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Trade-based measures of offshoring: an overview for Belgium

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Abstract - Offshoring has since long been a matter of concern in developed countries and has recently received growing attention in the economic literature. The aim of this paper is to provide a critical review of definitions of offshoring that have been put forward in recent years, thereby updating the definitions in earlier publications of the Federal Planning Bureau. We also take a closer look at how offshoring can be measured. In the absence of individual firm data, we focus on indirect trade-based measures of offshoring, compare them and present results for Belgium that show an upward trend in offshoring.

Jel Classification - F14, F15, F23, C81

Keywords - Offshoring, trade-based measures, processing trade, imported intermediate inputs, supply and use tables, shift-and-share analysis

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Executive Summary

In times of growing economic globalisation, the fear of a shift of economic activities abroad is an important issue in developed economies. This cross-border shift used to be referred to as relocation, but is nowadays mostly called offshoring. It is a common concern for many workers who feel that their jobs are threatened and it has turned into a popular subject in the press. However, offshoring has changed in recent years. It was typically thought of as the transfer of assembly lines to low-wage countries putting pressure on low-skilled jobs in developed countries. Although this is still partially true, the scope has widened. Today, the focus in terms of offshoring is more on intermediate stages of the production process and on services, and the worries about job losses due to offshoring have spread to higher skilled workers. Moreover, the gradual opening up of very big low-wage economies such as China and India has added to the feeling that offshoring is a growing threat for developed economies.

In this context, the aim of this analysis has been twofold. First of all, we strived to find out how offshoring can best be defined given its changing characteristics. Based on an overview of recent contributions to the literature, we have updated the definition of offshoring from earlier publications of the Federal Planning Bureau. We have retained the core of the definition. This states that offshoring is a cross-border transfer of economic activities. Possible consequences of such a transfer are job losses and imports. We believe that those consequences should not be included in the definition. For practical purposes, many authors have adopted a short-cut definition, arguing that offshoring corresponds to the use of imported intermediate inputs in production. This is not equivalent to a shift of activities, but conceptually rather close to ideas such as international production sharing or the fragmentation of the value chain. We prefer a definition based on the transfer of activities, but recognise that the short-cut definition proves useful given the problem of measurement.

The second aim of the analysis has been to look at how offshoring can be measured and find concrete data to illustrate the extent of offshoring for Belgium. In order to measure offshoring directly, it is necessary to have individual firm data on the transfer of activities abroad. We did not have such data for Belgium. Therefore, we have turned to indirect measures, which are generally trade-based and more readily available. It is, of course, true that those measures do not directly refer to a transfer of activities, but rather to a possible consequence of offshoring, i.e. a rise in imports. Even though they do not lead to a precise measurement of the magnitude of offshoring, they provide interesting indications about trends in offshoring for Belgium.

We started off with traditional measures, i.e. data on imports by geographical origin and product category. For the period 1995-2005, they confirm some well-known facts and some widely-held beliefs about the internationalisation of production patterns for Belgium. At the surface, we find that the shares in Belgian imports of low-wage economies such as China or the new

Central and Eastern European member states of the EU are on the rise, or that there is a strong growth in imports of intermediate goods in absolute value. Digging a bit deeper, we were able to detect more interesting trends that come closer to offshoring, e.g. the substantial and growing share of China in Belgian imports of parts and components of office machines and the increasing share of Central and Eastern Europe in Belgian imports of parts and components of motor vehicles. Moreover, data on Belgian service imports reveal an above average growth for IT services as well as other business services, which notably include call centres. But they also show that the shares of low-wage countries in those imports remain very low. Nevertheless, it must be emphasized that those import data give only a very rough picture of offshoring.

Trends in offshoring are better reflected in data on outward and inward processing trade. Those refer to goods that are temporarily exported or imported for transformation, repair or assembly. The data for Belgium show a strong increase in such trade flows between 1995 and 2005. Moreover, the share of China in Belgian processing trade is also growing fast. But although those data point to an upward trend in offshoring for Belgium, they must be interpreted carefully since the share of processing trade in total trade is fairly small and other factors, e.g. strategically directed trade flows within multinationals, influence processing trade very substantially.

Finally, the best indirect measure of offshoring is the share of imported intermediate inputs in output, which has become the standard measure in the literature in recent years. It refers to a combination of trade and production data and corresponds to the short-cut definition of offshoring. We have computed the share of imported intermediate inputs in output for Belgium for the years 1995 and 2000 based on supply-and-use tables taken from the EUKLEMS database developed at the Federal Planning Bureau. It contains constant price data on imported intermediate inputs and output by product category and by industry. We have found a moderate rise in this share between 1995 and 2000, which confirms that there is an increase in offshoring for Belgium. Our detailed results have allowed us to draw several extra conclusions: offshoring has traditionally been strong in manufacturing industries, for which the share of imported intermediate inputs is much higher than for service industries. But the significantly higher growth rate of the share of imported intermediate inputs in output for service industries between 1995 and 2000 shows that offshoring is becoming more important in service industries. It is also noteworthy that the share of imported intermediate inputs of service products in output is growing fast over the period 1995-2000. This growth highlights the increasing importance of the offshoring of service functions, most notably business services such as call centres or accounting.

Although the imported intermediate input measure is the most appropriate one among the trade-based measures, there remains the problem that it is an indirect measure of offshoring, i.e. that not all imports necessarily correspond to a transfer of activities. Through a shift-and-share analysis of the share of imported intermediate inputs in output we have come to the conclusion that for our Belgian data a rise in this share is generally equivalent to a transfer of activities since the rise essentially occurs within industries at a given production structure. This strengthens our conclusions on the growing importance of offshoring.

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1. Introduction

In times of growing economic globalisation, the fear of a shift of economic activities abroad is an important issue in developed economies. This cross-border shift used to be referred to as relocation, but is nowadays mostly called offshoring. It is a common concern for many workers who feel that their jobs are threatened, it haunts political decision makers, and it has turned into a popular subject in the press. In the economic literature, offshoring has also received growing attention in recent years. Several questions have been raised: what is offshoring and how can it be defined? How can it be measured? What are its causes? What are the costs and benefits for developed and developing economies? This paper focuses on the first two questions.

It is striking to see that in the literature, no consensus on a precise definition of offshoring has emerged so far, although recent efforts by international organisations such as the OECD or UNCTAD have streamlined things a bit. This lack of consensus is partly due to terminological uncertainty: there are indeed many terms in use to describe the same phenomenon. But there is also the problem that offshoring is closely related to concepts such as the cross-border fragmentation of the value chain or the international division of labour. Our aim is to provide an overview of developments in the definition of offshoring that have occurred since the subject was first treated by the Federal Planning Bureau in the mid-90's and adopt a definition that is up to date and directed at measurement. This is what has been done in Chapter 2.

Measuring offshoring is the second and foremost aim of this paper. Given the very limited availability of direct evidence on the cross-border shift of activities, the focus is on indirect measures, which are mostly trade-based. They have been widely used in the literature as proxies for offshoring and will be examined one by one in the sections of Chapter 3. We will describe the construction of these indicators, analyse their advantages and shortcomings, and provide data for Belgium. The data come from the foreign trade and balance of payments statistics of the National Bank of Belgium and the supply-and-use-table database developed at the Federal Planning Bureau in the context of the EUKLEMS project. The period covered for most of those measures is 1995-2005. An accurate quantification of the extent of offshoring for Belgium proves difficult with those trade-based measures because they are noisy indirect measures. But they allow at least to identify trends in offshoring.

2. Definitions

2.1. Terminology

Offshoring is the most recent one among the many terms that have been put forward in the academic literature and in the press to describe transnational location patterns for production facilities and the changing nature of the international division of labour. The idea behind offshoring is not really new: it basically comes down to a country change in the location of production, which implies the loss of this economic activity and associated jobs in the initial home country and the creation of a corresponding activity and jobs abroad. This may affect an entire production chain or just parts of it.

For manufacturing, this was traditionally referred to as relocation abroad[1], whereas offshoring came to be used mainly for services. The definition of offshoring in Clement and Natrop (2004), GAO (2004), van Welsum (2004), and UNCTAD (2005) is focused on services, but it is quite clear that they pertain just as well to goods. In other sources, e.g. OECD (2007), offshoring is indeed taken to encompass both goods and services. We will use relocation and offshoring as synonyms, mostly preferring the latter.

Some authors have used the term outsourcing to describe this phenomenon, e.g. Kirkegaard (2004), Amiti and Wei (2005) or Havik and McMorrow (2006). However, according to GAO (2004) and OECD (2007) the use of this term can lead to confusion as it refers to a different concept, which is the sourcing or vertical integration decision made by a firm. The definition of offshoring below will illustrate this point and make clear why we prefer to avoid using outsourcing as a synonym for offshoring or relocation.

The most comprehensive and precise definitions of offshoring or relocation are found in Bernard et al. (1994)[2], GAO (2004) and OECD (2007). We will largely draw on those three papers for the definition presented here. As stated above, offshoring is the transfer or shift of an activity – an entire production chain or just part of it – from a home country to a host country entailing job losses in the home country. These jobs have been 'offshored'. This definition pertains to the firm-level and to more aggregate levels of analysis. Moreover, this definition is equivalent to the most restrictive definition given in Bernard et al. (1994)[3] and similar to the one in GAO (2004). There are three differences between the definitions of offshoring of Bernard et al. (1994) and GAO (2004). Firstly, as mentioned above, the latter only refers to services. But OECD (2007) generalises this to include goods. Secondly, GAO (2004) considers only business functions, i.e. inter-

1 Relocation is the standard translation for the French term 'délocalisation'. We will use relocation or offshoring throughout this text when referring to papers in French on the issue of 'délocalisation'.

