role of international financial openness on manufacturing productivity working through the impact on services trade and points to complementarity between different modes of services trade.

6. Heterogeneity across countries and time

We have established so far that international financial openness can positively affect manufacturing productivity by removing restrictions to services trade across different modes of provision. In particular, we have shown that the positive effect of removing restrictions to one mode of services trade is observed and maximized when the other mode of services trade is relatively unrestricted. In this section, we further characterize these patterns by exploring the behavior of the relationships of interest across different economic environments.

Heterogeneity at different levels of openness to international payments and transfers

We start by replicating our baseline exercises for different levels of international financial openness. To this end, we compute the sample median of both $PAYinv$ and $RECcap$ and define a "high restrictions" subset of the sample as those observations for which $PAYinv$ and $RECcap$ are smaller than or equal to their sample medians. The "low restrictions" subsample comprises observations where values of $PAYinv$ and $RECcap$ are greater than or equal to their respective sample medians. We replicate columns (3) and (4) of Table 2 for these two subsets of the data. Estimates are reported in Table 5. This exercise highlights how the strong complementarity found in the baseline analysis is driven by contexts where overall levels of restrictions are relatively low. When this is not the case, and the international financial transfers affecting services imports face high restrictions, liberalization is likely to have a positive impact on productivity premia for sectors with higher services input intensity.

We find that at all levels of policy restrictions the hypothesized mechanisms linking financial openness and manufacturing productivity is confirmed (column 1 and 3). However, the complementarity between the two modes is only active and particularly strong at low levels of policy restrictions. This suggests that within the context of the mechanisms under analysis here, i.e. the effect of international financial openness on manufacturing productivity through a trade-in-services channel, at low levels of policy barriers a positive productivity effect from further liberalization benefits from a coordinated effort spanning policies affecting different modes of services. Figure 4 provides a graphical illustration of the complementarity result at low levels of policy restrictions. Conversely, in policy environments where barriers are relatively high, lower financial restrictions for each specific mode of services trade does make a difference for manufacturing sectors' productivity, independently of the policy stance towards the other modes of services provision.

This exercise highlights how the strong complementarity found in the baseline analysis is driven by contexts where overall levels of restrictions are relatively low. When this is not the case, and international financial transfers affecting services imports face high restrictions, liberalization is likely to have a positive impact on productivity premia for sectors with higher services input intensity.

