

The impact of regulation of network and professional services on competition and trade

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Using data from Belgium over the period 1997-2005 and taking the perspective of the domestic policy maker, this paper looks at how regulation of network and professional services affects competition on the domestic market as well as imports and affiliates of foreign companies. The impact of regulation on the wider domestic economy is looked at first in terms of forward and backward linkages using input-output tables, second in terms of the impact of imports on manufacturing productivity and third that of foreign investment on productivity of the services themselves. Policy should look beyond the immediate impact of a regulation on the sector concerned to take into consideration the wider effects on the economy as a whole.

1. Introduction

There has been increasing interest in the way regulation affects key economic outcomes and in particular the way in which regulation can affect trade either internationally or within the European Single Market. However attempts to open up services to trade will likely fail if the domestic imperatives for regulation remain strong. In the first instance domestic regulation must be addressed through the interests of policy makers in the country concerned. In turn this warrants attention on the domestic effects of regulation, both on the services concerned and more widely on the rest of the economy through the linkages between regulated services and other sectors.

This paper therefore looks at the way in which regulation of certain types of services affects the domestic economy in terms of competition as well as trade. It looks first at the impact on network and professional services themselves. Then it looks at how these services impact the wider economy. The paper applies to Belgium over the period 1997 to 2005, a period when many regulatory changes were being made to this small open economy using micro data on more or less all enterprises in Belgium.

The paper innovates first in using micro data covering nearly all of the economy and not only large companies. Second it innovates in looking at forward linkages between these services and the rest of the economy and the impact on costs of user sectors both manufacturing and other service sectors. Third it extends the analysis to providers of services as a source of demand, particularly for manufacturing industry. Fourth it goes beyond intermediate inputs to look also at the effect of regulation on demand for machinery and equipment and other forms of capital investment.

2. Literature Review

Interest in opening up previously protected services to competition largely dates back to the 1980s, when such services as air transport and telecommunications began to be affected first in the United States and then in other English speaking and Nordic countries. The OECD has provided a significant boost to the study of the process of liberalisation of services through a series of product market indicators for services dating back to the late 1990s and sometimes earlier using a comparable methodology and applying to a large number of countries (Conway & Nicoletti, 2006; Koske; Wanner; Bitetti; Barbiero, 2015). The indicators have been criticised (Pelkmans, 2010) but they nevertheless constitute a very rich source of information. The possibility to use low level and intermediate levels of aggregation to verify the effect of different kinds of product market regulation on economic performance represents a key advantage of the OECD product market indicators for services and one that is exploited in this paper. A limitation acknowledged by the OECD is the fact that the indicators make no attempt to measure the stance of regulation with respect to public policy goals other than promoting competition. While this makes the process of constructing indicators less subjective, policy makers must always take into consideration the balance between efficiency gains from greater competition with the adequate protection of public policy goals. Enforcement is another important issue which the indicators have not been able to deal with satisfactorily.

A large number of macro-and micro-economic studies have applied the indicators to test the impact of regulation on a wide variety of different dimensions of economic performance including domestic and foreign direct investment, productivity, employment and wages, markups and firm entry rates. These studies use different techniques and types of data from economy wide to sectoral to micro data on individual enterprises. From the beginning a dual impact of services' regulation has been identified, that on the sector concerned and that on the rest of the economy, in particular manufacturing industry. These "knock on" effects depend on the extent of anti-competitive regulation in non-manufacturing sectors and the importance of services as suppliers of intermediate inputs. The importance of services as a source of demand for, often high technology, investment goods supplied by the manufacturing sector appears to have been largely overlooked, but an issue explored in this paper.

A number of studies look at the level of competition in services measured by markups or price cost margins. Høj et al. (2007), Bouis and Klein (2008) and Christopoulou and Vermeulen (2008) use sectoral level data. Nguyen-Hong (2000), Dihel and Shepherd (2007) and Bottini and Molná (2010) use individual company data. Christopoulou and Vermeulen and Bottini and Molná limit themselves to estimating markups, while Bouis and Klein further look at the effect of markups on productivity. Høj et al., Nguyen-Hong and Dihel and Shepherd all relate the degree of product market regulation to the level of competition, the latter two extending the analysis to the impact on trade by calculating tax equivalents.

These studies all find that the level of competition in services is generally lower than in manufacturing, but can differ on which services and which countries record the lowest levels of competition. The most recent study using micro data (Bottini; Molná, 2010) concluded that estimated markups were high for services where a high degree of information asymmetry prevails and products are customer specific, such as real estate, renting and utilities and professional services. Markups tend to be substantial-

ly lower for traded services and industries that produce more standardised products such as construction, computer services, distribution and catering.

In the light of the conclusion of the Uruguay Round when services entered for the first time the multi-lateral framework for trade and efforts to complete the EU's Single Market for services, the impact of domestic regulation became an important topic. Molinuevo and Sáez (2014) describe the different approaches to measuring the impact of regulation on trade along with an extensive discussion of the literature. They include measuring the impact of regulation on markups or price-cost margins discussed above and a number of indirect methods including gravity equations and CGE models. Less frequent are studies of the impact on (inward) FDI, which is a major lacunae since most trade in services takes place through permanent presence rather than through cross-border trade (Smith, 2015).

Three studies cover the interaction between manufacturing and services (Pilat; Wöfl, 2005; Faini; Haskel; Navaretti; Scarpa;Wey, 2006; ECSIP, 2014). Pilat et al show that the link can be measured in various ways. First the contribution of intermediate inputs and value added in the growth of gross output can be used to calculate rising dependency on bought in goods and services. Second occupational data can be used to show how service functions increase in manufacturing industry. Third input-output tables can be used to show how services are "embodied" directly and indirectly in manufacturing production. In the mid-1990s, the beginning of the period examined in this paper, services accounted directly or indirectly on average for about 22% of OECD manufacturing production. Backward linkages measure a sector's dependence on other sectors which supply it with intermediate products. However as mentioned some of the impact of greater demand for manufacturing occurs through demand for investment goods, which is included as a component of final demand in the input-output tables rather than intermediate consumption. Pilat et al do not mention the possibility of also measuring forward linkages using input-output tables. Forward linkages measure a sector's dependence upon other sectors as buyers of its output.

A study by Dietzenbacher (2002) addresses both of these issues by taking into account final output coefficients of consumption, exports and investment and by measuring both backward and forward linkages and then applying them to the case of an intercountry input-output table for six European Union countries. He found that the three smaller countries (Netherlands, Belgium and Denmark) have smaller backward and forward multipliers than the larger countries (Germany, France and Italy) indicating that their production processes depend more on external sources such as imports and exports and that small countries also have significantly larger import and export multipliers than large countries. Manufacturing sectors have larger backward output multipliers than services, larger import multipliers and larger intercountry spillover effects. For forward effects, the major distinction is between sectors that produce for final demand, which have small output multipliers, and those that produce for intermediate consumption which usually exhibit large output multipliers, among which are to be found services such as transport and communications.

As pointed out by Faini et al, aggregate productivity analyses exclude input-output linkages by definition while sectoral or firm-level analysis typically focus exclusively on variables that are related to the sector of interest. Both Faini et al and ECSIP look at the impact of services on growth in manufacturing productivity, with the first using OECD regulatory restrictiveness indices for network and professional services weighted by the direct and indirect contribution of these services to goods producing

industries, finding a negative effect of regulation on productivity. ECSIP looks at how domestic and foreign linkages affect manufacturing productivity growth and find that domestic linkages play the major role for large European countries and foreign linkages for the small ones like Belgium.

In addition to their work on manufacturing productivity, Faini et al also show that regulation of network and professional services negatively affects inward FDI in manufacturing industries that use these services heavily and because foreign affiliates have higher productivity than domestic firms this also affects negatively levels of productivity. Their work is in line with that of the OECD where Nicoletti et al. (2003) show that regulatory policies that restrict market access or reduce the potential returns to foreign investment negatively influence the share of foreign direct investment in OECD countries. Conway et al. (2006) regress the share of employment by foreign affiliates in total employment at the sectoral level on the regulation impact indicators and a number of control variables. They find that regulatory restrictions to domestic competition and FDI both have a significant negative effect on the employment share of foreign affiliates across model specifications.

Input-output models can be used alongside other models to assess the impact of a change in policy or the threat posed by an exogenous change in the economic environment on output, employment or other variables of interest. Studies by Susuki and Uchiyama (2010) and by Kerschner et al (2013) for example look at the impact of a rise in the price of oil on respectively the Japanese and US economies and identify vulnerable sectors based on the energy dependence and location within the production chain. Kveiborg et al. (2006) evaluated regional economic impacts from heavy vehicle fees comparing input-output based models with system dynamic and computable general equilibrium models (CGE). Input-output models do not often look at how demand side can react to changes in prices. Price increases will affect both intermediate and final demand leading to further declines in demand. CGE models are typically comparative static equilibrium models with substitution between inputs. They are capable of taking into consideration different types of interaction. However it is usually difficult to distinguish what is driving the results and because the adjustment path is instantaneous the time dimension is absent. System dynamic models can take into consideration different types of effect and are better able to take into consideration the dynamic aspect of a policy change but the models have not been very consistent.

Ogarenko and Hubacek (2013) made a study of the effect of eliminating energy subsidies in Ukraine that from a methodological point of view most resembles the approach adopted in this paper. First a price model is utilized to estimate price changes resulting from subsidy elimination and then a demand driven input-output model is adopted for estimation of associated changes of environmental and social variables. Their approach uses own price elasticities of demand to establish the link between price changes estimated by the price model with changes in final demand.

3. Methodology

Measurement of the effect of regulation proceeds in two stages. First the effect of regulation on competition and trade on enterprises in Belgium is measured econometrically. The econometric results are then used to evaluate the impact of such regulation on the wider economy, including the manufacturing sector.