2 Bernard et al. (1998) is an update of Bernard et al. (1994). However, the definition of relocation or offshoring is essentially the same in both papers. We will always refer to Bernard et al. (1994).

3 This is called "Délocalisation 1: Arrêt" (Bernard et al., 1994, p.37).

mediate stages or parts of the production chain, in its definition. Thirdly and most importantly, the definition of GAO (2004) explicitly takes the imports of offshored production into account. This is not part of the definition of Bernard et al. (1994), although they recognise changes in imports as an implicit consequence of offshoring. As we will see further on, the inclusion of imports paves the way for the use of detailed trade data when trying to measure the magnitude of offshoring. All in all, those differences show the changes in the way offshoring or relocation is perceived today compared to the mid-90s. The threat of offshoring is felt to be stronger in services today[4], and the focus on individual stages of the production process is more in line with the current strategies of multinational firms, which seek for the most appropriate location for each production stage and not necessarily for the process as a whole.

Thus, offshoring a business function or part of the production chain implies the cross-border transfer of an activity that was initially carried out in the home country. The crossing of a border is crucial in this context and allows to explain the difference with respect to outsourcing. Take a firm that looks for the optimal provision of a business function or some stage in the production process. It has several possibilities: it may decide to carry out this production itself in the home country, i.e. full domestic vertical integration; it may look for a non-affiliated domestic provider, i.e. domestic outsourcing; it may turn to a non-affiliated provider abroad, i.e. foreign outsourcing; or it may decide to produce itself abroad, i.e. cross-border vertical integration. Leaving aside job losses and imports, the last two of those four possibilities correspond to offshoring. This is clearly not the same concept as outsourcing, which is described by the second and third possibilities. Outsourcing is the result of a make-or-buy decision of a firm, whereas offshoring is the result of a location decision of a firm. All four possibilities are illustrated on Graph 1, which can be found in similar versions in many papers.[5] It combines in a matrix diagram the sourcing and the country-location decision. The two shaded cells of the matrix represent offshoring as defined above disregarding job losses and imports. Offshoring may involve outsourcing. This is then international or foreign outsourcing – also referred to as subcontracting abroad in OECD (2007). But offshoring may also be conducted within the boundaries of the firm. OECD (2007) calls the latter 'offshore in-house sourcing' or 'captive offshoring'.

Note that some authors such as Hijzen (2005) deliberately restrict their analysis to international or foreign outsourcing, i.e. the bottom right cell of the matrix. However, many others, e.g. Amiti and Wei (2005) or Gomez et al. (2005), use the term outsourcing or foreign outsourcing for what we have called offshoring. We believe that the term offshoring should be preferred in order to avoid any confusion.

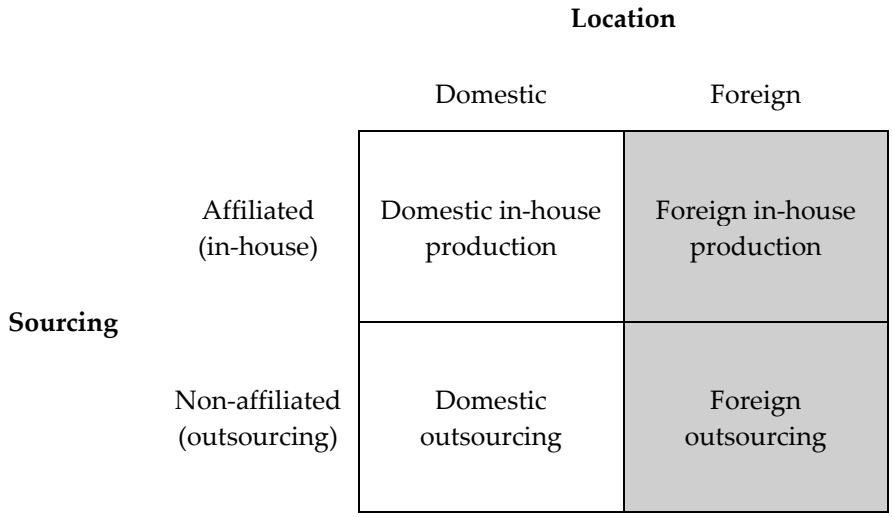
4 See, for example, van Welsum and Vickery (2004) and Hijzen (2005).

5 See GAO (2004), UNCTAD (2004), van Welsum and Vickery (2004), WTO (2005), Hertveldt et al. (2005) OECD (2007a), and OECD (2007b)

2.2. Offshoring and job losses

At this stage, it becomes useful to incorporate the idea of job losses again and extend the two-dimensional framework of Figure 1. This is done in GAO (2004) through a graphical illustration that includes job losses or rather employment displacement as a third dimension. We take up this graphical illustration and adapt it to our purposes. The starting point is a firm that reconsiders the organisation of its production process.

Figure 1 Offshoring and Outsourcing



Source: GAO (2004).

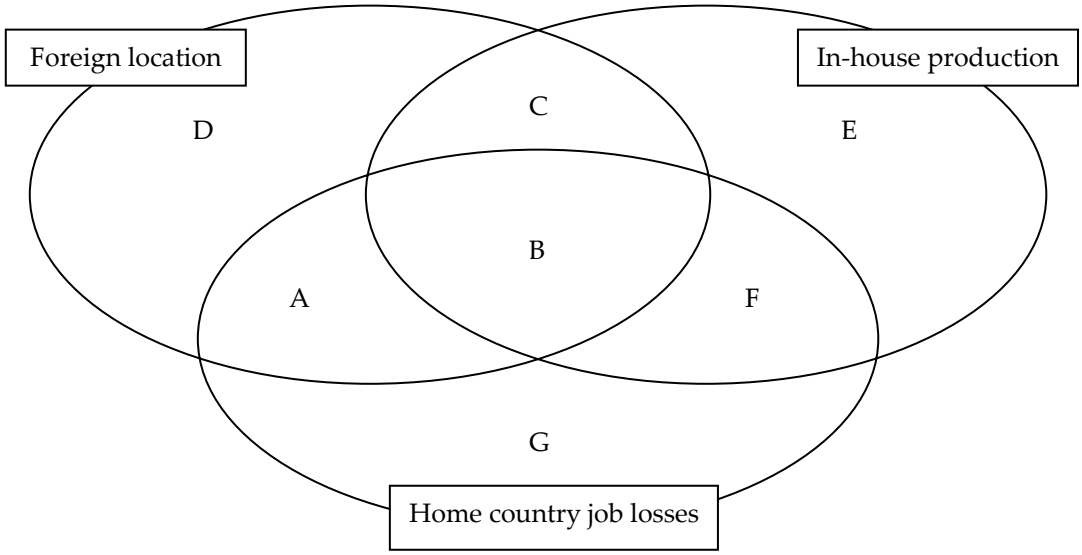
The ovals in Figure 2 represent the three dimensions: the upper left one represents the cross-border dimension (everything inside the oval corresponds to a foreign location), the upper right one represents the intra-extra firm dimension (everything inside the oval corresponds to an in-house production), and the bottom one represents the home country employment dimension (everything inside the oval corresponds to home country job losses). The intersection areas A and B together correspond to the most restrictive definition of offshoring of Bernard et al. (1994): production is carried out in a foreign location no matter whether this is done within or outside the boundaries of the firm, and this leads to home country job losses. We will call this 'offshoring in the strict sense'.[6]

Offshoring as shown by the shaded area on Figure 1 is a broader concept as it disregards the employment dimension. Let us call this 'offshoring in the broad sense'. On Figure 2, this corresponds to the areas A, B, C and D, i.e. the entire upper left oval.[7] Hence, it is the foreign location choice that is crucial – no matter whether this implies outsourcing or job losses in the home country. Offshoring in the strict sense is part or a subset of offshoring in the broad sense. With regard to the definitions provided by Bernard et al. (1994), offshoring in the broad sense en-

[6] This is not the same as 'offshoring in the strict sense' in OECD (2007) where it corresponds to area B only.
[7] Again, this is not the same as 'offshoring in the broad sense' in OECD (2007) where it corresponds to area A only.

compasses both their most restrictive concept of offshoring and an extension, which does indeed take into account the transfer abroad of activities without job losses for the home country.[8]

Figure 2 Offshoring with employment impact: reorganising the production process



A: Foreign outsourcing with job losses for the home country
B: Foreign in-house production with job losses for the home country
C: Foreign in-house production without job losses for the home country
D: Foreign outsourcing without job losses for the home country
E: Domestic in-house production without job losses (status quo)
F: Domestic in-house production with job losses
G: Domestic outsourcing with job losses
Rest: Domestic outsourcing without job losses

Source: Adapted from GAO (2004)

The remaining areas in Figure 2 – E, F, G and the Rest meaning the area outside the three ovals – are associated with a reorganisation of the production process without any offshoring. Some of them imply home country job losses (F and G), but for reasons other than offshoring, which may be domestic outsourcing, firm restructuring and technological changes or others. Although this separation between offshoring and other reasons for job losses is clear-cut in Graph 2, it proves difficult in practice to disentangle the reasons for job losses in the home country.