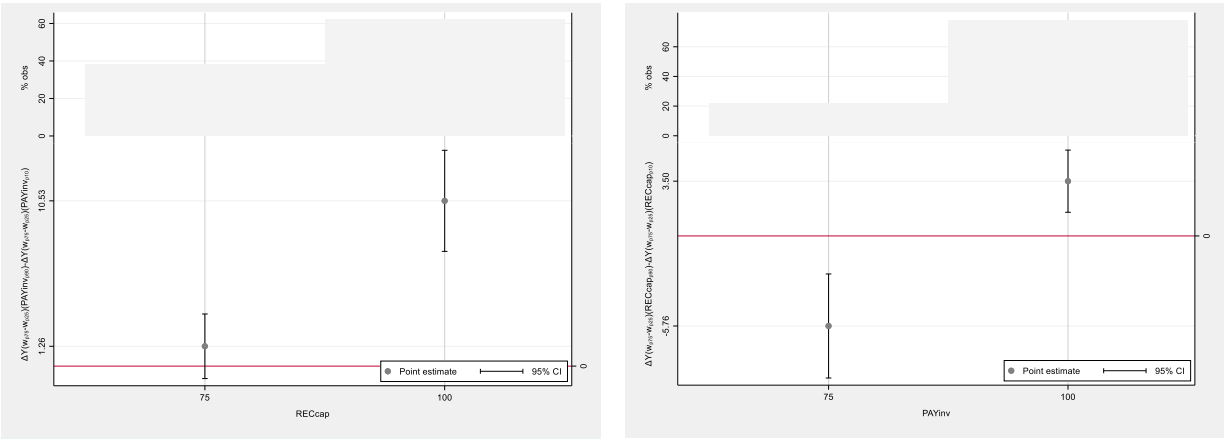
TABLE 5: HIGH AND LOW POLICY RESTRICTIONS ENVIRONMENTS

Dependent variable:	Labor Productivity (VA per worker) in US$ thousand (Y_{ijt})			
Subset:	Low policy restrictions		High policy restrictions	
	(1)	(2)	(3)	(4)
$PAYinv_{i(t-2)} \times w_j$	8.044***	-70.86***	2.829***	4.554*
	(2.983)	(20.71)	(0.878)	(2.409)
$RECcap_{i(t-2)} \times w_j$	6.282**	-89.62***	4.319***	6.239**
	(2.957)	(23.49)	(0.940)	(2.562)
$PAYinv_{i(t-2)} \times RECcap_{i(t-2)} \times w_j$		0.990***		-0.0354
		(0.249)		(0.0465)
log K/L ($x_{ij(t-2)}$)	9.655***	9.632***	4.383***	4.389***
	(0.646)	(0.645)	(0.416)	(0.416)
Observations	18721	18721	17882	17882
Adjusted R-squared	0.650	0.651	0.485	0.485
Country by Year FE	Yes	Yes	Yes	Yes
Sector by Year FE	Yes	Yes	Yes	Yes

Notes: Robust standard errors clustered at the country-time level are reported in parentheses. Statistical significance: * p<0.1; ** p<0.05; *** p<0.01.

FIGURE 4: COMPLEMENTARITY BETWEEN $PAYinv$ AND $RECcap$ WITH LOW POLICY RESTRICTIONS

Panel A: $ddPAYinv$ as function of $RECcap$ **Panel B**: $ddRECcap$ as function of $PAYinv$



Notes: The two panels plot estimates of $ddPAYinv$ as a function of $RECcap$ (Panel A) and of $ddRECcap$ as a function $PAYinv$ (Panel B). These estimates are computed using results reported in column (2) of Table 5 and the formulas: $\widehat{ddPAYinv} = (\hat{\beta} + \hat{\mu}RECcap)(w_{p75} - w_{p25})(PAYinv_{p75} - PAYinv_{p25})$; $\widehat{ddRECcap} = (\hat{\gamma} + \hat{\mu}PAYinv)(w_{p75} - w_{p25})(RECcap_{p75} - RECcap_{p25})$.

Financial crises and recessions

More liberal financial policy regimes might be associated with higher economic fragility during periods of systemic financial crises or recessions.[24] This raises the question whether the mechanisms identified in our baseline analysis operate during a banking crisis or economic recession. To evaluate this, we replicate the estimations in columns (3) and (4) of Table 2 for country-year observations characterized by a systemic financial crisis or an economic recession. For each country we identify systemic financial crisis periods using the database compiled by Laeven and Valencia (2018). This database covers all 94 countries in our estimation sample but two: Hong Kong and Malta. Among the remaining 92 countries, 55 experienced at least one systemic banking crisis. To capture episodes of economic recession we follow Alesina et al. (2024). Formally, we identify recessions if country-year observations satisfy the following condition:

$$F(z_{it}) \equiv \frac{e^{-\gamma z_{it}}}{1 + e^{-\gamma z_{it}}} > 0.8 \tag{10}$$

where z_{it} is a business cycle indicator equal to a three-year moving average of GDP growth, normalized to have zero mean and unit variance, and γ is a parameter set to be equal to 1.5, as calibrated by Auerbach and Gorodnichenko (2012) to reflect a 0.2 probability of an economy to be in a recession at any time.

For both systemic banking crises and economic recessions, Table 6 reports estimates obtained for crisis as well as non-crisis observations. Baseline results are fully confirmed for no-crisis periods (columns 3, 4, 7 and 8). Moving to columns 1 and 2, the estimates show that the role of both $PAYinv$ and $RECcap$ in explaining sectoral productivity differentials also is observed during periods of systemic banking crisis and may even be stronger in terms of estimated magnitudes. The positive effect on manufacturing productivity of financial openness through services trade is unaffected in economic environments characterized by banking crises. This can at least partially compensate for the potential negative economic effects of financial liberalization, which might materialize in crisis periods because of higher economic fragility (Bonfiglioli 2008; Bekaert et al. 2011). What fails to hold during systemic banking crises is the complementarity result. This is reflected in the negative sign and lack of statistical significance for the estimated coefficient of the triple interaction in column 2. This suggests that the role of one type of international financial policy is unaffected by the level of restrictiveness of the other. This result can be linked back to the previous discussion on the absence of complementarity between $PAYinv$ and $RECcap$ when the overall policy environment is relatively more restrictive. Indeed, there exists a negative relationship between the systemic banking crisis dummy and both $PAYinv$ and $RECcap$, which suggests that international payment restrictions are relatively higher after a crisis.[25] Crises tend to be followed by relatively more restricted policy environments where liberalization via increasing $PAYinv$ or $RECcap$ has a positive productivity effect independent of the value of the other policy measure.

