Discussion Paper

The determinants of service imports: the role of cost pressure and financial constraints

Elena Biewen
(Deutsche Bundesbank)

Daniela Harsch
(University of Tuebingen)

Julia Spies
(International Trade Centre)

Abstract:

This study provides evidence on how German multinational firms have restructured their service activities around the recent crisis. Making use of new micro-level data on service imports of German multinationals from 2002-2008, we assess the determinants of service offshoring along the extensive and intensive margins. In particular, we evaluate how internal frictions in terms of a sharp drop in the sales level (per employee) and external frictions in terms of a reduced availability of credit co-determine the likelihood and the extent of sourcing services from abroad. First, we find that firms are less likely to start to import services from abroad if they are under cost pressure. By contrast, firms intensify existing service imports linkages in times of a sales drop. Second, financial constraints, which played a major role for the goods trade during the crisis, did not have any significant effect on service imports. These results are in line with the argument that the generally observed crisis-resilience of service trade stems from increased pressures to save on variable costs through offshoring and from its lower dependence on external finance. Furthermore, and in line with our argument, we find that a decline in sales and labor productivity induces firms to sort into intra-firm rather than arm's-length trading.

Non-technical summary

The financial crisis in the years 2007-2008 and the resulting recession had a strong impact on international trade in goods. In contrast to the general decrease of cross-border activities, trade in services proved to be relatively resilient throughout the crisis. In a recent policy paper, Borchert and Mattoo (2012) give three possible explanations for the apparent different behavior of trade in services. First, they argue that the demand for services is less cyclical than the demand for goods. Second, trade in services is less dependent on external finance and therefore less susceptible to changes in credit availability. Third, internal cost pressure may have forced firms into the international outsourcing of services that were formerly conducted in-house. These arguments give rise to the presumption that the financial and real frictions to which firms are exposed affect trade in goods and trade in services differently.

This study provides first insights into the factors that determine service imports with a particular focus on the role of internal cost pressure and external financial constraints. We use information on cross-border service transactions available in the International Trade in Services Statistics for Germany and combine it with information on German multinational firms and information on cross-country and cross-sectoral occupational wages. We adopt a two-step estimation approach to investigate the adjustments of German multinationals along the extensive margin (the probability of being a service importer) and the intensive margin (the level of service imports) of service imports.

Our first-stage results are mostly in line with the vast evidence on trade in goods. We show that more productive firms are more likely to engage in international trade. Moreover, these service importing firms source from nearby countries with a high GDP and low wages in the sector which supplies the respective service. Furthermore, firms with a foreign ultimate beneficial owner are more likely to import services than firms with a German ultimate beneficial owner. We introduce changes in sales and sales per employee (labor productivity) as measures of internal frictions and find a positive impact on the probability of service offshoring, i.e., the probability of a firm importing services from abroad decreases if the firm is under cost pressure. Then, we use credit conditions on the capital market as a measure of external frictions. They have – in contrast to trade in goods – no significant impact on service trade.

Our second-stage results differ from the results for trade in goods. We find evidence that both a decrease in sales and a decrease in labor productivity significantly increase the level of service imports. Hence, while internal cost pressures do not force firms to start importing services from abroad, they intensify already existing service import relations. Credit conditions have no significant effect on the intensity of offshoring.

Additionally, we analyze the factors which influence the channel (intra-firm versus arm's-length) through which firms decide to import services. *Inter alia*, we find that a decline in domestic sales (per employee) causes firms to import services from their foreign affiliates than from independent suppliers. These results strengthen our hypothesis that internal cost pressure induces firms to import services from lower-cost foreign countries.

Nicht-technische Zusammenfassung

Die Finanzkrise der Jahre 2007-2008 und die daraus resultierende Rezession hatten immense Auswirkungen auf den weltweiten Handel. Im Gegensatz zum generellen Einbruch des Güterhandels, erwies sich der Handel mit Dienstleistungen während der Krise als relativ robust. In einem aktuellen Forschungspapier nennen Borchert und Mattoo (2012) drei mögliche Gründe für die geringe Krisenanfälligkeit des Dienstleistungshandels. Als erstes Argument führen die Autoren an, dass die Nachfrage nach Dienstleistungen weniger konjunkturabhängig als Güternachfrage sei. Zweitens sei der Handel mit Dienstleistungen weniger abhängig von Fremdkapital und somit auch weniger von Änderungen des Kreditangebots betroffen. Drittens bestehe die Möglichkeit, dass Unternehmen in Zeiten von erhöhtem Kostendruck dazu neigen, Dienstleistungen, die ursprünglich unternehmensintern bereitgestellt wurden, nun ins Ausland zu verlagern. Diese Argumentation führt zu der Hypothese, dass sowohl finanzielle als auch reale Friktionen, mit denen Unternehmen konfrontiert sind, unterschiedliche Auswirkungen auf den Handel mit Dienstleistungen und den Handel mit Gütern haben.

Diese Studie zeigt erstmalig die Determinanten von Dienstleistungsimporten deutscher multinationaler Firmen auf. Der Schwerpunkt der Untersuchung liegt dabei auf der Rolle von unternehmensinternem Kostendruck und veränderter Fremdkapitalbedingungen. Wir verwenden Informationen zu grenzüberschreitenden Dienstleistungstransaktionen aus der internationalen Dienstleistungsstatistik für Deutschland und verknüpfen diese mit Informationen über deutsche multinationale Unternehmen und Informationen zu Lohnkosten in unterschiedlichen Ländern und Sektoren. Mit Hilfe eines zweistufigen Schätzverfahrens untersuchen wir die Anpassungen deutscher multinationaler Unternehmen entlang des extensiven Rands (die Wahrscheinlichkeit, dass ein Unternehmen Dienstleistungen importiert) und des intensiven Rands (die Intensität der Dienstleistungsimporte).

Die Ergebnisse der ersten Stufe unserer Schätzung entsprechen denjenigen für den Güterhandel. Wir zeigen, dass produktivere Unternehmen mit größerer Wahrscheinlichkeit Dienstleistungen importieren. Darüber hinaus importieren diese Firmen die Dienstleistungen aus näher liegenden Ländern mit einem hohen BIP und einem geringen Lohnniveau in dem Wirtschaftsbereich, der die Dienstleistung bereitstellt. Die Wahrscheinlichkeit für Dienstleistungsimporte ist zudem höher für Unternehmen mit einem ausländischen Eigentümer als diejenigen mit einem deutschen Eigentümer. Als Maß für den internen Kostendruck wird die Veränderung des Gesamtumsatzes und des Umsatzes je Mitarbeiter (Arbeitsproduktivität) verwendet. Wir kommen zum Ergebnis, dass eine Veränderung des Umsatzes und der Arbeitsproduktivität einen positiven Einfluss auf die Wahrscheinlichkeit von Dienstleistungsimporten ausübt. Ein Unternehmen, das unter einem zunehmenden Kostendruck steht, importiert also mit geringerer Wahrscheinlichkeit Dienstleistungen. Des Weiteren verwenden wir die Angebotsbedingungen auf dem Kapitalmarkt als Maß für externe Friktionen. Im Gegensatz zum Güterhandel haben diese keinen signifikanten Einfluss auf den Import von Dienstleistungen.

Die Ergebnisse der zweiten Stufe der Schätzung unterscheiden sich von den Ergeb-

nissen für den Güterhandel. Sowohl ein Umsatz- als auch ein Produktivitätsrückgang erhöhen signifikant die Intensität der Dienstleistungsimporte. Während der interne Kostendruck also nicht dazu führt, dass Unternehmen mit Dienstleistungsimporten beginnen, steigert er die Intensität der bereits bestehenden Importbeziehungen. Kreditbedingungen haben keinen signifikanten Einfluss auf die Intensität der Dienstleistungsimporte.

Darüber hinaus untersuchen wir die Faktoren, die die Entscheidung beeinflussen, ob ein Unternehmen Dienstleistungen von einem ausländischen Tochterunternehmen oder von einem unabhängigen Anbieter bezieht. Unter anderem zeigt sich dabei, dass bei einem Umsatzrückgang (je Mitarbeiter) im Inland Unternehmen bevorzugt Dienstleistungen von ihren ausländischen Töchtern (und nicht von unabhängigen Unternehmen im Ausland) importieren. Dies stärkt unsere Hypothese, dass Kostendruck im Inland dazu führt, dass Dienstleistungen verstärkt aus dem kostengünstigen Ausland bezogen werden.

Contents

List of Tables

List of Figures

The Determinants of Service Imports: The Role of Cost Pressure and Financial Constraints[1]

1 Introduction

The 2007-2008 financial crisis and the subsequent recession had an unprecedented impact on global economic integration. In 2009, worldwide FDI inflows fell by 39% (UNCTAD, 2010), and the volume of world trade contracted by over 12% and therefore by more than world GDP (IMF, 2010). In contrast to the general collapse of cross-border activities, trade in services proved to be relatively resilient throughout the crisis. While German manufacturing goods experienced a decrease in imports by 16.5%, the contraction of commercial service imports by 7.7% appears comparably modest (see Figure A.1).[2] This becomes even more apparent if one abstracts from trade-related service categories like transport services (see Figure A.2) which leads to the hypothesis that the determinants of trade in goods and trade in services differ.

Borchert and Mattoo (2012) give three possible explanations for the apparent different behavior of trade in services. First, they state that the demand for services is less cyclical than the demand for goods. Second, on the supply side, trade in services is argued to be less dependent on external finance and therefore less susceptible to changes in interest rates or credit conditions. Amiti and Weinstein (2009), Feenstra et al. (2011), and Chor and Manova (2010) demonstrate that credit conditions act as financial frictions

[2]Note that this calculation is derived from World Bank data. Using the micro-level German International Trade in Services (*ITS*) data, we calculate a 10% drop in service imports. The difference may result from the fact that publicly reported aggregate statistics usually include earnings and expenditures of the state, positions related to goods trade, import sales taxes, and ancillary services in transit trade in addition to the service transactions of firms. Furthermore, they contain estimates (e.g. for transactions below the reporting limit of €12,500) and collective reports which are excluded from the *ITS* data. Finally, we adjust for negative reports that may occur if incorrect payments or cancellations were made.

which affect trade in manufactured goods, in particular for sectors which require extensive external financing. Third, Borchert and Mattoo (2012) justify the crisis-resilience of cross-border service trade with the cost pressures firms have to cope with. These constraints may have forced firms into the international outsourcing of services that were formerly conducted in-house. Following this line of argumentation, the financial and real frictions to which firms are exposed affect trade in goods and trade in services differently.