3.1. The impact of regulation on competition and trade for individual enterprises

OECD sector specific regulatory indices are used to measure types of regulation separately for network industries and for professional services. The indices are constructed on the basis of very detailed questionnaires, the results of which are then weighted and combined into sub-indices and an aggregate index for each sector with values varying between 0 for no regulation and 6 for the most restrictive regulation (Conway; Nicoletti, 2006). From a policy point of view and also to avoid the need for weighting, the most detailed level of regulation proves the most useful. Rather than measuring whether regulation per se has an impact on a particular variable, it is much more interesting to be able to distinguish which particular type of regulation is affecting competition or alternatively trade. However, at a disaggregated level, indices for the same sector for the same country tend to be highly related and to pose a problem of multi-collinearity in the estimation procedure. Regulations that weigh heavily in the overall result will likely have a high explanatory power when taken individually, and a comparison between the adjusted r^2 s of the overall regression with those of regressions on the underlying individual regulations can help to identify which these are.

For network industries, the questions on entry relate to the legal conditions by which domestic or foreign suppliers may enter the market. Additional questions relevant to the particular market may be added to the basic questions on market access such as participation in open skies agreements, third party access to the grid, consumption thresholds to be able to choose a supplier. Because the underlying questions differ from one sector to another for network industries, only sub-indices can be used to compare the effects of entry regulation across sectors. The indicator on public ownership relates to the percentage share in the largest firm(s) in the sector and is highly comparable across the different network industries.

Since the underlying questionnaires for the four professional services are the same, comparability of the results can be assured. The indicators on entry concern the exclusive right to provide certain services (for instance to plead in court or to audit publicly quoted companies), educational and training requirements to be admitted to the profession and restrictions on the number of firms that may practise a profession. Indicators on conduct relate to the legal form that is permitted to practice, limitations on cooperation between professionals, price regulations and restrictions on the ability to advertise. It should be noted that in Belgium none of the professions had restrictions on the number of foreign professionals/ firms permitted to practice by quo-

tas or economic needs tests so that this type of regulation could not be tested. These restrictions would have needed to be abolished subsequently under the Services Directive, which applies also to professional services, had they existed.

The regulatory indices used for the estimation phrase are limited to the period 1996 to 2004 for network industries and to the years 1996 and 2003 for professional services owing to limitations in the availability of Belgian micro data (see section on data) and in the case of professional services to the collection periods for the OECD exercise. The OECD overall product market regulatory indicator for Belgium declined from 2.3 in 1998 to 1.64 in 2003 and then to 1.52 in 2008 and 1.39 in 2013. It can be of interest to see how regulation has developed since 2004 also for the network industries covered (electricity generation and distribution, postal and telecommunications services, air and rail transport) and professional services (lawyers, accountants, architects and engineers) (Table 1).

year	Electricity			Telecom			Post			Rail			Airlines		
	Overall	Entry	Public Ownership	Overall	Entry	Public Ownership	Overall	Entry	Public Ownership	Overall	Entry	Public Ownership	Overall	Entry Barriers	Public Ownership
1996	4.68	5.00	1.73	4.62	5.00	3.01	4.33	2.00	5.00	5.63	6.00	6.00	1.53	0.00	3.06
1997	4.68	5.00	1.73	4.35	5.00	3.11	4.33	2.00	5.00	5.63	6.00	6.00	1.53	0.00	3.06
1998	4.68	5.00	1.73	3.96	3.75	3.21	3.33	2.00	5.00	5.63	6.00	6.00	1.02	0.00	2.04
1999	4.67	5.00	1.68	2.39	1.50	3.21	3.00	1.00	5.00	5.63	6.00	6.00	1.02	0.00	2.04
2000	3.86	2.33	1.49	1.81	0.00	3.21	3.00	1.00	5.00	5.63	6.00	6.00	1.02	0.00	2.04
2001	3.85	2.33	1.44	1.70	0.00	3.21	3.00	1.00	5.00	5.63	6.00	6.00	0.00	0.00	0.00
2002	3.84	2.33	1.39	1.70	0.00	3.21	3.00	1.00	5.00	5.63	6.00	6.00	0.00	0.00	0.00
2003	3.82	2.33	1.34	1.69	0.00	3.21	3.00	1.00	5.00	5.63	6.00	6.00	0.00	0.00	0.00
2004	3.57	1.33	1.34	1.67	0.00	3.21	3.00	1.00	5.00	5.63	6.00	6.00	0.00	0.00	0.00
2005	3.57	1.33	1.34	1.66	0.00	3.21	2.67	1.00	5.00	4.88	6.00	6.00	0.00	0.00	0.00
2006	2.91	1.33	1.68	1.64	0.00	3.21	2.00	1.00	3.00	3.75	3.00	6.00	0.12	0.00	0.25
2007	2.17	1.00	1.68	1.62	0.00	3.21	2.00	1.00	3.00	3.75	3.00	6.00	0.12	0.00	0.25
2008	2.17	1.00	1.68	1.60	0.00	3.21	2.00	1.00	3.00	3.75	3.00	6.00	0.12	0.00	0.25
2009	2.17	1.00	1.68	1.59	0.00	3.21	2.00	1.00	3.00	3.75	3.00	6.00	0.12	0.00	0.25
2010	1.84	1.00	1.87	1.58	0.00	3.21	2.00	1.00	3.00	3.75	3.00	6.00	0.12	0.00	0.25
2011	1.84	1.00	1.87	1.58	0.00	3.21	1.67	0.00	3.00	3.75	3.00	6.00	0.12	0.00	0.25
2012	1.84	1.00	1.87	1.58	0.00	3.21	1.67	0.00	3.00	3.75	3.00	6.00	0.12	0.00	0.25
2013	1.84	1.00	1.87	1.57	0.00	3.21	1.67	0.00	3.00	3.75	3.00	6.00	0.12	0.00	0.25

Table 1a: OECD Regulatory Indices for Network Services

year	Accounting			Legal			Architect			Engineer		
	Overall	Entry	Conduct	Overall	Entry	Conduct	Overall	Entry	Conduct	Overall	Entry	Conduct
1996	3.79	4.08	3.50	3.75	4.13	3.38	2.54	2.83	2.25	0.00	0.00	0.00
2003	3.23	4.08	2.38	4.69	5.00	4.38	2.17	3.58	0.75	0.00	0.00	0.00
2008	3.23	4.08	2.38	4.31	5.00	3.63	2.35	3.21	1.50	0.00	0.00	0.00
2013	3.23	4.08	2.38	4.31	5.00	3.63	2.35	3.21	1.50	0.00	0.00	0.00

Table 1b: OECD Regulatory Indices for Professional Services

While the OECD regulatory indicators measure domestic regulation, the main impetus for liberalisation of network industries in Belgium has come from European Union legislation to open up such industries to competition in the context of completion of the Single Market for Services. The major legislation affecting professional services has been the Directive on Mutual Recognition of Qualifications, which has a much wider coverage than the four professions covered here.

Electricity and Telecommunications undertook the major process of market liberalisation during the period covered. Entry regulation diminished gradually for postal services before during and after the period covered while public ownership only began to fall from 2006. Entry for rail services remained heavily regulated until 2006 and public ownership remains high today, while entry barriers for airlines had already been eliminated prior to 1996. Public ownership of airlines fell markedly in 2001 with the bankruptcy of the national flag carrier SABENA. Therefore it is possible to exploit differences in changes over time as well as differences in the initial level of regulation between network sectors. For professional services there has been no clear pattern of liberalisation either during or after the period covered. The major difference con-

cerns regulation across sectors with accounting and legal services highly regulated, architects less regulated and engineers not regulated at all.

As indicated in the previous section, the OECD regulatory indices have been used in the past to measure tax equivalents for trade in services. The potential gains from trade are then assumed to flow from the total elimination of regulatory barriers. However, this approach inherently lacks realism. Services are regulated for a purpose and will continue to be regulated in future. Rather at issue is the form that regulation takes and whether regulation adequately meets the public interest that prompted the introduction of regulation in a way that minimises the adverse impact on competition and trade. For this reason it is more realistic to begin from the identification of those regulations that adversely affect competition and trade most severely and from there to try and devise alternatives that minimise these adverse effects.

This paper continues to use price-cost margins as a measure of competition on the domestic market. Price-cost margins have the advantage that data on an individual firm level can be calculated from balance sheet data while prices and quantities are not directly observable. Greater competition should lead to lower margins and ceteris paribus lower prices for users. A key assumption has been that the fall in price-cost margins from a one point decrease in regulation will lead to an equivalent fall in prices of the service in question. While questionable, it should be understood that the impact assessments are presented as an exercise in possible outcomes and that another price assumption can easily be substituted for the one employed here.

The basic regressions are a reduced form similar to that in Nihel and Shepherd (2007) using a pooled OLS with robust standard errors clustered on the firm for competition and cross-border trade and a logit regression for measuring the probability of permanent presence.

For competition:

$$(1) \quad \log(PCM_{ij}) = c + B[controls_{ij}] + X.TRI_j + \varepsilon_{ij}$$

where the price cost margin (PCM) for firm i in sector j is “explained” by a constant, a set of sector and firm level control variables, the regulatory indices $X.TRI$ and a white noise error term.

For cross-border trade:

$$(2) \quad \log(imports_{ij}) = c + B[controls_{ij}] + X.TRI_j + \varepsilon_{ij}$$

where imports are measured as the world wide imports of firm i for services j .

For permanent presence:

$$(3) \quad \log\frac{p_i}{1-p_i} = c + B[controls_{ij}] + X.TRI_j + \varepsilon_{ij}$$

where foreign affiliate takes a value of 1 if the firm i in sector j is the affiliate of a foreign company and 0 otherwise and $p_i = P\{y_i=1|x_i\}$ is the probability of observing outcome 1.