[24] See, e.g., Bonfiglioli (2008), Ranciere et al. (2006), Kose et al. (2009) and Bekaert et al. (2011).

[25] We verify this relationship by regressing $PAYinv$ and $RECcap$ on a crisis dummy using a version of our estimation sample featuring only country-time variability. The two regressions include country fixed effects and year fixed effects in addition to a crisis dummy lagged by 1 year. The estimated coefficient for the lagged crisis dummy in both regressions is negative and statistically significant at the 5% level. Estimates are available upon request.

TABLE 6: SYSTEMIC BANKING CRISES AND RECESSIONS

Dependent variable:	Labor Productivity (VA per worker) in \$k (Y_{ijt})							
Type of crisis:	Systemic banking crisis				Recession			
Crisis at $(t-2)$:	Yes		No		Yes		No	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$PAYinv_{i(t-2)} \times w_j$	8.130**	10.23	2.177***	-5.841***	-1.762	-6.223	1.804**	-4.678***
	(3.551)	(8.630)	(0.762)	(1.618)	(3.748)	(8.471)	(0.851)	(1.652)
$RECcap_{i(t-2)} \times w_j$	8.672**	11.81	8.853***	-3.006*	4.793	0.0235	9.215***	-1.230
	(4.217)	(10.71)	(0.884)	(1.827)	(3.418)	(6.964)	(0.977)	(2.087)
$PAYinv_{i(t-2)} \times RECcap_{i(t-2)} \times w_j$		-0.0386		0.150***		0.0782		0.126***
		(0.151)		(0.0257)		(0.120)		(0.0276)
log K/L ($x_{ij(t-2)}$)	9.180***	9.191***	7.088***	7.023***	10.92***	10.91***	7.686***	7.621***
	(1.619)	(1.613)	(0.387)	(0.385)	(1.866)	(1.865)	(0.403)	(0.402)
Observations	2828	2828	32682	32682	2809	2809	31121	31121
Adjusted R-squared	0.693	0.693	0.631	0.632	0.636	0.636	0.632	0.633
Country by Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector by Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Robust standard errors clustered at the country-time level reported in parentheses. Statistical significance: * p<0.1; ** p<0.05; *** p<0.01.

Columns 5 and 6 of Table 6 reveal a partially similar pattern under economic recessions. As for systemic banking crises, complementarity between different types of reforms ceases to hold. However, the negative and not statistically significant estimated coefficient for $PAYinv_{i(t-2)} \times w_j$in column 5 suggests that the expected baseline effect of current account financial liberalization on manufacturing productivity is not observed during recessions. Note that this is a milder version of the results of the analysis of within country-sector variation presented in Table 3. We assess whether the role of crises can explain the negative and statistically significant coefficient for $PAYinv_{i(t-2)} \times w_j$ in column 3 of Table 3 and find that in periods characterized by the absence both systemic banking crises and recessions, the coefficient for $PAYinv_{i(t-2)} \times w_j$ in the same specification is no longer statistically significant.[26]

Heterogeneity across income levels

We next explore the heterogeneity of our results when varying the composition of the estimation sample in terms of countries' income groups as defined by the World Bank. More precisely, we replicate columns (3) and (4) of Table 2 on two subsamples: one composed of low and lower middle-income countries, and the other of higher-middle and high-income countries. To ensure that a country does not feature in more than one group over time, we map countries to income groups based on the mode of the income group each country was assigned to by the World Bank during the period 1989 to 2018 (there are no such assessments by the World Bank prior to 1989).

Table 7 reports the estimation results. These confirm the finding that international financial policy affects services trade provided through commercial presence across all different sample compositions, reflected in the positive and strongly significant estimated coefficient for $RECcap \times w$ in columns 1 and 3. The estimated coefficient on policy affecting cross-border services trade ($PAYinv \times w$) remains positive and statistically significant for higher-middle and high-income countries (column 3). However, it becomes negative and statistically significant when the estimation is conducted on low and lower-middle income countries (column 1). The variation introduced by higher middle and high-income countries seems to be necessary to get a positive and significant coefficient on the interaction term $PAYinv \times w$. This suggests a stronger impact of liberal policies toward payment for invisibles in countries with higher levels of economic development. This may capture the role of technology, connectivity, infrastructure networks, and institutional frameworks in supporting cross border trade to occur and thus responsiveness to more open international payment regimes.