The increasing role of services in the global economy has given rise to a growing research interest in international services trade that has been supported by the availability of firm-level data in recent years. Motivated by the lack of trade models developed for services, researchers have started investigating the pattern of service trade and service traders. Supporting the applicability of trade-in-goods models, Breinlich and Criscuolo (2011) find that only a small fraction of UK firms are engaged in international trade in services (either exports or imports, or both). The authors also report important differences between traders and non-traders in terms of firm size, productivity and other characteristics. In particular, service exporters and importers are larger and more productive than non-traders, using more capital intensive production processes. Kelle and Kleinert (2010) describe international trade in services using German data for 2005. First, they argue that service trade is not limited to firms which are classified as service firms, but that firms from all industries export and import services. Second, confirming the reasoning of Breinlich and Criscuolo (2011), they report that the service trade of German firms is dominated by only a few large multinationals, which are active in many countries and which trade many different services. These trading patterns are very similar for both importers and exporters of services. Using Italian firm-level data, Federico and Tosti (2011) also confirm that trade in services is highly concentrated among the top exporters and importers. Challenging the applicability of the trade-in-goods models, Conti et al. (2010) find that a higher level of productivity and a higher skill intensity affect the performances of exporting firms in the service sector only if the geographical distance to their trading partners is large. Instead, the authors explain that the success of service traders is due to their experience in the national market and with their belonging

to national as well as international networks.[3]

Since firm-level data on service trade have only recently become available, the few existing studies have described the pattern of service trade and service traders but have remained inconclusive about the factors which determine trade in services and whether they differ from the factors which determine trade in goods. By focusing on the analysis of the determinants of service imports of German multinationals, we complement the existing literature. We put a special emphasis on potential differences to factors that influence trade in manufactured goods.

We proceed as follows: first, we investigate the factors that affect the probability of a firm being a service importer (extensive margin) – i.e. to offshore services which would otherwise potentially be provided by domestic service suppliers – and intensifying existing linkages (intensive margin). Second, following the arguments of Borchert and Mattoo (2012), we analyze the effect of internal cost pressures and of disruptions in external liquidity on the supply side on both margins of cross-border service activities. Pressures to save (wage) costs may force firms to offshore service tasks that were previously conducted domestically. External liquidity constraints are supposed to play a major role for trade in goods but may be less relevant for trade in services. Even though financial restrictions are especially important for exporters, they may also affect imports if problems in (pre-)financing production lead to disruptions in the supply. Third, in addition to the propensity and intensity of service offshoring, we study which factors influence the channel (in-house versus arm's-length) through which firms import services.

We use comprehensive information on the cross-border service trade of German firms for 2002-2008 from the German International Trade in Services Statistics (*ITS*) and complement it with information on multinational service traders from the Micro Database Direct Investment (*MiDi*) – both datasets are provided by the Deutsche Bundesbank. Additionally, we make use of cross-country and cross-sectoral occupational wage data, as

---

[3]See also Kelle et al. (2012) who describe the patterns of service trade and traders for Germany, and Walter and Dell'mour (2010) for Austria, or Temouri et al. (2010) who use a sample of German, French and UK firms. Biewen and Blank (2012) give firm-level evidence on international trade in services for Germany between 2001-2011 and analyze the contributions of the intensive and extensive margins to the variations in firm-level and country-level service trade.

recently collected and prepared by Harsch and Kleinert (2011), which allow us to study the impact of wages in much more detail than previously done in the literature.

The rest of the paper is organized as follows: Section 2 contains the description of the merged *ITS-MiDi* data along with the explanatory variables. After explaining the methodology in Section 3, the results are presented in Section 4. We find evidence that a firm which is confronted with a decline in sales and sales per employee (labor productivity) is less likely to start importing services. By contrast, firms that are already service importers intensify existing linkages in times of cost pressures. Furthermore, firms facing a drop in sales and labor productivity tend to increase their imports from foreign affiliates rather than from independent suppliers. Credit constraints do not seem to have any impact on service imports. Section 5 concludes.

2   Data

This section describes the data that we use for our empirical analysis. We combine two micro datasets provided by the Deutsche Bundesbank – the *ITS* and the *MiDi* – and complement them with information on cross-country and cross-sectoral occupational wages data as well as on credit constraints. After presenting the main data sources (2.1), we lay out in detail which explanatory variables we use (2.2).

2.1   Micro Data

The *ITS* comprises information on all service transactions between German residents and non-residents that surpass the threshold of €12,500. Since the reporting limit is rather low, the *ITS* covers almost the entire population of German cross-border service transactions. With the exception of mode 3 (commercial presence), the statistics include all modes of service delivery that are defined in the General Agreement on Trade in Services (GATS): cross-border trade (mode 1), consumption abroad (mode 2) and the presence of natural persons (mode 4). The dataset has recently been made available for research purposes for the years 2001 until 2010. In its original version, the *ITS* also

includes reports from public authorities and private transfers, which we remove in order to focus on firms' transactions. For the empirical estimations, we restrict the sample to the years for which our explanatory variables are available. Consequently, our sample is reduced to the years 2003-2008.

The *ITS* reports comprehensive service trade information at the level of the individual transaction (for both imports and exports): the value of the transaction, the type of the traded service based on the classification of the Balance of Payments Statistics, the country of the trade partner, and the NACE Rev. 1 industrial sector of the German firm. While the information on the single service transaction is very detailed, the dataset does not provide any firm-level characteristics. Thanks to a common firm identifier, some firm-level information can, however, be retrieved from the *MiDi*.

The *MiDi* covers all international capital links from and to Germany (see Hügelschäffer et al., 2009) and is available for research purposes as a panel dataset, currently covering the time period 1996-2009. It contains information on balance sheets of foreign affiliates as well as their turnover and number of employees. While the report regarding the foreign affiliates is very detailed, the information on the German investor comprises only a few key variables, such as the balance sheet total, the turnover, the number of employees, the industry (*3/4*-digit NACE Rev. 1), and the legal form. Since some of these variables are only available from 2002 onward, we exclude all previous years.[4] Because of the changes of the reporting thresholds for indirect (or second-tier) investments in 2007, we limit our sample in this study to direct (or first-tier) investments.[5] We also make use of the information on the sector and the country in which the foreign affiliates of the German investor operate – these two dimensions allow us to roughly differentiate between intra-firm and arm's length trade.

Before matching the *ITS* and *MiDi*, we made a few adjustments. First, we aggregated

---

[4]For further information on this database, see Hügelschäffer et al. (2009).

[5]Since 2002, direct foreign investments (first-tier investments) have been subject to reporting requirements if a German investor holds at least 10% of the shares or voting rights in a direct investment enterprise and if the balance sheet total of the latter exceeds €3 million. See Hügelschäffer et al. (2009) and Foreign Direct Investment Stock Statistics (2012) for a detailed description of reporting requirements.

the individual service transactions in the *ITS* to the level of each firm, source country, service type and year. We then dropped all remaining negative import values or values that equal zero.[6] Second, we grouped the single service categories in the *ITS* into eight larger categories and assigned each industrial sector in which a foreign affiliate is active according to the *MiDi* to a corresponding service group (see Table A.1). By doing this, we implicitly assume that if a multinational German parent imports a particular service (e.g. transport) from a certain country and at the same time has an affiliate in this same country which operates in a sector similar to the imported service type (e.g. transport), the transaction takes place between the parent and its affiliate. The described adjustments enabled us to match the data on several dimensions – the firm, the year, the country, and the service type (sector)[7] and to broadly approximate intra-firm vs. arm's length trade when we investigate the channels of international sourcing.[8]

Our matched sample consists of German service-importing firms that own at least one affiliate abroad. In 2008, the last year in the sample, out of 28,476 service importers only 2,701 firms also own at least one affiliate abroad. However, their joint import value accounts for about 59% of total service imports (see Table A.3).[9] On average, these multinationals import more than three and a half times as much as their domestic counterparts. We must keep in mind that by studying the service imports of multinational firms only, our sample is restricted. This selectivity is, however, mitigated by the fact that multinational firms are the driving force of international service trade.

2.2 Explanatory Variables

Our main variables of interest are measures of cost pressure and liquidity constraints. By employing these variables, we aim at testing Borchert and Mattoo (2012)'s argument that services trade and goods trade react differently to internal and external frictions.

---

[6]Negative or zero values may arise in the case of corrected or cancelled payments.

[7]See also Kelle et al. (2012) for a more detailed description of the matching process.

[8]Note that this procedure contains the risk of overestimating intra-firm trade. When interpreting the results, we will keep in mind that they are rather lower-bound estimates for the international sourcing of services from independent suppliers.

[9]Altomonte et al. (2012) show very similar results for France. While multinational business groups represent only 10% of the trading firms, they account for almost 65% of exports and 62% of imports.

We assume that firms are exposed to cost pressure if they experience a decrease in their sales or in their sales per employee from one year to another. We calculate changes in sales and in sales per employee between the years t and $t-1$ as

$$\Delta x_{it} = \frac{x_{it} - x_{it-1}}{0.5\left(x_{it} + x_{it-1}\right)}, \tag{1}$$

where Δx_{it} is the mid-point growth rate of firm-level sales ($sales_{it}$) or sales per employee ($prod_{it}$) of firm i. In contrast to conventional growth rates, mid-point growth rates bearhave the advantage of keeping observations which are 0 in $t-1$ (earlier applications include Davis and Haltiwanger, 1992 and Buono et al., 2008).[10]

In principle, lower sales or sales per employee may have two opposing effects on service imports. As a result of reduced sales levels, firms may limit their overall demand for services which would eventually result in a decrease in imports. During the financial crisis this decline proved, however, to be much less pronounced in services than in goods trade. In order to save (wage) costs, firms may shift the services they use to cheaper foreign countries which would then induce an increase in imports.