In the case of the regressions on price-cost margins and on imports of services, the log-linear form constitutes a semi-elasticity which implies that a coefficient β_j measures the proportionate change in the expected value of the dependent variable as the explanatory variable changes. In the case of competition, this can be seen as the proportionate change in price-cost margins, PCM_j , for each one unit change in regulation, $X.TRI_j$. This feature of the regressions proves very useful for subsequent work on the impact of changes in regulation on manufacturing and the rest of the economy and is preferred to the tax equivalents approach. Similarly, for cross-border trade the coefficient β_j provides an estimate of the proportionate change in imports of services for each one unit change in regulation. In the case of FDI which uses a logit form of regression the coefficient cannot be interpreted in this way.

While offering the virtue of simplicity, the reduced form regression must be subject to a number of caveats. As is standard in an OLS regression, problems of endogeneity and of omitted variable bias are to be expected. To control partially for endogeneity, the regulatory indicators are lagged one period with regard to the dependent variables. Control variables for both sectoral and firm specific characteristics pose a particular problem for regressions on price-cost margins because the denominator for the margins is turnover. A great many of the common standardised variables such as capital intensity or labour costs also use turnover as the denominator leading to the same variable on both sides of the regression. For that reason, control variables have been limited to the Herfindahl index to control for sector specific characteristics influencing competition and labour productivity to control for firm specific characteristics. Year dummies control for business cycle effects. First a regression is run using sectoral dummies in the place of the indices of regulation and then the same regression is run replacing the dummies with the regulation indices and the results compared in terms of their explanatory power. Indirectly, it is hypothesised that the regulatory indices represent the major influence on the observed differences in outcomes due to the different sectors.

Because service characteristics and regulation are related, observed differences in regulation could potentially be ascribed to inherent characteristics rather than regulation itself (Smith, 2014). To mitigate this source of error, services with similar inherent characteristics have been selected. Correlation coefficients for the different services have been calculated based on nine questions relating to physical and mental intangibility, five questions related to the search-experience-credence framework and one variable measuring whether cross-border trade takes place through the need for both the provider and the user to be physically present for a transaction to take place. The results are presented in Tables 2a and b.

	<i>Passenger transport by air</i>	<i>Freight transport by air</i>	<i>Postal services</i>	<i>Courier services</i>	<i>Telecommunications</i>	<i>Passenger on rail</i>	<i>Freight on rail</i>	<i>Electricity</i>
<i>Passenger transport by air</i>	1							
<i>Freight transport by air</i>	0.94	1						
<i>Postal services</i>	0.93	0.90	1					
<i>Courier services</i>	0.88	0.90	0.92	1				
<i>Telecommunications</i>	0.52	0.63	0.62	0.48	1			
<i>Passenger on rail</i>	0.92	0.90	0.86	0.93	0.36	1		
<i>Freight on rail</i>	0.89	0.90	0.90	0.97	0.41	0.94	1	
<i>Electricity</i>	0.25	0.44	0.37	0.30	0.76	0.09	0.23	1

Table 2a: Degree of Similarity in Service Characteristics between Network Services

	<i>Legal services</i>	<i>Accounting, auditing, book-keeping and tax consulting services</i>	<i>Architectural, engineering and other technical consultancy</i>
<i>Legal services</i>	1		
<i>Accounting, auditing, book-keeping and tax consulting services</i>	0.71	1	
<i>Architectural, engineering and other technical consultancy</i>	0.56	0.69	1

Table 2b: Degree of Similarity in Service Characteristics between Professional Services

Transport, postal and courier services share similar characteristics while telecommunications and electricity are more similar to each other than they are to other network services. Electricity in particular, which has highly intangible characteristics, displays least similarity with the other network services. Among professional services accounting services are most similar to both legal services and architectural and engineering services.

3.2. The impact of regulation of service industries on manufacturing and the economy

Backward and forward linkages in the economy form the basis for measuring the extent to which regulation of competition can affect the rest of the economy and in particular manufacturing. The coefficients on price-cost margins can be used to estimate the value of a reduction in price for user industries (forward linkages). It can be considered as a measure of improved competitiveness for the rest of the economy and therefore excludes the price effect on the own consumption of the regulated service itself. Backward linkages are estimated through the effect of the price reduction on demand for the service considered. The impact of regulation on trade is evaluated here in terms of the effect on the productivity of manufacturing industry in the case of imports of services or on productivity of the sector concerned in the case of foreign direct investment.

Since estimates for the effect of regulation on competition relate to Belgium, 2005 national input-output tables produced jointly by the Federal Planning Bureau and the National Bank of Belgium are the primary source for the impact assessment of domestic regulation on competition (Federal Planning Bureau, 2010; Eurostat, 2008). They are used to calculate forward and backward linkages of network and profes-

sional services. Understandably, domestic policy makers are most interested in the impact on the domestic economy rather than spillover effects on the rest of the EU or third countries. Coefficients for the domestic economy therefore are the basis for the impact assessment.

The basic approach to impact assessment using input-output tables is set out by Miller & Blair (2009) and the necessary matrix algebra summarised in the methodological appendix. A symmetric input-output table has the use for each product or sector as row while the column represents all the inputs that are required to produce a given output. The Leontief model is usually used to calculate the effects of a change in demand on upstream inputs (backward linkages). Here the quantities change but prices remain the same. In order to calculate the impact of a change in regulation on backward linkages a further assumption has to be made concerning the impact of a fall in prices on demand for the services in question. Estimating own price elasticities of demand represents a major undertaking in itself and existing studies have been used to derive a range of plausible elasticities to apply to final demand. For meta studies in which both an average and standard deviation of values are provided, the low and high elasticities have been calculated as plus or minus one standard deviation from the average. A list of the studies consulted is provided in Annexe 2. While there are a large number of studies on price elasticities for network industries, only one study has been found for professional services and that relates to the US, which may well not be representative of Belgium or the EU generally.

	Total demand elasticities		
	Low	Average	High
Electricity	-0.2	-0.4	-0.6
Telecommunications	-0.3	-0.5	-0.7
Postal	-0.3	-0.6	-0.9
Air Transport	-0.8	-1.3	-1.8
Postal + Telecommunications	-0.3	-0.5	-0.8
Professional Services	-0.4	-0.6	-0.8

Table 3: Own price elasticities for network and professional services

Since elasticities vary according to different types of product or according to different types of users, elasticities have to be weighted appropriately to arrive at an overall price elasticity of demand. The estimated impact on total initial demand (both final demand and demand for intermediate inputs) is then calculated as a combination of the own price elasticity and the fall in price for a one unit change in regulation estimated econometrically. The production of this additional demand in turn requires the production of more inputs to the sectors whose demand has increased. This indirect output is estimated using the input coefficients required for one unit of output of the service in question.

A particular problem arises with regard to the impact on purchases by network and professional services on machinery and equipment. These are treated as outputs of manufacturing industry to gross fixed capital formation and final demand rather than as sales to other sectors. For the total, including imports, the Belgian input-output tables provide an estimate for GFCF by ownership branch which enables an investment rate to be calculated, but there is no breakdown by type of investment. To arrive at a figure for the impact on manufacturing industry, the share of machinery and equipment in total GFCF by network and professional services is calculated.

It should be emphasised that the estimates are made for network and professional services as groups and are not valid for individual services since the econometric coefficients are for the groups of services. In order to avoid aggregation bias, forward and backward linkages for network services are estimated using the most detailed level of input-output tables available (60 by 60 products) and then aggregated into a group, rather than first aggregating the products. Professional services are all part of the group “other business services” and it is impossible to differentiate the coefficients of that group further so that it has been necessary to apply those coefficients to the share of professional services in the total output of that group (28%). Combined with the poor quality of price elasticity information all the linkage effects for professional services need to be treated with particular caution. With the exception of air transport, estimated own price elasticities of demand for these services are quite low and below unity, meaning that a fall in price does not lead to an equivalent increase in the volume of the service demanded.

Similar to the Leontief model for backward linkages, the Ghosh model can be used to calculate the effects of an increase in supply on the rest of the economy. Following Dietzenbacher (1997), the Ghosh model can be interpreted as a price model. The coefficients can then be viewed as the effect of a change in one euro in the costs of industry i on the total value of production with quantities unchanged.

A number of limitations to the approach should be pointed out. In reality, lower prices for network and professional services would result in consumption of more services per unit of output and more service intensive intermediate inputs, which in turn would increase prices. The input-output price model sets the upper margins to price changes which would eventually occur and thus it is suitable for short term impact rather than long term analysis and that the impacts of regulatory reform are estimated before the economy has adjusted for price changes assuming that there is no time for structural changes and substitution of labour and capital for bought in services as well as cross-substitution between services.

A different approach has been taken with regard to impact of trade, in particular of the effect of regulation on imports of the relevant services. While the econometric procedure for estimation is the same as for price-cost margins the coefficients are used to assess the impact of more imports on manufacturing productivity in line with the results of the recent study by ECSIP for the European Commission on the relation between industry and services in terms of productivity and value creation. Although covering a somewhat different list of services than this paper, that study found that for small open economies like Belgium only linkages for foreign services had a positive effect on manufacturing productivity. Their estimate of a significant and positive effect of 0.264 on labour productivity growth rates appears plausible and will be used here as a basis for the impact of lower regulation on imports of services. Surprisingly, the study did not find evidence of positive effects of foreign direct investment in business services on manufacturing productivity. Instead the impact of foreign direct investment on the productivity of firms in the sector will be examined.