We also find that the complementarity between the two types of international finance policies is not robust when considering only low and lower middle-income countries in the estimation sample. In that case, the estimated coefficient of the triple interaction $PAYinv \times RECcap \times w$ becomes negative and statistically significant (column 2). Thus, we observe a substitutability relationship between the two types of policies. These findings indicate that for countries with lower levels of economic development more liberal (open) policy stances towards payments associated with one mode of services provision explain productivity premia for sectors with higher services input intensity more when restrictions on the other mode are higher. This suggests that modal complementarity is more likely to be associated with the type of services imports conducted by higher middle and high income countries, which tend to not only have relatively larger volumes of services imports but also to import a greater variety of more complex business and professional services as compared to lower income countries (WTO, 2019).

[26] Estimation results available on request.

TABLE 7: HETEROGENEITY ACROSS INCOME LEVELS

Dependent variable:	Labor Productivity (VA per worker) in US$ thousand (Y_{ijt})			
Subset:	Low and lower middle income		Higher middle and high income	
	(1)	(2)	(3)	(4)
$PAYinv_{i(t-2)} \times w_j$	-3.289***	0.997	1.995**	-3.937*
	(1.017)	(1.990)	(0.990)	(2.115)
$RECcap_{i(t-2)} \times w_j$	1.699*	6.878***	8.378***	-1.695
	(0.987)	(2.295)	(1.214)	(2.601)
$PAYinv_{i(t-2)} \times RECcap_{i(t-2)} \times w_j$		-0.0800**		0.118***
		(0.0361)		(0.0346)
log K/L ($x_{ij(t-2)}$)	3.988***	4.015***	10.13***	10.09***
	(0.476)	(0.476)	(0.534)	(0.532)
Observations	10638	10638	25619	25619
Adjusted R-squared	0.433	0.434	0.660	0.660
Country by Year FE	Yes	Yes	Yes	Yes
Sector by Year FE	Yes	Yes	Yes	Yes

Notes: Robust standard errors clustered at the country-time level reported in parentheses. Statistical significance: * p<0.1; ** p<0.05; *** p<0.01.

A decomposition of our sample across time undertaken subsequently in this section is consistent with this potential explanation—suggestion that complementarity emerged in recent decades where trade of high-income countries increasingly comprised intra-industry exchanges and specialization organized in through global value chains, with lead firms engaging in large scale FDI.

Heterogeneity and quality of governance

One potential mechanism for the results in Table 7 arises from the close correlation between economic development levels and governance quality. As noted above, prior literature has shown that a nation's governance affects its international economic outcomes. Therefore, we explore heterogeneity by governance levels using either the International Country Risk Guide (ICRG) or the World Governance Indicators (WGI) to split the sample.[27] Each country is assigned to a low or a high governance state, depending on whether their average governance score is below or above the median of the distribution of governance in the database.

The estimates reported in Table 8 (governance) using the ICRG indicator show a very similar pattern to the results from Table 7 (levels of development). The estimates for high governance and high-income countries alike have identical signs and levels of statistical significance, with strong evidence of modal complementarity in both high-income and high-governance settings. In poorer governance settings, in contrast, the unconditional gains from liberalizing *RECcap* disappear (as measured by a loss of

[27] The ICRG data from the PRS group began in 1984, and the WDI data began in 1996. For each country, we take the average of each indicator from its start through 2018, the last year in our sample. For ICRG data, we use the quality of governance (qog) indicator. For WDI, we focus on government effectiveness. The WDI data are available for all 94 countries in our sample. For the ICRG, we have six fewer countries (Barbados, Hong Kong, Fiji, Georgia, Nepal, and Romania). Because of the longer time series, we report the ICRG results in Table 8 below.

statistical significance). Heretofore, liberalizing *RECcap* unconditionally has been associated with improved manufacturing productivity for sectors using services more intensely. High-quality governance is an enabler of productivity gains from liberalization, as evidenced by this.[28]