[8] This extension is called "Délocalisation 2: Expansion" (Bernard et al., 1994, p.37). Offshoring in the broad sense as defined through Graph 2 is not entirely equivalent to the two concepts "Délocalisation 1: Arrêt" and "Délocalisation 2: Expansion" in Bernard et al. (1994) as they exclude some special cases from the latter, e.g. if the transfer abroad of the activity is motivated by a search for primary inputs. Furthermore, Bernard et al. (1994) define another extension "Délocalisation 3: Diversification" (Bernard et al., 1994, p.37), which relates to firm's diversification strategies in foreign locations, i.e. the activity started abroad is not exactly the same as the one abandoned in the home country.

So far, we have described offshoring as a static concept: an activity is stopped in the home country and the same activity is started up abroad. However, the two events must not necessarily take place at the same time. In other words, the start up of an activity abroad may occur long before the corresponding activity is abandoned in the home country, thereby blurring the link between the two events and making the measurement even more difficult.

Let us illustrate the link between our concepts of offshoring and strategic firm behaviour with an example from the automobile industry: take a car producer that builds up an assembly line in Eastern Europe in order to expand its production capacity and access the local market, while maintaining all existing assembly lines in Western Europe. After a few years during which the expansion has worked out well, the car market in Europe is hit by a fall in demand. Faced with plummeting demand, the car producer wants to reduce production capacity by closing down one assembly line. The assembly lines in Western Europe are older and prove to be less efficient than the one in Eastern Europe and, therefore, one of them is closed down. Is this offshoring?

We may draw two conclusions from this example. First of all, when looking only at the final outcome over the whole period, this may be seen as offshoring in the strict sense, but we feel that this does not capture all that is going on. The concept of offshoring in the broad sense may seem more appropriate as it takes expansionary strategies abroad into account. However, the explicit link with job losses is then given up. Our second conclusion is linked to the first: there is a case for considering the decision to invest abroad rather than in the home country as offshoring.[9] This corresponds to an idea of foregone investments[10] and again pleads in favour of offshoring in the broad sense.

2.3. Offshoring and imports

GAO (2004) and OECD (2007) explicitly include imports into their definitions of offshoring. Indeed, when production is shifted abroad, this will very often lead to imports. However, as explained in Hertveldt et al. (2005), things are not always that straightforward. Certain goods and services may have been directly exported when they were still produced domestically. Once their production is shifted abroad, there is a fall in exports instead of a rise in imports. Cross-border flows of goods and services within multinational firms may involve several countries and be complicated to trace, and a change in the location of production may lead to changes in trade flows for several countries. Nonetheless, the basic trade flow associated with the displacement of an activity is an increase in imports to the home country. Including such imports in the definition of offshoring therefore makes sense even though some cases, which we would clearly perceive as offshoring, may be excluded because they do not give rise to imports.

[9] Bernard et al. (1994) explicitly take the motivations for expanding abroad into account in their extended definition of offshoring "Délocalisation 2: Expansion".

[10] Hertveldt et al. (2005) also mention this idea.

The case for including imports in the definition of offshoring is even stronger when considering only intermediate inputs. When a firm offshores the provision of an intermediate good or service, it is very likely that it will import this good or service. Therefore, the bulk of the recent literature focuses on offshored intermediate inputs. Hence, offshoring of the production of goods and services for the final demand is mostly not taken into account in the more recent literature.

Several authors such as Feenstra and Hanson (1996), Amiti and Wei (2005), and Hijzen (2005), simply define what they call outsourcing or international outsourcing as "the import of intermediate inputs by domestic firms"[11]. With regard to the definitions provided above, this amounts to a shortcut that ignores the displacement of an activity. In this context, it is important to state that imports of intermediate inputs and offshoring – both in the strict and the broad sense – are not equivalent. Indeed, as mentioned above, some cases of offshoring may not lead to imports or they may not concern intermediates. Likewise, some imports of intermediates may not correspond to cases of offshoring. However, faced with the problem of finding appropriate data for measuring the extent of offshoring, it proves often very convenient to resort to this shortcut definition.

Several other concepts related to offshoring have been put forward in the academic literature: fragmentation of the value chain[12], global production sharing[13] or vertical specialisation[14]. They are all linked to trade in intermediates. Strauss-Kahn (2003) defines vertical specialisation as "the share of imported inputs in production", whereas Hummels et al. (2001) only consider imports that go into the production of goods for exports. According to Yeats (1998) "production sharing is defined as the internationalization of a manufacturing process in which several countries participate in different stages of the manufacture of a specific good". This gives rise to trade in components, i.e. intermediates. Finally, Pilat (2006) states that the globalisation of value chains is based on increased trade in intermediate inputs. Some authors, e.g. Amiti and Wei (2005) and Hijzen (2005), consider these concepts as equivalent to offshoring or relocation. We believe that this is indeed true when using the shortcut definition that merely refers to imports of intermediate inputs. But we know from our more elaborate definitions that there are conceptual differences between offshoring and the imports of intermediate inputs.

All in all, most of what we would believe to be today's standard definition of offshoring or relocation was already contained in the definitions of Bernard et al. (1994). This includes the transfer of an activity to a foreign location with job losses in the home country. But in the recent literature, there is a greater focus on services, intermediate inputs and imports. For practical purposes, many authors have preferred to use a simpler definition based on imports of intermediate inputs. This is due to major difficulties in finding appropriate measures for offshoring and the aim of analysing employment effects.

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11 See Feenstra ans Hanson (1996), p.240.
12 See, for example, Pilat (2006).
13 See, for example, Yeats (1998).
14 See, for example, Hummels et al. (2001).

3. Measuring offshoring

This chapter is aimed at finding an appropriate measure of offshoring. There is quite some anecdotal evidence, but, ideally, we would like to have individual firm data that identify activities that have been driven down or stopped in the home country leading to the start-up or extension of the same activity by a foreign affiliate or a foreign subcontractor. This would then give rise to imports by those firms and job losses in the home country. However, the discussion in the previous chapter has shown that even if individual firm data allowing to measure all those parameters were available, there would still be scope for debate on issues such as the timing of the offshoring process. Only a few authors have so far used individual firm data to look at offshoring[15]. But even those individual firm data mostly rely on some indirect measure of the displacement of activities, e.g. imports, and do not identify the displacement directly. Moreover, those data are often restricted to a partial set of firms or do not allow to measure all the parameters mentioned above. Nonetheless, individual firm data are clearly to be preferred when trying to measure offshoring.

Since datasets allowing a direct measure of offshoring are scarce, other means of estimating the magnitude of offshoring must be found. The vast majority of indirect or proxy measures of offshoring is trade-based. Trade data – or rather data on imports – are indeed convenient: they measure one of the main consequences of offshoring and they are easy to come by. We must, however, repeat that import based proxy measures tend to neglect the shift of activity, which is part of the offshoring process, and to include events giving rise to imports that do not correspond to offshoring. In other words, there is no reason to believe that all imports substitute for production that used to be carried out in the home country. This may make for substantial differences between offshoring and imports. Therefore, many authors state the shortcut definition described in the previous chapter to justify the use of trade data.

Several types of trade based measures may be used. These include total trade flows broken down into geographical areas or product categories, e.g. the Broad Economic Categories (BEC), data on imports of components based on the Standard International Trade Classification (SITC), data on outward and inward processing trade (OPT and IPT), and, finally, data on the use of imported intermediate inputs taken from input-output or supply-use tables. In his literature review, Hijzen (2005) provides a fairly exhaustive overview of those different measures. Our aim is twofold: firstly, analyse the advantages and shortcomings of those measures with regard to the definitions given in the previous chapter, and, secondly, provide data for Belgium for all those measures.[16]

[15] See, for example, Aubert and Sillard (2005), Görg and Hanley (2003), Bernard et al. (1994), Bernard et al. (1998).

[16] Most of our trade data are in the national concept rather than in the community concept. Data in the latter concept will be flagged. Exports and imports in the national concept exclude sales (re-exports) by non-resident companies in Belgium and are therefore better linked to domestic economic activity. Note that total trade according to the national concept amount to about 80% of total trade in the community concept for Belgium.

3.1. Total trade flows of goods by geographical area

The first and most readily available dataset for measuring offshoring is total trade with a geographical breakdown. According to Aubert and Sillard (2005), this is the traditional measure. Hijzen (2005) does not mention those data as he focuses exclusively on trade in intermediate inputs. Gorter et al. (2005) use total trade flows by geographical area to analyse relocation for the Netherlands. The same type of analysis for Belgium can be found in Hertveldt et al. (2005).

In this section, we update the analysis in Hertveldt et al. (2005) breaking down total trade flows of goods for Belgium into certain key geographical areas. As shown in Table 1, this includes several low-wage countries or groups of countries: the new Central and Eastern European Member States of the EU (CEEC), the new industrialized countries of South East Asia (Asian NICs), China and India.

Table 1 Geographical distribution of manufacturing trade for Belgium, share in total 1995/2005

	Exports		Imports	
	1995	2005	1995	2005
EU15	76.6%	72.9%	76.4%	70.9%
CEEC[a]	1.7%	3.6%	1.2%	3.0%
US	3.7%	4.5%	5.6%	4.7%
Asian NICs[b]	3.0%	2.1%	1.8%	2.4%
China	0.6%	1.2%	0.9%	2.7%
India	1.6%	2.4%	0.7%	1.0%

Source: Own calculations based on NBB.

a. CEEC = new Central and Eastern European Member States of the EU (including Roumania and Bulgaria).

b. Asian NICs = South Korea, Hong Kong, Singapore, Taiwan, Thailand, Malaysia, Philippines, Indonesia.

