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Working Paper

Business services outsourcing and economic growth: Evidence from a dynamic panel data approach

Jena Economic Research Papers, No. 2012,049

Provided in Cooperation with:
Max Planck Institute of Economics

Suggested Citation: Dettmer, Bianka (2012) : Business services outsourcing and economic growth: Evidence from a dynamic panel data approach, Jena Economic Research Papers, No. 2012,049, Friedrich Schiller University Jena and Max Planck Institute of Economics, Jena

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JENA ECONOMIC RESEARCH PAPERS



2012 – 049

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www.jenecon.de

ISSN 1864-7057

The JENA ECONOMIC RESEARCH PAPERS is a joint publication of the Friedrich Schiller University and the Max Planck Institute of Economics, Jena, Germany. For editorial correspondence please contact markus.pasche@uni-jena.de.

Impressum:

Friedrich Schiller University Jena
Carl-Zeiss-Str. 3
D-07743 Jena
www.uni-jena.de

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**Business services outsourcing and economic growth:
Evidence from a dynamic panel data approach**

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August 2012

Abstract

Innovations in information- and telecommunication technology render the proximity requirement between business partners obsolete and make business service outsourcing via cross-border trade more feasible. Although the (service-led) growth prospects have been widely discussed, evidence at the country level is scarce. In this paper, we evaluate the effect of openness to trade commercial- and specialized business services on long-run growth by applying a dynamic panel data approach to account for unobserved country specific effects and endogenous growth determinants. The system GMM estimates validate that a long-run growth effect for countries taking part in the outsourcing process of producer services exists. The growth effect is significantly stronger in a sample of Non-OECD countries and suggests a kind of catching-up process. Evidence from two stage least square indicate that the impact of professional service regulation on long-run growth work rather indirectly through trade flows.

Keywords: international trade, business services, growth, system GMM

JEL: F12, F15, L84, O41

1 Introduction

Innovations in information- and telecommunication technology (ICT) render the proximity requirement between business partners obsolete and make producer service outsourcing more feasible. As these business services are mainly intermediate inputs, the theoretical and empirical research focuses on productivity enhancing effects in the manufacturing industry. On the one hand, firm-level evidence suggests that manufacturing firms have a better performance when foreign service providers deliver high quality and low cost services to the production chain (Arnold et al. 2008, 2011, 2012). Industry-level evidence, on the other hand, finds that not all manufacturing industries benefit in the same way (Francois and Woerz 2008) and suggest that the effect of opening up the producer service sector to foreign competition and, thus, the growth potential depend on the country's industry structure.

* The paper has benefited a lot from further suggestions by Andreas Freytag, Christoph Vietze, and Sebastian Voll. Excellent research assistance by Robert Bowen is acknowledged.

Although the service-led growth prospects have been widely discussed for developing countries - especially for India - the evidence at the country level is very scarce. Most of the previous work has analysed the traditional backbone services (e.g. telecommunication, transport, financial, and energy services) which have been characterised by a monopoly structure and, now, researchers aim at appropriately measuring the countries' service sector openness to derive its growth potential for the economy (e.g. Mattoo, Rathindran, and Subramanian 2006; Eschenbach and Hoekman 2006). Some of the regulatory indicators, for example those based on the countries' commitments under GATS or the OECD indicators for product market regulation, have been criticized of overstating the level of barriers so that markets appear to be more restrictively regulated than they really are (Barth et al. 2006; Pelkmans 2010).

The scarce availability of indicators on non-tariff trade barriers in services, for either a limited number of developed countries or only a few points in time, constrain the empirical evidence on the growth effect to cross-section estimates rather than panel data models and, thus, makes it difficult to evaluate the growth potential of service outsourcing to developing countries as well as to account for endogeneity and reverse causality in the trade-growth-nexus. Even more surprising is that the growth potential of specialized business services (e.g. leasing, legal, accounting, auditing, and consulting services) where international trade has long been restrained for technical reasons and which have become tradable in the last decade, receive limited attention.

This is the focus of the present paper. We aim to evaluate the growth potential of professional service outsourcing. In contrast to previous studies, our two stage least square estimates suggest rather an indirect impact of trade restrictions on long-run growth working through trade flows. We further apply a dynamic panel data approach – the system generalized method of moments (GMM) proposed by Blundell and Bond (1998) – which has the advantage of accounting for unobserved country-specific effects and the endogeneity of growth determinants by first differencing the data and using lagged levels and differences as instruments.

The paper is structured as follows: In the next section we review the theoretical and empirical literature on the role of producer and specialized business services in the production process and discuss implications for the aggregate growth rate of per capita income. Section 3 explains the econometric methodology and data sources used. The empirical evidence is presented in section 4. The last section concludes the paper.

2 Literature Review

In economic theory growth is considered as a function of rising quantity and productivity of capital and labour inputs. In this context, the growth potential of services contrasts with the longstanding debate on deindustrialisation. From a closed economy perspective Baumol (1967) shows in a two sector growth model that a shift from manufacturing towards services employment in the economy depresses the rate of economic growth because non-tradable "stagnant" services are less productive and the price of those services will rise relative to other sectors. While this argument is becoming known as "cost disease" hypothesis Pugno (2006) argues that many of those "stagnant" household services (education, health and cultural services) contribute to human capital formation and thus enhance productivity and economic growth.

The early endogenous growth theory pioneered by Lucas (1988), Romer (1990), and Aghion and Howitt (1992) only implicitly recognizes the role of services by considering human capital ('maintained' and 'updated' by health- and education services) as an important input for production (and R&D) generating productivity growth. Hoekman (2006) argues that services are very heterogeneous and have a diversity of influences on economic growth: for example, a high quality and low cost communications network can generate economic gains as it presents a transport channel for information services and digitized products. Transport services determine the cost of shipping goods within and between countries. Retail and distribution services link producer supply and consumer demand and can influence the competitiveness of producers in local and international markets. Specialized business services (accounting, consulting, and legal services) reduce transaction costs related to the enforcement of contracts and present a channel through which process innovations are transmitted. Bhagwati (1984) argues that the services-from-goods splintering process is a consequence of specialisation of firms which emerges due to economies of scale and technical change in communication networks. Accordingly, service activities are taken out from intra-firm transactions and become part of inter-firm transactions, and thus, the share of service industries in production and GDP is growing. Moreover, the services-from-goods processes tend to create rather progressive services industries, whereas the goods-from-services processes create technically stagnant and highly labour intensive services industries. Oulton's (2001) theoretical model emphasizes that a rise in service employment increases economic growth when services are inputs into manufacturing production and have a higher rate of productivity growth.¹ Based on these productivity enhancing effects in the manufacturing sector, services outsourcing contributes not only directly but also indirectly to economic

¹ Sasaki (2007) provides a model that includes both services for intermediate input and for final consumption and he concludes that economic growth and manufacturing employment will decline in the long run because it is assumed that the productivity growth in both services are lower than in manufacturing.

growth because it will enable the manufacturing industry to receive better service quality and produce at lower costs.

With respect to the increasing use of services as an intermediate input, the interaction between manufacturing and services industries takes on various forms. Antràs and Helpman (2004) distinguish between four main categories depending on the countries which are involved (domestic or international sourcing) and the organisational form of the firm (domestic or international production). Thus, service outsourcing can occur towards external service providers either within the economy or towards foreign countries. Francois (1990a,b) and Rivera-Batiz and Rivera-Batiz (1990) provide theoretical models and argue that the growth of producer services within the economy is an important determinant of economic development because it allows more specialization.

The link between international outsourcing and economic growth builds upon two strands of literature: trade theory and growth theory. Trade theory determines the distribution of welfare across countries based upon comparative advantage which leads to a reallocation of resources within the economy and generates efficiency gains (allocative efficiency) or monopolistic competition and economies of scale (productive efficiency) with the consequence that consumers profit from the availability of a variety of products. A range of papers have investigated the consequences of including services in international trade theory. Either the models incorporate a producer services sector which provides intermediate input into manufacturing of final goods but is otherwise non-tradable, or models formalize the gains from opening up the services sector to international trade.² For example, Jones and Kierzkowski (1990) argue that developing countries can benefit from liberalizing trade in services, as fragmented production blocks can be increasingly located in those countries because producer services allow for coordination of the value added chain.

Although there is a consensus among trade economists stating a positive relationship between international trade (in services) and economic growth, the relationship is far from simple when development economists distinguish between *level*- and *growth* effects of trade policies. In the neoclassical growth model trade and other policies will rather affect the equilibrium *level* of aggregate output, but not its *growth rate*.³ With recent

² Theoretical models deal with producer services as a tradable or non-tradable intermediate input produced with constant returns to scale in either a Ricardo-Viner-type model (e.g. Jones and Ruane 1990; Van Long, Riezman and Soubeyran 2005) or in a Heckscher-Ohlin type model (e.g. Hirsch 1989; Melvin 1989; Djajic and Kierzkowski 1989; Burgess 1990). Models which consider increasing returns to scale in the service production include Markusen 1989; Francois 1990a; Ishikawa 1992; and Van Marrewijk et al. 1997.

³ Tariff cuts can lead to a level effect increasing income in a certain period but not in the following periods. The question is whether trade policy changes lead to temporary or permanent effects on income. Trade economists argue that international competition increases firms' incentives to invest in R&D which leads to technological progress (dynamic efficiency) and, thus, suggests permanent effects. Edwards (1993) surveys the early literature on trade and growth. Lopéz (2005) provides a more recent review.

contributions to the endogenous growth literature, the framework for trade policy and growth has been modified. From an open economy perspective growth theorists emphasize that technological change can be influenced by a country's openness to trade (Romer 1989, 1990; Grossman and Helpman 1990, 1991; Rivera-Batiz and Romer 1991). The models allow a distinction between a *level* effect and *growth* effect. While some models imply that trade restrictions can slow down the rate of growth, others provide arguments for small restrictions on trade that can increase the rate of growth.⁴

Rivera-Batiz and Rivera-Batiz (1992) theoretically formalize the benefits from the liberalization of business service trade which leads to more investments into the business sector and raises productivity of sectors and firms that use these services. Moreover, they argue that the crucial factor is the existence of distortions and externalities in service sectors rather than the linkages between services and manufacturing. The welfare effect from capital inflows is larger when the services sector of the economy is characterized by monopolistic competition. Moreover, a range of computational general equilibrium models suggest that services liberalization leads to larger gains in GDP compared to manufacturing liberalization.⁵

From the empirical perspective, a part of literature at the micro-level analyses the (intra-industrial) spillover effects of FDI on domestic firms in the same industry and finds that entry of foreign owned firms results in knowledge transfer (see Görg and Strobl (2001) for a review of the literature). A related part of the literature rather argues that foreign investors have an incentive to prevent knowledge leakage to their competitors but encourage transfer of information towards upstream and/or downstream industry (e.g. to local suppliers). Empirical work finds a positive relationship between FDI and productivity in upstream industries, e.g. Javorcik (2004) for Lithuania, Blalock and Gertler (2007) for Indonesia (see Görg and Greenaway (2004) for a review of the literature). Given that producer services are mainly inputs into the manufacturing production, the recent literature investigates the productivity effects of international sourcing of services and finds a positive impact of the presence of foreign service providers on performance of

⁴ Grossman and Helpman (1990) study the link between trade intervention and long-run growth in a two-country model with comparative advantage (cross-country differences in efficiency of R&D and manufacturing). Rivera-Batiz and Romer (1991) develop a growth model for trade between identical countries (endowments and technologies) and highlight that importing new product varieties contributes to long-run growth.

⁵ Markusen, Rutherford and Tarr (2005) show GDP gains arising from service liberalization of a hypothetical country whose final goods producers profit from specialized expertise. Markusen (2011) provides more insights by distinguishing services by their skill-intensity. Nordas (2010) analyse the interrelation between intermediate goods and services. CGE-applications for developed countries (e.g. the EU) include Gerlauff and Lejour (2006); De Bruijn, Kox and Lejour (2008); Copenhagen Economics (2005); Bajo-Rubio and Gomez-Plana (2005); and O'Toole (2005). CGE-applications for less developed and transition countries include Jensen and Tarr (2008, 2010, and 2012) for Kazakhstan, Tanzania and Armenia, Rutherford and Tarr (2010) for Russia, Jensen, Rutherford and Tarr (2006, 2007, 2010) for Russia and Tanzania, Konan and Maskus (2006) for Tunisia, and Balistreri, Rutherford and Tarr (2009) for Kenya.

domestic firms.⁶ The results of these studies validate that an improved quality and availability of services inputs leads to productivity gains in manufacturing industries.

Empirical work at the industry-level provides mixed results with respect to the manufacturing industry. Amiti and Wei (2009) evaluate the effect of services and material outsourcing on (labour) productivity in the US industry. They find even stronger effects for service- than for intermediate goods offshoring (as a share of imported inputs) and argue that offshoring of service inputs is a new possibility for firms to restructure the production process while productivity benefits from intermediates offshoring have been exploited so far. Francois and Woerz (2008) extend the analysis to OECD countries and find that imported business services promote the performance of technology-intensive industries (export, value added and employment) while labour-intensive industries experience a decreasing competitiveness (in terms of value added and exports). Blyde and Sinyavskaya (2007) use a large panel data sample and evaluate the effect of trade in various services on the export performance in different industries. They find similar results and argue that by facilitating trade in goods the liberalization of services yields gains that are larger than the benefits to the services sector alone. In contrast to Francois and Woerz (2008), Barone and Cingano (2011) find that the impact of service regulations on the economy is associated with the service dependence of the manufacturing sector. They conclude that low service regulation - especially regulation on professional services and energy - increases the performance (value added, productivity and export) in service-intensive industries in OECD countries. In sum, these studies suggest that the indirect effect of open services sectors on the growth potential depend on a country's industry structure. At the country level, Wölf (2005) and Nordas (2008) point out that services - especially business related services - are increasingly involved in the production as an intermediate input. Francois and Reinert (1996) show that the relative importance of services incorporated in manufacturing export increases as countries become richer.