Dependent variable: Labour productivity growth rates (VA-based)

	Membership status			Country size		Technology intensity		
	EU-27	EU-15	EU-12	Large	Small	Medium-high	Medium-low	Low tech
Initial VA-based LP	-0.038*** (-7.84)	-0.014* (-1.88)	-0.048*** (-4.91)	-0.028*** (-3.23)	-0.038*** (-6.42)	-0.049*** (-6.57)	-0.048*** (-4.76)	-0.020* (-1.92)
Business service linkages: domestic	-0.017 (-0.21)	0.007 (0.10)	0.279 (0.87)	0.240*** (2.93)	-0.211 (-1.14)	0.144 (1.58)	-0.280 (-1.23)	0.028 (0.22)
Business service linkages: foreign	0.274** (2.60)	0.281*** (2.87)	0.517** (2.13)	0.452 (1.28)	0.264** (2.11)	0.396*** (4.05)	-0.115 (-0.32)	0.086 (0.51)
Share high-skilled labour	0.042 (0.85)	-0.079 (-1.34)	0.214 (1.59)	0.026 (0.38)	0.032 (0.45)	-0.047 (-0.83)	0.057 (0.44)	0.099 (1.31)
Share low-skilled labour	-0.045** (-2.27)	-0.059** (-2.48)	-0.254*** (-2.74)	-0.038 (-1.10)	-0.035 (-1.32)	-0.058*** (-2.77)	-0.014 (-0.27)	-0.062** (-2.31)
Inward FDI intensity	0.010 (0.54)	-0.008 (-0.47)	-0.011 (-0.20)	0.066 (1.02)	0.010 (0.48)	0.019 (1.19)	0.010 (0.22)	-0.009 (-0.17)
R&D intensity	0.592*** (3.17)	0.385** (2.38)	2.066*** (3.04)	0.219 (0.95)	0.739*** (2.94)	0.327* (1.93)	2.046 (1.59)	-0.237 (-0.10)
Constant	0.156*** (8.36)	0.092** (2.54)	0.150*** (2.80)	0.064 (1.28)	0.171*** (6.88)	0.191*** (9.04)	0.237*** (4.30)	0.096*** (3.36)
No of observations	189	106	83	44	145	76	59	54
Adjusted R ²	0.371	0.201	0.431	0.582	0.281	0.579	0.375	0.226

Note: t-statistics in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

Source: ECSIP

Table 4: Impact of service linkages on manufacturing productivity

4. Data

Panel data on individual firms for the period 1997 to 2005 held by the National Bank of Belgium is drawn from different sets linked by the basic business repertoire. For this paper data on balance sheets, on cross-border trade in services and on inwards foreign direct investment has been used. From these different data sets the relevant variables identified in the previous section are extracted and combined. Firms are selected on the basis of their principal activity for the regressions on price-cost margins and foreign direct investment. Unlike goods, where imports are concentrated within either the manufacturing sector or the distribution sector, a wide variety of user sectors import services. For this reason, the impact of regulation is measured on all imports irrespective of whether the service itself is the importer in question.

All firms in Belgium with a limited liability legal form are obliged to file balance sheet data with the National Bank of Belgium (NBB). Most economically active firms in Belgium choose to incorporate in order to benefit from limited liability. The exception are some of the self-employed who may choose to incorporate or not. Balance sheet data served to calculate price-cost margins on an individual firm basis from accounting data and to select firms on the basis of their principle activity.

There are two major problems with the balance sheet data. Small firms are not required to file data on turnover in their balance sheets. In fact only 40% did so in 1997 declining to 25% in 2005. Since turnover is required as the denominator to calculate price-cost margins, it was imperative to solve this problem by combining data from the VAT authorities with that from the National Bank. In this way it was possible to achieve an overall coverage of turnover of 84.2% of all firms for which there is balance sheet data. These firms however represent 97.5% of value added, 98.4% of employees, 99.1% of imports of services, 98.7% of exports of services and all imports and exports of goods.

The second major problem encountered is that only employees are covered in the balance sheet data while 52% of all firms in the NBB balance sheet data had no employees, which falls to 48% if only those firms for which there is data on turnover are considered. On the one hand this makes the coverage of the data very interesting

because it covers service firms that are excluded in most data sets, including micro enterprises which are very common particularly in professional services. On the other hand the absence of any employment data for these firms makes any calculation of labour productivity problematic because we lack a suitable denominator. The work around employed following that of Eurostat (2010) is to make a statistical adjustment to the figures on paid employees by adding a constant representing unpaid employment of one. However very small enterprises may have more than one non-salaried worker and this biases the labour productivity upwards. For that reason a quadratic form of labour productivity has been added to the variables in order to control for possible non-linearities.

Another important issue concerns the coverage of the data on cross-border trade in services. Data on cross-border trade in services is collected by the National Bank of Belgium as part of the statistics on balance of payments but the level of detail is quite limited and this poses a problem of matching between the regulatory indices and the trade data. Imports of both electricity and rail transport are englobed within broader categories (other business services and land transport respectively) which means that the effect of regulation on trade cannot be isolated for these two network industries. For professional services the situation is equally problematic. One category englobes imports of legal services, accountancy with management consultancy. Another category englobes both architectural and engineering services. The solution adopted was to weight the regulatory indices by the share of each profession in value added for the relevant category, putting all the indicators for management consultancy at zero since this is essentially an unregulated profession.

Further difficulties have been encountered with the impact assessments of the second stage. As with imports, input-output tables for rail transport englobe also road transport, which is both a much bigger sector and one that sells mainly to other enterprises contrary to rail transport, which supplies predominantly individual consumers. Coefficients for land transport are unlikely therefore to be valid for rail transport alone and therefore rail transport has had to be excluded from evaluations of the impact on the rest of the economy. As indicated previously, the only way impact assessments can be made for professional services using input-output tables is to use the coefficients for other business services and apply them to the share of output of professional services. The investment rate for air transport in 2005 poses a particular problem. Prior to bankruptcy the national carrier made substantial investments in aircraft which were acquired by the successor airline, which made few further investments with the result that the observed investment rate in 2005 was particularly low at 1%. Instead an investment rate of 9% for air transport has been assumed in line with that for other transport services.

5. Results

5.1. The impact of regulation on service sectors

Regressions on price cost margins for network and professional services are presented in table 5. For both network and professional services, the coefficients for entry regulation are positive and significant implying that regulation acts to increase margins and depress competition on those markets. For network services the impact

indicated previously such restrictions do not apply in Belgium to the four professions considered here (although such restrictions do apply to pharmacies). Less justifiable also are restrictions to the possibility of offering services beyond those required to protect the public. In the case of Belgium, the coefficient on the exclusive right of a profession to provide a service is negative, not significant and the overall explanatory power low. Even if an individual coefficient that is not significant can become significant alongside other variables, the negative sign should indicate that this seemingly strong barrier to entry does not have the expected effect on competition. While therefore some entry barriers for professional services do restrict competition, public interest requirements are likely to maintain such barriers for the foreseeable future. This should be borne in mind when interpreting the results for the impact of entry barriers to professional services on the rest of the economy.

Even though regulation on conduct appears to increase price-cost margins less than entry regulation it is much more difficult to justify on public interest grounds. Since the explanatory power on restrictions on the legal form under which a business can operate (for instance partnerships) is high, this restriction would appear as a prime candidate for future action to increase competition for professional services.

Variable	B_NP_6	B_NP_7	B_NP_8	B_NP_9	B_NP_10	B_NP_11	B_NP_12	B_NP_13
HHI	-0.0003***	-0.0001	0.0001*	-0.0001*	-0.0002***	-0.0003***	-0.0001	0
lp	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***
lp2	-0.0000***	-0.0000***	-0.0000***	-0.0000***	-0.0000***	-0.0000***	-0.0000***	-0.0000***
YR04	-0.0572***	-0.028	0.0067	-0.0293*	-0.0463**	-0.0659***	0.0007	0.0340*
Exclusive right	-0.0012							
Duration education		0.0313***						
Compulsory practice			0.1004***					
Professional exams				0.1990***				
Legal form					0.1584***			
Price regulation						-0.0193*		
Regulation of advertising							0.0872***	
Forms of cooperation								0.1271***
_cons	-1.7313***	-1.8947***	-2.0656***	-1.9103***	-1.8709***	-1.7241***	-1.9032***	-1.9612***
N	18384	18384	18384	18384	18384	18384	18384	18384
r2	0.0751	0.0762	0.081	0.0817	0.081	0.0754	0.0756	0.0789
ll	-2.65E+04	-2.64E+04	-2.64E+04	-2.64E+04	-2.64E+04	-2.65E+04	-2.65E+04	-2.64E+04

legend: * p<.05; ** p<.01; *** p<.001

Table 6: Regressions on price-cost margins for individual forms of professional regulation

The coefficients for the impact of a one unit change in regulation on the value of imports are very high and often highly significant (Table 7). In the case of network services both entry and public ownership depress imports of these services highly significantly while for professional services it is only entry regulations that depress imports when both entry and conduct regulations are taken together. The rationale for restrictions on imports appear much weaker than for the regulation of domestic markets. It is not obvious for example why a profession that is regulated in a similar way to a similar level in another member state of the EU should be less proficient in providing a service than a domestic supplier. The highest explanatory power of the specific types of regulation for professional services taken individually are for duration of education and forms of cooperation. Duration of education and compulsory practice are in fact highly correlated and that between legal form and possibilities for

cooperation between professions is also quite high so that we have a similar pattern for the effects of individual regulations on imports as for competition. In itself this is an important finding since it shows that regulation can have multiple types of effect.