TABLE 8: HETEROGENEITY BY GOVERNANCE LEVELS

Dependent variable:	Labor Productivity (VA per worker) in US$ thousand (Y_{ijt})			
Subset:	Below average Governance		Above average Governance	
	(1)	(2)	(3)	(4)
$PAYinv_{i(t-2)} \times w_j$	-0.867	4.191**	2.660***	-6.280***
	(1.111)	(2.114)	(0.953)	(2.166)
$RECcap_{i(t-2)} \times w_j$	-0.292	6.943***	9.358***	-3.806*
	(1.083)	(2.540)	(1.241)	(2.268)
$PAYinv_{i(t-2)} \times RECcap_{i(t-2)} \times w_j$		-0.099***		0.163***
		0.035		0.033
log K/L ($x_{ij(t-2)}$)	5.157***	5.189***	9.427***	9.377***
	(0.555)	(0.556)	(0.490)	(0.487)
Observations	11289	11289	24965	24965
Adjusted R-squared	0.479	0.479	0.665	0.665
Country by Year FE	Yes	Yes	Yes	Yes
Sector by Year FE	Yes	Yes	Yes	Yes

Notes: Robust standard errors clustered at the country-time level are reported in parentheses. Statistical significance: * p<0.1; ** p<0.05; *** p<0.01.

Heterogeneity across time periods

In order to assess if support for our hypotheses is time dependent, we split the sample into two time periods – 1965-1989 and 1990-2018 – and replicate columns (3) and (4) of Table 2 for each sub-period. The last period comprises years sometimes characterized as spanning hyper-globalization (Rodrik, 2011) or globalization of factories, reflected in global value chains (Baldwin, 2016). Results are reported in Table 9. Estimation results show that our hypothesis regarding the role of international financial policy as an indirect determinant of productivity differentials across manufacturing sectors is confirmed in both sub periods, with stronger magnitudes found in the 1990-2018 period. We also find a clear distinction in terms of the relationship between $PAYinv$ and $RECcap$. The data reveal a substitution relationship between the two types of policies in the first part of the period and a strong complementarity in the more recent period.

This shift is consistent with the extensive literature analyzing the growth of global trade, pointing to the increasing complementarity of trade and FDI and the increasing share of intermediates and components

[28] Results using the WDI indicators are very similar and are available upon request. We also explore settings with either high quality governance but lower levels of development or higher levels of development but lower quality of governance. The estimates are more precise in the higher development/lower quality sample, and are similar to the results in Table 7, column 2 and Table 8, column 2.

in total trade, reflecting the increasing reliance on value chain specialization and associated fragmentation of global production. In the case of trade in services, this is reflected in a massive increase in inward FDI into major markets, much of which comprised services (UNCTAD, 2004; WTO, 2019), made possible by large scale reform of foreign investment-related policies, including removal of capital account restrictions. Research has shown that this cross-hauling of FDI is associated with a large increase in sales of services by foreign affiliates in host countries, and that the growth in GVCs has been accompanied by greater cross-border trade in services (including offshoring).[29]

TABLE 9: HETEROGENEITY ACROSS TIME PERIODS

Dependent variable:	Labor Productivity (VA per worker) (y_{ijt})			
Time period (t in):	1965-1989		1990-2018	
	(1)	(2)	(3)	(4)
$PAYinv_{i(t-2)} \times w_j$	1.781***	7.474***	2.550**	-11.47***
	(0.529)	(1.454)	(1.291)	(2.661)
$RECcap_{i(t-2)} \times w_j$	2.772***	10.46***	12.26***	-9.375***
	(0.691)	(1.881)	(1.309)	(3.140)
$PAYinv_{i(t-2)} \times RECcap_{i(t-2)} \times w_j$		-0.111***		0.252***
		(0.0236)		(0.0395)
log K/L ($x_{ij(t-2)}$)	3.507***	3.571***	9.291***	9.207***
	(0.375)	(0.375)	(0.541)	(0.539)
Observations	13655	13655	22608	22608
Adjusted R-squared	0.525	0.525	0.611	0.612
Country by Year FE	Yes	Yes	Yes	Yes
Sector by Year FE	Yes	Yes	Yes	Yes

Notes: Robust standard errors clustered at the country-time level are reported in parentheses. Statistical significance: * p<0.1; ** p<0.05; *** p<0.01.

These developments largely occurred in the post-1990 period. They provide an intuitive explanation for our findings regarding substitutability vs. complementarity across our proxies for services trade policies. Services imports were previously relatively less important overall and predominantly comprised transport and travel (tourism) related categories. In the more recent period, the volume of services trade expanded relative to trade in goods, and a much greater share of the total comprises non-transport and non-travel related activities[30]. Many of these services are differentiated intermediate products – business services, professional services, financial services, etc. Using available BoP data recently compiled by Loungani et al. (2017), Figure 5 plots the evolution of financial and business services exports relative to world exports of transport services. These data illustrate both the growth in cross-border trade in services during the second half of the time period considered (Panel A) and the change in the composition of services trade towards financial and other business services that occurred (Panel B).