The empirical research on the direct link between services trade and economic growth at the country level is rather scarce. Most studies concentrate on traditional backbone service (transport, telecommunication, financial- and energy service) characterized by (former) monopolies and analyse the effect of privatization based on Baumols (1981)

⁶ The empirical work includes Arnold, Javorcik and Mattoo (2011) for Czech Republic; Arnold, Mattoo and Narcisco (2008) for sub-Saharan Africa; Arnold, Javorcik, Lipscomb and Mattoo (2012) for India; Fernandes (2007) and Tarr (2012) for European transition countries; Fernandes and Paunov (2012) for Chile; Fernandes and Mattoo (2009) for Mozambique, Görg and Hanley (2011), Görg, Hanley and Strobl (2008); Debaere, Görg and Raff (2010) for Ireland; Javorcik and Li (2008) for Romania, and Markusen and Trofimenko (2009) for Colombia.

contestable markets hypothesis.⁷ For example, Mattoo, Rathindran and Subramanian (2006) construct openness indicators for financial- and telecommunication sectors in roughly 60 countries based on their commitments under GATS and perform a cross-section analysis which shows that a country's openness in those service sectors has a positive impact on the average growth rate. Eschenbach and Hoekman (2006) evaluate the liberalization progress (in financial, infrastructure and telecommunication services) based on indicators from the European Bank for Reconstruction and Development. They find a significant relationship between services policy reforms and economic performance in a panel consisting of 24 transition economies in the period from 1990 to 2004. El Khoury and Savvides (2006) incorporate the openness indicators developed by Mattoo et al. (2006) in a threshold regression model with 60 countries and find that the growth effect of open service sectors depends on the country's level of development. The increasing investment into telecommunication services (which is associated with opening-up the market), for example, is successful in boosting productivity, but strongly related to the availability of physical capital.⁸ Accordingly, low developed countries profit more from open telecommunication services than from financial services because the provision needs a higher share of physical- rather than human capital which is less available.

The argumentations by Mishra, Lundstrom and Anand (2011) and Lundstrom and Mishra (2011) on service export sophistication tend to go in a similar direction. Their analysis is based on an index developed by Hausmann, Hwang and Rodrik (2007) which considers (the quality of) a country's export basket rather than trade barriers that countries face when exporting. The growth performance of countries is better when exporting a set of goods and services that are placed high in the quality spectrum. The gains from exporting, conversely, depend on the ability of a country to position themselves appropriately along the quality spectrum. Of course, the ability of a country to export goods and services depends on the availability of respective production factors within the country. The export sophistication story is to some extent related to the export-led growth hypothesis which becomes recently widened to the services-led growth hypothesis (Ghani 2010).⁹

⁷ For liberalization of telecommunication service see Röller and Waverman (2001), Fink, Mattoo and Rathindran (2003), Wallsten (2001), Ros (1999) and Li and Xu (2000). For liberalization of financial services see Goldsmith (1969), King and Levine (1993), Levine (1997), Francois and Schuhknecht (1999) and Bayraktar and Wang (2006). Beck (2002) examines the link between financial development and a country's comparative advantage in manufacturing sectors which rely on external finance. Hoekman and Mattoo (2008) provide a review.

⁸ Papageorgiou (2002) estimate the impact of trade openness on growth based on a threshold regression model which suggests the presence of multiple equilibria for (high growth and low growth) middle-income countries.

⁹ There are some nontrivial reasons why higher GDP growth could, in principle, result in faster growth of exports. Time series evidence has shown that reverse causality exists, going from GDP growth to exports growth (Rao and Rao 2009; Singh 2011; Din et al. 2003). Giles and Williams (2000a,b) survey the literature on merchandise trade. Bangake and Eggoh (2011) evaluate the financial service-growth-nexus on a larger set of countries with panel vector-autoregressive models.

In contrast to the export-led growth hypothesis, Li, Greenaway and Hine (2005) focus on the gains from importing business services (and the productivity enhancing effects) and find a significant positive impact on developed countries economic growth while the developing countries' growth rate suffers from services imports. In the light of this scarce country-level evidence which rather suggests that countries should concentrate on deregulating specific services sectors our paper aims at reassessing the arguments and providing consistent estimates on the long-run growth effect of open commercial- and business service sectors.

3 Econometric Investigation

In this section we describe briefly the econometric challenge in estimating a dynamic growth equation with a lagged dependent variable, unobserved country specific effects and endogenous growth determinants. While it is shown that in a dynamic panel data model OLS and fixed effects estimator result in biased estimates, the difference- and system generalized method of moments (GMM) estimation proposed by Arellano and Bond (1991), Arellano and Bover (1995) and Blundell and Bond (1998) yield consistent and efficient estimates.

3.1 Econometric Methodology

The dynamic growth equation builds upon the Solow growth model which is traditionally developed for a closed economy growing at the rate of exogenous technological progress equal to all countries. Recent empirical growth studies have tried to go beyond the original cross-section regressions and, instead, emphasize on identifying those factors that explain international differences in the level of technology. Relative to the theoretical neoclassical growth model these exercises can be interpreted as parameterizing the level of technology. Approximating the level of technology with measurable inputs is becoming known as the "augmented" cross-section approach (Durlauf and Quah 1999).¹⁰ Following Baltagi (2008:147), the empirical growth model for panel data can be written in the following form

$$y_{i,t} - y_{i,t-1} = \beta_0 + \beta_1 y_{i,t-1} + \beta_2 x_{i,t} + \varepsilon_{i,t} \quad (1)$$

or equivalently,

$$y_{i,t} = \beta_0 + (1 + \beta_1) y_{i,t-1} + \beta_2 x_{i,t} + \varepsilon_{i,t} \quad (2)$$

¹⁰ The paper by Bond, Hoeffler and Temple (2001) is one of a few studies re-estimating growth models with GMM to account for endogeneity. See also Caselli, Esquivel and Lefort (1996) and Hoeffler (2002) for GMM applied to the Solow closed economy model and Söderbom and Teal (2003) for augmenting the Solow model with total trade openness.

where the dependent variable $(y_{i,t} - y_{i,t-1})$ represents the growth rate over a series of five or three year periods which is regressed on the level of per capita income at the beginning of each period $(y_{i,t-1})$ and a vector of growth determinants contained in $x_{i,t}$ (either as an average of each five year period or the level at the beginning of each period). In empirical applications of the Solow model these include the log of investment rate, the log of population growth rate plus the exogenous rate of technical change and the depreciation rate. In the augmented version of the Solow model the set of variables is extended and includes measures for human capital and trade openness (or policy) variables. However, compared to the cross-section specification of growth models which use an average growth rate of up to 30 years, the dynamic panel model allows accounting for unobserved country specific effects.

Moreover, due to the presence of a lagged dependent variable among the regressors, it is assumed that $\varepsilon_{i,t}$ follows a one-way error component model with $\varepsilon_{i,t} = \gamma_i + v_{i,t}$ where $\gamma_i \sim IID(0, \sigma_\gamma^2)$ and $v_{i,t} \sim IID(0, \sigma_v^2)$ independent of each other and among themselves (Baltagi 2008:147). Estimating equation (2) requires considering two sources of persistence over time: autocorrelation as a consequence of the inclusion of a lagged dependent variable (past shocks have an impact on current outcomes) and heterogeneity among countries due to unobserved country specific effects (γ_i). However, omitting country specific effects and performing OLS will upward bias the coefficients because the lagged dependent variable $y_{i,t-1}$ is correlated with the unobserved country specific effects included in the error term even if $v_{i,t}$ are serially uncorrelated (Hsiao, 1986). Although the fixed effects (within) estimator as an alternative to OLS wipes out the country specific effects by demeaning all variables over time, the demeaned lagged dependent variable $(y_{i,t-1} - \bar{y}_{i,-1})$ with $\bar{y}_{i,-1} = \sum_{t=2}^T y_{i,t-1} / (T-1)$ is still correlated with the demeaned error term $(v_{i,t} - \bar{v}_{i,-1})$ by construction (Nickell 1981). Thus, estimating the fixed effects model with a lagged dependent variable provides rather downward biased and inconsistent estimates in short panels (small T and large N). While the OLS estimates are considered as an upper bound on the coefficient, the fixed effects estimates are regarded as a lower bound (Hoeffler 2002; Bond, Hoeffler and Temple 2001). However, in macro-panels (e.g. evaluating long-run growth) when T is not small relative to N the fixed effects estimator becomes consistent with T going to infinity but is still biased. First difference (FD) estimation is an alternative to the fixed effects estimator as it removes country specific effects. Anderson and Hsiao (1982) propose first differencing the data

$$\Delta y_{i,t} = (1 + \beta_1) \Delta y_{i,t-1} + \beta_2 \Delta x_{i,t} + \Delta v_{i,t} \quad (3)$$

or equivalently,

$$(y_{i,t} - y_{i,t-1}) = (1 + \beta_1)(y_{i,t-1} - y_{i,t-2}) + \beta_2(x_{i,t} - x_{i,t-1}) + (v_{i,t} - v_{i,t-1}) \quad (4)$$

and in addition using the lagged levels of $y_{i,t-1}$ as instruments for the first-differenced equation. As long as the error term $v_{i,t}$ is independent across countries and not serially correlated, $E(v_{i,t}, v_{i,s}) = 0$ for $s \neq t$, lagged levels are valid instruments because they are not correlated with the first differences of the error term, $E(y_{i,t}, \Delta v_{i,t}) = 0$ if $t \geq 2$ (i.e. shocks to GDP in one period in time is not correlated with the initial per capita income at this time). The instrument variables (IV) estimation builds upon internal instruments and leads to consistent estimates.

Arellano and Bond (1991) perform one step further and suggest a generalized method of moment (GMM) estimation that is proposed to be more efficient than the Anderson and Hsiao (1982) estimator because it uses not only the first lag but also all following lags as valid instruments. Thus, the matrix of valid instruments W_i becomes larger and the moment conditions require that the set of instruments is not correlated with the error term, $E[W_i \Delta v_i] = 0$. The resulting GLS estimation yields the one-step estimator, while Arellano and Bond (1991) show that the two-step estimator which replaces the differenced residuals by the estimated differenced residuals from the first step is more efficient when asymptotic properties in building the weighting matrix are given.

In addition to a lagged dependent variable the growth model includes determinants, $x_{i,t}$ (e.g. investment, population growth, human capital, and openness to trade), for which under the assumption of strict exogeneity, $E[x_{i,t}, v_{i,s}] = 0$, all past, present and future levels are valid instruments for the first-differenced equation. As some of the regressors can be considered as endogenous (i.e. past shocks to GDP are correlated with current trade volumes via the error term), all lagged levels can be used to build valid instruments for the first-differenced equation. However, Blundell and Bond (1998) show that the difference GMM estimator has poor finite sample properties when the lagged levels present weak instruments for future changes. This is the case when the autoregressive parameter of the series approaches unity (i.e. the series is highly persistent or close to a random walk process so that past shocks have permanent effects), because the lagged levels are weakly correlated with subsequent first differences of the endogenous variable.

For highly persistent series Blundell and Bond (1998) develop the system GMM estimator outlined in Arellano and Bover (1995) which forms a two-equation system consisting of the first-differenced equation in (4) and the original level equation in (2). Thus, in

addition to the lagged levels in the difference GMM estimator, the first differences of the variables, $\Delta x_{i,t}$, can be used as instruments in the level equation as long as $x_{i,t}$ is strictly exogenous and the first differences of the regressors are uncorrelated with the unobserved country specific effects, $E(\Delta x_{i,t} \gamma_i) = 0$. For endogenous variables the lagged difference of the series ($\Delta x_{i,t-1}$) presents valid instruments. The new instruments proposed by Blundell and Bond (1998) are more relevant when the series follow a random walk because lagged first differences may be more predictive of current levels than lagged levels for current first differences (Roodman 2009). However, Blundell and Bond (2000) further test the robustness of the difference GMM in a production function approach in which data series are rather persistent (with no unit root). They find that the difference GMM estimator is downward biased towards the fixed effects (within) estimator which is consistent with the finite sample bias found in their earlier paper (Blundell and Bond 1998). Bond, Hoeffler and Temple (2001) develop and test this argument in a dynamic growth model.

According to Roodman (2009:97), a crucial assumption for the GMM estimation is the validity of instruments used. The validity of the instruments in the difference GMM and the system GMM can be tested with the Sargan test of overidentifying restrictions.¹¹ Moreover, the Sargan test is inconsistent when accounting for heteroskedastic error terms in the estimation.¹² The Hansen test is a theoretically superior overidentification test to the Sargan test. Moreover, the Hansen test statistic is also used to test the validity of a subset of an instrument. Since the moment conditions used in the difference GMM are a strict subset of those in system GMM, a difference-in-Hansen test checks for the validity of additional instruments used by the system GMM.¹³ In addition, Arellano and Bond (1991) develop a test for autocorrelation in the disturbances which render some lags of a variable invalid as an instrument.¹⁴ Accordingly, the Arellano and Bond (1991) test should reject the null of no first-order autocorrelation but not reject the null of no second order autocorrelation.