Liquidity constraints are likely to have an impact on the imports of goods whose production requires substantial pre-financing of the employed intermediate inputs.[11] Borchert and Mattoo (2012) argue that liquidity constraints may have a lower effect on services imports because they bind less financial resources in their production. While Chor and Manova (2010) use the interbank lending rate to measure the impact of credit constraints on the crisis-related reduction of US imports, we use information on external liquidity constraints from the financial structure database of Beck et al. (1999)[12] and employ the variable "claims on the private sector by deposit money banks and other financial institutions over GDP". In order to arrive at the level of aggregated loans in the trade partner country, we multiply the measure again with GDP. We then calculate the mid-point growth rate of this variable as outlined above and obtain a proxy of the

---

[10]Note that growth rates can only be calculated for firms which have been present in the sample for at least two years and which have not reported zero sales for two consecutive years.

[11]See for instance Chor and Manova (2010).

[12]We use the 2010 updated version of the data.

evolution of the partner country's credit conditions over time.

We complement our set of explanatory variables with other variables that have been suggested in previous literature. Given the lack of detailed information on inputs into the production of services, we use labor productivity, defined as sales per employee, as our productivity measure. Additionally, we take advantage of information on the foreign ownership status of the investing firms. Altomonte and Ottaviano (2009) argue that global supply chains had a non-neutral effect on the trade collapse during the financial crisis. On the one hand, large multinationals are financed by globally operating institutions which were strongly hit by the crisis. Through this channel, foreign ownership may have a negative impact on the intensive margin of service imports. On the other hand, large multinationals may be more resilient to financial crises as they can alleviate any temporary liquidity shortages of affiliates. We include a dummy variable and test whether foreign ownership has an impact on a firm's service imports, in particular when the firm faces an internal cost pressure.

To assess whether low wage costs in a country have induced firms to newly engage in or to increase their service offshoring, we use comprehensive data on sector-specific cross-country wages that were recently compiled by Harsch and Kleinert (2011). The data are based on the International Labor Organization's October Inquiry which has in its raw version hardly been used in the past. The by now cleaned, standardized and imputed dataset contains wages for up to 161 occupations from 49 industries in 112 countries between 1983 and 2008. As the dataset is still highly unbalanced and does not include wage information on the same occupations for every country in each year, we cannot take the median or mean wage across all occupations belonging to a certain sector. Instead, we select one "representative" occupation per sector, which shows the greatest country and year coverage within our sample (see Table A.2). The chosen occupations are all low-skilled.

We estimate the probability and the level of service offshoring as gravity-type equations. For this purpose, we take bilateral great-circle distances between the most populated cities from CEPII. GDP is taken from the World Bank.

8

In addition to estimating the determinants of service offshoring, we assess the mode choice of global sourcing (in-house versus arm's-length). Since firms cannot choose freely between intra-firm and arm's-length trade, we estimate first the probability that a firm had previously established an affiliate in the sector from which it wants to import. We assume that this probability is influenced by the firm's "diversity". This variable draws on evidence from Kelle et al. (2012) and Breinlich and Criscuolo (2011) and captures the range of sectors and countries in which a firm owns affiliates. Higher diversity supposedly helps firms to surpass the barrier of also having an affiliate in the import sector. We then estimate the choice between arm's length and intra-firm imports by additionally controlling for the experience a firm has in a certain market. We assume that a firm has experience in a certain market if its ultimate owner originates from the country from which the firm imports. The additional variables we use for the mode choice estimations are both constructed from the *MiDi*. The descriptive statistics of all explanatory variables are summarized in Table A.4.

3 Methodology

In our main estimations, we distinguish between the extensive margin (the probability of service offshoring) and the intensive margin (the offshoring value). A Heckman selection model allows us to model the service offshoring of multinational firms as a two-stage process.

In the first stage, we estimate the determinants that affect the probability of being a service importer by employing a simple probit model. For this purpose, we inflate our dataset to include all firm-country-service type-year combinations for which we have information on the explanatory variables. This strategy implicitly supposes that there is a (potentially small) fixed cost that renders importing services profitable for some but not for all firm-country-service type combinations.[13] Hence, we use the information contained in the zeros to model the selection into importing services. We estimate the

---

[13]Note that the low reporting limit of €12,500 allows us to treat zero observations as non-profitable strategies.

extensive margin of offshoring by using the following selection equation:

$$z^*_{ikjt,\text{off}} = \alpha_1 Z'_{\text{off}} + \alpha_2 \Delta x_{it} + \alpha_3 \Delta credit_{jt} + e_{ikjt,\text{off}}, \tag{2}$$

where

$$z_{ikjt,\text{off}} = \begin{cases} 1 & \text{if } z^*_{ikjt,\text{off}} > 0 \\ 0 & \text{otherwise,} \end{cases} \tag{3}$$

and where i denotes a firm importing service type k from country j, and t denotes a particular year. Z'_{off} is a vector of explanatory variables of the service offshoring propensity, such as the labor productivity of the investing firm, the country- and sector-specific wages, GDPs and distances, and a foreign ownership dummy.[14] Δx_{it} is the mid-point growth rate of firm-level sales ($\Delta sales_{it}$) or sales per employee ($\Delta prod_{it}$) as calculated in equation (1). $\Delta credit_{jt}$ applies this same formula to changes in the availability of credit at the country-level. $e_{ikjt,\text{off}}$ is the error term.

In the second stage, we estimate the change in the level of service imports conditioning on the multinational firm being a service importer. We estimate the intensive margin of offshoring as

$$y_{ikjt,\text{off}} = \beta_1 Y'_{\text{off}} + \beta_2 \Delta x_{it} + \beta_3 \Delta credit_{jt} + \beta_4 mills_{ikjt,\text{off}} + u_{ikjt,\text{off}}. \tag{4}$$

The dependent variable $y_{ikjt,\text{off}}$ (import intensity) is regressed on a vector of explanatory variables Y'_{off}, the growth rate of sales (per employee) Δx_{it}, the growth rate of the availability of credit $\Delta credit_{jt}$, and on the inverse Mills ratio $mills_{ikjt,\text{off}}$ that has been calculated from equation (2).[15]

After the analysis of the determinants of service offshoring we proceed to the estima-

---

[14]Here, we write Z'_{off} merely for simplicity reasons. Please note that the variables are used at different levels, e.g. at the firm-level (productivity, foreign ownership), at the country-sector level (wages), and at the country-year level (GDP).

[15]Consistent estimation requires either exclusion restrictions or a sufficiently non-linear Mills ratio. The existing literature provides little guidance on valuable exclusion restrictions. Therefore, in our case, $Z'_{\text{off}} = Y'_{\text{off}}$, and model identification is based solely upon the non-linearity in the functional form.

tion of the choice of a multinational firm to source services either through an affiliated supplier (intra-firm trade) or through an independent supplier (arm's-length trade). Since we know in which country and in which sector the foreign affiliates of German investors operate, we can broadly sort service import transactions into the two sourcing modes: a multinational firm is said to engage in arm's-length trade if it imports a service type from a country in which it does not possess an affiliate that operates in the sector to which the service type has been assigned. Following the same logic, it engages in intra-firm trade if it imports a service type from a country where it also runs an affiliate operating in the same sector. The admittedly broad categories – country and sector – form the criteria along which we sort service transactions into sourcing modes (intra-firm versus arm's-length service imports).[16]

In order to analyze through which channel a firm imports services, we have to condition our sample on firms that have foreign affiliates in sectors corresponding to the imported services types. Since the decision to set up a foreign affiliate is not random, but depends on some systematic factors such as the fixed costs or the firm's productivity, firms cannot freely choose between sourcing a service from an affiliated or from an independent supplier. Not accounting for this sample selectivity concern would lead to biased regression coefficients. Hence, we apply a Heckman-type selection model similar to the one outlined in equations (2)-(4), but with the difference that the outcome equation is again a probit equation. We first estimate the likelihood that a multinational firm has an affiliate in the service sector k. Then, we assess the probability of outsourcing $y_{ikjt,\text{out}}$ – conditional on the firm having an affiliate in sector k. The decision to source from an independent or an affiliated supplier is driven by variations in firm, sector and country characteristics:

$$y_{ikjt,\text{out}} = \left(\beta_1 Y'_{\text{out}} + \beta_2 \Delta x_{it} + \beta_3 \Delta credit_{jt} + \beta_4 mills_{ikjt,\text{out}} + u_{ikjt,\text{out}} > 0 \right), \quad (5)$$

---

[16]In 2008, out of the 2,701 multinational service importers, only 266 were classified as intra-firm traders using the above definition. These imported, on average, an over six times greater value than arm's-length traders (see Table A.5).

where Y'_{out} is again the vector of other explanatory variables, Δx_{it} the growth rate of sales (per employee) and $\Delta credit_{jt}$ the change in the availability of credit. $mills_{ikjt,\text{out}}$ is the inverse Mills ratio obtained from the selection equation and $u_{ikjt,\text{out}}$ the error term.

4 Results

This section presents the results of estimating the determinants of service offshoring (4.1) and the determinants of the mode choice for the sourcing of these services (4.2) as well as robustness checks (4.3).

4.1 Determinants of Service Offshoring

For our empirical estimations, we restrict the sample to firms for which our main variables of interest are available. As we calculate internal cost pressure as the change in sales ($\Delta sales_{it}$) and in labor productivity ($\Delta prod_{it}$) between t and $t-1$, our estimation sample is reduced to the years 2003-2008.

In the first stage of the Heckman procedure, we estimate the probability of a multinational firm being a service importer (extensive margin). Because firms concentrate their service activities on only a limited number of countries and service types, the number of firm-year-country-service type-year combinations equal to zero by far exceeds the number of ones in the inflated dataset. In fact, we observe service imports for only 0.4% of all firm-country-service type combinations. Since the high ratio of zeros results in extremely low marginal effects and increases the computation time substantially, we randomly draw a 5% sample of all zeros. In the second stage, we estimate the offshoring intensity (intensive margin).

Extensive Margin

The results of the first stage estimation are given in the upper part of Table 1. They show that productivity has a positive and significant effect on the probability of a firm importing services from abroad. The result that more productive firms are more likely to

engage in international trade is in line with the vast evidence on trade in goods.[17] Table 1 further shows that firms also tend to source from nearby countries with a high GDP but low wages in the sector supplying the respective service. These results are highly significant at the 1%-level after controlling for unobserved heterogeneity at the country-, sector-, service type, and year-level. Firms with a foreign ultimate beneficial owner are more likely to import services than firms with a German ultimate beneficial owner and are, hence, better able to overcome entry barriers. All these results are very robust to the inclusion of additional variables.