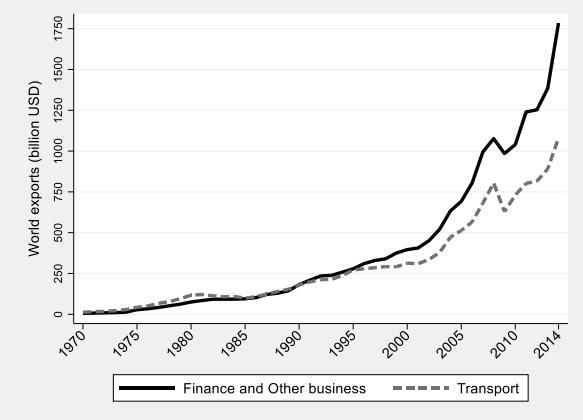
[29] See e.g., Miroudot at al. (2009) and the literature reviews in Francois and Hoekman (2010) and WTO (2019).

[30] These are classified as "other commercial services" in the balance of payments (BoP).

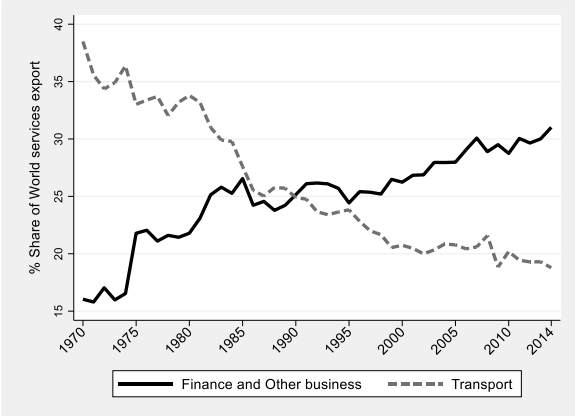
Complementarity emerges in environments where services trade volumes are greater relative to other products and manufacturing sectors use more differentiated and complex services. We leave analysis of the drivers of complementarity for future research and simply note here that our findings are consistent with the extensive literature documenting the complementarity between FDI and trade (e.g., Venables, 1999; Helpman et al. 2004; Oberhofer and Pfaffermayr, 2012). Our results suggest that this research finding, which is almost exclusively based on the analysis of trade in goods, also applies to trade in services.

FIGURE 5: EXPORT OF FINANCIAL AND OTHER BUSINESS SERVICES VS TRANSPORT SERVICES EXPORTS

Panel A: Levels



Panel B: Shares



7. Conclusion

Restrictive services trade and investment policies may impact the level of competition in services markets, and thus mark-ups and/or sectoral efficiency. This, in turn, can have negative implications for industries that depend on services. In this paper, we extend the existing empirical literature on the downstream productivity effects of services trade policies by using new time series measures of the restrictiveness of policies towards trade in services, focusing specifically on the role of services as inputs into the production of manufacturing sectors. We hypothesize that the performance of industries that rely more on services, i.e., with higher services input intensity, will be more adversely affected by restrictions on payments for imported services and inward investment.

Our baseline results support the hypothesis. Openness to international financial transactions can explain productivity premia for manufacturing activities that utilize producer services inputs more intensively, with a stronger and more robust effect observed from reducing restrictions on international payments associated with inward investment. This finding is consistent with the services trade literature, which finds that mode 3, or the establishment of a commercial presence in foreign markets (FDI), is a major mode of supplying services reflecting the characteristics of services that make them less amenable to cross-border trade. While technological changes are reducing the proximity constraint, FDI continues to account for a large share of trade in services (WTO, 2019).

We also find conditional evidence for complementarity between the two measures of cross-border payment restrictions, including in the period when cross-border trade was less feasible than it has become in more recent years. In cases where there are no restrictions on international financial transfers affecting mode 3 services trade, significant productivity effects are associated with liberalizing

international financial payments for invisibles (i.e., cross-border, arms-length services trade). Such complementarity, however, is subject to thresholds: policy openness for one type of international transactions has a positive impact only if the policy environment for the other type of activity is sufficiently open. When restrictions on capital inflows reach a certain level, an open regime for payments for invisibles no longer produces the expected positive differential effect on productivity across manufacturing sectors. Similarly, if restrictions on payments for invisibles are high, an open capital transfer regime has a diminished effect on productivity.