¹¹ Under the null of joint validity the vector of moment conditions (valid instruments indicate that the model is exactly identified) is randomly distributed around zero.

¹² Heteroskedastic error terms is accounted for by using Windmeijer (2005) corrected standard errors. Windmeijer (2005) proposes small-sample correction for two-step standard errors which tend to be biased due to the re-weighting of empirical moments based on estimated standard errors from the one-step estimate (compare Roodman 2009:95). According to Windmeijer (2005), two-step GMM with corrected standard errors performs better than the one-step GMM in estimating unbiased coefficients.

¹³ Accordingly, the difference-in-Hansen test statistic builds upon the estimates of a model with (restricted) and without (unrestricted) subsets of instruments. Under the null of joint validity the test statistic is calculated as the difference in the two reported Hansen statistics which are asymptotically chi(2) distributed.

¹⁴ The difference and system GMM are designed to eliminate unobserved country specific effects which are contained in the disturbances, and thus, the error term is presumed to be autocorrelated of order one but not of order two.

In summary, the GMM approach proposed by Arellano and Bond (1991) and further developed by Arellano and Bover (1995) and Blundell and Bond (1998) has the advantage to cope with the Nickell (1981) bias by first differencing the data (to remove the unobserved country specific effects) and by instrumenting the lagged dependent variable with their lagged levels. In addition, the GMM approach is able to account for endogenous right hand side variables by using lagged levels and first differences as instruments.

Our estimation strategy is as follows: We first run OLS (model M1), perform fixed effects (within) (M2) and first difference estimator (M3) and test for heteroskedasticity, autocorrelation and panel unit root. We account for autocorrelation and heteroskedasticity by computing panel-corrected standard errors (Prais-Winsten transformation). We specify the model with a first-order autocorrelation process which is common to all countries (M4A) and check for robustness by allowing panel-specific autocorrelation (M4B). We further perform difference GMM and system GMM which allows to get rid of the unobserved country specific effects and the endogeneity of independent variables by considering four model specifications. The first GMM model (M5) uses instruments only for the lagged dependent variable while all explanatory variables are considered as exogenous. The following model specifications subsequently enhance the instrument set while the lagged dependent variable is instrumented throughout. Thus, the investment share is treated endogenous in the second GMM model (M6) while human capital and openness to commercial- and business service trade is considered endogenous in the third GMM model (M7). In the fourth GMM model (M8) all explanatory variables except the population growth rate are instrumented by their lagged levels in the first differenced equation (and subsequent first differences in the level equation). We check the validity of the instrument set using the Sargan- and Hansen test and the difference-in-Hansen test for the system GMM.

3.2 Data and descriptive statistics

The recent debate on off-shoring of service transactions focuses rather on knowledge-intensive commercial- and business services than on traditional services (e.g. travel, transportation and government services). For evaluating the growth effect of countries' engagement in commercial- and business services trade we combine data from several statistical sources.

As most of the theoretical literature on trade and growth has given attention to the relationship between trade policies and growth rather than the relationship between trade volumes (or shares) and growth, the empirical research on the growth effect of liberalized service sectors mainly concentrates on measuring trade barriers

appropriately.¹⁵ Services, in contrast to goods, are rather subject to non-tariff barriers and by far more regulated behind the border. In the last decade when services became even more tradable, attempts have been made to quantify restrictions on services delivery. The scarce availability of these restrictiveness indicators (either for only a few countries or/and few periods in time) makes it difficult to appropriately account for the endogeneity and reverse causality between openness indicators and growth in cross-section estimates.¹⁶

Against this background, a range of studies estimate the gravity model and find a negative impact of non-tariff trade barriers on bilateral trade in services (Dettmer 2012, OECD 2009, Grosso and Shepherd 2008, Schwellnus, 2007; Mirza and Nicoletti 2004, Nicoletti et al. 2003) and suggest that non-tariff trade barriers and trade flows are strongly related.¹⁷

As a consequence, we measure openness directly for commercial services (OPENCOM) and business service (OPENBUS) by export and import data which rather reflect the extent of true market barriers. In the growth literature, the country's openness to trade is traditionally revealed in the trade share (exports and imports relative to GDP).¹⁸ Although, previous literature on the welfare effects of trade liberalization evaluate the export-led growth hypothesis, there exist reasonable arguments for not neglecting the productivity effects of service imports for the manufacturing industry in the importing country. The services trade data provided by UNCTAD (2012a,b) is on balance-of-payments basis and, thus, covers most of GATS mode 1 trade (cross-border) and mode 2 transactions (consumption abroad). In contrast, it includes only a small part of GATS mode 3 (commercial presence) and mode 4 (movement of natural persons) transactions.¹⁹ Commercial service trade as an aggregate of all service sectors is available from UNCTAD since 1980 onwards and includes communication services,

¹⁵ See Matto et al. (2006) and Eschenbach and Hoekman (2006) for financial-, infrastructure- and telecommunication services. Conway and Nicoletti (2006) and Nguyen-Hong (2000) provide regulatory indicators for business services. Yannikaya (2003) discusses problems of various openness measures in general. Nielson and Taglioni (2003) review studies that quantify restrictions in several services sectors.

¹⁶ Hoekman, Mattoo and Sapir (2007) discuss what kind of service deregulation is subject to interest groups lobbying for or against protection and, thus, influence the countries' GATS commitments. Moreover, Barth et al. (2006) show that substantial divergences exist between the GATS commitments and indices of market openness for financial services. They argue that applied policy is much more liberal than the GATS commitments. Pelkmans (2010) testify an EU-neglect bias in the OECD's product market regulation and argues that, compared to other OECD countries, the EU's goods and services markets appear to be more restrictive than they really are. Consequentially, openness indicators are subject to measurement errors and tend to be endogenous in the growth equation.

¹⁷ Edwards (1993) in his review on the early literature on trade and growth points out that Krueger's (1978) estimates provide strong evidence in favor of trade liberalization and growth rather working through exports according to which more liberalized economies have higher export growth which, in turn, result in higher economic growth.

¹⁸ We use the log of trade shares (openness) rather than the level. Due to a highly skewed distribution to the right it may be possible that a given change in the openness may matter more at relatively low trade shares.

¹⁹ The WTO estimated that world service trade covered by GATS is dominated by mode 3 (commercial presence) with 50 per cent, followed by mode 1 (cross-border trade) with 30 per cent, mode 2 (consumption abroad) with 15 per cent and mode 4 (presence of natural persons) with 1 to 2 per cent (Maurer et al. 2006).

construction services, insurance and financial services, computer and information services, royalties and licenses fees, and other business services while the traditional services sectors (travel, transport and government services) are excluded. However, disaggregated trade data for single service sectors is reported and collected rather most recently. We are interested in the specialized business services (which include merchanting and other trade related services, as well as leasing, legal, accounting, auditing, book-keeping, tax consulting, business and management consulting, advertising, and research) for which export and import data is available for the period from 2000 to 2009 only.

Switching from simple cross-section growth to a dynamic panel framework can be made by splitting the complete period into a number of shorter time spans. The appropriate length of the time span can range between annual growth rates and even longer time spans. The empirical growth literature suggests five year growth rates as more appropriate to study convergence to steady state equilibrium than annual growth rates (Islam 1995). However, due to the limited availability of trade data on single services sectors we have to construct two data samples. The first sample builds upon a five year growth rate of real per capita GDP (which is the difference in the log of per capita GDP) to evaluate the growth effect of the countries' engagement in international commercial services transactions. As trade data is available for the period from 1980 to 2010, the sample consists of six data (time) periods for each country (i.e. 1980-85, 1985-90, 1990-95, 1995-2000, 2000-2005, and 2005-2010). However, due to data limitation for specialized business service trade for the period from 2000 to 2009, the growth effect is evaluated while we have to rely on a three year growth rate of real per capita GDP which lowers the data periods to three for each country (2000-03, 2003-06, and 2006-09). Data on real per capita GDP are provided by UNCTAD (2012c).

Standard growth determinants in the model include the log of the investment share (calculated as an average of the respective time period) and the log of population growth in each time span (both is provided by Heston, Summers and Aten (2012)). In addition to service trade openness we include a measure for human capital (the mean years of schooling in the beginning of each period from Barro and Lee (2010)).²⁰ While the growth rate is calculated for the five year interval (1980-85, 1985-90, ...), the investment share and the openness measures are averages over the preceding years (1980-1984, 1985-89, ...).

²⁰ The human capital data from Barro and Lee (2010) is available from 1950 onwards in a five year interval. For the sample with three year growth rates we interpolated the schooling data in between 2000 and 2010 and included the average for the respective period instead.

Data on growth rates and commercial service trade is available for 142 countries consisting of 33 OECD countries and 109 Non-OECD countries (see appendix A1 for a list of countries for which a complete set of data is available). We consider Chile, Estonia, Israel, Russia and Slovenia in the OECD sample for the complete period although they are members of the OECD since 2010. According to descriptive statistics in appendix A2, sample A (for OPENCOM) consist of 1152 observations on five year growth rates while sample B (OPENBUS) contains roughly half the number of observations (612) on three year growth rates. Due to limited availability of commercial- and business service trade data for a range of countries and time periods the number of observation drops to 888 (on OPENCOM) and 434 (on OPENBUS).²¹

Due to the presence of a lagged dependent variable in our model we check for panel autocorrelation and heteroskedasticity in the error term (appendix A4). According to the Wooldridge (2002) test, the hypothesis of no first order autocorrelation in panel data is always rejected. However, the Breusch-Pagan/ Cook-Weissberg test for a constant variance is not rejected when including OPENCOM but heteroskedasticity is relevant when estimating the growth effects of OPENBUS. According to Blundell and Bond (1998), lagged levels are weak instruments in the difference GMM when data series are persistent or follow a random walk. The Fisher-type unit root test rejects the null of a unit root for all variables and indicates that all data series are non-stationary. Blundell and Bond (2000) show that the system GMM performs better than the difference GMM as first differences are valid instruments for levels.

4 Empirical Evidence

In this section we present results from testing the augmented Solow model with human capital and openness in commercial- and business services sectors. The dependent variable is the change in the log of real per capita income and regressed on log initial per capita income, the log of population growth, the log of investment share, the log of human capital and the log of service openness OPENCOM (and OPENBUS respectively). We first consider the effect of a broad range of commercial services and turn to the growth effect of specialized business services trade in the second part of the section. In the third part we evaluate the effect of non-tariff trade barriers (in professional services) on economic growth to link the previous analysis to respective conclusions for trade policy.

²¹ Appendix A3 contains the correlation matrix for the independent variables and reveals that (except for the high correlation between human capital and initial per capita GDP) the correlation coefficients on openness measures are relatively low in both samples.

4.1 Commercial service openness and per capita income growth

Table 1 provides OLS and standard panel data estimates for the growth effects of OPENCOM while in table 2 we present further results from performing difference- and system GMM accounting for the dynamic structure of the model and endogeneity of the independent variables. The validity of the growth effect of an open commercial services sector is evaluated while comparing the results across all model specifications. The coefficients on standard growth variables are significant in most of the regressions and have expected signs throughout.

According to the OLS estimates in column M1, the coefficient on the initial per capita income is negative and significant and is interpreted as conditional convergence. As predicted by the Solow model, the population growth has a negative effect on per capita income growth while the investment share contributes positively. In addition, investment in human capital is associated with a positive effect on the growth rate as well. The point estimates on investment share (.072) and human capital (.061) are close to estimates found in previous empirical growth studies.²² Turning to the openness of commercial services, we find a positive effect on per capita income growth which is significant at the five per cent level. Compared to the growth effect of investment and human capital the coefficient on commercial services openness seems reasonable.

The second column (M2A) provides results from the fixed effects estimator. The point estimate on the commercial service openness remains significant at the five per cent level, but including time dummies in the fixed effects model (M2B) turns the coefficient on commercial service openness insignificant. The first differences specification in column M3 leads to similar results: openness in commercial services has a positive albeit insignificant effect on the growth rate. In the last two columns we account for serial correlation and heteroskedasticity by computing panel corrected standard errors using Prais-Winsten transformation. For both models (with common autocorrelation in M4A and panel-specific autocorrelation in M4B) the drivers of per capita income growth (investment, human capital and openness) are highly significant. The result that countries which trade more commercial services have a significantly higher growth rate is robust.

²² Hoeffler (2002) reports a coefficient of 0.1 on investment and 0.019 on the human capital measure. Bond, Hoeffler and Temple (2001) find effects in a similar range (0.08 on investment share and 0.03 on human capital respectively). The estimates by Caselli, Esquivel and Lefort (1996) reveal similar coefficient on investment (0.1). Söderbom and Teal (2003) estimate the Solow growth model with the capital-labor ratio instead of investment and find similar results on human capital of around 0.031.