Turning to our main variables of interest, we include internal cost pressure and external liquidity constraints as explanatory variables (see Columns (3)-(8)). Both the growth rate of sales and the growth rate of sales per employee (labor productivity) exhibit a positive impact on the probability of service offshoring. Or, to put it differently, if firms experience a decline in sales or labor productivity, the likelihood that they will import services from abroad also decreases. Even though the costs of sourcing services may be lower compared with the costs of sourcing goods, it seems plausible that the probability of importing a service type from abroad decreases if a firm is under cost pressure. The effect is higher for foreign-owned firms, as the positive interaction effect indicates.

We test the external finance channel measured as the mid-point growth rate of credits. In line with the argument of Borchert and Mattoo (2012), we find no evidence that external credit constraints are of importance for services imports. One possible explanation is that the fixed costs of service traders are well below the fixed costs involved in trade in goods. Consequently, the need for finance on the supply side (e.g. for financing the production of services) is limited and does not significantly influence the imports of services.

Taken together, these results indicate that internal cost pressures are more important

---

[17]While the literature on the (positive) link between productivity and goods exports is extensive (see, for instance, Bernard and Jensen (1999), Bernard et al. (2003), or Wagner (2007) for a survey of the existing studies), only a few studies concentrate on imports. A positive effect of productivity on firm's imports is found e.g. in Vogel and Wagner (2010) for German manufacturing firms in 2001-2005 (see also Vogel and Wagner (2010) for a literature overview regarding importing and productivity).

than the availability of external finance in determining a firm's decision to be a service importer.

1st stage results: offshoring probability (marginal effects)

Explanatory Variables	Basic	$\Delta sales_{it}$			$\Delta prod_{it}$		
$prod_{it}$	0.043^a	0.043^a	0.043^a	0.043^a	0.048^a	0.048^a	0.048^a
	(33.42)	(32.87)	(32.91)	(32.27)	(35.27)	(35.33)	(34.45)
$wage_{kjt}$	-0.022^a	-0.022^a	-0.022^a	-0.025^a	-0.025^a	-0.025^a	-0.027^a
	(-3.62)	(-3.63)	(-3.63)	(-3.79)	(-3.98)	(-3.97)	(-4.06)
gdp_{jt}	0.106^a	0.106^a	0.106^a	0.148^a	0.107^a	0.108^a	0.145^a
	(2.80)	(2.80)	(2.81)	(3.09)	(2.80)	(2.83)	(2.97)
$distance_j$	-0.051^a	-0.051^a	-0.051^a	-0.056^a	-0.051^a	-0.052^a	-0.056^a
	(-7.68)	(-7.70)	(-7.72)	(-7.31)	(-7.66)	(-7.69)	(-7.19)
$foreign_{it}$	0.021^a	0.022^a	0.021^a	0.023^a	0.022^a	0.021^a	0.024^a
	(4.92)	(5.09)	(4.95)	(5.26)	(5.04)	(4.84)	(5.27)
$\Delta sales_{it}$		0.018^a	0.010^b	0.018^a			
		(6.92)	(2.16)	(6.67)			
$foreign_{it} * \Delta sales_{it}$			0.014^b				
			(2.51)				
$\Delta prod_{it}$					0.015^a	0.005	0.015^a
					(5.18)	(1.01)	(5.13)
$foreign_{it} * \Delta prod_{it}$						0.017^a	
						(2.94)	
$\Delta credit_{jt}$				-0.045			-0.038
				(-1.43)			(-1.17)

2nd stage results: offshoring intensity

	Basic	$\Delta sales_{it}$			$\Delta prod_{it}$		
$prod_{it}$	0.520^a	0.525^a	0.526^a	0.525^a	0.545^a	0.546^a	0.545^a
	(28.18)	(28.40)	(28.42)	(28.5)	(28.70)	(28.73)	(28.39)
$wage_{kjt}$	-0.318^a	-0.319^a	-0.319^a	-0.412^a	-0.327^a	-0.326^a	-0.417^a
	(-4.05)	(-4.08)	(-4.08)	(-5.06)	(-4.17)	(-4.17)	(-5.12)
gdp_{jt}	1.264^b	1.241^b	1.241^b	0.877	1.302^a	1.317^a	0.945
	(2.54)	(2.50)	(2.50)	(1.50)	(2.62)	(2.65)	(1.62)
$distance_j$	-0.250^a	-0.244^a	-0.244^a	-0.190^b	-0.249^a	-0.251^a	-0.198^b
	(-3.02)	(-2.96)	(-2.96)	(-2.08)	(-3.01)	(-3.04)	(-2.16)
$foreign_{it}$	-0.201^a	-0.209^a	-0.220^a	-0.201^a	-0.220^a	-0.238^a	-0.211^a
	(-4.00)	(-4.16)	(-4.36)	(-3.91)	(-4.38)	(-4.71)	(-4.12)
$\Delta sales_{it}$		-0.113^a	-0.260^a	-0.109^a			
		(-2.83)	(-3.84)	(-2.70)			
$foreign_{it} * \Delta sales_{it}$			0.221^a				
			(2.67)				
$\Delta prod_{it}$					-0.266^a	-0.455^a	-0.275^a
					(-6.45)	(-7.09)	(-6.55)
$foreign_{it} * \Delta prod_{it}$						0.314^a	
						(3.84)	
$\Delta credit_{jt}$				0.262			0.307
				(0.64)			(0.75)
mills ($lambda$)	0.732^a	0.695^a	0.688^a	0.658^a	0.661^a	0.668^a	0.626^a
	(6.81)	(6.52)	(6.46)	(6.16)	(6.40)	(6.48)	(6.03)
N	50,275	50,275	50,275	47,650	48,896	48,896	46,335

Note: The upper part of the table reports 1st stage results on the extensive margin of service imports. Results are obtained for a 5% random sample of all zero observations. The lower part reports 2nd stage results on the intensive margin conditional on the probability of offshoring. i denotes a firm in sector k in country j and in year t. All estimations contain country, sector, service type and year dummies. ^{a}p<0.01, ^{b} p<0.05, ^{c} p<0.1. Robust t statistics in parentheses.

Intensive Margin

Next, we investigate the determinants of the level of service imports. The results are given in the lower part of Table 1. From the baseline model (Column 2), it becomes evident that a multinational firm's labor productivity positively affects service imports also in terms of imported values. A higher wage level in the sector and country from where the imports originate decreases them. This is again in line with the hypothesis that firms offshore service activities to save wage costs. The gravity variables, GDP and distance, have the expected sign and are mostly significant. Foreign ownership negatively impacts the intensive margin of service imports. Hence, whereas foreign ownership increases the likelihood of service offshoring (as indicated by the positive coefficient in the upper part of Table 1), it decreases its level (as indicated by the negative coefficient in the lower part of Table 1).

From Column (3) onward, we add firm-level measures of cost pressure. Columns (3)-(5) show that a sales drop between t and $t-1$ significantly increases the level of service imports. This effect is stronger for domestically-owned than for foreign-owned firms. The inclusion of a drop in labor productivity, as measured by a drop in sales per employee, from Column (6) onward, exhibits a similar but even stronger impact than the sales drop. While high internal cost pressures seem to prevent firms from becoming a service importer (results from the first stage of the Heckman estimation), they intensify already existing linkages. Reasoning in terms of Borchert and Mattoo (2012), a reduced sales or productivity level puts pressure on the firm to save production costs and eventually intensifies the import of services from foreign producers. Furthermore, the higher coefficient of the productivity drop variable indicates that a reduced sales level becomes especially problematic for firms if it is generated by an equal amount of employees, i.e. if the firm is not instantaneously able to adjust its workforce. Likewise, the interaction effect is also more pronounced. A productivity drop harms domestically-owned multinationals more than foreign-owned multinationals which seem to be better able to absorb the increased cost pressure. This latter effect is in line with the literature that claims a higher crisis-resilience of global value chains.

Furthermore, we do not find any evidence that a deterioration in credit conditions lowers service trade in a similar way as it affected trade in goods during the recent crisis (Columns (5) and (8)).

4.2 Determinants of Service Sourcing Modes

In addition to the determinants of service offshoring, we analyze which factors influence the mode through which firms import services. The results of estimating a two-stage Heckman-type selection model are summarized in Table 2.

Surprisingly, Column (2) suggests that the probability of having an affiliate in sector k is not driven by the labor productivity of the multinational firm. Being diverse in the sense of owning affiliates in a wide range of sectors and countries does, however, help firms to overcome the entry barrier and makes it more likely that a multinational firm will buy or establish an additional affiliate in sector k. Kelle et al. (2012) use a similar variable as a proxy for productivity and also find that it is a strong predictor of service trade. Wages have the expected negative effect on the dependent variable except for the specification in which we control for credit constraints in the outcome equation.

In contrast to the missing link between productivity and owning an affiliate in sector k in the selection equation, productivity is found to negatively impact the decision to source from an independent supplier in the outcome equation. Wages again exercise a negative influence, the coefficient being highly significant at the 1% level. Thus, the lower the wage costs in a sector and country from which the multinational firm imports, the higher the propensity that the firm will do so at arm's length. This result is in line with the observation that multinational firms pay wage premia which make independent suppliers competitive especially in low cost environments. Foreign ownership is not significant in any of the specifications. As expected, experience in a foreign market (defined as the nationality of the ultimate owner) is positively associated with the likelihood of sourcing through independent suppliers.