Trade growth in current prices is strong for Belgium over the period 1995-2005 with a annual growth rate above 6%. The share of the EU15 is on the fall in both exports and imports. Nonetheless, this area still represents more than two-thirds of the total value of Belgian trade. Regarding the so-called low-wage countries, the growth rates of their trade with Belgium are above average and their shares in Belgium's trade are on the rise except for exports to the Asian NICs. This trend is strongest for imports from China and the CEEC. However, the share of each of those countries in total Belgian imports still remains relatively low.

The main advantage of total trade data with a geographical breakdown is that they are easy to come by. Moreover, the geographical breakdown allows to take account of the most frequently quoted cause of offshoring: differences in the price of labour between countries making the shift of activities attractive for cost efficiency reasons. No distinction is made between types of goods in terms of their use. This means that offshoring of both intermediate and final production stages is taken into account. But several arguments plead against the use of total trade flows by geographical area to measure offshoring. The loss of activity is neglected, although this is, of course, true for any trade-based measure. Imports must not necessarily correspond to an activity that used to be carried out in the home country. In other words, the growth in total trade

with any geographical area is influenced by many factors and not merely offshoring. Finally, services are not covered by the data in Table 1.

Regarding the results in Table 1, it may be argued, on the one hand, that the rise in imports from those low-wage countries is a clear indicator of a rise in offshoring. But, on the other hand, this rise may also be seen as a perfectly normal consequence of the gradual opening up of those economies to international trade. All in all, the total trade data do not allow robust conclusions on or precise measurement of the magnitude of offshoring as defined in Chapter 1. Therefore, in the next two sections, we turn to detailed trade data on types of goods to shed more light on the question of offshoring for Belgium. Trade in services will be covered in a separate section.

3.2. Trade in intermediate goods based on broad economic categories

An approach that records trade flows in intermediate goods should provide further insights, even though offshoring may also give rise to changes in trade flows of final consumption goods, i.e. if the final stage of the production process is relocated abroad. Nonetheless, the advantage of restricting the analysis to imports of intermediate goods is that we can be sure that there is some link with a production in the home country. In other words, imports of intermediates are a sign of production sharing as defined in the first chapter and maybe of offshoring.

An easy way of identifying trade in intermediates is through the Broad Economic Categories (BEC), which are based on the Standard International Trade Classification (SITC).[17] The BEC splits traded goods into four major categories: consumption goods, capital goods, intermediate goods and others (unclassified – rest of trade). Havik and McMorrow (2006) measure the extent of offshoring for the EU15 through the share of intermediate goods defined according to the BEC in total trade. Their analysis covers the period 1992-2003 and they also include data for the US, Japan, the EU10[18], China and South East Asia. They obtain a result that is rather surprising at first sight: overall, the share of intermediates is on the decline in total EU15 imports[19]. The decline amounts to about four percentage points.

Trade data by BEC are also available for Belgium for the period 1995-2005 and the analysis of Havik and McMorrow (2006) can easily be done for Belgium. The data are shown in Table 2 and Figure 3 and they confirm that there is a downward trend for Belgium just like for the EU15. Despite a very substantial rise in Belgium's imports of intermediate goods in absolute value, the share of those goods in total imports falls from 66.8% in 1995 to 63.9% in 2005. Moreover, Table 2 shows that the share of imports of consumption goods is on the fall, whereas the share of capital goods increases by more than two percentage points. The picture is different for exports: despite some ups and downs as shown in Figure 1, there is an overall rise in the share of intermediate goods in total exports from 58.9% to 61.2% over the period 1995-2005. The fall in the share

17 Both the SITC and the BEC have been developed by the United Nations (UN).
18 The 10 new Member States that joined the EU in 2004.
19 They consider only extra-EU15 imports, i.e. imports of the EU15 Member States excluding intra-area flows.

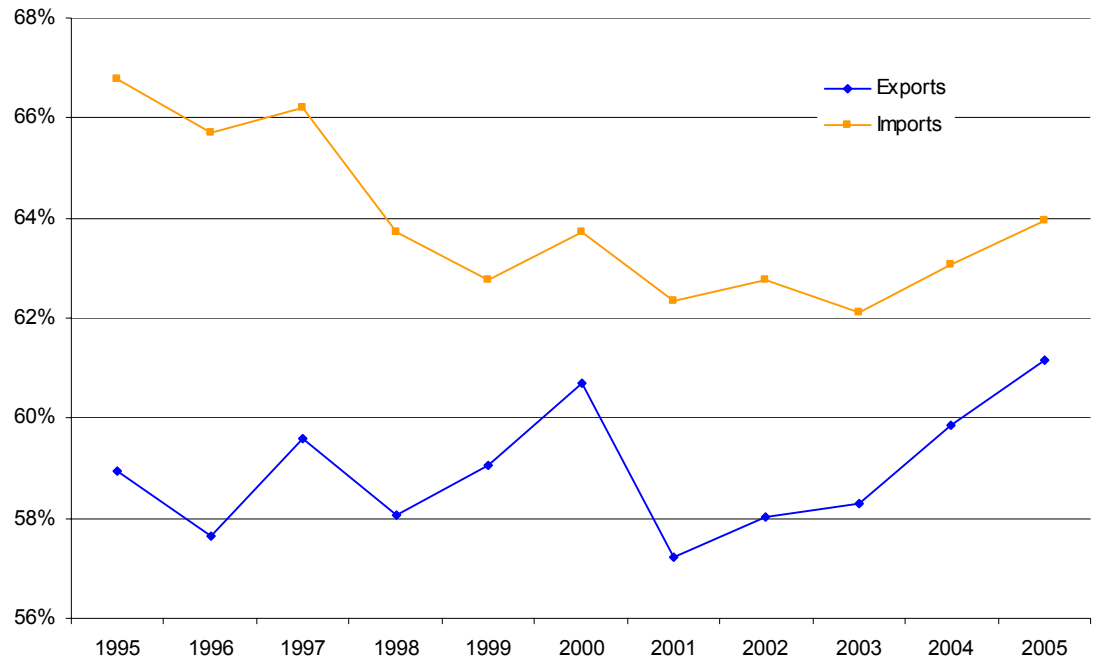
of consumption goods is similar to the one for imports, but the increase in the share of capital goods is much smaller.

Table 2 Breakdown of trade by Broad Economic Categories (BEC), Belgium, 1995/2005

	Exports				Imports			
	1995		2005		1995		2005	
	Mio €	Share	Mio €	Share	Mio €	Share	Mio €	Share
Consumption goods	23584	20.1%	39629	18.8%	21001	19.4%	37902	18.4%
Capital goods	10965	9.3%	20888	9.9%	9713	9.0%	23277	11.3%
Intermediate goods	69192	58.9%	128969	61.2%	72349	66.8%	131569	63.9%
Primary food supplies	*619*	*0.5%*	*591*	*0.3%*	*1986*	*1.8%*	*1800*	*0.9%*
Processed food supplies	*1219*	*1.0%*	*1616*	*0.8%*	*969*	*0.9%*	*1346*	*0.7%*
Primary industrial supplies	*6080*	*5.2%*	*12223*	*5.8%*	*8223*	*7.6%*	*14395*	*7.0%*
Processed industrial supplies	*48651*	*41.4%*	*80180*	*38.0%*	*36779*	*34.0%*	*59928*	*29.1%*
Primary fuels	*139*	*0.1%*	*5549*	*2.6%*	*3630*	*3.4%*	*18908*	*9.2%*
Processed fuels	*2663*	*2.3%*	*10180*	*4.8%*	*2913*	*2.7%*	*10941*	*5.3%*
Parts of capital goods	*5921*	*5.0%*	*10573*	*5.0%*	*5986*	*5.5%*	*10919*	*5.3%*
Parts of transport equipment	*3900*	*3.3%*	*8056*	*3.8%*	*11863*	*11.0%*	*13334*	*6.5%*
Unclassified (rest of trade)	13640	11.6%	21326	10.1%	5252	4.8%	12998	6.3%
Total	186574	100.0%	339779	100.0%	180664	100.0%	337316	100.0%

Source: NBB.

Figure 3 Trade in intermediates (BEC definition – share of total), Belgium, 1995-2005



Source: NBB.

To get a clearer picture of what has caused the fall in the share of intermediate goods in total imports, intermediate goods are divided into eight subcategories. These include not only parts and components or semi-finished goods, but also food supplies and fuels, i.e. types of interme-

diate goods that are not commonly associated with offshoring. Table 2 shows a decreasing share in total imports for all subcategories except fuels. The increasing share of fuels is largely due to price hikes for those goods. More importantly, this means that the decrease in the share of the other subcategories taken together is even stronger than for intermediate goods as a whole. The decrease proves to be the most striking for 'Parts of transport equipment' and 'Processed industrial supplies'. The latter is moreover the biggest subcategory. However, note that imports in absolute value are on the rise for all subcategories except 'Primary food supplies'.