Table 1: Commercial service trade and per capita income growth (1980-2010)

	OLS	FE	FE	FD	PCSE	PCSE
	(M1)	(M2A)	(M2B)	(M3)	(M4A)	(M4B)
L.Ln PCI	-0.0261*** (0.00522)	-0.247*** (0.0276)	-0.384*** (0.0372)	-0.668*** (0.0419)	-0.0283*** (0.00626)	-0.0221*** (0.00469)
Ln Pop growth	-0.462*** (0.0986)	-0.266 (0.255)	-0.141 (0.208)	-0.119 (0.0997)	-0.440** (0.146)	-0.426*** (0.113)
Ln Inv	0.0720*** (0.0141)	0.128*** (0.0349)	0.152*** (0.0304)	0.173*** (0.0258)	0.0717*** (0.0176)	0.0810*** (0.0139)
Ln HC	0.0610*** (0.0121)	0.157*** (0.0314)	-0.111** (0.0410)	-0.185*** (0.0525)	0.0661*** (0.0161)	0.0632*** (0.0126)
Ln OPENCOM	0.0201** (0.00652)	0.0402** (0.0150)	0.0102 (0.0135)	0.0175 (0.0114)	0.0207** (0.00769)	0.0226*** (0.00659)
const	0.0817 (0.0603)	1.570*** (0.235)	2.774*** (0.309)	0.0943*** (0.00966)	0.0913 (0.0791)	0.0164 (0.0612)
N	567	567	567	420	567	567
Adj.Rsquad	0.175	0.198	0.352	0.405		
Country FE	N	Y	Y	N	N	N
Year FE	N	N	Y	N	N	N
Within Rsq		0.2052	0.3626			
Between Rsq		0.0062	0.0103			
Overall Rsq		0.0015	0.0055		0.1606	0.2707
Heteroskedasticity	N	Y	Y	N	Y	Y
Autocorrelation	N	N	N	Y	Common	Panel-sp.

*** significant at 1 per cent level, ** significant at 5 per cent level, * significant at 10 per cent level

Note: The dependent variable is the five year growth rate of log real per capita income in the period from 1980 to 2010. The explanatory variables are in log-linear form and averaged over the preceding four years, except population growth and human capital. Commercial services (OPENCOM) include all services categories except transport, travel and government services. Standard errors robust to heteroskedasticity are reported in parenthesis. Standard errors in Model M4A are additionally corrected for a common autocorrelation process of order one (AR1). Standard errors in Model M4B are corrected for panel-specific autocorrelation (AR1).

Table 2 reports difference and system GMM estimates which use additional moment conditions to construct a set of instruments for endogenous variables. In the first column we instrument the lagged dependent variable and subsequently increase the instrument set to include investment (M6), human capital and openness (M7) and instrument all variables except population growth (M8). All reported estimates are based on the two-step GMM estimator which is shown to be more efficient than the one step estimator. Reported standard errors are corrected for heteroskedasticity.

The difference GMM estimator highlights the growth effect of trading commercial services but provides rather poor results for the traditional growth determinants: Although all coefficients have the expected signs, only the openness to commercial services (OPENCOM) is highly significant throughout. The Arellano-Bond test correctly rejects the null of no first order autocorrelation while autocorrelation of the second order is absent across all specifications.

Table 2: Commercial service trade and per capita income growth: GMM estimates

	Two-step DIFF-GMM ^{a)}				Two-step SYS-GMM ^{b)}			
	(M5)	(M6)	(M7)	(M8)	(M5)	(M6)	(M7)	(M8)
L.LnPCI	-0.046 (0.089)	-0.027 (0.099)	-0.185 (0.235)	-0.271 (0.220)	-0.023 (0.087)	-0.030 (0.053)	-0.016 (0.060)	-0.0095 (0.042)
Ln Pop growth	-0.295 (0.342)	-0.255 (0.355)	-0.052 (0.256)	-0.039 (0.332)	-0.450* (0.252)	-0.831** (0.396)	-1.073* (0.562)	-1.105*** (0.320)
Ln Inv	0.132*** (0.039)	0.066 (0.185)	0.081 (0.065)	0.081 (0.253)	0.090 (0.128)	0.190** (0.088)	0.291* (0.154)	0.196** (0.077)
Ln HC	0.069 (0.046)	0.061 (0.053)	-0.056 (0.138)	0.021 (0.120)	0.061 (0.144)	-0.0065 (0.110)	-0.175* (0.103)	-0.102 (0.118)
Ln OPENCOM	0.038** (0.014)	0.037** (0.014)	0.249** (0.116)	0.270** (0.112)	0.020 (0.023)	0.0485** (0.023)	0.093** (0.032)	0.0495 (0.035)
N	420	420	420	420	567	567	567	567
Group	129	129	129	129	142	142	142	142
Year FE	N	N	N	N	N	N	N	N
Endog. (GMM)								
L.LnPCI	Y	Y	Y	Y	Y	Y	Y	Y
Inv	N	Y	N	Y	N	Y	N	Y
HC	N	N	Y	Y	N	N	Y	Y
OPENCOM	N	N	Y	Y	N	N	Y	Y
# instruments	7	9	11	13	8	15	17	19
AR(1) [p]	0.000	0.000	0.019	.043	0.000	0.000	0.003	0.000
AR(2) [p]	0.780	0.762	0.553	.454	0.755	0.706	0.975	0.889
Sargan Test	0.232	0.017	0.406	.396	0.053	0.636	0.065	0.375
Hansen Test	0.140	0.011	0.523	.528	0.176	0.276	0.347	0.321
Diff Hansen ^{c)}	-	-	-	-	-	0.317	0.171	0.173
GMM	-	-	-	-	-	0.266	0.641	0.517
Diff Hansen ^{d)}	-	0.002	0.574	.562	0.160	0.273	0.243	0.256
IV	-	0.365	0.323	.259	0.257	0.332	0.725	0.985

*** significant at 1 per cent level, ** significant at 5 per cent level, * significant at 10 per cent level

Note: The dependent variable is the five year growth rate of log real per capita income in the period from 1980 to 2010. The explanatory variables are in log-linear form and averaged over the preceding four years, except population growth and human capital. Standard errors robust to heteroskedasticity are reported in parenthesis. Commercial services (OPENCOM) include all services except transport, travel and government services.

^{a)} Instruments for the endogenous variables in DIFF-GMM are L1.(L.InPCI), L1.(LnINV), L1.(LnHC), L1.(LnOPENCOM).

^{b)} Instruments for the endogenous variables in SYS-GMM are L1.(L.InPCI), L2.(LnINV), L2.(LnHC), L2.(LnOPENCOM) in the first differenced equation and D.L1.(L.InPCI), D.L2.(LnINV), D.L2.(LnHC), D.L2.(LnOPENCOM) in the level equation.

^{c)} The difference-in-Hansen test indicates the exogeneity of GMM instrument subset (lagged differences of endogenous variables in the level equation) used in the system GMM.

^{d)} The difference-in-Hansen test indicates the exogeneity of instrument variable (IV) subset which is not treated as endogenous.

Although the Hansen test does not reject the null of validity instrumenting endogenous variables with their first lag (except in the second model), the lagged levels tend to be poor instruments when data series are highly persistent. The system GMM instead uses the first differences of the variables which are better instruments for predicting future levels than lagged levels are for predicting future changes. In the system GMM estimates, we instrument the levels of the respective endogenous variables (in model M6 to M8) with their second lag because including the variables lagged one period leads to a rejection of the Sargan- and Hansen test as well as the difference-in-Hansen test. All

growth determinants have expected signs throughout, except for human capital. The coefficient on initial per capita income is negative and close to the fixed effects estimate in table 1. Nevertheless, conditional convergence associated with the coefficient on initial per capita income is not confirmed. The negative effect of population growth is significant throughout. The investment rate affects the growth rate positively but is only significant when instrumenting with its lagged values. Rather the lagged differences additionally used in the system GMM (M6 to M8) turn the impact of the investment rate on growth significant. Commercial service trade is a significant contributor to the growth rate of per capita income. The growth effect is only slightly larger when using GMM instruments to account for the endogeneity of variables. Across all model specifications, the Arellano-Bond test confirms first order autocorrelation and, as suggested, rejects second order autocorrelation. The Hansen test confirms validity of instruments. The difference-in-Hansen test does not find any problem with the instrument subset.

The results clearly show that the growth effect of trading commercial services is robust across model specification and confirm cross-section estimates which do not appropriately account for the endogeneity of growth determinants. Moreover, cross-section estimates reveal that the effect of liberalizing services markets tend to differ for country groups with respect to their income level (El Khoury and Savvides 2006). We split the complete sample into a sample comprising OECD countries and a sample including only NON-OECD countries. Detailed evidence in appendix table A5 shows that the growth effect of commercial service trade tends to be stronger for Non-OECD countries. Although OLS estimates yield coefficients of similar size (.022) and significance in both samples, the fixed effects estimates reveal that taking part in the international production of commercial services can be a significant growth escalator for Non-OECD countries. According to the system GMM estimates OPENCOM remains significant at the 5 per cent level. The growth effect for advanced OECD countries is rather insignificant throughout when GMM is applied. The Sargan- and the Hansen test confirm lagged levels as valid instruments. The Arellano-Bond test correctly rejects the null of first order autocorrelation and confirms absence of second order autocorrelation. The strong evidence for Non-OECD countries highlights a kind of catching-up process with consumers and manufacturing industry benefiting substantially from better services quality and lower prices in these countries. Allowing more international competition in the broad range of producer services has a strong growth potential for Non-OECD countries.

4.2 Business service openness and per capita income growth

In this section, we evaluate the growth effect of specialized business service trade. We consider a subset of three year growth rates as trade data is available for the period 2000 to 2009. The OLS and panel data estimates presented in table 3 are significant and

show results as expected. As suggested by the Solow model, initial per capita income and population growth affects the income growth rate negatively while investment has a positive impact on the growth rate. In the augmented version of the Solow model, investment into human capital has a significant positive effect on the growth rate. Moreover, trading specialized business services affects the growth rate significantly. Country fixed effects and heteroskedasticity-consistent standard errors do not change the effect on the growth rate of opening up business service markets. The Wooldridge (2002) test in appendix A4 recommends accounting for serial correlation when estimating a lagged dependent variable in the growth equation. We compute panel corrected standard errors and allow for both a common AR(1) process (model M4A) and panel-specific autocorrelation (model M4B) which yield consistent estimates. All variables are highly significant and have the expected sign.

Table 3: Business service trade and per capita income growth (2000-2009)

	OLS (M1)	FE (M2A)	FE (M2B)	FD (M3)	PCSE (M4A)	PCSE (M4B)
L.Ln PCI	-0.0367*** (0.00412)	-0.268** (0.0946)	-0.395*** (0.105)	-0.533*** (0.0633)	-0.0368*** (0.00431)	-0.0361*** (0.00307)
Ln Pop growth	-0.695*** (0.146)	-0.194 (0.225)	-0.0503 (0.161)	0.381 (0.334)	-0.692*** (0.196)	-0.640*** (0.180)
Ln Inv	0.0436** (0.0133)	0.0338 (0.0373)	0.0138 (0.0330)	0.0281 (0.0304)	0.0435*** (0.0128)	0.0567*** (0.0125)
Ln HC	0.0425** (0.0130)	0.432*** (0.0945)	-0.0642 (0.121)	0.0292 (0.151)	0.0426** (0.0141)	0.0469*** (0.0124)
Ln OPENBUS	0.00461*** (0.00106)	0.00448** (0.00180)	-0.00572 (0.00346)	0.0118*** (0.00156)	0.00465*** (0.00113)	0.00459*** (0.000953)
Constant	0.217*** (0.0440)	1.375* (0.705)	3.324*** (0.859)	0.0818*** (0.0112)	0.218*** (0.0489)	0.164*** (0.0478)
N	357	357	357	215	357	357
Adj.Rsq	0.225	0.219	0.401	0.469	-	-
Country FE	N	Y	Y	N	N	N
Year FE	N	N	Y	N	N	N
Within Rsq		0.2296	0.4128			
Between Rsq		0.2054	0.0778			
Overall Rsq		0.1374	0.0611		0.2335	0.4461
Heterosked.	N	Y	Y	N	Y	Y
Autocorr.	N	N	N	Y	Common	Panel-sp.

*** significant at 1 per cent level, ** significant at 5 per cent level, * significant at 10 per cent level

Note: The dependent variable is the three year growth rate of log real per capita income in the period from 2000 to 2009. The explanatory variables are in log-linear form and averaged over the preceding three periods. Standard errors robust to heteroskedasticity are reported in parenthesis. Standard errors in Model M4A are corrected for common autocorrelation (AR1) while model M4B allows for panel-specific autocorrelation (AR1). Specialized business services (OPENBUS) include merchandising and other trade-related services; operational leasing services; and miscellaneous business, professional and technical services (legal, accounting, auditing, book-keeping, tax consulting, business and management consulting, advertising, and research).

Nevertheless, the endogeneity of growth determinants is not considered so far. We do so by performing GMM which uses lagged levels and differences as instruments. We

increase the instrument subset to include investment share (M6), human capital and openness to business services (M7) and instrument all variables except population growth (M8). In the system GMM, we instrument the variables by their levels (and the subsequent first differences) lagged two periods because using the levels lagged one period as instrument in the system GMM, the Sargan- and Hansen-test on the validity of the instrument set is strongly rejected.