In Columns (3)-(8), we introduce again our cost pressure variables. A positive growth rate of sales and labor productivity increases the probability of arm's-length importing

and, accordingly, a negative growth rate decreases it. Hence, *ceteris paribus*, given a certain sales and productivity level of the firm, a drop in these measures induces firms to sort into intra-firm trading. In the case of productivity, this effect is stronger for domestic firms as indicated by the negative interaction effect. As before, credit constraints do not play any role.[18]

Table 2: Determinants of Service Outsourcing (Heckman)

	basic	$\Delta sales_{it}$			$\Delta prod_{it}$		
Selection equation: probability of having an affiliate in the sector (marginal effects)							
$prod_{it}$	0.0030	0.0035	0.0035	0.0035	0.0034	0.0034	0.0034
	(1.13)	(1.30)	(1.30)	(1.28)	(1.27)	(1.27)	(1.25)
$wage_{kjt}$	-0.0053^c	-0.0053^c	-0.0053^c	0.0024	-0.0055^c	-0.0055^c	0.0022
	(-1.81)	(-1.80)	(-1.80)	(0.78)	(-1.85)	(-1.85)	(0.72)
$diverse_{it}$	0.1384^a	0.1381^a	0.1381^a	0.1368^a	0.1385^a	0.1385^a	0.1372^a
	(38.93)	(38.71)	(38.70)	(37.81)	(38.81)	(38.78)	(37.91)
Outcome equation: outsourcing probability through arm's-length (marginal effects)							
$prod_{it}$	-0.0129^a	-0.0144^a	-0.0144^a	-0.0136^a	-0.0161^a	-0.0158^a	-0.0152^a
	(-5.46)	(-5.90)	(-5.89)	(-5.52)	(-6.50)	(-6.30)	(-6.12)
$wage_{kjt}$	-0.0294^a	-0.0276^a	-0.0277^a	-0.0307^a	-0.0277^a	-0.0282^a	-0.0307^a
	(-2.90)	(-2.69)	(-2.69)	(-2.89)	(-2.66)	(-2.70)	(-2.86)
$foreign_{it}$	-0.0110	-0.0101	-0.0099	-0.0125	-0.0141	-0.0106	-0.0167
	(-1.07)	(-0.96)	(-0.93)	(-1.17)	(-1.31)	(-0.99)	(-1.54)
$experience_{ikt}$	0.0567^a	0.0583^a	0.0583^a	0.0613^a	0.0651^a	0.0637^a	0.0681^a
	(5.84)	(5.89)	(5.89)	(6.20)	(6.44)	(6.32)	(6.74)
$\Delta sales_{it}$		0.0281^a	0.0313^a	0.0276^a			
		(4.53)	(2.70)	(4.39)			
$foreign_{it} * \Delta sales_{it}$			-0.0049				
			(-0.37)				
$\Delta prod_{it}$					0.0371^a	0.0621^a	0.0359^a
					(5.29)	(5.76)	(5.09)
$foreign_{it} * \Delta prod_{it}$						-0.0410^a	
						(-3.03)	
$\Delta credit_{jt}$				0.0735			0.0785
				(1.35)			(1.42)
ρ	0.833	0.820	0.819	0.813	0.811	0.808	0.803
N	18,632	18,632	18,632	17,885	18,536	18,000	17,791

Note: The upper part of the table reports results of the selection equation on the likelihood of owning an affiliate in sector k. The lower part reports results of the outcome equation on the likelihood of sourcing though an independent supplier conditional on the probability of having an affiliate in sector k. i denotes a firm in sector k in country j and in year t. All estimations contain country, sector, service type and year dummies. ^{a}p<0.01, ^{b} p<0.05, ^{c} p<0.1. Robust t statistics in parentheses.

---

[18]The previous literature has shown that the decision to source from an independent supplier depends on the institutional quality in the source country (see, in particular, Antras and Helpman, 2008). In unreported estimations, we added variables capturing the quality of regulation and the level of corruption in a country. These variables did not have any significant effect. Results are available from the authors upon request.

4.3 Robustness Checks

In Section 4.1, we estimated the service offshoring probability and intensity using the entire sample, i.e. we pooled all different service types together. While goods trade-related services, particulary transport services, were hit especially hard in the aftermath of the 2007-2008 financial crisis, the decline in business services proved to be moderate. Our descriptive statistics presented in Figure A.2 confirm this: the 2009 decrease in transport services measured in terms of both import values and number of importers was large compared to, for instance, R&D, data processing, management and personnel services. Therefore, the inclusion of transport services in the sample might have pushed the effects of internal cost pressures and external finance in the direction of goods imports. In what follows, we repeat the estimations for a sample from which we exclude transport services. We expect the determinants of service imports to differ even more from those of goods imports.

Table 3 reports the results of this exercise. The results of the first stage of the Heckman approach differ only slightly from the results presented for the entire sample (Table 1). The signs do not change. The probability of offshoring increases with labor productivity, but the effect is – as expected – smaller compared with the sample including transport services. The offshoring probability decreases with higher wage costs in the sector and country from where the imports are sourced. These results are highly significant at the 1%-level. GDP and distance have the expected sign and are also significant. Both cost pressure measures, the growth rate of sales and the growth rate of sales per employee (labor productivity), again exhibit a positive impact on the probability of service offshoring, but are mostly of smaller magnitude. In line with expectations, in times of decreasing sales (per employee) firms which import business services still behave similarly to goods importers and are less likely to start importing, but this tendency is lower when goods-related services are excluded. Similar to the sample including all service types, the coefficient of external liquidity remains insignificant. However, the sign changes from negative to positive.

The results of the second stage of the Heckman estimation confirm that the intensity

of service offshoring is less responsive to labor productivity when trade in goods-related services is excluded (cf. Tables 1 and 3). It is more responsive to foreign ownership. The finding that foreign-owned investors offshore less and that this effect is stronger in the reduced sample underlines the particular role of transport services. The size of the wage coefficient remains similar in both samples.

Most interestingly, service offshoring also proves to be more responsive to sales or productivity drops if the sample is limited to business services. The higher coefficient therefore strengthens the hypothesis that firms which experience cost pressures offshore more rather than less services. This reaction helps explain the absence of a collapse in service trade in times of recession. Again, changes in the availability of external finance do not influence service trade.

Table 3: Determinants of Service Offshoring Excluding Transport (Heckman Two-Step)

1st stage results: offshoring probability (marginal effects)

Explanatory Variables	Basic	$\Delta sales_{it}$			$\Delta prod_{it}$		
$prod_{it}$	0.028^a	0.027^a	0.027^a	0.028^a	0.033^a	0.033^a	0.033^a
	(19.83)	(19.56)	(19.58)	(19.51)	(22.28)	(22.34)	(21.94)
$wage_{kjt}$	-0.018^a	-0.018^a	-0.018^a	-0.021^a	-0.021^a	-0.021^a	-0.023^a
	(-2.92)	(-2.94)	(-2.93)	(-3.14)	(-3.35)	(-3.34)	(-3.45)
gdp_{jt}	0.090^b	0.090^b	0.090^b	0.114^b	0.098^b	0.099^b	0.123^b
	(2.31)	(2.32)	(2.32)	(2.18)	(2.48)	(2.49)	(2.30)
$distance_j$	-0.041^a	-0.041^a	-0.041^a	-0.045^a	-0.043^a	-0.043^a	-0.047^a
	(-6.26)	(-6.28)	(-6.30)	(-5.57)	(-6.39)	(-6.43)	(-5.66)
$foreign_{it}$	0.019^a	0.019^a	0.019^a	0.020^a	0.019^a	0.018^a	0.020^a
	(4.20)	(4.30)	(4.19)	(4.18)	(4.18)	(4.02)	(4.12)
$\Delta sales_{it}$		0.010^a	0.001	0.009^a			
		(6.63)	(0.20)	(3.43)			
$foreign_{it} * \Delta sales_{it}$			0.014^b				
			(2.54)				
$\Delta prod_{it}$					0.015^a	-0.001	0.008^a
					(2.94)	(-0.31)	(2.81)
$foreign_{it} * \Delta prod_{it}$						0.016^a	
						(2.77)	
$\Delta credit_{jt}$				0.014			0.019
				(0.39)			(0.53)

2nd stage results: offshoring intensity

	Basic	$\Delta sales_{it}$			$\Delta prod_{it}$		
$prod_{it}$	0.474^a	0.486^a	0.489^a	0.489^a	0.520^a	0.525^a	0.525^a
	(20.73)	(21.08)	(21.18)	(21.01)	(21.62)	(21.78)	(21.61)
$wage_{kjt}$	-0.318^a	-0.320^a	-0.320^a	-0.436^a	-0.332^a	-0.331^a	-0.444^a
	(-3.57)	(-3.60)	(-3.60)	(-4.70)	(-3.74)	(-3.73)	(-4.79)
gdp_{jt}	1.401^b	1.365^b	1.366^b	0.777	1.390^b	1.410^b	0.821
	(2.20)	(2.14)	(2.15)	(1.02)	(2.18)	(2.22)	(1.07)
$distance_j$	-0.313^a	-0.305^a	-0.306^a	-0.213^c	-0.299^a	-0.304^a	-0.215^c
	(-3.06)	(-2.99)	(-2.99)	(-1.83)	(-2.93)	(-2.98)	(-1.82)
$foreign_{it}$	-0.347^a	-0.365^a	-0.369^a	-0.369^a	-0.389^a	-0.404^a	-0.392^a
	(-5.28)	(-5.55)	(-5.61)	(-5.51)	(-5.93)	(-6.11)	(-5.88)
$\Delta sales_{it}$		-0.163^a	-0.375^a	-0.169^a			
		(-3.48)	(-4.94)	(-3.55)			
$foreign_{it} * \Delta sales_{it}$			0.338^a				
			(3.54)				
$\Delta prod_{it}$					-0.294^a	-0.543^a	-0.314^a
					(-6.15)	(-7.60)	(-6.48)
$foreign_{it} * \Delta prod_{it}$						0.437^a	
						(4.71)	
$\Delta credit_{jt}$				0.081			0.114
				(0.14)			(0.20)
mills ($lambda$)	1.103^a	1.064^a	1.063^a	1.005^a	0.990^a	1.014^a	0.943^a
	(8.77)	(8.51)	(8.50)	(8.07)	(8.21)	(8.42)	(7.83)
N	34,844	34,844	34,844	32,978	33,800	33,800	31,987

Note: The upper part of the table reports 1st stage results on the extensive margin of service imports excluding transport services. Results are obtained for a 5% random sample of all zero observations. The lower part reports 2nd stage results on the intensive margin conditional on the probability of offshoring. i denotes a firm in sector k in country j and in year t. All estimations contain country, sector, service type and year dummies. ^{a}p<0.01, ^{b} p<0.05, ^{c} p<0.1. Robust t statistics in parentheses.