How should the decline in the share of intermediate goods in total imports be interpreted? Does this mean that there is little or no offshoring going on or at least less production sharing than before 1995? First of all, it should be kept in mind that in absolute value the imports of intermediate goods have almost doubled over the period 1995-2005. The total value of domestic production in Belgium has grown at a much slower pace over the same period[20], which implies an increase in the ratio of imported intermediate goods to total output, i.e. Belgian firms use proportionally more imported intermediates in production in 2005 than in 1995. Hence, there has probably been some offshoring going on. Furthermore, this implies that the measure of Havik and McMorrow (2006) is not the most appropriate for finding evidence of offshoring.

Secondly, all measures presented in Table 2 and Figure 1 are in value terms. The shares in total imports may therefore be influenced by differences in price trends for imports of intermediate goods and imports of other goods. We may even push this reasoning a bit further. One of the main driving forces behind offshoring is the firms' search for cost efficiency in low wage countries. In other words, firms try to obtain their inputs at lower prices by relocating production to those countries. Hence, if there is some offshoring going on, we should not expect price hikes for imported intermediate goods, but rather a fall in their relative price. According to this line of reasoning, offshoring is not necessarily in contradiction with a fall in the current price share of intermediate goods in total imports.

Thirdly, there may be offshoring of assembly lines, i.e. the ultimate stage in the production chain. If such offshoring occurs and if the parts and components that have to be assembled were already produced in the destination country, then the share of intermediate goods in total imports should fall. This is the main argument put forward by Havik and McMorrow (2006) to explain their findings.

To sum things up, trade data based on BEC provide a good overview of trends in the types of goods that are traded. But regarding the measurement of offshoring as defined in chapter 1, they should be interpreted very carefully. There are not only the usual caveats concerning the use of trade data as a proxy measure for offshoring, but also other problems such as the need to compare them to output data, price effects or the exclusion of the offshoring of assembly lines.

[20] According to the latest National Accounts figures for Belgium, production at current prices increases by about 55% between 1995 and 2005.

3.3. Imports of parts of machinery and transport equipment

In order to measure global production sharing for OECD countries over the period 1978-1995, Yeats (2001) focuses on Section 7 'Machinery and transport equipment' of the Standard International Trade Classification (SITC) Rev.2 and uses detailed product descriptions at the 5-digit level to isolate flows which specifically refer to parts. These flows of parts are interpreted to represent intermediate inputs. The analysis is restricted to SITC Section 7 because the separation between parts and other goods is less clear-cut for the other SITC sections. But 'Machinery and transport equipment' accounts for a substantial part of total imports of goods for all OECD countries in 1995[21]. For Belgium, the share of 'Machinery and transport equipments' in total imports of goods amounted to 28.9% in 1995 and 25.6% in 2005.

The results of Yeats (2001) are only partially relevant for our analysis of offshoring as they mainly concern exports and as the period covered – 1978-1995 – is very different from our period of reference, i.e. 1995-2005. Our aim is to apply the method to import data for Belgium in order to test the results reported in the previous section for 'Parts of capital goods' and 'Parts of transport equipment', which were based on BEC import data. It is, of course, true that the trade data in BEC are obtained from SITC trade data and therefore the calculations based on the method of Yeats (2001) should confirm the results of the previous section. But direct use of SITC trade data allows us to refine our analysis by going into greater detail in terms of products.

In brief, the method of Yeats (2001) implies drawing up a list of 5-digit product codes of SITC Section 7 for which the description explicitly mentions parts and then adding up trade in value for those product codes and comparing the results with total trade for SITC Section 7. This can also be done based on the more recent SITC Rev.3. The list of codes that refer to parts is only slightly different. Table 3 presents the results obtained when applying the method to SITC Rev.3 import data for Belgium for the period 1995-2005. Total imports and imports of parts are reported for SITC Section 7 as a whole and all divisions (2-digit level) belonging to this section.

The results do indeed confirm those obtained from the import data in BEC for the categories 'Parts of capital goods' and 'Parts of transport equipment'. The total value of imports of parts is on the rise between 1995 and 2005 for SITC Section 7 'Machinery and transport equipment' as a whole and for all its divisions except 'Other transport equipment', but the share of parts in total imports of this section falls from 28.0% to 24.6%. There are quite substantial differences between the divisions in terms of the share of parts in total imports and the changes in this share. Figure 2 shows that the downward trend in the share for the entire section is mainly driven by the division 'Road vehicles', which accounts for more than 40% of Belgium's total imports of SITC Section 7.

[21] See Yeats (1998), p.12.

Table 3 Imports[a] for SITC Section 7, Total and Parts and components, Belgium, 1995/2005

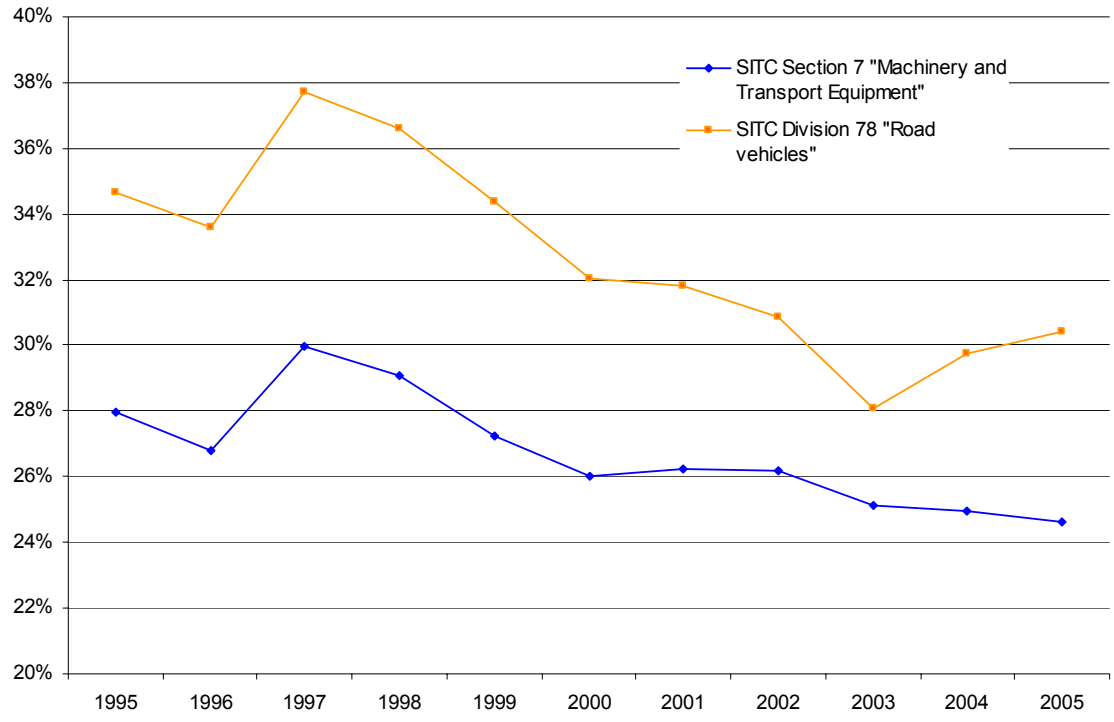
	Total (Tot)		Components				
	1995	2005	1995		2005		95-05
SITC code and description	% of 7	% of 7	Mio €	% of Tot	Mio €	% of Tot	avg gr
7 Machinery and transport equipment	100.0%	100.0%	9404.2	28.0%	16122.0	24.6%	5.5%
71 Power generating machinery	7.6%	6.1%	446.0	17.4%	910.8	22.7%	7.4%
72 Machinery specialised	6.8%	6.6%	874.4	38.1%	1442.9	33.3%	5.1%
73 Metal working machinery	1.5%	1.6%	195.8	37.7%	453.0	43.8%	8.7%
74 General industrial machinery	13.4%	12.1%	1050.0	23.2%	2197.4	27.8%	7.7%
75 Office machines	7.9%	8.5%	664.0	24.8%	1237.4	22.1%	6.4%
76 Telecommunications apparatus	6.4%	8.1%	470.1	21.9%	612.1	11.6%	2.7%
77 Electrical machinery	12.3%	12.9%	429.5	10.4%	741.8	8.8%	5.6%
78 Road vehicles	42.3%	41.4%	4935.1	34.6%	8241.1	30.4%	5.3%
79 Other transport equipment	1.7%	2.7%	339.3	60.3%	285.3	16.1%	-1.7%

Memo item:	1995	2005
Share SITC 7 in total imports	28.9%	25.6%

Source: Own calculations based on NBB.

a. Community concept.

Figure 4 Share of parts and components in total imports[a] of SITC Section 7 "Machinery and Transport Equipment" and Division 78 "Road Vehicles", Belgium, 1995-2005



Source: Own calculations based on NBB.

a. Community concept.

Given those findings, we may again wonder whether any offshoring of the production of 'Machinery and transport equipment' has occurred for Belgium between 1995 and 2005. The same arguments as in the previous section can be put forward to prove that there may nonetheless be some offshoring taking place, i.e. there is a rise in imports of parts in absolute value, these imports should be compared to production rather than total imports, relative prices of parts may be expected to fall through offshoring to low wage countries, and there may also be some offshoring of assembly lines.

Table 4 Shares of certain countries or groups of countries in Belgium's imports[a] of parts and components of SITC Section 7 "Machinery and Transport Equipment", 1995-2005

	1995	2000	2005
OECD	98.1%	96.4%	95.3%
EU15	79.1%	74.8%	76.6%
CEEC[b]	0.6%	2.1%	5.0%
US	9.8%	11.5%	5.4%
Japan	6.6%	5.8%	5.6%
Asian NICs[c]	1.1%	2.1%	2.3%
China	0.2%	0.7%	1.8%

Source: Own calculations based on NBB.

a. Community concept.

b. CEEC = new Central and Eastern European Member States of the EU (including Roumania and Bulgaria).

c. Asian NICs = South Korea, Hong Kong, Singapore, Taiwan, Thailand, Malaysia, Philippines, Indonesia.