Table 4: Business service trade and per capita income growth: GMM estimates

	Two-step DIFF-GMM ^{a)}				Two-step SYS-GMM ^{b)}			
	(M5)	(M6)	(M7)	(M8)	(M5)	(M6)	(M7)	(M8)
L.Ln PCI	0.548** (0.240)	0.699*** (0.197)	-0.176 (0.235)	0.0067 (0.190)	-0.873 (0.642)	0.022 (0.270)	-0.490 (0.656)	-0.088 (0.111)
Ln Pop growth	-0.410 (0.359)	-0.215 (0.415)	0.172 (0.221)	0.369 (0.239)	0.511 (1.740)	0.428 (1.811)	0.897 (4.396)	1.875 (1.852)
Ln Inv	0.041 (0.076)	-0.0342 (0.193)	0.0119 (0.0603)	-0.164 (0.153)	1.178 (0.839)	-0.034 (0.385)	0.610 (0.566)	-0.088 (0.191)
Ln HC	0.339* (0.177)	0.330* (0.193)	1.845*** (0.467)	1.733*** (0.433)	1.924 (1.422)	0.039 (0.604)	1.188 (1.964)	0.591 (0.399)
Ln OPENBUS	0.021*** (0.004)	0.023*** (0.0045)	0.016*** (0.003)	0.016*** (0.003)	0.022** (0.007)	0.011** (0.004)	0.017*** (0.005)	0.011*** (0.002)
N	215	215	215	215	357	357	357	357
Group	113	113	113	113	138	138	138	138
Year FE	N	N	N	N	N	N	N	N
Endog. (GMM)								
L.Ln PCI	Y	Y	Y	Y	Y	Y	Y	Y
Inv	N	Y	N	Y	N	Y	N	Y
HC	N	N	Y	Y	N	N	Y	Y
OPENBUS	N	N	Y	Y	N	N	Y	Y
# instruments	6	7	7	8	6	7	6	7
AR(1) [p]	.777	.978	.364	.561	.936	.551	.916	.916
AR(2) [p]	.	.	.	.	.	.	.	.
Sargan Test	.000	.000	.050	.108	.126	.000	.233	.000
Hansen Test	.000	.001	.025	.038	.825	.002	.699	.006
Diff Hansen ^{c)}	-	-	-	-	-	.	-	.
GMM	-	-	-	-	-	.002	-	.006
Diff Hansen ^{d)}	-	-	.	.015	.	.	-	.004
IV	-	-	.025	.988	.825	.002	-	.188

*** significant at 1 per cent level, ** significant at 5 per cent level, * significant at 10 per cent level

Note: The dependent variable is the three year growth rate of log real per capita income in the period from 2000 to 2009. The explanatory variables are in log-linear form and averaged over the preceding three years except for population growth. Standard errors robust to heteroskedasticity are reported in parenthesis. Specialized business services (OPENBUS) include merchanting and other trade-related services; operational leasing services; and miscellaneous business, professional and technical services (legal, accounting, auditing, book-keeping, tax consulting, business and management consulting, advertising, and research).

^{a)} Instruments for endogenous variables in DIFF-GMM: L1.(L.InPCI), L1.(L.InINV), L1.(L.InHC), L1.(L.InOPENBUS).

^{b)} Instruments for endogenous variables in SYS-GMM: L2.(L.InPCI), L2.(L.InINV), L2.(L.InHC), L2.(L.InOPENBUS) in the first differenced equation and D.L2.(L.InPCI), D.L2.(L.InINV), D.L2.(L.InHC), D.L2.(L.InOPENBUS) in the level equation.

^{c)} The difference-in-Hansen test indicates the exogeneity of GMM instrument subset (lagged differences of endogenous variables in the level equation) used in the system GMM.

^{d)} The difference-in-Hansen test indicates the exogeneity of IV instrument subset (the levels of the exogenous variables)

The GMM estimates in table 4 confirm estimates from previous panel data models: the growth effect of trading business service is strongly significant. The system GMM

estimates validate that business service openness contributes significantly to the growth rate. The result is robust across model specification (M5 to M8) while all other traditional growth determinants lose in significance when instrumenting with their lagged values.²³ Thus, the cross-border tradability of the specialized business services (including leasing, legal, accounting, auditing, book-keeping and tax consulting) which has recently been advanced by innovation in information- and communications technology allows for more international competition and has a favourable effect on the growth rate. Countries which participate in the international division of business service production grow on average at a higher rate.

Given the strong growth effects of trading specialized business services in general we perform estimates for a sub-sample of OECD and Non-OECD countries (appendix A6). The OLS and fixed effects specification reveal on average stronger growth effects of trading business services for OECD countries. But the picture reverses when accounting for endogeneity of growth determinants by estimating GMM. In the two-step system GMM – which is the preferred model because it is better suited for highly persistent data series – the growth effect of trading business services vanishes for OECD countries. Rather, Non-OECD countries strongly benefit from open business services sectors: the impact on the growth rate is positive and highly significant throughout as previously shown for commercial services trade.

The evidence suggests that Non-OECD countries involved in the international outsourcing of business services tend to catch-up more rapidly with the industrialized world by higher per capita income growth rates on average. Although these services comprise a higher input of human capital which is rather less available in developing countries the significance of the results speaks in favour of opening specialized business services to international competition. In the last decade especially these services become increasingly tradable and allow developing and emerging economies to take part in the outsourcing process.

4.3 Trade policy and per capita income growth

In the previous empirical growth models we treated openness of service sectors to international competition as an endogenous variable which was instrumented by its lagged values. A second alternative to account for endogeneity of business service openness in growth equations is to use exogenous variables (i.e. trade policy variables)

²³ According to the Arellano-Bond test performed after two-step GMM, the null of no first order autocorrelation is not rejected. Missing data prevent testing second order autocorrelation throughout.

that are correlated with the outcome measures (OPENBUS) but uncorrelated with the error term in the model.

Services in contrast to goods are to a higher extent subject to non-tariff trade barriers and regulated behind the border. As a consequence, the availability of data on regulatory barriers is limited to a small number of countries (mostly high income countries) and a few periods in time and, therefore, strongly requests to perform rather cross-section estimates which in turn do not allow controlling for endogeneity. Measures on non-tariff trade barriers in services in general can be classified into frequency indicators, quantity-based measures and price-based measures (see Nielson and Taglioni (2003) and Banga (2005) for a review). The frequency indicators are constructed indicators based on qualitative information which are translated via a system of scores and weights into quantitative measures (Hoekman 1995; Nguyen-Hong 2000; Langhammer 2005). The OECD has developed and recently updated indicators of product market regulation (PMR) which is a subset of several indicators (Wölfl et al. 2009; Conway and Nicoletti 2006).

Generally speaking, the PMR indicators for professional services measure the extent to which policy settings promote competition in the area of professional services in a given year. The PMR indicator data represents an internationally comparable dataset which is consistent across time and countries. The regulatory indicators for specialized business services (accounting, architectural, engineering and legal service) are based on questionnaires among professional service providers on entry- and conduct-regulation in a given profession in a respective country. The OECD provides an overall country-level indicator for professional service (PROF) which is the simple average of the indicators for each profession. We calculate an indicator for entry regulation (PROF-E) and conduct regulation (PROF-C) accordingly. The regulation database for professional services offers status quo level of regulation for the years 1996, 2003, and 2008. As all three restrictiveness indicators (PROF, PROF-E, and PROF-C) are scaled from zero to six with higher levels indicating higher restrictions, we expect a negative impact on the growth rate, because a higher level of regulation is associated with a lower trade volume and thus a lower growth rate of per capita income.

Table 5 contains evidence on the (direct and indirect) effect of professional service regulation on economic growth. In the first three columns (M1 to M3) we directly include the regulatory indicators into the fixed effects model and find insignificant effects of trade restrictions on the growth rate which rather tend to be positive.²⁴ The significance of the trade policy variables do not change when first differencing the data and removing

²⁴ The Wooldridge (2002) test of no first order autocorrelation cannot be rejected when professional service regulation is added to the growth model while the Breusch-Pagan test for heteroskedasticity is rejected to the eight per cent level.

country specific effects (in model M4 to M6). The results suggest that the effect of trade barriers on growth works rather through the trade channel. In this perspective, previous empirical research finds a strong impact of trade barriers on bilateral trade in services (e.g. Dettmer 2012, Schwellnus 2007).

Table 5: Business service trade vs. professional service trade regulation

	(M1)	(M2)	(M3)	(M4)	(M5)	(M6)	(M7)	(M8)	(M9)
	FE	FE	FE	FD	FD	FD	2SLS-IV	2SLS-IV	2SLS-IV
L.Ln PCI	-0.639*** (0.140)	-0.634*** (0.140)	-0.653*** (0.151)	-0.732*** (0.204)	-0.730*** (0.200)	-0.736*** (0.203)	-0.512** (0.214)	-0.504** (0.215)	-0.515** (0.213)
Ln Popgr	-2.042 (1.211)	-1.939 (1.193)	-1.881 (1.186)	-0.782 (1.223)	-0.461 (1.158)	-0.643 (1.211)	-1.874 (1.564)	-1.897 (1.573)	-1.865 (1.562)
Ln Inv	0.064 (0.069)	0.066 (0.070)	0.062 (0.067)	0.073 (0.103)	0.070 (0.105)	0.066 (0.099)	0.155 (0.102)	0.140 (0.102)	0.155 (0.101)
Ln HC	0.091 (0.115)	0.084 (0.105)	0.094 (0.120)	0.145 (0.185)	0.138 (0.165)	0.152 (0.175)	0.624** (0.255)	0.507** (0.246)	0.623** (0.255)
PROF	0.007 (0.009)			0.010 (0.013)					
PROF-E		0.0010 (0.005)			-0.003 (0.0068)				
PROF-C			0.005 (0.008)			0.015 (0.011)			
Ln							0.0112** (0.004)	0.0102** (0.004)	0.0111** (0.004)
Constant	6.147*** (1.363)	6.123*** (1.345)	6.278*** (1.437)	-0.047** (0.015)	-0.048** (0.015)	-0.045** (0.015)	3.433* (2.084)	3.666* (2.092)	3.460* (2.075)
N	86	87	87	52	53	52	77	78	78
group	34	34	35	-	-	-	33	33	33
Adj.Rsq	0.815	0.814	0.815	0.758	0.761	0.764			
Country FE	Y	Y	Y	N	N	N	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
Within Rsq	0.8300	0.8292	0.8303				.6648	.6523	.6656
Between	0.0597	0.0586	0.2828				.0566	.0531	.2546
Overall Rsq	0.0767	0.0774	0.1564				.1210	.1170	.2110

*** significant at 1 per cent level, ** significant at 5 per cent level, * significant at 10 per cent level.

Note: The dependent variable is the three year growth rate of log real per capita income in the period from 2000 to 2009. The explanatory variables are in log-linear form and averaged over the preceding three periods. Standard errors robust to heteroskedasticity are reported in parenthesis. In the two-stage least square (2SLS)-IV estimation the endogenous variable OPENBUS is instrumented by (M7) PROF (M8) PROF-E, and (M9) PROF-C and country- and year dummies.

In line with this argument, we perform a two stage least square instrument variable estimation (2SLS-IV) to evaluate the indirect effect of trade restriction on per capita income growth. The endogenous trade variable OPENBUS is instrumented by regulatory indicators (PROF, PROF-E, and PROF-C) which are exogenous to the growth model but correlated with OPENBUS. In this case, it is assumed that the exogenous variables (regulatory indicators) do not affect the growth rate directly (shown in the first part of table 5). In the first stage the endogenous variable OPENBUS is regressed on the instrument (each regulatory indicator separately) and a set of country- and time fixed effects. In the second stage OPENBUS is replaced by the predicted values from the first

stage regression and the per capita income growth is regressed on the predicted values instead. In the last three columns of table 5 we present the two-stage instrument variable estimation (M7 to M9). Instrumenting OPENBUS by regulatory indicators lead to significant outcomes. All variables have the expected sign, although investment and population growth is insignificant. Business service trade (instrumented by regulatory barriers PROF in model M7, PROF-E in model M8, and PROF-C in model M9) has a positive and strong effect on the growth rate of per capita income. The analysis holds for members of the OECD due to the availability of regulatory data. However, the effect of trade policy on the growth rate is rather of an indirect nature and materializes through service trade flows. The result has the important implication for trade policy to keep barriers to services trade low because countries which allow for international competition in business service sectors benefit more by being deeper integrated into the value added chain and profit from significantly higher per capita income growth rates.

5 Conclusion

Innovations in information- and telecommunication technology (ICT) render the proximity requirement between business partners obsolete and make business service outsourcing more feasible. A large part of previous evidence focuses on the productivity enhancing effects for manufacturing firms when foreign service providers deliver high quality and low cost services as an intermediate input to the production chain. Although the service-led growth prospects have been widely discussed for developing countries, the evidence at the country level is very scarce. Most of the previous work has concentrated on the traditional backbone services (e.g. telecommunication, transport, financial, and energy services) which have been characterised by a monopoly structure and, now, researchers aim at appropriately measuring the countries' service sector openness to evaluate the potential gains. A part of the empirical evidence (El Khoury and Savvides 2006; Li, Greenaway, Hine 2005) find insignificant and even a negative impact of opening certain services sectors to international competition on the growth rate of developing countries. The results suggest that policy should carefully select those services for deregulation which uses the available input factor in the economy most. Even more surprising is that the professional and business services (e.g. leasing, legal accounting, auditing, and consulting services), where international trade has long been restrained for technical reasons, receive limited attention.