5   Conclusions

The financial crisis in the years 2007-2008 and the resulting recession had a strong impact on international trade in goods. In contrast to the general decrease of cross-border activities, trade in services proved to be relatively resilient. This has led to the hypothesis that the determinants of trade in goods and trade in services differ substantially. While the former are very well studied, little is known about the latter. Research on the factors that influence service trade has been conducted at the macro level. Micro level datasets have only recently become available, and have so far been explored with the aim of describing the general pattern of service trade and service traders. As a consequence, Borchert and Mattoo (2012)'s arguments that the greater resilience of service trade may, amongst others, stem from a lower dependence on external finance and from the tendency of firms under cost pressure to offshore services that were formerly provided domestically, have remained untested.

This study has filled the gap in the literature. By combining new data on German service trade at the transaction level with existing data on multinational firms, we have studied the determinants of service imports. We have put a special emphasis on investigating the potential differences compared with factors that influence trade in goods. Using a Heckman-type selection model, our first stage results indicate that firms which are confronted with a decline in sales and sales per employee (labor productivity) are less likely to become a service importer. By contrast, our second stage results suggest that firms which are already service importers intensify the existing linkages in times of internal cost pressures. Credit constraints which play an important role in trade in goods do not seem to have an impact on service imports. The results were strongly confirmed when we excluded goods trade-related services, such as transportation, from the estimation sample.

Our results partly support the arguments of Borchert and Mattoo (2012): the probability of firms becoming service importers decreases when they face internal cost pressures. This is not unexpected, but seems to be rather in line with the previous literature

on trade in goods and cannot explain the crisis-resilience of service trade. However, the level of service offshoring increases in the light of internal cost pressures. Both margins are unaffected by supply-side credit shortages. These latter results support Borchert and Mattoo (2012)'s hypotheses. Such findings are relevant to other researchers since they show that firm-level models developed for trade in goods are only partly applicable to trade in services. They are also of significance for policymakers. In times of cost pressure, firms are unlikely to replace domestic suppliers with foreign suppliers. They tend, however, to intensify existing relationships abroad, which may in the long run drive domestic firms out of the market.

References

Altomonte, C., Mauro, F. D., Ottaviano, G., Rungi, A., Vicard, V., Jan. 2012. Global Value Chains During the Great Trade Collapse: a Bullwhip Effect? Working Paper Series 1412, European Central Bank.

Altomonte, C., Ottaviano, G. I., 2009. Resilient to the Crisis? Global Supply Chains and Trade Flows. In: The Great Trade Collapse: Causes, Consequences, and Prospects. Richard Baldwin, Ch. 11, pp. 95–100.

Amiti, M., Weinstein, D. E., 2009. Exports and Financial Shocks. NBER Working Papers 15556, National Bureau of Economic Research, Inc.

Antras, P., Helpman, E., 2008. Contractual Frictions and Global Sourcing. In: Helpman, E., Marin, D., Verdier, T. (Eds.), The Organization of Firms in a Global Economy. Harvard University Press, Ch. Contractual Frictions and Global Sourcing, pp. 9–54.

Beck, T., Demirguc-Kunt, A., Levine, R., 1999. A New Database on Financial Development and Structure. Policy Research Working Paper Series 2146, The World Bank.

Bernard, A. B., Eaton, J., Jensen, J. B., Kortum, S., 2003. Plants and Productivity in International Trade. American Economic Review 93(4), 1268–1290.

Bernard, A. B., Jensen, J. B., 1999. Exceptional Exporter Performance: Cause, Effect, or Both? Journal of International Economics 47 (1), 1–25.

Biewen, E., Blank, S., 2012. Margins of Service Trade. Mimeo.

Borchert, I., Mattoo, A., 2012. The Crisis-Resilience of Services Trade. Service Industries Journal 30 (13), 2115–2136.

Breinlich, H., Criscuolo, C., 2011. International Trade in Services: A Portrait of Importers and Exporters. Journal of International Economics 84 (2), 188–206.

Buono, I., Fadinger, H., Berger, S., 2008. The Micro Dynamics of Exporting: Evidence from French Firms. MPRA Paper 12940, University Library of Munich, Germany.

Chor, D., Manova, K., 2010. Off the Cliff and Back? Credit Conditions and International Trade during the Global Financial Crisis. NBER Working Papers 16174, National Bureau of Economic Research, Inc.

Conti, G., Turco, A. L., Maggioni, D., 2010. Exporters in Services: New Evidence from Italian Firms. Applied Economics Quarterly (formerly: Konjunkturpolitik) 56 (1), 73–98.
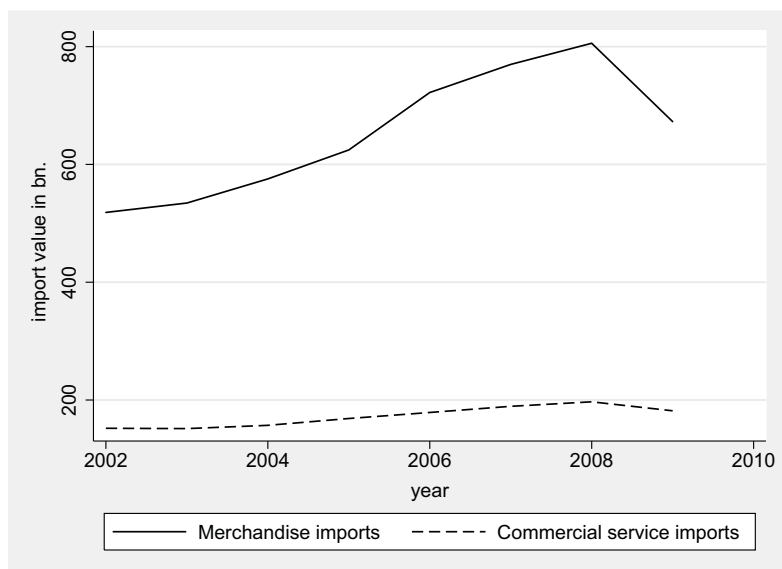
Davis, S. J., Haltiwanger, J. C., August 1992. Gross Job Creation, Gross Job Destruction, and Employment Reallocation. The Quarterly Journal of Economics 107 (3), 819–63.

Federico, S., Tosti, E., 2011. Exporters and Importers of Services: Firm-Level Evidence on Italy. Working paper, Preliminary version.

Feenstra, R. C., Li, Z., Yu, M., 2011. Exports and Credit Constraints Under Incomplete Information: Theory and Evidence from China. NBER Working Papers 16940, National Bureau of Economic Research, Inc.

Foreign Direct Investment Stock Statistics, April 2012. Special Statistical Publication 10. Tech. rep., Deutsche Bundesbank.
URL http://www.bundesbank.de

Harsch, D., Kleinert, J., 2011. An Almost Ideal Wage Database Harmonizing the ILO October Inquiry. IAW Discussion Papers 71, Institut für Angewandte Wirtschaftsforschung (IAW).

Hügelschäffer, S., Kromer, D., Lipponer, A., November 2009. Die deutsche Statistik über Direktinvestitionen: Neuerungen und wissenschaftliche Nutzung. AStA Wirtschafts- und Sozialstatistisches Archiv 3 (3), 157–167.

IMF, 2010. World Economic Outlook (WEO): Rebalancing Growth. Tech. rep., International Monetary Fund.

Kelle, M., Kleinert, J., 2010. German Firms in Service Trade. Applied Economics Quarterly (formerly: Konjunkturpolitik) 56 (1), 51–72.

Kelle, M., Kleinert, J., Raff, H., Toubal, F., 2012. Cross-Border and Foreign-Affiliate Sales of Services: Evidence from German Micro-Data. CESifo Working Paper Series 3806, CESifo Group Munich.

Special Statistical Publication 7, March 2009. Notes on the Coding List for the Balance of Payments Statistics. Tech. rep., Deutsche Bundesbank.
URL http://www.bundesbank.de

Temouri, Y., Vogel, A., Wagner, J., Aug. 2010. Self-Selection into Export Markets by Business Services Firms: Evidence from France, Germany and the United Kingdom. IZA Discussion Papers 5147, Institute for the Study of Labor (IZA).

UNCTAD, 2010. Global Investment Trends Monitor, No. 2. Tech. rep., Geneva.

Vogel, A., Wagner, J., 2010. Higher Productivity in Importing German Manufacturing Firms: Self-Selection, Learning from Importing, or Both? Review of World Economics 145(4), 641–665.

Wagner, J., 2007. Exports and Productivity: A Survey of the Evidence from Firm Level Data. The World Economy 30(1), 60–82.

Walter, P., Dell'mour, R., 2010. Firm-Level Analysis of International Trade in Services. IFC Working Papers (4).
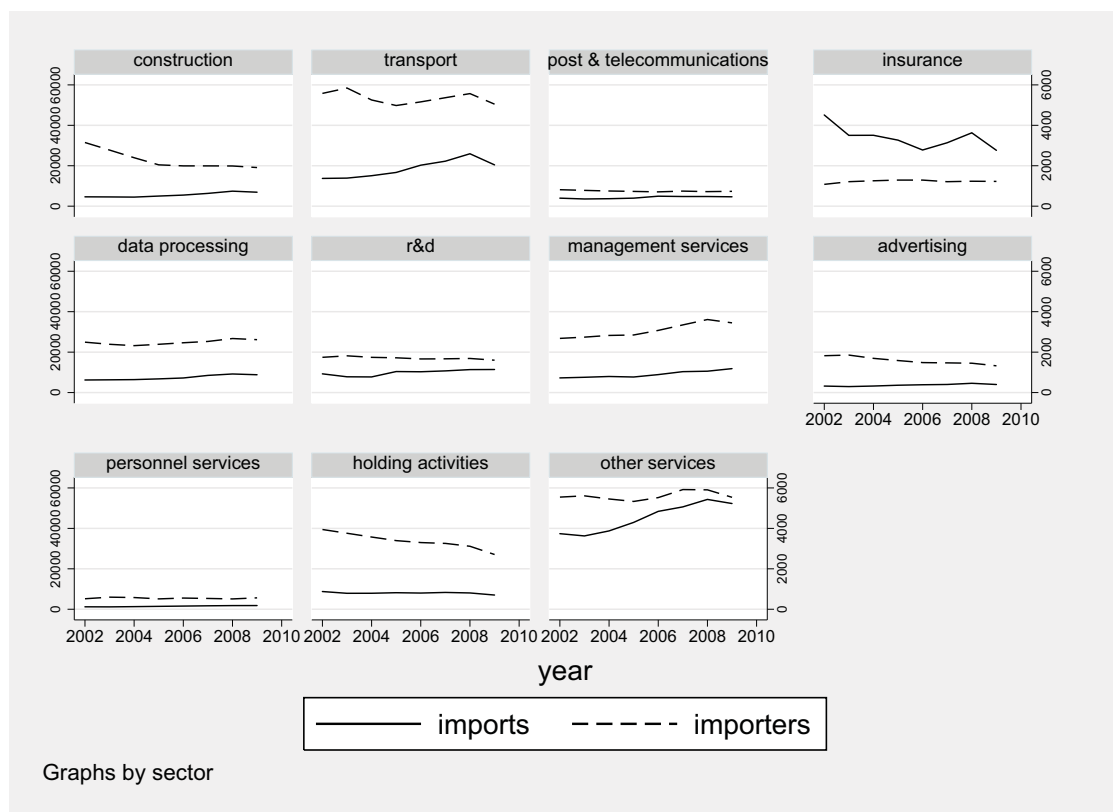
A Appendix

A.1 Evolution of Service Imports

Figure A.1: German Imports of Goods and Services

Source: own calculations, data from World Bank (2011).