Network Services						Professional Services					
Variable	B_NRT_1	B_NRT_2	B_NRT_3	B_NRT_4	B_NRT_5	Variable	B_PT_1	B_PT_2	B_PT_3	B_PT_4	B_PT_5
HHI	0.0010***	0.0010***	0.0009***	0.0010***	0.0010***	HHI	0.0003***	0.0003***	0.0003***	0.0003***	0.0003***
lp	0	0	0	0	0	lp	0.0000*	0.0000*	0.0000*	0.0000*	0.0000*
lp2	0	0	0	0	0	lp2	0	0	0	-0.0000*	0
telecommunic	1.2272**					legal	0.5564**				
postal	-2.0441					accounting	1.2827***				
air						architects	0.7165***				
rail											
YR98	0.1211	0.0836	0.1399	0.1639	0.1684	YR04	-0.0064	-0.044	-0.0482	-0.0338	-0.0469
YR99	0.2073	-0.206	0.0494	0.0498	-0.0538	overall		-0.6437***			
YR00	0.3018*	-0.5197**	-0.2634	0.2205	-0.1873	entryreg			-0.5311***		-0.4540**
YR01	0.4465**	-0.5298**	-0.3991*	0.4001**	-0.2057	conduct				-0.7795***	-0.1209
YR02	0.6457***	-0.7050***	-0.2261	0.1582	-0.4107*	_cons	10.8093***	11.6378***	11.5511***	11.7296***	11.5857***
YR03	0.8585***	-0.6031**	-0.0324	0.2413	-0.3243	N		2730	2730	2730	2730
YR04	0.9167***	-0.5527**	0.0459	0.2886	-0.2758	r2		0.0271	0.0487	0.0488	0.0469
YR05	1.1175***	-0.3093	0.2562	0.5468***	-0.0191	ll		-5.90E+03	-5.87E+03	-5.87E+03	-5.87E+03
overall		-0.7432***				legend:		* p<.05; ** p<.01; *** p<.001			
entryreg			-0.4402***		-0.3063***	legend:		* p<.05; ** p<.01; *** p<.001			
public ownership				-0.5046***	-0.4522***						
_cons	9.4044***	11.7757***	10.4198***	11.1134***	11.6231***						
N	6079	6079	6079	6079	6079						
r2	0.1421	0.2095	0.1564	0.1948	0.2086						
ll	-1.48E+04	-1.45E+04	-1.47E+04	-1.46E+04	-1.45E+04						

Table 7: Regressions on imports of services

The situation with regard to the impact of regulation on inward direct investment is not so clear cut. On the one hand, the negative effect on imports may induce foreign suppliers to enter the market via permanent presence rather than through exporting to Belgium. On the other hand, entry regulations that apply to domestic firms will also apply to firms from other EU member countries under the principle of non-discrimination. They will therefore have to overcome similar types of barrier although if the foreign firms are better resourced they may be in a better position to do so. For network services, public ownership seems to be a greater barrier to inward FDI than entry regulations although the coefficient is no longer significant when taken together with entry regulation. In highly concentrated industries public ownership of the major player(s) affects the potential for entry through acquisition or the form by which entry takes place (joint venture between Vodafone and Belgian Telecoms for mobile telephony as opposed to local subsidiary).

For professional services, it is only entry regulation that appears to depress inward FDI. These results need to be interpreted with great caution. There are very few legal and accounting affiliates of foreign firms established in Belgium in the FDI data and none for architects. Essentially the comparison made in the regression on FDI for professionals is between unregulated engineering services and regulated professions. This may be because the legal form for other professions are often partnerships and sole practitioners, which after establishment may be treated as domestic firms or too small to be reported under the surveys for foreign direct investment. However when it is the professional association itself that assesses the equivalence

of foreign diplomas under the European Professional Qualification Directives as appears to be the case for architects, this can lead to protectionist outcomes unfavourable to local establishment by suitably qualified professionals.

Network Services						Professional Services					
Variable	B_NRT_1	B_NRT_2	B_NRT_3	B_NRT_4	B_NRT_5	Variable	B_PT_1	B_PT_2	B_PT_3	B_PT_4	B_PT_5
HHI	-0.0002*	-0.0006**	-0.0004*	-0.0001	-0.0002	HHI	0.0022	0.0043**	0.0019	0.0084**	0.0041***
lp	0	0	0	0	0	lp	0	0	0	0	0
lp2	0	0	0	0	0	lp2	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***
telecommunic	-2.0394**					legal	-0.0563				
postal	-2.2697**					accounting	-3.2160*				
air	-2.2516					architects	(omitted)				
rail											
YR98	-0.0402	-0.1419	-0.1831	0.0467	-0.0274						
YR99	-0.282	-0.2051	-0.1619	-0.2996*	-0.0341						
YR00	-0.8710***	-0.2964	-0.2336	-0.8241***	-0.1585						
YR01	-0.7369**	0.2418	0.6635	-0.7200***	0.6431						
YR02	-0.6730**	0.3021	0.6655	-0.8946*	0.5513						
YR03	-0.7219**	0.2515	0.6376	-0.8744*	0.5339						
YR04	-1.2771***	-0.3391	0.0517	-1.4176**	-0.0077	YR04	0.4554	1.5904*	0.3325	3.3494	0.9655
YR05	-1.6012***	-0.6855	-0.2795	-1.6915**	-0.2182						
overall		0.8324				overall		-0.4015			
entryreg			0.5357		0.4607	entryreg			-0.6612***		-1.1912**
public ownership				-0.4459**	-0.3601	conduct				0.1728	0.8969
_cons	-0.1096	-3.6537*	-2.8934**	-0.8848	-2.5360*	_cons	-5.7183***	-7.3568***	-5.4435***	-10.6709***	-7.2897***
N	10333	10333	10333	10333	10333	N	18145	18145	18145	18145	18145
r2						r2					
ll	-1.50E+03	-1.52E+03	-1.55E+03	-1.61E+03	-1.53E+03	ll	-439.4623	-451.7641	-445.9601	-452.8989	-438.3604

legend: * p<.05; ** p<.01; *** p<.001

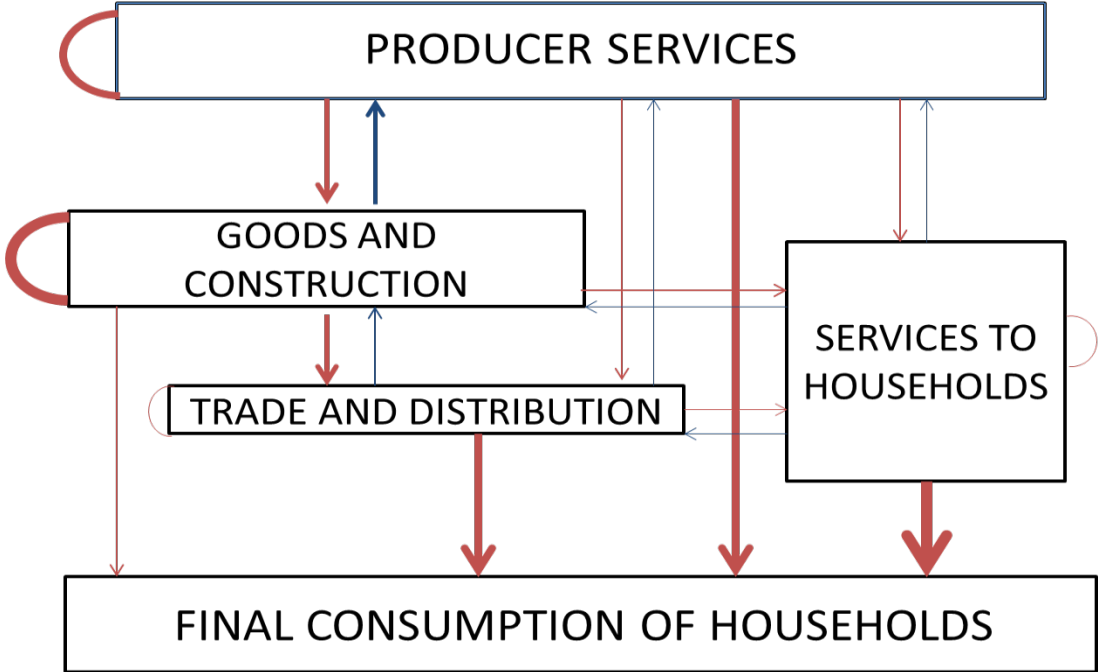
Table 8: Regressions on inward foreign direct investment

5.2. The impact of regulation of services on manufacturing and the rest of the economy

Linkages between the major sectors of the economy are illustrated in Fig.1 adapted from the Eurostat EU-27 input-output tables for 2007. The area of the rectangles is proportionate to the share of the sector in total value added. The value of sales to or purchases from each sector is proportionate to the width of the arrows: forward linkages are in red and backward linkages in blue. Producer services use their own primary inputs (labour and capital) to provide services to the rest of the economy. Their linkages are mainly forward but they also have sizable purchases from the goods producing sectors as well as very sizable sales among producer services. Goods producing sectors (including agriculture, mining and construction) act to transform brought in goods and services and then to sell them on to other sectors, thus exhibiting both very strong forward and backward linkages. The trade and distribution sector acts as a conduit for enabling goods and some service producing sectors to reach the final consumer and is characterised by strong forward linkages. Services to households use their own primary inputs to provide services to the final consumer and unlike the other three major sectors are very little integrated with the rest of the economy. Services therefore are situated either at the beginning of the flow of goods and services through the economy or at the end with goods producing sectors in the middle.