In this paper we reassess the argument by empirically evaluating the effect of open producer services sectors on long-run growth. We apply a dynamic panel data approach – the difference and system GMM proposed by Blundell and Bond (1998) – which has the advantage to account for unobserved country specific effects and endogenous growth

determinants by first differencing the data and using lagged levels and differences as instruments.

The system GMM estimates reveals that a significant growth effect for countries taking part in international outsourcing of producer- and specialized business services is valid – even when controlling for reverse causality. The evidence suggests that especially Non-OECD countries which are deeper involved in the international sourcing of business services tend to catch-up more rapidly with the industrialized world by higher per capita income growth rates on average. While information- and telecommunication technology have promoted the tradability of these specialized business services during the last decade and have enabled developing and emerging economies participation in the outsourcing process, we find that non-tariff trade barriers in services add to the growth effect. The empirical evidence from a two stage least square model in which we instrument trade openness in business services by regulatory barriers in the professional services indicates that the effect on the growth rate works through the trade channel. Countries which keep their restrictions in business services low tend to grow on average at a higher rate.

Appendices

Appendix A1: Country groups

33 OECD countries				
Australia	Estonia	Ireland	New Zealand	Sweden
Austria	Finland	Israel	Norway	Switzerland
Belgium	France	Italy	Poland	Turkey
Canada	Germany	Japan	Portugal	United Kingdom
Chile	Greece	Korea	Slovak Republic	United States
Czech Republic	Hungary	Mexico	Slovenia	
Denmark	Iceland	Netherlands	Spain	
109 NON-OECD countries				
Afghanistan	China	India	Mauritius	Singapore
Albania	Colombia	Iran	Micronesia	Solomon Islands
Algeria	Congo	Jamaica	Moldova, Rep.	South Africa
Angola	Congo, Dem. Rep.	Jordan	Mongolia	Sri Lanka
Argentina	Costa Rica	Kazakhstan	Morocco	Sudan
Armenia	Cote D'Ivoire	Kenya	Mozambique	Swaziland
Azerbaijan	Croatia	Kuwait	Namibia	Syrian Arab Rep.
Bahamas	Cyprus	Kyrgyzstan	Nepal	Tajikistan
Bahrain	Dominican Rep.	Lao People's Dem. Rep.	Nicaragua	Tanzania
Bangladesh	Ecuador	Latvia	Niger	Thailand
Barbados	Egypt	Lesotho	Pakistan	Togo
Belize	El Salvador	Liberia	Panama	Tonga
Benin	Ethiopia	Libyan Arab Jamahiriya	Papua New Guinea	Trinidad and Tobago
Bolivia	Fiji	Lithuania	Paraguay	Tunisia
Botswana	Gabon	Macedonia	Peru	Ukraine
Brazil	Gambia	Madagascar	Philippines	United Arab Emirates
Bulgaria	Ghana	Malawi	Romania	Uruguay
Burundi	Guatemala	Malaysia	Russian Federation	Venezuela
Cambodia	Guyana	Maldives	Rwanda	Yemen
Cameroon	Haiti	Mali	Sao Tome and Principe	Zambia
Cape Verde	Honduras	Malta	Senegal	Zimbabwe
Central African Rep.	Hong Kong	Mauritania	Sierra Leone	

Note: Bold countries indicate countries that report data on specialized business services in the period from 2000 to 2009.

Appendix A2: Summary statistics

Variable	Obs.	Mean	Std. Dev.	Min	Max
5year growth (1980-2010)					
D5. LnRPCI	1152	0.084	0.191	-1.259	1.419
L5. LnRPCI	1162	7.952	1.630	4.347	11.319
D5. LnPOP	940	0.084	0.072	-0.279	0.430
Av. LnINV	1047	3.032	0.497	0.309	4.309
L5. LnHC	910	1.647	0.689	-3.450	2.582
Av. LnOPENCOM	888	-3.193	0.942	-8.402	0.454
3year growth (2000-2009)					
D3. LnRPCI	612	.072	.115	-.533	.744
L3. LnRPCI	614	8.088	1.654	4.747	11.349
D3. LnPOP	564	.041	.040	-.202	.231
Av. LnINV	561	3.076	.473	.058	4.344
Av. LnHC	492	1.853	.544	-.080	2.569
Av. LnOPENBUS	434	-6.173	4.118	-21.024	-1.205
PROF	86	2.184	.882	.6	4.178
PROF-E	87	2.904	1.111	.789	5.111
PROF-C	87	1.511	1.058	0	4.572

Appendix A3: Correlation matrix

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
5year growth (1980-2010)									
(1) D5. LnRPCI	1								
(2) L5. LnRPCI	-.0168	1							
(3) D5. LnPOP	-.2015	-.3338	1						
(4) Av. LnINV	.1997	.2281	-.0664	1					
(5) L5. LnHC	.2003	.6773	-.4946	.2215	1				
(6) Av. LnOPENCOM	.1165	.3286	-.1525	.2272	.3107	1			
3year growth (2000-2009)									
(1) D3. LnRPCI	1								
(2) L3. LnRPCI	-.2085	1							
(3) D3. LnPOP	-.0753	-.3565	1						
(4) Av. LnINV	-.0058	.2612	-.0559	1					
(5) Av. LnHC	-.0479	.7166	-.5540	.1404	1				
(6) Av. LnOPENBUS	.1161	.1598	-.0800	-.0475	.1208	1			
(7) PROF	.0791	-.3328	-.0381	.0718	-.2818	-.0598	1		
(8) PROF-E	.1162	-.4477	-.1452	.1343	-.0875	-.1546	.8380	1	
(9) PROF-C	.1038	-.1624	.0968	.0560	-.3883	.0260	.8136	.3646	1

Appendix A4: Test for Heteroskedasticity and Autocorrelation

	Wooldridge test for autocorrelation		Breusch-Pagan/ Cook-Weisberg test for heteroskedasticity	
	Test statistic	p-value	Test statistic	p-value
5year growth (1980-2010): D5. LnRPCI = L5. LnRPCI + D5. LnPOP + Av.LnINV + L5.LnHC + ...				
Av. LnOPENCOM	F(1,103) = 31.838	0.0000	chi2(1) = 1.46	0.2263
OECD				
Av. LnOPENCOM	F(1,28) = 9.247	0.0051	chi2(1) = 7.81	0.0052
NON-OECD				
Av. LnOPENCOM	F(1,74) = 27.915	0.0000	chi2(1) = 2.63	0.1047
3year growth (2000-2009): D3. LnRPCI = L3. LnRPCI + D3. LnPOP + Av. LnINV + Av.LnHC + ...				
Av. LnOPENBUS	F(1,101) = 30.686	0.0000	chi2(1) = 16.19	0.0001
OECD				
Av. LnOPENBUS	F(1,27) = 2.706	0.1116	chi2(1) = 4.44	0.0351
PROF	F(1,21) = 0.191	0.6668	chi2(1) = 3.01	0.0830
PROF-E	F(1,22) = 0.597	0.4479	chi2(1) = 3.28	0.0701
PROF-C	F(1,21) = 0.162	0.6913	chi2(1) = 12.25	0.0005
NON-OECD				
Av. LnOPENBUS	F(1,73) = 29.092	0.0000	chi2(1) = 4.10	0.0429

Appendix A5: Commercial service trade and growth: OECD vs. Non-OECD countries

	NON-OECD					OECD				
	OLS	FE	DIFF-GMM ^{a)}	SYS-GMM ^{b)}	SYS-GMM ^{b)}	OLS	FE	DIFF-GMM ^{a)}	SYS-GMM ^{b)}	SYS-GMM ^{b)}
	(M1)	(M2)	(M8)	(M7)	(M8)	(M1)	(M2)	(M8)	(M7)	(M8)
L.Ln PCI	-0.031*** (0.008)	-0.262*** (0.035)	-0.009 (0.312)	0.0875 (0.0568)	0.0116 (0.054)	-0.057*** (0.011)	-0.248*** (0.041)	-0.411 (0.277)	-0.188*** (0.0532)	-0.158** (0.0769)
Ln Popgr	-0.442*** (0.116)	-0.262 (0.263)	-0.0605 (0.551)	-0.418 (0.401)	-0.857* (0.486)	-0.262 (0.203)	-0.500 (0.583)	-1.513 (1.204)	-0.524 (0.424)	-0.664 (0.638)
Ln Inv	0.071*** (0.017)	0.122** (0.038)	0.226 (0.491)	0.0491 (0.110)	0.160** (0.078)	0.130*** (0.031)	0.142* (0.075)	0.604*** (0.161)	0.332** (0.153)	0.242* (0.146)
Ln HC	0.060*** (0.014)	0.150*** (0.032)	-0.105 (0.139)	-0.171 (0.134)	-0.094 (0.126)	0.065** (0.030)	0.261** (0.092)	0.160 (0.283)	0.363* (0.199)	0.353 (0.233)
Ln OPENCOM	0.022** (0.008)	0.037** (0.018)	0.243** (0.082)	0.124** (0.0591)	0.076 (0.053)	0.022** (0.011)	0.039 (0.031)	0.072 (0.0724)	-0.051 (0.0429)	-0.054 (0.0450)
const	0.122 (0.074)	1.562*** (0.278)	-	-	-	0.210 (0.140)	1.692*** (0.316)	-	-	-
N	417	417	303	417	417	150	150	117	150	150
Group	-	109	96	109	109	-	33	33	33	33
Adj.Rsq	0.164	0.198	-	-	-	0.241	0.197	-	-	-
Year FE	N	N	N	N	N	N	N	N	N	N
Endogenous										
L.LnPCI	N	N	Y	Y	Y	N	N	Y	Y	Y
Inv	N	N	Y	N	Y	N	N	Y	N	Y
HC	N	N	Y	Y	Y	N	N	Y	Y	Y
OPENCOM	N	N	Y	Y	Y	N	N	Y	Y	Y
#instruments			16	17	19			16	17	19
AR(1) [p]			.302	.008	.002			.044	.004	.006
AR(2) [p]			.433	.665	.852			.437	.288	.275
Sargan Test			.797	.092	.033			.175	.003	.003
Hansen Test			.672	.400	.292			.035	.076	.063
Diff Hansen			.139	.331	.159			.536	.013	.014
GMM			.875	.460	.493			.021	.764	.480
Diff Hansen			.652	.552	.236			.024	.109	.065
IV			.402	.151	.727			.655	.144	.241

*** significant at 1 per cent level, ** significant at 5 per cent level, * significant at 10 per cent level.

Note: The dependent variable is the five year growth rate of log real per capita income in the period from 1980 to 2010. The explanatory variables are in log-linear form and averaged over the preceding four years, except population growth and human capital. Standard errors robust to heteroskedasticity are reported in parenthesis. Commercial services (OPENCOM) include all services except transport, travel and government services.

^{a)} Instruments for endogenous variables in DIFF-GMM: L1.(L.InPCI), L1.(L.InINV), L1.(L.InHC), L1.(L.InOPENCOM).

^{b)} Instruments for endogenous variables in SYS-GMM: L1.(L.InPCI), L2.(L.InINV), L2.(L.InHC), L2.(L.InOPENCOM) in the first differenced equation and D.L1.(L.InPCI), D.L2.(L.InINV), D.L2.(L.InHC), D.L2.(L.InOPENCOM) in the level equation.

^{c)} The difference-in-Hansen test indicates the exogeneity of GMM instrument subset (lagged differences of endogenous variables in the level equation) used in the system GMM.

^{d)} The difference-in-Hansen test indicates the exogeneity of IV instrument subset (the levels of the exogenous variables).

Appendix A6: Business service trade and growth: OECD vs. Non-OECD countries

	NON-OECD					OECD				
	OLS	FE	DIFF-GMM ^{a)}	SYS-GMM ^{b)}	SYS-GMM ^{b)}	OLS	FE	DIFF-GMM ^{a)}	SYS-GMM ^{b)}	SYS-GMM ^{b)}
	(M1)	(M2)	(M8)	(M7)	(M8)	(M1)	(M2)	(M8)	(M7)	(M8)
L.Ln PCI	-0.034*** (0.006)	-0.256** (0.099)	0.028 (0.154)	-0.336 (0.468)	0.046 (0.078)	-0.05*** (0.008)	-0.403** (0.144)	-0.009 (0.313)	-0.305 (0.386)	-0.069 (0.389)
Ln Popgr	-0.729*** (0.169)	-0.093 (0.229)	0.370** (0.184)	-0.056 (2.329)	-0.543 (0.693)	-0.335 (0.309)	-3.114 (2.009)	-2.162 (3.046)	3.317 (5.399)	-0.883 (6.560)
Ln Inv	0.044** (0.015)	0.027 (0.040)	-0.048 (0.091)	0.603 (0.737)	-0.097 (0.119)	0.017 (0.030)	0.025 (0.077)	0.096 (0.326)	0.444 (2.229)	0.503 (2.393)
Ln HC	0.039** (0.015)	0.378*** (0.098)	1.49*** (0.327)	0.484 (0.873)	0.096 (0.151)	0.047 (0.037)	0.523* (0.258)	1.247** (0.593)	0.763 (1.635)	-0.304 (2.688)
Ln OPENBUS	0.003** (0.001)	0.003 (0.002)	0.015*** (0.003)	0.015** (0.008)	0.008*** (0.002)	0.011*** (0.002)	0.009*** (0.002)	0.020** (0.006)	0.019 (0.013)	0.021 (0.017)
const	0.192*** (0.052)	1.280* (0.689)	-	-	-	0.426** (0.132)	2.921** (1.174)	-	-	-
N	264	264	158	264	264	93	93	57	93	93
Group	-	105	84	105	105	-	33	29	33	33
Adj.Rsq	0.161	0.161	-	-	-	0.447	0.539	-	-	-
Year FE	N	N	N	N	N	N	N	N	N	N
Endogenous										
L.LnPCI	N	N	Y	Y	Y	N	N	Y	Y	Y
Inv	N	N	Y	N	Y	N	N	Y	N	Y
HC	N	N	Y	Y	Y	N	N	Y	Y	Y
OPENCOM	N	N	Y	Y	Y	N	N	Y	Y	Y
#instruments			11	6	7			11	6	7
AR(1) [p]			.616	.654	.106			.880	.230	.845
AR(2) [p]			.	.	.			.	.	.
Sargan Test			.184	.089	.001			.001	.085	.422
Hansen Test			.275	.544	.010			.148	.613	.941
Diff Hansen ^{c)}			-	-	-			-	-	-
GMM			-	-	-			-	-	-
Diff Hansen ^{d)}			.201	-	.003			.113	-	.755
IV			.620	-	.822			.443	-	.878

*** significant at 1 per cent level, ** significant at 5 per cent level, * significant at 10 per cent level.

Note: The dependent variable is the three year growth rate of log real per capita income in the period from 2000 to 2009. The explanatory variables are in log-linear form and averaged over the preceding three years except for population growth. Standard errors robust to heteroskedasticity are reported in parenthesis. Specialized business services (OPENBUS) include merchanting and other trade-related services; operational leasing services; legal, accounting, auditing, book-keeping, tax consulting, business and management consulting, advertising, and research.