Moreover, Table 4 shows that Belgium imports proportionally less parts of 'Machinery and transport equipment' from the EU15 and the US in 2005 than in 1995, whereas imports of such parts from the new Central and Eastern European Member States of the EU (CEEC), China and the Asian NICs have risen in relative terms. This rise is particularly strong for the CEEC and Chine over the period 2000-2005. Detailed data by division show that the shift is particularly striking for 'Office Machines', where the share of China in Belgium's imports of parts is already greater than 10% in 2005, and 'Road vehicles', where the share of the CEEC amounts to almost 6% in 2005. These shifts in shares may be due to offshoring, but they may also come from a geographical substitution for the imports of parts from neighbouring high-wage countries towards low wage countries. Again, there is some evidence of offshoring, but we have to be very careful when using those trade data to draw conclusions in terms of the magnitude of offshoring.

3.4. Trade data for services from the balance of payments

One shortcoming of the analysis conducted up to here is the lack of evidence for services. Since the beginning of the 1990's, services have become much more tradable due to ICT developments and service offshoring is nowadays a common concern for many developed countries. In this context, some service categories such as call centres or accounting services appear to be particularly vulnerable.[22]

[22] See, for example, van Welsum and Vickery (2005) or Michel (2007).

There is a lot of anecdotal evidence, e.g. stories about firms that move call centres or accounting operations to Eastern Europe or India.[23] But comprehensive data allowing to measure service offshoring are hard to come by. We are not aware of any direct measures based on individual firm data. Indirect measures prove to be scarce, too. In terms of trade data for services, there is often only one source: the Balance of Payments (BoP). Both van Welsum (2004) and Amiti and Wei (2005) use services trade data from the BoP as an indicator of service offshoring covering a wide range of countries. Gorter et al. (2005) for the Netherlands and Hertveldt et al. (2005) for Belgium provide a similar kind of analysis. The focus is mainly on two categories of services in the BoP: 'Computer and information services', which include computer software services, and 'Other business services', which include accounting and other back office services.[24] These types of services are mainly used as intermediates in the production process.

Note, however, that there are some concerns regarding BoP data on trade in 'Computer and information services' and 'Other business services'. Major issues are transfer pricing for service delivery within multinationals and large differences between reported exports by low-wage countries and the corresponding reported imports by developed countries.[25]

Table 5 Imports for BoP categories 'Computer and information services' and 'Other business services', Belgium, 1995/2005

	1995		2005		1995-2005
	Mio €	Share[a]	Mio €	Share[a]	Δ[b]
Computer and information services	444	2.0%	1497	3.6%	12.9%
Other business services	4317	19.9%	9434	22.9%	8.1%

Source: Own calculations based on NBB.

a. Share = share in total imports of services in the Balance of Payments.

b. Δ = average annual growth rate.

Let us briefly comment on data for Belgium's trade in services from the BoP. This is an update and extension of the analysis in Hertveldt et al. (2005). Total exports of services have on average grown faster than total exports of goods between 1995 and 2005 – 7.6% per year against 6,0%, whereas for imports, the average annual growth rate is the same – 6.6%. Table 5 shows that, in absolute value, Belgium's imports of 'Computer and information services' triple between 1995 and 2005, while those of 'Other business services' double and that the shares of those categories in total service imports increase. Moreover, it is noteworthy that exports are on the rise, too, and that Belgium remains a net exporter of those kinds of services over the whole period 1995-2005.

23 See, for example, UNCTAD (2004).

24 In fact, 'Computer and information services' and 'Other business services' are respectively items 7 and 9 of the part on services trade (current account) in the structure of the balance of payments. For 'Other business services', we report data only for 'Miscellaneous business, professional and technical services' (9.3) leaving out 'Merchanting and other trade-related services' (9.1) and 'Operational leasing services' (9.2), which do not correspond to the types of services we are looking for.

25 Regarding the latter problem, OECD (2006) provides an overview of the difference between Indian data on service exports to the US and US data on service imports from India and explains why the Indian figures are higher.

A brief look at the geographical breakdown of Belgium's imports of those services brings further insights. More than 95% of Belgium's imports of 'Computer and information services' and 'Other business services' come from OECD countries in both 1995 and 2005, the US and the UK being the main providers followed by Belgium's traditional trading partners for goods, i.e. the Netherlands, France and Germany. Imports from low-wage countries are of a much lesser magnitude. The new Eastern and Central European Member States of the EU account for about 3% of Belgium's imports of those services in 2005, while the shares of India, China and the new industrialised countries of South East Asia (Asian NICs) are still very small despite some recent growth.

The geographical breakdown of the import data leads us to believe that service offshoring to low-wage countries had not reached a sizeable scale for Belgium in 2005. This is consistent with findings reported in Engmann (2007). This author looks at production and exports of information technology and business process services of several low-wage countries. For India, for example, he finds that in 2005 more than 80% of exports of those services go to the US and the UK. It seems indeed to be true that in terms of service offshoring these two countries are frontrunners.

The main advantage of the BoP data presented here is that they are relatively easy to come by. Despite the above-mentioned concerns about their quality, they provide a rough picture of the trends in IT and business services trade over the decade 1995-2005. However, there are quite a few caveats regarding the use of those service trade data as a proxy for offshoring. The rise in imports of IT and business services may to some extent reflect offshoring according to our strict definition from chapter 1. The fact that those services are mainly used as intermediate inputs in the production process lends support to this idea. But there are still other factors that influence changes in service imports. Moreover, the parallel growth in exports implies that companies established in Belgium are increasingly becoming cross-border providers of 'Computer and information services' and 'Other business services'. Hence, BoP data on trade in services are an indicator of growing internationalisation and production sharing, but given that the data do not tell anything about a shift in activities we should be very careful when it comes to drawing conclusions on offshoring as we have defined it earlier on.

3.5. Outward processing trade

As regards offshoring of manufacturing activities a further trade-based measure relies on processing trade – outward processing trade (OPT) and inward processing trade (IPT). Those are trade flows of goods, which occur under a special customs procedure granting tariff exemptions for goods that are temporarily exported for transformation, repair or assembly abroad. They are subsequently re-imported to the exporting country under this special tariff regime. From the point of view of Belgium, outward processing trade implies exports of intermediate or semi-finished goods to a foreign country for further processing (outward processing exports) and imports of the processed goods (outward processing imports). Inward processing trade is the

mirror image: it pertains to goods that are imported by Belgium for further processing (inward processing imports) and that are exported thereafter to the country they initially came from (inward processing exports). In both cases the re-imported or re-exported processed goods benefit from an exemption from duties or levies normally applied to traded goods. This is the definition of OPT and IPT found in Eurostat (1998). Typical examples include textiles sent abroad for sewing or dyeing and automobile spare parts sent abroad for assembly.

There is indeed a very natural link between processing trade and the fragmentation and internationalisation of production processes or a broad concept of offshoring. Several authors have analysed processing trade from this perspective. Yeats (2001) presents data on 'offshore assembly processing trade' for the US as part of his study of international production sharing. Baldone et al. (2001) take a closer look at OPT for textiles and apparel between several Western European and Central European countries to determine patterns of the international fragmentation of production and its driving forces, while Egger and Egger (2005) analyse the determinants of total EU processing trade. [26]

However, there are some shortcomings of OPT data as a measure of offshoring that must be pointed out. Most are mentioned in Hijzen (2005). First of all, OPT is mainly trade in intermediate goods, which means that offshoring of the final production stage is mostly not taken into account when using this measure.[27]. Furthermore, firms may try to adapt their trade flows so as to take as much as possible advantage of the tariff exemption granted for OPT.

But, more importantly, Hijzen (2005) notes that "comparisons across industries and over time on the basis of outward processing trade data can be problematic since trade barriers differ across industries and trade arrangements change over time"[28]. In fact, this problem deserves some further explanations because a lot depends on how processing trade is identified statistically. According to the definition above, a trade flow will be considered as OPT only if it occurs under a preferential customs treatment. For Belgium – as for any other EU member state – statistics on such OPT are drawn from Extrastat declarations, which contain information on trade by statistical procedure.[29] Trade by statistical procedure is not available in Intrastat declarations because preferential treatment for OPT is redundant when there are no customs barriers. Hence there cannot be any OPT measured through statistical procedure within the EU.

For measuring offshoring, this is far from satisfactory and it is the link with preferential customs treatment that is problematic. There is indeed no reason why there should be no exports for further processing abroad and subsequent imports within the EU just because there are no customs barriers. In other words, firms continue to send intermediate goods abroad for further

[26] They refer to processing trade as a "narrow measure of international outsourcing", which corresponds to what we have called offshoring. See Egger and Egger (2005), p.149.

[27] Note nonetheless that some OPT may correspond to offshoring of the final production stage, e.g. when spare parts are sent abroad for assembly and the final goods are subsequently re-imported for sale on the domestic market.

[28] See Hijzen (2005), p.48.