Fig. 1:

The Flow of Goods and Services through the Economy



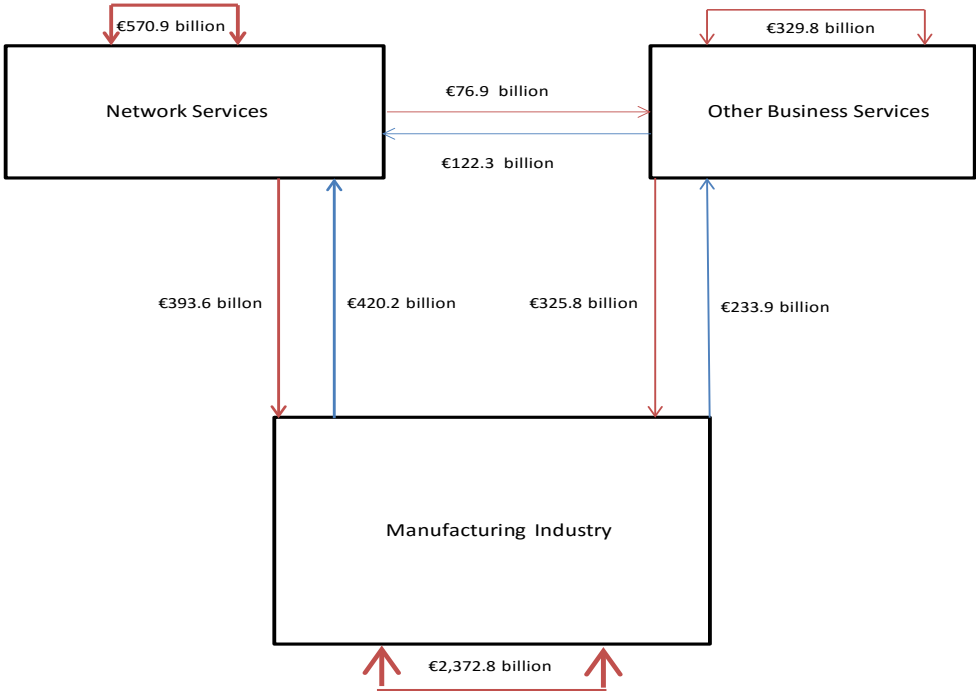
Source: Eurostat 2007 input-output tables EU-27

Within this general schema, this paper looks more particularly at the relationship between certain types of producer service (network services and other business services) and manufacturing industry. Network services cover energy, transport and post and telecommunications. Other business services comprise professional services and administrative and support services. The EU combined value added of network and other business services in 2007 was of a comparable size to manufacturing industry (€2 trillion against €1.9 trillion). Services for which econometric estimation was conducted comprise 59% of production of network services and 36% of other business services in the EU. The equivalent figures for Belgium are 57% and 28%.

Figure 2 examines these relationships for the EU in more detail. Of note are the very large intra-group exchanges, particularly for manufacturing (€2.4 trillion). Rather balanced flows characterise sales to and purchases from network services, business services and manufacturing. Sales of network and other business services constitute essentially intermediate consumption of user industries but purchases can be composed either of intermediate consumption or of machinery and equipment in the form of gross fixed capital formation by these services. An estimated 54% of manufacturing sales to network services and 60% of sales to other business services are constituted by sales of transport and other machinery and equipment, often with a high technological content. By contrast, these purchases are estimated to make up only 8% of purchases by manufacturing industry from itself essentially because of very large purchases of intermediate inputs within manufacturing industry. Measurement of intangible investments in gross fixed capital formation continues to lag that of

goods so that it is difficult to distinguish from these figures the important role of business services as a leading supplier of such investments.

Fig. 2: Network services, business services and manufacturing industry: flows within and between sectors



Source: Eurostat 2007 input-output tables and own calculations

Applying the methodology outlined in section 3.2, the effect of a 6.57% reduction in price of selected network services from a one unit reduction in entry regulation on the rest of the economy via forward linkages can be estimated in 2005 for Belgium as a cost reduction of 1,311 million euros of which 359 million euros for manufacturing industry and 952 million for all other sectors of the economy apart from network services themselves. For professional services a price reduction of 7.24% as a result of entry barriers could be estimated as a cost saving of 1,314 million euros of which 342 for manufacturing industry and 972 for all other sectors of the economy apart from professional services themselves. For the reasons indicated previously, it is probably not reasonable to expect that such a reduction would in fact be achieved. A reduction of 3.68% as a result of a one point reduction in conduct regulation appears more realistic. This can be estimated as equivalent to a cost reduction of 668 million euros of which 174 million for manufacturing industry and 494 million for all other sectors of the economy. Likely gains from reducing entry regulation of selected network services would therefore be roughly double those from reducing conduct regulation of professional services. These estimates represent the possible impact on the competitiveness of user sectors from regulatory reform.

Applying an estimate of the own price elasticities on overall demand to the projected fall in price from a one unit change in regulation of network services generates a total increase in output of 768 million euros under the low elasticity assumption, 1,378 million under the average assumption and 2,005 million under the high assumption. 68% of this increase can be attributed directly to the increase in demand for network services and the rest, between 247 and 632 million euros, indirectly from the additional output required to meet that demand from sectors that supply intermediate in-

puts to network services (backward linkages). The equivalent figures for professional services from the reduction of entry regulation would be respectively 642 million, 962 million and 1,283 million, of which 78% from professional services themselves and between 143 and 285 million euros from additional output in supplier sectors. More realistically, those for a one unit reduction in conduct regulation would be 326 million, 489 million and 652 million euros (between 72 and 145 million in supplier sectors). The impact on total output for a reduction of entry regulation for network industries is therefore estimated to be between 2.4 and 3.1 times that of a reduction of conduct regulation for professional services. Since network services depend more on inputs from other sectors than professional services, the relative impact on the output of other sectors from a reduction of regulation in network services is greater at between 3.4 and 4.4 times that of a reduction of conduct regulation for professional services.

In view of the strong links between producer services and manufacturing industry for often industry specific capital equipment, it can be interesting to evaluate the impact of an increase in demand as a result of lower regulation also on gross fixed capital formation and in particular that of purchases of machinery and equipment in addition to the impact on intermediate consumption. Again, increases in both of these items can be attributed directly by increased demand in the services for which prices are reduced or indirectly through increased demand in the industries serving the services in question.

By applying an overall investment rate in the sector in question to the estimate of increased output for that sector from the reduction in price of network or professional services, an estimate of increased gross fixed capital formation can be derived. Taking the share of machinery in equipment in total gross fixed capital formation, a further estimate of the impact on manufacturing industry can be made (most of the rest of GFCF is in construction and public works). In this way a reduction of entry regulation for network industries can be estimated according to the demand elasticity chosen as producing an increase of 77 million, 138 million or 201 million euros in gross fixed capital formation of which around two thirds by the network services themselves and the rest from increased demand in sectors supplying inputs. Of these respectively 38 million, 71 million and 105 million euros are expected to go to the manufacturing sector in the form of increased demand for machinery and equipment, three quarters of which by the network industries themselves. It should be noted that unlike the other figures quoted, this increased demand can be supplied either by domestic or by foreign firms in the form of imports.

Similar estimations can be made for professional services bearing in mind that both their overall investment rate and the share of machinery are lower than for network services. Taking also the lower estimate for the impact of conduct rather than entry regulation, professional services are estimated to contribute respectively 24 million, 37 million and 49 million additional demand for gross fixed capital formation under the different elasticity assumptions, 60% in professional services and the rest in supplier sectors. Respectively 13 million, 19 million and 25 million euros are for equipment and machinery of which 64% would be in professional services.

Bearing in mind that in 2005 Belgian gross output totalled 629,713 million euros, the figures quoted above may seem small (less than 1% of total gross output) but they are not insignificant in absolute terms. They are based on the hypothesis of a one unit decrease in regulation and more extensive market liberalisation can then be expected to produce greater benefits. The effect of a price reduction with unchanged

technical coefficients can be considered as a short term indicator of improvements in cost competitiveness of users. The impact on demand would be of a longer term nature. Measuring adjustments in terms of relative labour and capital inputs and of technical coefficients require the use of CGE models and are beyond the scope of this paper. They have been used extensively for example in ex ante and ex post evaluations of the effect of European integration but have been shown to be widely implausible in their results. The advantage of the procedure employed here is that it can be related directly to actual flows of goods and services in the economy and identifies different ways in which a change in regulation can affect the economy. The extent of linkages within the economy, the share of a sector in gross output, own price elasticities of demand and the semi-elasticity of a change in regulation on price are the four elements that together condition potential effects on the economy.

A different type of impact can be expected in terms of how imports of services affect the economy. Traditionally impacts in terms of greater competition for domestic suppliers as well as more choice for users have been highlighted as gains from trade. Here the impact on manufacturing productivity of more imports have been looked at more narrowly. The 0.264 coefficient for the effect of foreign business service linkage on labour productivity for small countries from the ECSIP study for the European Commission is quite high. In line with the conservative estimates made for the impact of greater competition, a lower coefficient of 0.200 would probably be more appropriate. Combined with a semi-elasticity of -0.306 for entry regulation for network services and an even higher -0.452 for public ownership a combined effect of 0.15% on the growth rate of labour productivity in manufacturing from a one point decrease in regulation of selected network services should probably be taken as an upper bound. Professional services represent only 2% of imports of business services in the study and it is not considered realistic here to make an estimate of the effect of an increase in imports on manufacturing productivity.

The impact of greater access for foreign firms on the domestic market is expected to result first of all in an increase in labour productivity since the affiliates of foreign firms may displace or take over domestic firms rather than adding to competition on the domestic market (Smith, 2015). With the significant exception of electricity foreign firms have higher labour productivity than domestic firms (Table 9; numbers of observations in brackets). The difference can be substantial in other network industries than electricity or negligible in the case of legal and accountancy services. There are no foreign affiliates in the data for rail transport or architectural services so it is not possible to compare productivities for these services. The high domestic labour productivity for electricity can stem from a combination of high capital intensity and a dominant supplier in the period under consideration (even though Electrabel was already majority controlled by Suez during this period and presumably should have been classified as an affiliate of a foreign company). It should be mentioned that there are very few affiliates of foreign firms among legal services (9) or accountancy firms (3). Limitations on the legal form under which professional firms can operate alongside limitations on several professions operating together may be particularly burdensome for foreign firms.