^{a)} Instruments for the endogenous variables in DIFF-GMM are L1.(L.InPCI), L1.(LnINV), L1.(LnHC), L1.(LnOPENBUS).

^{b)} Instruments for the endogenous variables in SYS-GMM are L2.(L.InPCI), L2.(LnINV), L2.(LnHC), L2.(LnOPENBUS) in the first differenced equation and D.L2.(L.InPCI), D.L2.(LnINV), D.L2.(LnHC), D.L2.(LnOPENBUS) in the level equation.

^{c)} The difference-in-Hansen test indicates the exogeneity of GMM instrument subset (lagged differences of endogenous variables in the level equation) used in the system GMM.

^{d)} The difference-in-Hansen test indicates the exogeneity of IV instrument subset (the levels of the exogenous variables).

References

- Aghion, P. and P. Howitt (1992), A model of growth through creative destruction, *Econometrica*, Vol. 60(2), 323-351.
- Amiti, M. and S.-J. Wei (2009), Service offshoring and productivity: Evidence from the US, *The World Economy*, Vol. 32(2), 203-220.
- Anderson, T.W. and C. Hsiao (1982), Formulation and estimation of dynamic models using panel data, *Journal of Econometrics*, Vol. 18(1), 47-82.
- Antras, P. and E. Helpman (2004), Global sourcing, *Journal of Political Economy*, Vol. 112(3), 552-580.
- Arellano, M. and S. Bond (1991), Some Tests of specification for panel data: Monte Carlo evidence and an application to employment equations, *Review of Economics Studies*, Vol. 58(2), 277-297.
- Arellano, M. and O. Bover (1995), Another look at the instrument variable estimation of error-components models, *Journal of Econometrics*, Vol. 68(1), 29-51.
- Arnold, J.M., B. Javorcik and A. Mattoo (2011), Does services liberalisation benefit manufacturing firms: evidence from the Czech Republic, *Journal of International Economics*, Vol. 85(1), 136-146.
- Arnold, J.M., B. Javorcik, M. Lipscomb and A. Mattoo (2012), Services reform and manufacturing performance: evidence from India, The World Bank Policy Research Working Papers No. 5948, The World Bank.
- Arnold, J.M., A. Mattoo and G. Narcisco (2008), Services inputs and firm productivity in Sub-Saharan Africa: Evidence from firm-level data, *Journal of African Economies*, Vol. 17(4), 578-599.
- Bajo-Rubio, O. and A.G. Gomez-Plana (2005), Simulating the effects of the European Single market: A CGE analysis for Spain, *Journal of Policy Modeling*, Vol. 27(6), 689-709.
- Balistreri, E.J., T.F. Rutherford, and D.G. Tarr (2009), Modeling services liberalization: The case of Kenya, *Economic Modelling*, Vol. 26(3), 668-679.
- Baltagi, B.H. (2008), *Econometric analysis of panel data*, fourth edition, Wiley: Chichester (a.o.).
- Banga, R. (2005), Trade in services: A review, *Global Economy Journal*, Vol. 5(2), 1-22.
- Bangake, C. and J.C. Eggoh (2011), Further evidence on finance-growth causality: a panel data analysis, *Economic Systems*, Vol. 35(2), 176-188.
- Barone, G. and F. Cingano (2011), Service regulation and growth: evidence from OECD countries, *The Economic Journal*, Vol. 121(555), 931-957.
- Barro, R. and J.-W. Lee (2010), A new data set of educational attainment in the world, 1950-2010, NBER Working Paper No. 15902.
- Barth, J., J.A. Marchetti, D.E. Nolle, and W. Sawangngoenyuan (2006), Foreign Banking: Do countries' WTO commitments match actual practices?, WTO Staff Working Paper ERSD 2006-11, World Trade Organization.
- Baumol, W.J. (1982), Contestable Markets: An uprising in the theory of industry structure, *American Economic Review*, Vol. 72(1), 1-15.
- Baumol, W.J. (1967), Macroeconomics of unbalanced growth: The anatomy of the urban crisis, *American Economic Review*, Vol. 57(3), 415-426.
- Bayraktar, N. and Y. Wang (2006), Banking sector openness and economic growth, World Bank Policy Research Working Paper No. 4019, The World Bank.

- Beck, T. (2002), Financial development and international trade: Is there a link?, *Journal of International Economics*, Vol. 57(1), 107-131.
- Bhagwati, J.N. (1984), Splintering and disembodiment of services and developing nations, *The World Economy*, Vol. 7(2), 133-144.
- Blalock, G. and P. Gertler (2008), Welfare gains from foreign direct investment through technology transfer to local suppliers, *Journal of International Economics*, 74(2), 402-21.
- Blundell, R. and S. Bond (1998), Initial conditions and moment restrictions in dynamic panel data models, *Journal of Econometrics*, Vol. 87(1), 115-143.
- Blundell, R. and S. Bond (2000), GMM estimation with persistent panel data: an application to production functions, *Econometric Review*, Vol. 19(3), 321-340.
- Blyde, J. and N. Sinyavskaya (2007), The impact of liberalizing trade in services on trade in goods: An empirical investigation, *Review of Development Economics*, Vol. 11(3), 566-583.
- Bond, S., A.E. Hoeffler and J. Temple (2001), GMM Estimation of empirical growth models, Discussion Paper DP3048, Centre for Economic Policy Research: London.
- Burgess, R. (1990), Services as intermediate goods: the issue of trade liberalization, in Jones, R.W and A.O. Krueger (eds.); *The political economy of international trade: Essays in honour of Robert E. Baldwin*, Blackwell: Cambridge, MA., 122-139.
- Caselli, F., G. Esquivel and F. Lefort (1996), Reopening the Convergence debate: A new look at cross-country growth empirics, *Journal of Economic Growth*, Vol. 1(3), 363-389.
- Conway, P. and G. Nicoletti (2006), Product market regulation in the non-manufacturing sectors of OECD countries: Measurement and highlights, OECD Economics Department Working Paper No. 530, OECD: Paris.
- Copenhagen Economics (2005), Economic Assessment of the barriers to the Internal market for services, Final report, Copenhagen.
- Debaere, P.; H. Görg and H. Raff (2010), Greasing the wheels of international commerce: how service facilitate firms' international sourcing, Kiel Working Paper No. 1591, Institute for the World Economy.
- De Bruijn, R., H. Kox and A. Lejour (2008), Economic Benefits of an integrated European market for services, *Journal of Policy Modeling*, Vol. 30(2), 301-319.
- Dettmer, B. (2012), The European Union's service directive: Contrasting ex ante estimates with empirical evidence, Jena Economic Research Papers No. 2012-019.
- Din, M., E. Ghani and O. Siddique (2003), Openness and economic growth in Pakistan, *Pakistan Development Review*, Vol. 42(4), 795-807.
- Djajic, S. and H. Kierzkowski (1989), Goods, services and trade, *Economica*, Vol. 56(1), 83-94.
- Durlauf, S.N. and D.T. Quah (1999), The new empirics of economic growth, in J.B.Taylor (ed): *Handbook of Macroeconomics*, Elsevier: Amsterdam (a.o.), 235-308.
- Edwards, S. (1993), Openness, trade liberalization and growth in developing countries, *Journal of Economic Literature*, Vol. 31(3), 1358-1393.
- El Khoury, A.C. and A. Savvides (2006), Openness in services trade and economic growth, *Economics Letters*, Vol. 92(2), 277-283.
- Eschenbach, F. and B. Hoekman (2006), Services policy reform and economic growth in transition economies, 1990-2004, *Review of World Economics*, Vol. 142(4), 746-764.

- Fernandes, A.M. (2007). Structure and Performance of the Services Sector in Transition Economies. World Bank Policy Research Working Paper 4357, The World Bank.
- Fernandes, A.M.; and A. Mattoo (2009), Professional services and development: A study of Mozambique, World Bank Policy Research Working Paper No. 4870, The World Bank.
- Fernandes, A.M. and C. Paunov (2012), Foreign direct investment in services and manufacturing productivity: evidence for Chile, *Journal of Development Economics*, Vol. 97(2), 305-321.
- Fink, C., A. Mattoo and R. Rathindran (2003), An assessment of telecommunications reform in developing countries, *Information Economics and Policy*, Vol. 15(4), 443-466.
- Francois, J.F. (1990a), Producer services, scale, and the division of labor, *Oxford Economic Papers*, Vol. 42(4), 715-742.
- Francois, J.F. (1990b), Trade in producer services and returns due to specialization under monopolistic competition, *Canadian Journal of Economics*, Vol. 23(1), 109-124.
- Francois, J.F. and K. Reinert (1996), The role of services in the structure of production and trade: stylized facts from cross-country analysis, *Asia-Pacific Economic Review*, Vol. 2(1), 35-43.
- Francois, J.F. and L. Schuknecht (1999), Trade in financial services: Procompetitive effects and growth performance, CEPR Discussion Paper 2144, Centre for Economic Policy Research: London.
- Francois, J.F. and J. Woerz (2008), Producer services, manufacturing linkages, and trade, *Journal of Industry, Competition and Trade*, Vol. 8(3/4), 199-229.
- Gerlauff, G.M.M. and A. M. Lejour (2006). The new Lisbon Strategy: An estimation of the economic impact of reaching five Lisbon targets. Report prepared for the enterprise and industry directorate-general of the European Commission. Industrial Policy and Economic Reforms Papers No. 1, CPB Netherlands Bureau for Economic Policy Analysis.
- Giles, J.A. and C.L. Williams (2000a), Export-led growth: A survey of the empirical literature and some noncausality results, Part 1, *Journal of International Trade and Economic Development*, Vol. 9(3), 261-337.
- Giles, J.A. and C.L. Williams (2000b), Export-led growth: A survey of the empirical literature and some noncausality results, Part 2, *Journal of International Trade and Economic Development*, Vol. 9(4), 445-470.
- Ghani, E. (2010), *The service revolution in South Asia*, Oxford University Press: New Delhi.
- Görg, H. and D. Greenaway (2004), Much ado about nothing? Do domestic firms really benefit from foreign direct investment?, *World Bank Research Observer*, Vol. 19(2), 171-197.
- Görg, H. and A. Hanley (2011), Services outsourcing and innovation: an empirical investigation, *Economic Inquiry*, Vol. 49(2), 321-333.
- Görg, H., A. Hanley, and E. Strobl (2008), Productivity effects of international outsourcing: evidence from plant-level data, *Canadian Journal of Economics*, Vol. 41(2), 670-688.
- Görg, H. and E. Strobl (2001), Multinational companies and productivity spillovers: A metaanalysis, *Economic Journal*, Vol. 111(475), 723-739.
- Goldsmith, R.W. (1969), *Financial Structure and Development*, Yale University Press: New Haven.