[29] Trade by statistical procedure divides flows into three major categories: 'Normal imports and exports', 'Inward processing trade' and 'Outward processing trade'. For more detail on statistical procedure, see Eurostat (1998).

processing even after trade barriers have been lifted, but this is no longer measured for purely statistical reasons as there is no preferential customs treatment.[30] The statistical procedure fails to capture what is really happening in terms of processing trade and offshoring. The remark quoted from Hijzen (2005) hinges upon this problem.

Using OPT data based on the statistical procedure as a proxy for offshoring makes only sense when restricting the analysis to specific products or industries, certain countries and a limited time span, over which trade agreements with those countries do not change. This has indeed been done in Baldone et al. (2001) as the analysis is focused on textile and apparel OPT between Germany, the Netherlands, France and Italy, and several Central and Eastern European countries in the early 90's.

Another means of identifying processing trade in both Intrastat and Extrastat declarations is through the split up of flows by type of transaction. Among those flows there are flows before processing and flows after processing. It is therefore possible to identify outward processing exports and imports as well as inward processing imports and exports. Those transaction categories are not linked to preferential customs treatment. Hence, the flows measured through those categories also encompass processing trade within the EU and other free trade agreements.[31] Moreover, the processed goods must not necessarily be re-imported.

All in all, we believe that for our purposes OPT flows based on declared transaction types are to be preferred to those based on statistical procedure, i.e. are a better measure for offshoring. Nonetheless, OPT flows based on declarations of transaction types will not necessarily capture all offshoring that is going on. Processing abroad is not the only way of offshoring and OPT flows cover neither services nor the final stage of the production process as pointed out earlier on. Moreover, there may also be a downward bias in OPT flows because firms do not declare certain trade flows as OPT although they are actually OPT flows. In case of a preferential customs treatment there is an incentive to declare OPT correctly, whereas for declarations on transaction types, it does not really matter for a firm whether it declares OPT flows as such or simply as normal trade flows. Finally, it seems worth pointing out that OPT data cover both flows between affiliated firms and flows between unaffiliated firms. This implies that they pertain to both categories that make up offshoring as defined in the first part of this paper, i.e. foreign in-house production and foreign outsourcing.

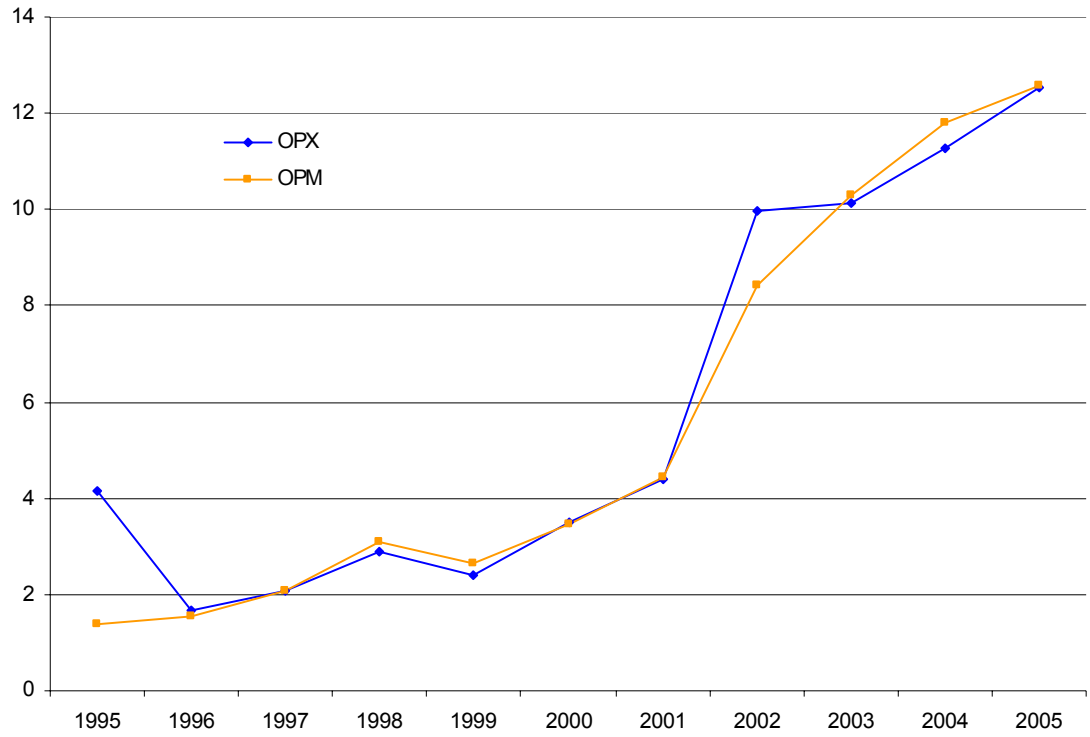
In the remainder of this section, we will take a look at OPT data for Belgium based on transaction type declarations. The period covered is 1995-2005 and the data are broken down into two-digit product categories of the Combined Nomenclature (CN) and by partner country. Figure 3 shows

[30] Another example of a case where a change in the customs environment brings about a fall in OPT flows measured according to the statistical procedure are the free trade agreements of the mid-90's between the EU and several Central and Eastern European countries before EU accession of the latter. Both Baldone et al. (2001) and Hijzen (2005) mention this example.

[31] Egger and Egger (2005) define OPT and IPT as linked to preferential customs treatment, but report data on processing trade comprising flows within the EU. Therefore, we believe that those data are based on transaction types rather than statistical procedure as their definition would suggest.

that there is substantial growth in both total outward processing exports (OPX) and total outward processing imports (OPM) between 1995 and 2005. The very sharp increase between 2001 and 2002 is striking – OPX and OPM more than double in one year. The data by product category show that this increase is almost entirely made up of 'Pharmaceutical products' (chapter 30 of the CN). The explanation is simple: in 2001, a big pharmaceutical multinational established an affiliate in Belgium leading to a very substantial rise in intra-EU trade for chapter 30, some of it being OPT.

Figure 5 Total outward processing exports (OPX) and outward processing imports (OPM)[a] for Belgium, billions €, 1995-2005



Source: NBB

a. Community concept.

Another striking feature of the OPT data in absolute value in Figure 3 is that total OPX exceeds total OPM for some years, e.g. 1995 and 2002. This may seem rather surprising since goods that are exported for processing should have a higher value when re-imported after processing. Of course, a positive balance between OPX and OPM is feasible for one single chapter of the CN, i.e. for one product category, as goods may belong to a different product category after having been processed abroad. A positive balance for total OPT can be explained as follows: there is no explicit link between OPX and OPM in declarations on the type of transaction. Hence, goods may be exported for processing without ever being re-imported to Belgium either because the goods

stay in the country where they have been processed or because they are imported by a third country.

Table 6 Geographical distribution of outward processing trade (mean of OPX and OPM)[a] for Belgium, share in total, 1995/2005

	1995	2005
EU15	76.1%	87.5%
CEEC[b]	2.1%	0.9%
US	2.7%	1.7%
Asian NICs[c]	8.6%	1.9%
China	0.5%	3.4%
Algeria, Morocco, Tunisia	0.5%	1.0%

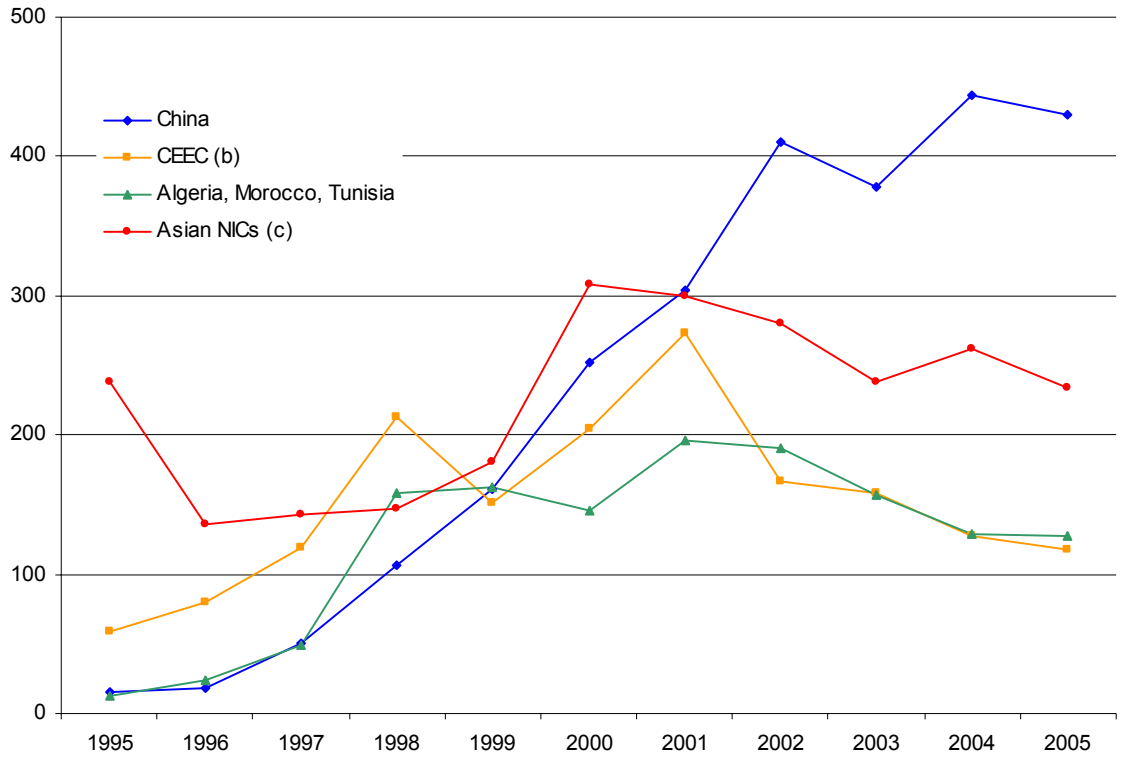
Source: NBB

a. Community concept.

b. CEEC = new Central and Eastern European Member States of the EU (including Roumania and Bulgaria).

b. Asian NICs = South Korea, Hong Kong, Singapore, Taiwan, Thailand, Malaysia, Philippines, Indonesia.