The complementarity finding is not observed for low and lower-middle-income countries, in instances where countries have high levels of restrictiveness towards international payments and transfers, and during the first two decades of our sample period. We also find no evidence for complementarity in settings of poor governance. The relationship also does not hold during crises. Thus, country contexts and characteristics matter, as does as the overall level of international economic integration and specialization.

Our findings suggest several areas for further research and data collection efforts. The longer time series data for the policy measures used in the analysis indicate that the effects of services trade policy in earlier periods might be very different from that observed since 2008, the period covered by the STRI datasets compiled by the OECD, WTO and World Bank. The differences in the relationship between services trade-related policies and manufacturing performance across time periods we find in our analysis points to the likely value of efforts to extend STRI datasets backwards in time in helping to improve our understanding of the effects of services trade policies on economic performance. An advantage of the services trade restrictiveness indicators relative to the policy measures used in this paper is that they differentiate across sectors, permitting analysis not only the relationship between policies affecting different modes of supply and but the interactions between services sectors. Another area for future research concerns the mechanisms of modal complementarity in services trade policy at the firm level.

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Annex

TABLE A1: COUNTRY COVERAGE

Geographic region	Income group (mode)	Country	First year	Last year
East Asia & Pacific	Low income	Myanmar	1991	2003
East Asia & Pacific	Low income	Vietnam	2000	2017
East Asia & Pacific	Lower middle income	China	1980	2018
East Asia & Pacific	Lower middle income	Fiji	1973	2007
East Asia & Pacific	Lower middle income	Indonesia	1972	2015
East Asia & Pacific	Lower middle income	Philippines	1965	2018
East Asia & Pacific	Lower middle income	Thailand	1991	2018
East Asia & Pacific	Upper middle income	Malaysia	1970	2017
East Asia & Pacific	High income	Australia	1965	2018
East Asia & Pacific	High income	Hong Kong SAR, China	1975	2018
East Asia & Pacific	High income	Japan	1965	2016
East Asia & Pacific	High income	Korea, Rep.	1965	2018
East Asia & Pacific	High income	New Zealand	1965	2018
East Asia & Pacific	High income	Singapore	1965	2018
Europe & Central Asia	Lower middle income	Albania	2002	2014
Europe & Central Asia	Lower middle income	Azerbaijan	2001	2014
Europe & Central Asia	Lower middle income	Bulgaria	1992	2009
Europe & Central Asia	Lower middle income	Georgia	2000	2014
Europe & Central Asia	Lower middle income	Ukraine	2014	2018
Europe & Central Asia	Upper middle income	Belarus	2013	2018
Europe & Central Asia	Upper middle income	Croatia	1994	2018
Europe & Central Asia	Upper middle income	Czech Republic	1997	2018
Europe & Central Asia	Upper middle income	Estonia	2003	2018
Europe & Central Asia	Upper middle income	Hungary	1983	2018
Europe & Central Asia	Upper middle income	Latvia	1995	2018
Europe & Central Asia	Upper middle income	Lithuania	2002	2018
Europe & Central Asia	Upper middle income	Poland	1987	2018
Europe & Central Asia	Upper middle income	Romania	1988	2018
Europe & Central Asia	Upper middle income	Slovak Republic	1995	2018
Europe & Central Asia	Upper middle income	Turkey	1965	2017
Europe & Central Asia	High income	Austria	1971	2018
Europe & Central Asia	High income	Belgium	1965	2018
Europe & Central Asia	High income	Cyprus	1973	2018
Europe & Central Asia	High income	Denmark	1969	2018
Europe & Central Asia	High income	Finland	1965	2018
Europe & Central Asia	High income	France	1965	2018
Europe & Central Asia	High income	Germany	2001	2018
Europe & Central Asia	High income	Greece	1965	2018
Europe & Central Asia	High income	Iceland	1992	2006
Europe & Central Asia	High income	Ireland	1965	2018
Europe & Central Asia	High income	Italy	1969	2018
Europe & Central Asia	High income	Luxembourg	1997	2018
Europe & Central Asia	High income	Netherlands	1965	2018
Europe & Central Asia	High income	Norway	1965	2018
Europe & Central Asia	High income	Portugal	1973	2018
Europe & Central Asia	High income	Slovenia	1994	2018