- Grossman, G.M. and E. Helpman (1991), Trade, knowledge spillovers, and growth, *European Economic Review*, Vol. 35(1/2), 517-526.
- Grossman, G.M. and E. Helpman (1990), Comparative advantage and long-run growth, *American Economic Review*, Vol. 80(4), 796-815.
- Grosso, M.G. and B. Shepherd (2008), Towards the development of a services trade restrictiveness index (STRI) for professional services, OECD Services Experts Meeting on Business services, Paris, 24. June 2008, OECD: Paris.
- Hausmann, R., J. Hwang and D. Rodrik (2007), What you export matters, *Journal of Economic Growth*, Vol. 12(1), 1-25.
- Heston, A., R. Summers and B. Aten (2012), Penn world table version 7.0, Center for International Comparisons of Production, Income and Prices at the University of Pennsylvania, Retrieved: May 2012.
- Hirsch, S. (1989), Services and services intensity in international trade, *Weltwirtschaftliches Archiv*, Vol. 125(1), 45-59.
- Hoeffler, A.E. (2002), The augmented Solow model and the African growth debate, *Oxford Bulletin of Economics and Statistics*, Vol. 64(2), 135-158.
- Hoekman, B. (2006), Liberalizing trade in services: A survey, World Bank Policy Research Working Paper No. 4030, The World Bank.
- Hoekmann, B. (1995), Assessing the General Agreement on Trade in Services, in Martin, W. and L.A. Winters (eds): *The Uruguay round and developing economies*, Cambridge University Press: Cambridge.
- Hoekman, B. and A. Mattoo (2008), Service trade and growth, World Bank Policy Research Working Paper 4461, The World Bank.
- Hoekman, B., A. Mattoo and A. Sapir (2007), The political economy of service trade liberalization: A case for international regulatory cooperation?, *Oxford Review of Economic Policy*, Vol. 23(3), 367-391.
- Hsiao, C. (1986), *Analysis of panel data*, Cambridge University Press: Cambridge.
- Ishikawa, J. (1992), Trade patterns and gains from trade with an intermediate good produced under increasing returns to scale, *Journal of International Economics*, Vol. 32(1/2), 57-81.
- Islam, N. (1995), Growth empirics: a panel data approach, *Quarterly Journal of Economics*, Vol. 110(4), 1127-1170.
- Javorcik, B. S. (2004), Does foreign direct investment increase the productivity of domestic firms? In search of spillovers through backward linkages, *American Economic Review*, Vol. 94(3), 605-627.
- Javorcik, B.S. and Y. Li (2008), Do the biggest aisles serve a brighter future?: Global retail chains and their implications for Romania, World Bank Policy Research Working Paper No. 4650, The World Bank.
- Jensen, J. and D.G. Tarr (2012), Deep trade policy options for Armenia: The importance of trade facilitation, services and standards liberalization, *Economics: The Open-Access, Open-Assessment E-Journal*, Vol. 6(1), 1-54.
- Jensen, J. and D.G. Tarr (2010), Regional trade policy options for Tanzania: The importance of service commitments, World Bank Policy and Research Working Paper No. 5481, The World Bank.
- Jensen, J. and D.G. Tarr (2008), Impact of Local Content Restrictions and Barriers against Foreign Direct Investment in Services: The Case of Kazakhstan Accession to the WTO, *Eastern European Economics*, Vol. 46(5), 5-26.

- Jensen, J., T.F. Rutherford, and D.G. Tarr (2010), Modeling Services Liberalization: The Case of Tanzania, *Journal of Economic Integration*, Vol. 25(4), 644–675.
- Jensen, J., T.F. Rutherford, and D.G. Tarr (2007), The Impact of Liberalizing Barriers to Foreign Direct Investment in Services: The Case of Russian Accession to the World Trade Organization, *Review of Development Economics*, Vol. 11(3), 482–506.
- Jensen, J., T.F. Rutherford, and D.G. Tarr (2006), Telecommunications reform within Russia's Accession to the WTO, *Eastern European Economics*, Vol. 44(1), 25-58.
- Jones, R.W. and H. Kierzkowski (1990), The role of services in production and international trade: A theoretical framework, in Jones, R.W and A.O. Krueger (eds.); *The political economy of international trade: Essays in honor of Robert E. Baldwin*, Blackwell: Cambridge, MA., 31-48.
- Jones, R.W. and F. Ruane (1990), Appraising the options for international trade in services, *Oxford Economic Papers*, Vol. 42(4), 672-687.
- King, R.G. and R. Levine (1993), Finance, Entrepreneurship and Growth: Theory and Evidence, *Journal of Monetary Economics*, Vol. 32(3), 513-542.
- Konan, D.E. and K.E. Maskus (2006), Quantifying the impact of service liberalization in a developing country, *Journal of Development Economics*, Vol. 81(1), 142-162.
- Krueger, A.O. (1978), *Foreign trade regimes and economic development: Liberalization attempts and consequences*, NBER, Ballinger Publishing Co.: Cambridge, MA.
- Langhammer (2005), The EU offer of service trade liberalization in the Doha round: Evidence of a not-yet-perfect customs union, *Journal of Common Market Studies*, Vol. 43(2), 311-25.
- Levine, R. (1997), Financial Development and Economic Growth: Views and Agenda, *Journal of Economic Literature*, Vol. 35(2), 688-726.
- Li, X., D. Greenaway and R.C. Hine (2005), Importaciones de servicios y crecimiento económico: un análisis dinámico de panel, *Información comercial española*, Vol. 824, 7-23. (English version available: Imports of services and economic growth: A dynamic panel approach, SETI working paper, Sustainable growth, employment creation and technological integration in the European knowledge-based economy.)
- Li, W. and L.C. Xu (2000), The impact of privatization and competition in the telecommunications sector around the world, *Journal of Law and Economics*, Vol. 47(2), 395-430.
- López, R.A. (2005), Trade and growth: Reconciling the macroeconomic and microeconomic evidence, *Journal of Economic Surveys*, Vol. 19(4), 623-648.
- Lucas, R.E. (1988), On the mechanics of economic development", *Journal of Monetary Economics*, Vol. 22(3), 3-42.
- Lundstrom, S. and S. Mishra (2011), Service export sophistication and Europe's new growth model, World Bank Policy Research Working Paper No. 5793, The World Bank.
- Markusen, J.R. (2011), Trade and foreign direct investment in business services: A modelling approach, in Anderton, R. and G. Kenny (eds.): *Macroeconomic performance in a globalising economy*, Cambridge University Press: Cambridge (a.o.), 73-92.
- Markusen, J. (1989), Trade in producer services and other specialized intermediates inputs, *American Economic Review*, Vol. 79(1), 85-95.
- Markusen, J.R., T.F. Rutherford, and D.G. Tarr (2005), Trade and direct investment in producer services and the domestic market for expertise, *Canadian Journal of Economics*, Vol. 38(3), 758-777.

- Markusen, J.R. and N. Trofimenko (2009), Teaching locals new tricks: Foreign experts as a channel of knowledge transfers, *Journal of Development Economics*, Vol. 88(1), 120-131.
- Mattoo, A.; R. Rathindran and A. Subramanian (2006), Measuring services trade liberalisation and its impact on economic growth: An illustration, *Journal of Economic Integration*, Vol. 21(1), 64-98.
- Maurer, A., J. Magdeleine and B. d'Andrea (2006), International trade in services – GATS, statistical concepts and future challenges, mimeo, The World Trade Organization.
- Melvin, J.R. (1989), Trade in producer services: A Heckscher-Ohlin approach, *Journal of Political Economy*, Vol. 97(5), 1180-1196.
- Mirza, D. and G. Nicoletti (2004), What is so special about trade in services?, GEP Research Paper 2004/02, Leverhulme Centre for Research on Globalization and Economic Policy.
- Mishra, S.; S. Lundstrom and R. Anand (2011), Service export sophistication and economic growth, World Bank Policy Research Working Paper No. 5606, The World Bank.
- Nickell, S. (1981), Biases in dynamic models with fixed effects, *Econometrica*, Vol. 49(6), 1417-1426.
- Nicoletti, G., S.S. Golub, D. Hajkova, D. Mirza and K.-Y. Yoo (2003), The influence of policies on trade and foreign direct investment, *OECD Economic Studies* No. 36, 2003/1, OECD: Paris.
- Nielson, J. and D. Taglioni (2003), Service trade liberalization: identifying opportunities and gains, OECD Trade Policy Working Paper No. 1, TD/TC/WP(2003)23/Final, OECD: Paris
- Nguyen-Hong, D. (2000), Restrictions on trade in professional services, Productivity Commission Staff Research Paper, AusInfo, Canberra, August 2000.
- Nordas, H.K. (2010), Trade in goods and services: two sides of the same coin? *Economic Modelling*, Vol. 27(2), 496-506.
- Nordas, H.K. (2008) The impact of service trade liberalization on trade in non-agricultural products, OECD Trade Policy Working Papers No. 81, OECD: Paris.
- OECD (2009), Testing the services trade restrictiveness index: Gravity regressions and trade costs analysis, OECD Experts Meeting on the service trade restrictiveness index (STRI), Paris, 2-3 July 2009, OECD: Paris.
- O'Toole, R. (2005), The Services Directive - An Initial Estimate of the Economic Impact on Ireland, Forfás, mimeo.
- Oulton, N. (2001), Must the growth rate decline? Baumol's unbalanced growth revisited, *Oxford Economic Papers*, Vol. 53(4), 605-627.
- Papageorgiou, C. (2002), Trade as a threshold variable for multiple regimes, *Economics Letters*, Vol. 77(1), 85-91.
- Pelkmans, J. (2010), Product market reforms in EU countries: Are the methodology and evidence sufficiently robust? CEPS Working Document No. 332, Centre for European Policy Studies.
- Pugno, M. (2006), The service paradox and endogenous economic growth, *Structural Change and Economic Dynamics*, Vol. 17(1), 99-115.
- Rao, B.B. and M. Rao (2009), Openness and growth in Fiji: some time series evidence, *Applied Economics*, Vol. 41(13/15), 1653-1662.

- Rivera-Batiz, F.L., and L.A. Rivera-Batiz (1992), Europe 1992 and the liberalization of direct investment flows: services vs. manufacturing, *International Economic Journal*, Vol. 6(1), 45-57.
- Rivera-Batiz, L.A., and P.M. Romer (1991), Economic Integration and Endogenous Growth, *Quarterly Journal of Economics*, Vol. 106(2), 531-555.
- Rivera-Batiz, F.L., and L.A. Rivera-Batiz (1990), The effects of direct foreign investment in the presence of increasing returns due to specialization, *Journal of Development Economics*, Vol. 34(1/2), 287-307.
- Röller, L.-H. and L. Waverman (2001), Telecommunications infrastructure and economic development: A simultaneous approach, *American Economic Review*, Vol. 91(4), 909-923.
- Romer, P.M. (1990), Endogenous technological change, *Journal of Political Economy*, Vol. 98(5), 71-102.
- Romer, P.M. (1989), What determines the rate of technological change? World Bank Working Paper No. 279, The World Bank.
- Roodman, D. (2009), How to do xtabond2: An introduction to difference and system GMM in Stata, *The Stata Journal*, Vol. 9(1), 86-136.
- Ros, A.J. (1999), Does Ownership or competition matter? The effects of telecommunications reform on network expansion and efficiency, *Journal of Regulatory Economics*, Vol. 15(1), 65-92.
- Rutherford and Tarr (2010), Regional impacts of liberalization of barriers against foreign direct investment in services: The case of Russia's accession to the WTO, *Review of International Economics*, Vol. 18(1), 30-46.
- Sasaki, H. (2007), The rise of service employment and its impact on aggregate productivity growth, *Structural Change and Economic Dynamics*, Vol. 18(4), 438-459.
- Schwellnus, C. (2007), The effect of domestic regulation on services trade revisited, CEPII Working Paper No 2007-08, Centre d'Études Prospectives et d'Informations Internationales.
- Singh, T. (2011), International trade and economic growth nexus in Australia: A robust evidence from time-series estimators, *The World Economy*, Vol. 34(8), 1348-1394.
- Söderbom, M. and F. Teal (2003), Openness and Human Capital as sources of productivity growth: An empirical investigation, The Centre for the Study of African Economies Working Paper Series 188.
- Tarr, D. (2012), Impact of service liberalization on industry productivity, exports and development: Six empirical studies in the transition countries, World Bank Policy Research Working Paper No. 6023, The World Bank.
- UNCTAD (2012a), Handbook of Statistics, Vol. 2012, Value, share and growth of services exports and imports by service -category, annual 1980-2011, retrieved: Mai 2012.
- UNCTAD (2012b) Handbook of Statistics, Vol. 2012, Merchandise and Service trade openness, annual, 1980-2011, , retrieved: Mai 2012.
- UNCTAD (2012c), Handbook of Statistics, Vol. 2012, Nominal and real GDP, total and per capita, annual, 1970-2010, retrieved: Mai 2012.
- Van Long, N., R. Riezman, and A. Soubeyran (2005), Fragmentation and services, *North American Journal of Economics and Finance*, Vol. 16(1), 137-152.
- Van Marrewijk, C.; J. Stibora; A. de Vaal; and J.-M. Viaene (1997), Producer services, comparative advantage, and international trade patterns, *Journal of International Economics*, Vol. 42(1/2), 195-220.

- Wallsten, S.J. (2001), An econometric analysis of telecom competition, privatization, and regulation in Africa and Latin America, *Journal of Industrial Economics*, Vol. 49(1), 1-19.
- Windmeijer, F. (2005), A finite sample correction for the variance of linear efficient two-step GMM estimators, *Journal of Econometrics*, Vol. 126(1), 25-51.
- Wölf, A. (2005), The service economy in OECD countries, in OECD (2005): *Enhancing the Performance of the Services Sector*, OECD: Paris.
- Wölf, A., I. Wanner, T. Kozluk, G. Nicoletti (2009). Ten years of product market reform in OECD countries – insights from a revised PMR indicator", OECD Economics Department Working Paper No 695, OECD: Paris.
- Wooldridge, J.M. (2002), *Econometric analysis of cross section and panel data*, Cambridge, Mass (a.o.): MIT Press.
- Yannikaya, H. (2003), Trade and economic growth: A cross-country empirical investigation, *Journal of Development Economics*, Vol. 72(1), 57-89.