Figure A.2: German Service Imports by Services Type

Source: own calculations, data from ITS (2011).

A.2 Classification of Services

Table A.1: *MiDi-ITS* Match

Sector	*MiDi* (NACE Rev. 1)	*ITS* (kza)*
Construction	4500: Construction	570, 580: Construction Services
Transport	6000: Land Transport, Pipelines 6100: Water Transport 6200: Air Transport 6300: Supporting & Auxiliary Transport Activities, Travel Agencies	20: Air Transport 210, 220, 300: Sea Transport 215, 226: Transport by Pipeline 240, 320: Road Transport & Inland Water Transport 310, 330: Miscellaneous Transport 560: Repairs to Means of Transport
Post & Telecommunications	6400: Post & Telecommunications	518: Communications Services 591: Postal & Courier Services
Insurance	6600: Insurance & Pension Funding, ex. Social Security	400, 401, 410, 420, 440-445, 450, 451, 460: Insurance Transactions
Data Processing	7200: Computer & Related Activities	513: IT Services
R&D	7300: Research & Development	501: Artistic Copyrights 502: Patents, Licenses & Inventions 511: R&D Activities
Management Services	7411: Legal Advice 7412: Accounting, Bookkeeping & Auditing Activities, Tax Consultancy 7413: Market Research, Public Opinion Polling 7414: Business & Management Consultancy	516: Commercial, Organisational and Administrative Services 519: Other Entrepreneurial Activities
Advertising	7440: Advertising	540: Advertising & Fair Costs
Personnel Services	7450: Labor Recruitment & Provision of Personnel	517: Personnel Leasing 521: Compensation of Employees
Holding Activities	7490: Management Activities of Holding Companies	523: Commission Fees 530: Subsidies to Subsidiaries

* According to the Bundesbank coding list, see Special Statistical Publication 7 (March 2009).

Table A.2: Representative Occupations by Industry

Occupation	Industry
Farm supervisor	Agricultural production (field crops)
Miner	Coalmining
Supervisor or general foreman	Crude petroleum and natural gas production
Miner	Other mining and quarrying
Baker (ovenman)	Manufacture of bakery products
Cloth weaver (machine)	Spinning, weaving and finishing textiles
Sewing-machine operator	Manufacture of wearing apparel (except footwear)
Shoe sewer (machine)	Manufacture of footwear
Sawmill sawyer	Sawmills, planing and other wood mills
Paper-making-machine operator (wet end)	Manufacture of pulp, paper and paperboard
Printing pressman	Printing, publishing and allied industries
Controlman	Petroleum refineries
Mixing- and blending-machine operator	Manufacture of industrial chemicals
Blast furnaceman (ore smelting)	Iron and steel basic industries
Welder	Manufacture of metal products (except machinery and equipment)
Machinery fitter-assembler	Manufacture of machinery (except electrical)
Electronic equipment assembler	Manufacture of electronic equipment, machinery and supplies
Ship plater	Shipbuilding and repairing
Wooden furniture finisher	Manufacture of wooden furniture and fixtures
Electric power lineman	Electric light and power
Building electrician	Construction
Automobile mechanic	Repair of motor vehicles
Salesperson	Wholesale trade (grocery)
Salesperson	Retail trade (grocery)
Cook	Restaurants and hotels
Automobile mechanic	Passenger transport by road
Aircraft accident fire-fighter	Supporting services to air transport
Post office counter clerk	Communication
Bank teller	Banks
Insurance agent	Insurance
Clerk of works	Engineering and architectural services
Stenographer-typist	Public administration
Technical education teacher (second level)	Education services
Professional nurse (general)	Medical and dental services

A.3 Descriptive Statistics

Table A.3: Service Imports by Firm Type

Year		No FDI, service imports	FDI, service imports	Total
2002	No. of firms	26,600	2,781	29,381
	Import value	51,325.11	89,549.54	140,874.7
	Av. import value	0.43543456	2.0028975	0.86648902
2003	No. of firms	26,737	2,651	29,388
	Import value	51,649.85	75,430.32	127,080.2
	Av. import value	0.41495822	1.6007453	0.74059497
2004	No. of firms	25,287	2,568	27,855
	Import value	56,232.01	75,437.7	131,669.7
	Av. import value	0.47045839	1.6287612	0.79394673
2005	No. of firms	24,287	2,544	26,831
	Import value	58,952.18	80,554.47	139,506.7
	Av. import value	0.49429575	1.6830217	0.83472939
2006	No. of firms	24,607	2,614	27,221
	Import value	63,320.4	83,507.23	146,827.6
	Av. import value	0.52234213	1.6951308	0.86122479
2007	No. of firms	25,412	2,638	28,050
	Import value	68,919.42	90,102.99	159,022.4
	Av. import value	0.54839843	1.8265353	0.90867872
2008	No. of firms	25,775	2,701	28,476
	Import value	72,188.33	102,190.5	174,378.8
	Av. import value	0.5577274	2.0352208	0.97069094

Note: own calculations. Data from *ITS* and *MiDi*. Import values are in € million.

Table A.4: Descriptive Statistics of the Explanatory Variables

	mode	$wage_{kjt}$	$prod_{it}$	gdp_{jt}	$distance_j$	$foreign_{it}$	$\Delta prod_{it}$	$\Delta sales_{it}$	$\Delta credit_{jt}$	$diverse_{it}$	$exper_{ikjt}$
No service	mean	1089.671	1570.081	516678	5385.606	0.48518	0.02106	-0.00528	0.13379	0	0
Trade	sd	1155.736	10854.49	1464640	4256.653	0.49979	0.58611	0.64266	0.11139	0	0
	N	31,737	31,737	31,737	31,737	31,737	30,454	31,737	29,856	0	0
Service trade	mean	1665.526	7043.814	1190226	3826.368	0.47895	0.03785	0.01866	0.11260	1.74670	0.10981
Intra-firm	sd	1338.407	124236.5	2411860	4156.653	0.49959	0.39691	0.40321	0.08913	0.90524	0.31268
	N	7,737	7,959	7,959	7,959	7,959	7,940	7,959	7,642	7,959	7,959
Service trade	mean	1712.442	9718.402	1529858	3187.068	0.56404	0.07930	0.06805	0.10911	1.55355	0.21032
Extra-firm	sd	1210.334	152852.6	2692503	3710.633	0.49591	0.42347	0.42783	0.08344	0.72685	0.40756
	N	10,579	10,579	10,579	10,579	10,579	10,502	10,579	10,152	10,579	10,579
Total	mean	1311.879	4151.215	836503	4676.142	0.50079	0.03629	0.01394	0.12513	1.63648	0.16717
	sd	1232.764	86287.63	1996462	4214.000	0.50000	0.52782	0.57080	0.10324	0.81389	0.37314
	N	50,275	50,275	50,275	50,275	50,275	48,896	50,275	47,650	18,538	18,538

Table A.5: Service Imports by Mode

year		intra-firm trade	extra-firm trade	total
2002	No. of firms	280	2,501	2,781
	Import value	71,771.35	17,778.19	89,549.54
	Av. import value	4.8820727	0.59242874	2.0028975
2003	No. of firms	289	2,362	2,651
	Import value	57,164.62	18,265.7	75,430.32
	Av. import value	3.7345412	0.57412227	1.6007453
2004	No. of firms	281	2,287	2,568
	Import value	52,857.67	22,580.03	75,437.7
	Av. import value	3.5051507	0.72288484	1.6287612
2005	No. of firms	264	2,280	2,544
	Import value	56,097.34	24,457.13	80,554.47
	Av. import value	3.620351	0.75559599	1.6830217
2006	No. of firms	287	2,327	2,614
	Import value	57,739.55	25,767.68	83,507.23
	Av. import value	3.5340649	0.78261734	1.6951308
2007	No. of firms	283	2,355	2,638
	Import value	65,904.87	24,198.12	90,102.99
	Av. import value	4.0881379	0.72866136	1.8265353
2008	No. of firms	266	2,435	2,701
	Import value	75,572.56	26,617.91	102,190.5
	Av. import value	4.8484354	0.76877051	2.0352208

Note: own calculations. Data from *ITS* and *MiDi*. Import values are in € million.