Network	Overall	Electricity	Air Transport	Postal & Courier Services	Telecommunications
<i>domestic firms</i>	115832 (10119)	474135 (761)	61038 (1626)	40336 (3585)	140018 (3993)
<i>affiliates of foreign firms</i>	145102 (414)	175539 (188)	87950 (45)	47599 (52)	159986 (129)
<i>Affiliates as % Domestic</i>	125	37	144	118	114

Professional Services	Overall	Legal Services	Accountancy Services	Engineering Services
<i>domestic firms</i>	55086 (18089)	83603 (1367)	46602 (11465)	66174 (5257)
<i>affiliates of foreign firms</i>	75960 (88)	86193 (9)	47864 (3)	75857 (76)
<i>Affiliates as % Domestic</i>	138	103	103	115

Table 9: Labour Productivity in Network and Professional Services, 2005

6. Policy Implications

The previous sections have illustrated the strong interactions between upstream and downstream service activities and goods producing, particularly manufacturing industry. Certain of these relations have been explored in more detail from the viewpoint of the effect of changes in regulation for services on competition and trade both on the sectors themselves and with regard to their impact on the rest of the economy. Two major types of policy conclusion can be deduced, one concerning the appropriate way to look at the impact of changes on the services concerned, the other on how to view and develop policy towards both industry and services in the context of today's economy.

It is not sufficient to demonstrate that there is a connection between the regulation of a service and some variable of interest. The exact regulation or failing that the type of regulation must be identified since individual regulations may have very different effects than those for regulation overall and it is important to be able to identify which particular regulations are causing the most negative effects on growth, employment or in the cases studied here on competition on the domestic market and trade. Ideally the specific channels through which a regulation affects outcomes should be specified. Even then it may be that a regulation that is burdensome may be required for public interest purposes when there is no other effective way of regulating the service.

While an econometric approach can be useful, knowledge of how the markets for specific services operate in practice will often be required. This can provide insights into which particular obstacles form a binding constraint on activity and help to narrow down the area of concern. The workshops organised by the author in the European Commission in 2007 were an example of how policy makers can obtain information easily and at low cost (Smith, 2007). The econometric analysis presented previously of conduct regulations, specifically restrictions on the permissible legal form for professions and the ability to cooperate between professions, has confirmed the insights previously garnered from the workshops that these restrictions are particularly burdensome for the ability to enter markets effectively. “Softer” forms of information and “harder” forms such as those presented here are indeed complementary.

The identification of particularly burdensome forms of regulation helps to go beyond the generic policy of more or less regulation to concentrate on the individual changes that are required. Many services will continue to be regulated in future, sometimes regulation of incumbents is even required to open up markets to competition as has been seen in numerous cases for network services. The term “de-regulation” is therefore inappropriate as a term for policy towards services and should be replaced by that of “appropriate regulation” by which is meant the regulation that achieves public policy aims with the minimum adverse effects.

Arguments about the nature of industrial policy, whether it should be so-called “vertical” or “horizontal” by which is usually meant “interventionist” or “non-interventionist” have largely been laid to rest although they resurface occasionally. It can be shown that framework conditions that apply to the economy as a whole can have very different effects on individual sectors whether manufacturing or services. Intellectual property rights provide an example. For pharmaceutical firms patent protection represents an indispensable part of their competitiveness. For information technologies it is the danger of being locked out of key technologies through patent thickets that represents the main issue for intellectual property. Other sectors may not patent because speed to market is more important than the time consuming procedure for obtaining a patent or because other forms of intellectual property are more important for that sector (trade marks for luxury goods or copyright for services). The fact that a policy which applies to the economy as a whole may have very different impacts on different sectors pleads in favour of examining more closely those impacts when formulating the policy in question not in favour of more targeted policies towards individual sectors.

The revival of interest in manufacturing industry in advanced industrial countries of western Europe has been driven partly by fear that these countries will no longer be able to maintain a strong manufacturing sector in the face of strong competition from China and other emerging markets and by the re-composition of supply chains around foreign direct investment in lower cost locations nearer home, particularly new members of the EU in central Europe. It has also been driven by the search for secure, well-paying jobs for those without advanced skills that manufacturing used to provide. While ultimately innovation, the provision of ever higher quality products and control of costs are the principle ways to maintain competitiveness in high cost locations such as Belgium, the overall environment for doing business and the very specific ways in which manufacturing interacts with services both upstream and downstream should not be neglected. Competitive suppliers of services constitute themselves an important competitive advantage for manufacturing industry – and one

that is relatively hard to replicate since it is built around intangibles and tacit knowledge. Nor should the importance of a competitive distribution sector be neglected because high mark ups dampen demand for goods and create rents between the consumer and the producer to the detriment of both a situation that has for instance been observed in southern Europe for a lack of pass through to final consumers of opening up the market for apparel under the Uruguay Round of trade negotiations.

The very strong linkages between upstream and downstream services and goods producing industries illustrated in figure 1 and explored in more detail in this paper would indicate that no policy towards manufacturing can be effective if it ignores the conditions under which such services are provided. The concept of “industrial policy” would then need to be broadened to include the relevant services so that it becomes a policy towards the productive sector in the sense of “standortspolitiek”. While this concept of policy may be considered too broad, it retains a sense of focus if the emphasis is placed on the interaction between different actors and different sectors rather than on each one taken individually. It ought also to be mentioned that certain very important services (public administration, non-market services and market services to households other than trade and distribution) are not in the first instance concerned by such an approach since the linkages with the rest of the economy are much less developed.

7. Conclusion and Further Work

This paper has set out a way to measure the impact of regulation of a service on both the service itself and the wider impact on the rest of the economy for a single country, Belgium. The information requirements particularly for the first stage of the procedure are high. It would of course be desirable to have such evaluations for a wider array of countries and also to be able to see how the impact of regulation changes over time.

Often it is the impact of regulation on the dynamics of an economy that are of interest. Here many other types of factors than regulation specific to a sector come into play. A dynamic model of entry, exit and growth using panel data and constraints in the form of different types of regulation including those that affect an economy as a whole, such as labour market regulation or ease of doing business, along with other important explanatory variables would be a more suitable approach to evaluating the effect of service specific regulation on growth of turnover, value added or employment. Since these areas are those of the most of interest to policy makers, such an approach marks a logical extension to the procedure outlined here, but the information requirements are even more demanding.

References

Bottini, Novella and Margit Molnár (2010), “How large are competitive pressures in services markets?: Estimation of mark-ups for selected OECD countries”, OECD Journal: Economic Studies, Vol. 2010/1.

- Bouis, R.; Klein, C. (2008), "La concurrence favorise-t-elle les gains de productivité? Une analyse sectorielle dans les pays de l'OCDE", *Economie et Statistique* No 419-420, pp. 73-99
- Christopoulou, R.; Vermeulen, P. (2008), "Markups in the Euro Area and the US over the Period 1981-2004 A comparison of 50 sectors", *ECB Working Paper Series* No 856
- Conway, P.; Nicoletti G. (2006), "Product market regulation in non-manufacturing sectors in OECD countries: measurement and highlights", *OECD Economics Department Working Paper* No.530.
- Conway, P.; D. De Rossa; Steiner, F.; Nicoletti G. (2006), ".Regulation, Competition, and Productivity Convergence.", *OECD Economics Department Working Paper* No. 509.
- Dietzenbacher, E. (1997), "In vindication of the Ghosh model: a reinterpretation as a price model", *Journal of Regional Science*, 37:4, pp. 629-651
- Dietzenbacher, E. (2002), "Interregional Multipliers: Looking Backward, Looking Forward", *Regional Studies*, 36:2, pp. 125-136
- Dihel, N. and B. Shepherd (2007), "Modal Estimates of Services Barriers", *OECD Trade Policy Papers*, No. 51
- Faini, R.; Haskel, J.; Navaretti, G.B.; Scarpa, C.; Wey, C. (2006): The impact of Services Regulation. In: Boeri, T.; Castanheira, M.; Faini, R.; Galasso, V. (ed.): *Structural Reforms Without Prejudices*. OUP, pp. 97-104.
- Høj, J.; Jimenez, M.; Maher, M.; Nicoletti, G.; Wise, M. (2007), "Product market competition in the OECD countries: taking stock and moving forward", *OECD Economics Department Working Paper* No.575.
- Kerschner, C.; Prell, C.; Feng, K.; Hubaceck, K. (2013), "Economic vulnerability to Peak Oil", *Global Environmental Change*, 23, pp.1424-1433
- Koske, I. et al. (2015), "The 2013 update of the OECD's database on product market regulation: Policy insights for OECD and non-OECD countries", *OECD Economics Department Working Papers*, No. 1200
- Kveiborg, O.; Pilegaard, N.; Holmblad, P. (2006), "Evaluating effects of introducing heavy vehicle fees – a comparison of different approaches", *European Transport Conference. papers of European Association for European Transport*, 2006
- Molinuevo, M.; Sáez, S. (2014), "Regulatory Assessment Toolkit: A Practical Methodology for Assessing Regulation on Trade and Investment in Service", *World Bank*, Washington, DC
- Nguyen-Hong, D. (2000), "Restrictions on Trade in Professional Services", *Australian Productivity Commission Staff Research Paper*, AusInfo, Canberra, August
- Nicoletti, G. and S. Scarpetta (2003), ".Regulation, Productivity and Growth: OECD Evidence.", *Economic Policy*, Vol.18, No.36.

- Pelkmans, J. (2010), "Product Market Reforms in EU Countries Are the methodology and evidence sufficiently robust?", Bruges European Economic Research Papers BEER n° 17
- Smith, P.M. (2007), " Market Integration for Services: Messages from the Workshops organised by the Bureau of European Policy Advisers", European Commission, Brussels
- Smith, P.M. (2014) "The impact of service characteristics on trade: evidence from Belgian enterprises", Proceedings of XXIV Annual RESER Conference 2014
- Smith, P.M. (2015) "Does integration of services differ from integration of goods?", The Service Industries Journal, 35:4, 217-235
- Suzuki, K.; Uchiyama, Y. (2010), "Quantifying the risk of an increase in the prices of non-energy products by combining the portfolio and input-output approaches", Energy Policy, 38, pp. 5867-5877

Appendix 1

Methodological approach

To start with, we shall use the following notation:

Z = domestic intermediate input-output matrix

I = identity matrix

x = output column vector

Backward linkages are derived directly from the technical coefficient a_{ij} calculated as the ratio between the purchased input i in sector j and the output of sector j derived from the values in **Z**.