Europe & Central Asia	High income	Spain	1966	2018
Europe & Central Asia	High income	Sweden	1965	2018
Europe & Central Asia	High income	Switzerland	2011	2018
Europe & Central Asia	High income	United Kingdom	1970	2018
Latin America & Caribbean	Lower middle income	Bolivia	1972	2000
Latin America & Caribbean	Lower middle income	Colombia	1965	2007
Latin America & Caribbean	Lower middle income	Ecuador	1965	2014
Latin America & Caribbean	Lower middle income	El Salvador	1980	1998
Latin America & Caribbean	Lower middle income	Guatemala	1976	1988
Latin America & Caribbean	Lower middle income	Nicaragua	1982	1985
Latin America & Caribbean	Lower middle income	Peru	1984	1998
Latin America & Caribbean	Upper middle income	Barbados	1974	1997
Latin America & Caribbean	Upper middle income	Brazil	1992	2018
Latin America & Caribbean	Upper middle income	Chile	1965	2017
Latin America & Caribbean	Upper middle income	Costa Rica	1965	1982
Latin America & Caribbean	Upper middle income	Mexico	1986	2018
Latin America & Caribbean	Upper middle income	Panama	1965	2001
Latin America & Caribbean	Upper middle income	Trinidad and Tobago	1983	2003
Latin America & Caribbean	Upper middle income	Uruguay	1970	2016
Latin America & Caribbean	Upper middle income	Venezuela, RB	1976	1998
Middle East & North Africa	Lower middle income	Algeria	2013	2017
Middle East & North Africa	Lower middle income	Egypt, Arab Rep.	1969	2018
Middle East & North Africa	Lower middle income	Iran, Islamic Rep.	1965	2014
Middle East & North Africa	Lower middle income	Jordan	1976	2018
Middle East & North Africa	Lower middle income	Morocco	1987	2018
Middle East & North Africa	Lower middle income	Tunisia	1965	2017
Middle East & North Africa	Upper middle income	Libya	1966	1980
Middle East & North Africa	High income	Israel	1965	2018
Middle East & North Africa	High income	Malta	1970	2014
Middle East & North Africa	High income	Saudi Arabia	2012	2014
North America	High income	Canada	1965	1992
South Asia	Low income	Bangladesh	1983	1992
South Asia	Low income	India	1979	2018
South Asia	Low income	Nepal	1988	2008
South Asia	Low income	Pakistan	1967	1990
South Asia	Lower middle income	Sri Lanka	1981	2018
Sub-Saharan Africa	Low income	Ethiopia	1992	2014
Sub-Saharan Africa	Low income	Ghana	1965	2015
Sub-Saharan Africa	Low income	Kenya	1969	2000
Sub-Saharan Africa	Low income	Madagascar	2003	2006
Sub-Saharan Africa	Low income	Nigeria	1982	1996
Sub-Saharan Africa	Low income	Senegal	1976	2014
Sub-Saharan Africa	Low income	Tanzania	1967	2014
Sub-Saharan Africa	Low income	Uganda	1965	1971
Sub-Saharan Africa	Low income	Zambia	1970	1982
Sub-Saharan Africa	Lower middle income	Cameroon	1978	2002
Sub-Saharan Africa	Upper middle income	Gabon	1993	1995
Sub-Saharan Africa	Upper middle income	South Africa	1965	1974

Notes: This table lists the countries covered in the baseline estimation sample described in Section 4. For each country the table reports its geographic region, its income group assigned as the mode of its World Bank income group during the period from 1989 to 2018, the first and last year that the country is observed in the estimation sample. Countries are sorted by income group and geographic region.

TABLE A2: SECTOR COVERAGE

Sector	Frequency	Percent
Food products, beverages and tobacco	2,390	6.59
Textiles, textile products, leather and footwear	2,508	6.92
Wood and products of wood and cork	2,434	6.71
Pulp, paper, paper products, printing and publishing	2,497	6.89
Coke, refined petroleum products and nuclear fuel	1,602	4.42
Chemicals and chemical products	2,404	6.63
Rubber and plastics products	2,334	6.44
Other non-metallic mineral products	2,471	6.81
Basic metals	2,298	6.34
Fabricated metal products except machinery and equipment	2,414	6.66
Machinery and equipment n.e.c	2,285	6.3
Office, accounting and computing machinery	874	2.41
Electrical machinery and apparatus n.e.c	2,220	6.12
Radio, television and communication equipment	471	1.3
Medical, precision and optical instruments	1,498	4.13
Motor vehicles, trailers and semi-trailers	2,296	6.33
Other transport equipment	918	2.53
Manufacturing n.e.c; recycling	2,349	6.48

Notes: This table lists the 18 sectors covered in the analysis. For each sector the table reports the number of observations in the estimation sample (frequency) and the percentage share (percent).