The following Discussion Papers have been published since 2012:

01	2012	A user cost approach to capital measurement in aggregate production functions	Thomas A. Knetsch
02	2012	Assessing macro-financial linkages: a model comparison exercise	Gerke, Jonsson, Kliem Kolasa, Lafourcade, Locarno Makarski, McAdam
03	2012	Executive board composition and bank risk taking	A. N. Berger T. Kick, K. Schaeck
04	2012	Stress testing German banks against a global cost-of-capital shock	Klaus Duellmann Thomas Kick
05	2012	Regulation, credit risk transfer with CDS, and bank lending	Thilo Pausch Peter Welzel
06	2012	Maturity shortening and market failure	Felix Thierfelder
07	2012	Towards an explanation of cross-country asymmetries in monetary transmission	Georgios Georgiadis
08	2012	Does Wagner's law ruin the sustainability of German public finances?	Christoph Priesmeier Gerrit B. Koester
09	2012	Bank regulation and stability: an examination of the Basel market risk framework	Gordon J. Alexander Alexandre M. Baptista Shu Yan
10	2012	Capital regulation, liquidity requirements and taxation in a dynamic model of banking	Gianni De Nicolò Andrea Gamba Marcella Lucchetta
11	2012	Credit portfolio modelling and its effect on capital requirements	Dilek Bülbül Claudia Lambert

12	2012	Trend growth expectations and U.S. house prices before and after the crisis	Mathias Hoffmann Michael U. Krause Thomas Laubach
13	2012	The PHF: a comprehensive panel survey on household finances and wealth in Germany	Ulf von Kalckreuth Martin Eisele, Julia Le Blanc Tobias Schmidt, Junyi Zhu
14	2012	The effectiveness of monetary policy in steering money market rates during the financial crisis	Puriya Abbassi Tobias Linzert
15	2012	Cyclical adjustment in fiscal rules: some evidence on real-time bias for EU-15 countries	Gerhard Kempkes
16	2012	Credit risk connectivity in the financial industry and stabilization effects of government bailouts	Jakob Bosma Micheal Koetter Michael Wedow
17	2012	Determinants of bank interest margins: impact of maturity transformation	O. Entrop, C. Memmel B. Ruprecht, M. Wilkens
18	2012	Tax incentives and capital structure choice: evidence from Germany	Thomas Hartmann-Wendels Ingrid Stein, Alwin Stöter
19	2012	Competition for internal funds within multinational banks: foreign affiliate lending in the crisis	Cornelia Düwel Rainer Frey
20	2012	Fiscal deficits, financial fragility, and the effectiveness of government policies	Markus Kirchner Sweder van Wijnbergen
21	2012	Saving and learning: theory and evidence from saving for child's college	Junyi Zhu

22	2012	Relationship lending in the interbank market and the price of liquidity	Falk Bräuning Falko Fecht
23	2012	Estimating dynamic tax revenue elasticities for Germany	Gerrit B. Koester Christoph Priesmeier
24	2012	Identifying time variability in stock and interest rate dependence	Michael Stein, Mevlud Islami Jens Lindemann
25	2012	An affine multifactor model with macro factors for the German term structure: changing results during the recent crises	Arne Halberstadt Jelena Stapf
26	2012	Determinants of the interest rate pass-through of banks – evidence from German loan products	Tobias Schlüter, Ramona Busch Thomas Hartmann-Wendels Sönke Sievers
27	2012	Early warning indicators for the German banking system: a macroprudential analysis	Nadya Jahn Thomas Kick
28	2012	Diversification and determinants of international credit portfolios: evidence from German banks	Benjamin Böninghausen Matthias Köhler
29	2012	Finding relevant variables in sparse Bayesian factor models: economic applications and simulation results	Sylvia Kaufmann Christian Schumacher
30	2012	Measuring option implied degree of distress in the US financial sector using the entropy principle	Philipp Matros Johannes Vilsmeier
31	2012	The determinants of service imports: the role of cost pressure and financial constraints	Elena Biewen Daniela Harsch Julia Spies

The following Discussion Papers have been published since 2011:

Series 1: Economic Studies

01	2011	Long-run growth expectations and "global imbalances"	M. Hoffmann M. Krause, T. Laubach
02	2011	Robust monetary policy in a New Keynesian model with imperfect interest rate pass-through	Rafael Gerke Felix Hammermann
03	2011	The impact of fiscal policy on economic activity over the business cycle – evidence from a threshold VAR analysis	Anja Baum Gerrit B. Koester
04	2011	Classical time-varying FAVAR models – estimation, forecasting and structural analysis	S. Eickmeier W. Lemke, M. Marcellino
05	2011	The changing international transmission of financial shocks: evidence from a classical time-varying FAVAR	Sandra Eickmeier Wolfgang Lemke Massimiliano Marcellino
06	2011	FiMod – a DSGE model for fiscal policy simulations	Nikolai Stähler Carlos Thomas
07	2011	Portfolio holdings in the euro area – home bias and the role of international, domestic and sector-specific factors	Axel Jochem Ute Volz
08	2011	Seasonality in house prices	F. Kajuth, T. Schmidt
09	2011	The third pillar in Europe: institutional factors and individual decisions	Julia Le Blanc
10	2011	In search for yield? Survey-based evidence on bank risk taking	C. M. Buch S. Eickmeier, E. Prieto

11	2011	Fatigue in payment diaries – empirical evidence from Germany	Tobias Schmidt
12	2011	Currency blocs in the 21st century	Christoph Fischer
13	2011	How informative are central bank assessments of macroeconomic risks?	Malte Knüppel Guido Schultefrankenfeld
14	2011	Evaluating macroeconomic risk forecasts	Malte Knüppel Guido Schultefrankenfeld
15	2011	Crises, rescues, and policy transmission through international banks	Claudia M. Buch Cathérine Tahmee Koch Michael Koetter
16	2011	Substitution between net and gross settlement systems – A concern for financial stability?	Ben Craig Falko Fecht
17	2011	Recent developments in quantitative models of sovereign default	Nikolai Stähler
18	2011	Exchange rate dynamics, expectations, and monetary policy	Qianying Chen
19	2011	An information economics perspective on main bank relationships and firm R&D	D. Hoewer T. Schmidt, W. Sofka
20	2011	Foreign demand for euro banknotes issued in Germany: estimation using direct approaches	Nikolaus Bartzsch Gerhard Rösl Franz Seitz
21	2011	Foreign demand for euro banknotes issued in Germany: estimation using indirect approaches	Nikolaus Bartzsch Gerhard Rösl Franz Seitz

22	2011	Using cash to monitor liquidity – implications for payments, currency demand and withdrawal behavior	Ulf von Kalckreuth Tobias Schmidt Helmut Stix
23	2011	Home-field advantage or a matter of ambiguity aversion? Local bias among German individual investors	Markus Baltzer Oscar Stolper Andreas Walter
24	2011	Monetary transmission right from the start: on the information content of the eurosystem's main refinancing operations	Puriya Abbassi Dieter Nautz
25	2011	Output sensitivity of inflation in the euro area: indirect evidence from disaggregated consumer prices	Annette Fröhling Kirsten Lommatzsch
26	2011	Detecting multiple breaks in long memory: the case of U.S. inflation	Uwe Hassler Barbara Meller
27	2011	How do credit supply shocks propagate internationally? A GVAR approach	Sandra Eickmeier Tim Ng
28	2011	Reforming the labor market and improving competitiveness: an analysis for Spain using FiMod	Tim Schwarzmüller Nikolai Stähler
29	2011	Cross-border bank lending, risk aversion and the financial crisis	Cornelia Düwel, Rainer Frey Alexander Lipponer
30	2011	The use of tax havens in exemption regimes	Anna Gumpert James R. Hines, Jr. Monika Schnitzer
31	2011	Bank-related loan supply factors during the crisis: an analysis based on the German bank lending survey	Barno Blaes

32	2011	Evaluating the calibration of multi-step-ahead density forecasts using raw moments	Malte Knüppel
33	2011	Optimal savings for retirement: the role of individual accounts and disaster expectations	Julia Le Blanc Almuth Scholl
34	2011	Transitions in the German labor market: structure and crisis	Michael U. Krause Harald Uhlig
35	2011	U-MIDAS: MIDAS regressions with unrestricted lag polynomials	C. Foroni M. Marcellino, C. Schumacher

Series 2: Banking and Financial Studies

01	2011	Contingent capital to strengthen the private safety net for financial institutions: Cocos to the rescue?	George M. von Furstenberg
02	2011	Gauging the impact of a low-interest rate environment on German life insurers	Anke Kablau Michael Wedow
03	2011	Do capital buffers mitigate volatility of bank lending? A simulation study	Frank Heid Ulrich Krüger
04	2011	The price impact of lending relationships	Ingrid Stein
05	2011	Does modeling framework matter? A comparative study of structural and reduced-form models	Yalin Gündüz Marliese Uhrig-Homburg
06	2011	Contagion at the interbank market with stochastic LGD	Christoph Memmel Angelika Sachs, Ingrid Stein
07	2011	The two-sided effect of financial globalization on output volatility	Barbara Meller
08	2011	Systemic risk contributions: a credit portfolio approach	Klaus Düllmann Natalia Puzanova
09	2011	The importance of qualitative risk assessment in banking supervision before and during the crisis	Thomas Kick Andreas Pfingsten
10	2011	Bank bailouts, interventions, and moral hazard	Lammertjan Dam Michael Koetter
11	2011	Improvements in rating models for the German corporate sector	Till Förstemann

12	2011	The effect of the interbank network structure on contagion and common shocks	Co-Pierre Georg
13	2011	Banks' management of the net interest margin: evidence from Germany	Christoph Memmel Andrea Schertler
14	2011	A hierarchical Archimedean copula for portfolio credit risk modelling	Natalia Puzanova
15	2011	Credit contagion between financial systems	Natalia Podlich Michael Wedow
16	2011	A hierarchical model of tail dependent asset returns for assessing portfolio credit risk	Natalia Puzanova
17	2011	Contagion in the interbank market and its determinants	Christoph Memmel Angelika Sachs
18	2011	Does it pay to have friends? Social ties and executive appointments in banking	A. N. Berger, T. Kick M. Koetter, K. Schaeck

Visiting researcher at the Deutsche Bundesbank

The Deutsche Bundesbank in Frankfurt is looking for a visiting researcher. Among others under certain conditions visiting researchers have access to a wide range of data in the Bundesbank. They include micro data on firms and banks not available in the public. Visitors should prepare a research project during their stay at the Bundesbank. Candidates must hold a PhD and be engaged in the field of either macroeconomics and monetary economics, financial markets or international economics. Proposed research projects should be from these fields. The visiting term will be from 3 to 6 months. Salary is commensurate with experience.

Applicants are requested to send a CV, copies of recent papers, letters of reference and a proposal for a research project to:

Deutsche Bundesbank
Personalabteilung
Wilhelm-Epstein-Str. 14

60431 Frankfurt
GERMANY