Input-coefficients

$$A = \mathbf{Z} * \text{diagonal}(\mathbf{x})^{-1}$$

In order to take into account the indirect value of inputs i present in other purchased inputs by sector j it is necessary to calculate the Leontief inverse or total requirements matrix given by:

Leontief inverse of input-coefficients

$$L = (\mathbf{I} - A)^{-1}$$

An equivalent matrix for forward linkages, the Ghosh matrix **G**, can be calculated from the direct output coefficients b_{ij} or the distribution of sector i 's outputs across sectors j that purchase inter-industry inputs from i .

Output-coefficients

$$B = \text{diagonal}(\mathbf{x})^{-1} * \mathbf{Z}$$

Ghosh inverse of delivery-coefficients

$$G = (\mathbf{I} - B)^{-1}$$

Appendix 2

Studies on price elasticities for network industries

Sector	Segment	Sub-segment	Period	Country	Source	Elasticity Low	Elasticity Average	Elasticity High
Electricity	Residential		1989	UK	Baker et al		-0.76	
	Residential		1999	Israel	Beenstock et al		-0.58	
	Residential		1999	Switzerland	Filippini		-0.3	
	Residential		2004	Greece	Hondroyiannis Hotledahl & Joutz		0	
	Residential		2004	Taiwan	Kamerschen & Porter		-0.16	
	Residential		2004	US	Narayan & Smyth		-0.93	
	Residential		2005	Australia	Labandeira et al		-0.26	
	Residential		2006	Spain	Various authors		-0.78	
	Residential		1980-2002	US	Various authors	-0.7	-0.9	-1.4
	Industrial		1999	Israel	Beenstock et al		-0.44	
	Industrial		2001	Denmark	Bjorner et al Kamerschen & Porter		-0.48	
	Industrial		2004	US	Porter		-0.35	
	Industrial		2001	US	EPRI	-0.9	-1.2	-1.4
Telecommunications								
	Fixed	Access connection	1994	US & Canada	Taylor		-0.03	
	Fixed	Connection charge	2003	International US & Canada	NZ Commerce Commission	-0.2		-0.04
	Fixed	Access subscription	1994	Canada	Taylor		-0.2	
	Fixed	Access charges	2003	International US & Canada	NZ Commerce Commission	-0.2		-0.1
	Fixed	Domestic local	1994	Canada	Taylor		-0.375	
	Fixed	Local calls	2003	International US & Canada	NZ Commerce Commission	-0.04		-0.11
	Fixed	Domestic medium	1994	Canada	Taylor		-0.65	
	Fixed	Domestic long distance	1994	Canada	Taylor		-0.75	
	Fixed	Long distance national	2003	International US & Canada	NZ Commerce Commission	-0.1		-1.55
	Fixed	International	1994	Canada	Taylor		-0.9	
	Fixed	International	2003	International	NZ Commerce Commission Cadman & Dineen	-0.3		-1.54
	Fixed	Broadband	2007	OECD	Competition Commisison		-0.43	
	Mobile	Subscriptions	2003	UK	Competition Commisison	-0.54		-0.8
	Mobile	Subscriptions	2002	US	Rodini et al		-0.43	
	Mobile	Subscriptions/access	2003	International	NZ Commerce Commission Dewenter & Haucap	-0.06		-0.54
	Mobile	Calls	1998-2002	Austria	Competition Commisison	-0.61	-0.74	-1.05
	Mobile	Calls	2003	UK	Competition Commisison	-0.48		-0.62
		Mobile originated calls	2003	International	NZ Commerce Commission	-0.09		-0.8
		Fixed to Mobile	2003	International	NZ Commerce Commission	-0.11		-0.8
	Mobile	Access & usage	2002	US	Rodini et al		-0.6	

	Mobile		2003	Australia	Access Economics		-0.8		
	Mobile		1984-1988	US	Parquet & Röller		-2.5		
	Mobile		1998-2002	EU	Grzybowski	-0.2		-0.9	
Postal									
	Letters	Aggregate	Unknown	US	Robinson Pimenta & Ferreira	-0.2		-0.8	
	Letters	Aggregate	1960-1999	Portugal	Florens, Marcy & Toledano		-0.16		
	Letters	Aggregate	1969-1999	France	Nakervis et al		-0.27		
	Letters	Aggregate	1977-1999	UK	Dubin		-0.2		
	Letters	Letters	1984-1996	Canada	Florens, Marcy & Toledano		-0.598		
	Letters	1st+2nd Class	1969-1999	France	Nakervis et al		-0.3		
	Letters	First Class	1976-1999	UK	Royal Mail		-0.91		
	Letters	First Class	1976-2000	UK	Nikali		-0.68		
	Letters	First Class	1975-1995	Finland	De Ryke et al		-0.78		
	Letters	First Class	1998	France	Nakervis et al		-0.82		
	Letters	Second Class	1976-1999	UK	Royal Mail		-0.61		
	Letters	Second Class	1976-2000	UK	Nikali		-0.3		
	Letters	Second Class	1975-1995	Finland	Florens, Marcy & Toledano		-0.15		
	Letters	2nd Class+Direct Mail	1969-1999	France	De Ryke et al		-0.68		
	Letters	Second Class	1998	France	Nikali		-0.17		
	Letters	Bulk mail	1971-1991	Finland	Dubin Santos & Lagoa		-0.3		
	Letters	Admail	1984-1996	Canada	Cazals et al London Economics		-0.423		
	Letters	Direct Mail	1998-1999	Portugal	WIK-Consult		-0.845		
	Letters	Direct Mail	1980-2007	UK	Cazals et al		-0.92		
	Letters	Bulk mail	2001-2011	Ireland	London Economics		-1.17		
	Letters	Advertising mail	2011	NL	WIK-Consult		-0.5		
	Letters	Commercial Mail	1980-2007	UK	WIK-Consult		-0.17		
	Letters	Office mail	2011	NL	WIK-Consult		-0.25		
	Letters	Transaction mail	2011	NL	WIK-Consult		-0.3		
	Letters	Metered	2001-2011	Ireland	London Economics		-0.39		
	Letters	B2B	1991-2007	Finland	Nikali		-0.37		
	Letters	B2C	1991-2007	Finland	Nikali		-1.38		
	Letters	Social mail	1980-2007	UK	Cazals et al London Economics		-0.52		
	Letters	Stamps	2001-2011	Ireland	WIK-Consult		-0.22		
	Letters	Social mail	2011	NL	WIK-Consult		-0.2		
	Letters	Consumers	1991-2007	Finland	Nikali		-0.0043		
	Letters	Periodicals	2011	NL	WIK-Consult		-0.3		
	Letters	International	2011	NL	WIK-Consult		-0.3		
	Parcels		1990-2005	US	Geddes		-1.013		
Air Transport									
	Long haul international business		Unknown	International	Candian Dept Finance	-0.198	-0.265	-0.475	
	Long haul international leisure		Unknown	International	Candian Dept Finance	-0.56	-1.04	-1.7	

	Long haul domestic business		Unknown	International	Candian Dept Finance	-0.836	-1.15	-1.428
	Long haul domestic leisure		Unknown	International	Candian Dept Finance	-0.787	-1.104	-1.228
	Short haul business		Unknown	International	Candian Dept Finance	-0.595	-0.7	-0.783
	Short haul leisure		Unknown	International	Candian Dept Finance	-1.288	-1.52	-1.743
	Aggregate		Unknown	International	Brons et al	-0.527	-1.146	-1.765
	Aggregate	Intra-Europe	1996-2006	International	Iata		-1.4	
	Aggregate	Trans Atlantic	1996-2006	International	Iata		-1.2	
	Aggregate	Europe-Asia	1996-2006	International	Iata		-0.9	
Rail Transport								
	Consumer	Peak	1990	Belgium	Mayeres		-0.37	
	Consumer	Off-Peak	1990	Belgium	Mayeres		-0.43	
	Consumer	Average	1980s	UK	Goodwin Owen & Philipps	-0.47	-0.79	-1.11
	Consumer	Average	1987	UK	Owen & Philipps	-0.61	-1.08	-1.38
	Consumer	Economy	1987	UK	Owen & Philipps		-1	
	Consumer	1st Class	1987	UK	Philipps		-1.17	
	Business Non-business	Intercity	1980s	US	Oum et al	-0.67		-1
	Business Non-business	Intercity	1980s	US	Oum et al	-0.37		-1.54
	Freight	Aggregate	1980s	US	Oum et al	-0.35	-1.52	-1.06
	Consumer	Suburban Rail	1951-2002	UK	Wardman & Shires	-0.27	-0.6	-0.93
	Consumer	Intercity	1951-2002	UK	Wardman & Shires	-0.48	-0.9	-1.32
	Business	Intercity	1988	UK	Kroes & Sheldon		-0.7	
	Discretionary	Intercity	1988	UK	Kroes & Sheldon		-1.4	
		Intercity	1984	Ireland	McGeehan	-0.37		-0.4
		Intercity	1983	Canada	Oum & Gillen	-1.08		-1.538
		Urban (peak)	1992	Australia	Nairn & Hooper		-0.3	
		Intercity	1992	Australia	Nairn & Hooper	-0.7		-1
Professional Services								
	Legal		Unknown	US	McTaggart, Findlay, Parker	-0.37	-0.61	
	Professional		Unknown	US	McTaggart, Findlay, Parker		1.09	

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