Figure 6 Outward processing trade (mean of OPX and OPM)[a] with several low-wage countries, Belgium, millions €, 1995-2005



Source: NBB

a. Community concept.

b. CEEC = new Central and Eastern European Member States of the EU (including Roumania and Bulgaria).

c. Asian NICs = South Korea, Hong Kong, Singapore, Taiwan, Thailand, Malaysia, Philippines, Indonesia.

The ten main product categories (chapters of the CN) in terms of OPT[32] make up between 75% and 95% of total OPT over the period 1995-2005. Most of them are also among the product categories with the biggest shares in Belgium's total exports and imports. It is the category 'Pharmaceutical products' that has by far the highest share of OPX in its total exports and of OPM in its total imports in 2005. Table 6 shows that, just like for total trade, Belgium's main trading partner is the EU15. However, for total trade the share of the EU15 in exports and imports is on the fall, whereas it is on the rise in OPX and OPM. This is again to a large extent the consequence of the rise in OPT for 'Pharmaceutical products' in 2001.

For so-called low-wage countries, OPT in absolute value is reported in Figure 4. The strongest increase in the average of OPX and OPM can be observed for China. There is clearly an increase in OPT intensity with China, i.e. the share of OPT in total trade with Belgium. Tables 1 and 6 show that the share of China in OPT grows faster than its share in total trade.

Overall, OPT is the best indirect measure of offshoring we have found so far. For the purpose of measuring offshoring, it seems useful to look at both OPX and OPM. A rise in exports for processing abroad or imports after processing abroad shows that there is some shift in activities going on. But there are some important caveats regarding the use of processing trade data as a proxy for offshoring: as mentioned above, activities may be shifted abroad without giving rise to processing trade. This is reflected in the fact that processing trade represents only a fairly small share of total trade. Moreover, services are not included in processing trade data. Finally, the explanation for the strong increase in Belgium's OPT in 2001 casts some very serious doubts on the use of those data as a proxy for offshoring. Given that this rise is due to a pharmaceutical multinational setting up an affiliate in Belgium that engages into massive OPT, it becomes questionable whether we may call this offshoring. This is rather a consequence of onshoring in Belgium since the increase would not have occurred without the setting-up of the affiliate. It also shows that the intricate trade links within multinationals may place serious restrictions on the use of trade data to measure offshoring.

3.6. Imported intermediate inputs

Having examined several types of trade data as measures of offshoring, let us now turn to the most frequently used indirect measure: the share of imported intermediate inputs in either total output, total intermediate inputs or value added. This kind of measure corresponds to the short-cut definition of offshoring identified in Chapter 1 and is used by many authors – mostly when trying to estimate the impact of offshoring on the labour market in the home country. The first were Feenstra and Hanson (1996) followed by many others: Campa and Goldberg (1997), Hummels et al. (1998), Feenstra and Hanson (1999), Hummels et al. (2001), Strauss-Kahn (2003), Egger and Egger (2003), Hijzen et al. (2004), Amiti and Wei (2005), Ekholm and Hakkala (2005),

[32] These are 'Inorganic chemicals' (28), 'Organic chemicals' (29), 'Pharmaceutical products' (30), 'Apparel and clothing accessories' (62), 'Pearls and precious stones' (71), 'Iron and steel' (72), 'Machinery and mechanical appliances' (84), 'Electrical machinery' (85), and 'Vehicles' (87).

Gomez et al. (2005), and Amiti and Wei (2006). Hijzen (2005) provides a fairly exhaustive overview of papers that have used this kind of measure as well as results for the UK. Although it may be referred to under names other than offshoring, e.g. outsourcing or vertical specialisation, it is always essentially based on the same ingredient: imported intermediate inputs found in Input-Output Tables (IOT). These are then divided by one of the three above-mentioned variables. In several recent OECD publications, e.g. OECD (2007a) and OECD (2007b), it has almost become a standardised measure based on the latest update of the OECD's IOT database.

3.6.1. Description of the measure

Measuring offshoring through imported intermediate inputs calls on more than just trade data: it is based on a combination of input-output and trade data. The IOT – just as the Supply and Use Tables (SUT) from which IOT are nowadays commonly derived – contain data on the uses of goods and services by product and by type of use – final or intermediate by industry. That is where basically all authors take their data on intermediate inputs from.[33] Offshoring (*Off*) – as a share of output – can be written as:

$$Off = \frac{III}{O}$$

where *III* stands for total imported intermediate inputs and *O* for total output of the economy.

However, in most cases, the imports of intermediate inputs were not directly available, although the IOT and SUT are supposed to be complemented by a table on the uses of imports. In the absence of such a table, the authors resorted to computing imported intermediate inputs for every product by multiplying total intermediate inputs with the share of imports in total supply of that product to the domestic market, i.e. production plus imports minus exports. We will call this the imputed measure and write it as:

$$III = \sum_i III_i = \sum_i \sum_j m_j I_{ij}$$

where III_i is imported intermediate inputs of industry i, m_j is the share of imports in total supply to the domestic market of that product j, and I_{ij} the total amount of product j used as intermediate input by industry i.

The imputed *III* is then divided by either total output, total intermediate inputs or value-added in order to obtain a measure of offshoring. It is only a second best since it contains the implicit assumption that for any product the share of imports is the same in all uses, i.e. no matter whether the product is used as intermediate input or for final demand. The first best would be imported intermediate inputs obtained from the use table of imports, i.e. a direct measure of *III*. However, when such tables exist they are often computed according to a proportional distribu-

[33] Feenstra and Hanson (1996) use census data on intermediate inputs by industry, but this comes down to the same as using IOT.

tion of imports, which is the same as the imputation described above.[34] This is because data on the origin of intermediate inputs used by firms or on the destination of imports in terms of use are mostly not available or at least very scarce. But even without such data it is possible to improve the quality of the use table of imports and thereby of the data on imported intermediate inputs compared to simple imputation. Those improvements are based on the use of very detailed trade data[35] and hypotheses on the uses of products. Van den Cruyce (2003) describes how such tables are computed for the use of imports of goods for Belgium.[36]

Furthermore, some authors suggest to restrict the measure to imported intermediate inputs from the "same" industry and call this 'narrow offshoring'.[37] This means that imported intermediate inputs are limited to product categories that are considered as main output of an industry. 'Narrow offshoring' for industry i, i.e. Off^n_i, based on a symmetrical table can be written as follows:

$$Off_i^n = \frac{III_{ii}}{O_i}$$

By definition, Off^n_i is smaller than Off_i. Feenstra and Hanson (1999) were the first to use this restrictive measure followed later on by others, e.g. Egger and Egger (2003), Strauss-Kahn (2003)[38] or Hijzen et al. (2004). We prefer to stick to the initial measure that takes all imported intermediate inputs into account.[39]

3.6.2. Results for Belgium

For Belgium, we have taken data on imported intermediate inputs from a database on SUT[40] rather than from IOT. The construction of this SUT database for Belgium for the years 1995-2003 is described in Avonds et al. (2007).[41] It comprises both current and constant price tables with a breakdown into 138 industries and 336 products.[42] The use tables of imports in this database have been produced for the reference years 1995 and 2000 according to the method described in Van den Cruyce (2003). These reference tables have been extrapolated for the remaining years. However, for the descriptive analysis in this section we will focus only on the reference tables.

34 This is also mentioned in Hijzen (2005).

35 Those detailed trade data contain information on transaction types and a breakdown into 8-digit product categories of the Combined Nomenclature (CN).

36 Hambÿe (2001) provides information on how to construct such a table for services.

37 Most authors actually refer to 'narrow outsourcing', but as we have argued in Chapter 1 what they call outsourcing mostly corresponds to what we have called offshoring. Therefore, we will refer to 'narrow offshoring'.

38 Note that Strauss-Kahn (2003) calls this the "limited index of vertical specialisation" (p.6) rather than 'narrow offshoring' or 'narrow outsourcing'.

39 Nonetheless, we have computed 'narrow offshoring' for Belgium from our SUT database. It turns out to be a bit higher than 5% in both 1995 and 2000.

40 Trade in those SUT is in the national concept.

41 This set of tables has been constructed at the Federal Planning Bureau for the EUKLEMS project. The current price tables are based on the original tables produced by the National Bank of Belgium (NBB).

42 As opposed to IOT, SUT are not necessarily square. The price concept of the SUT is basic prices and the breakdown into 336 products comprises 9 trade and transport margins.

Moreover, note that as domestic supply and imports are deflated separately in the construction of the SUT database, use tables of imports are available in current and constant prices.

We believe that SUT are more appropriate than IOT for constructing an imported intermediate input measure for offshoring. Product-by-product IOT are characterised by homogeneous industries, whereas SUT refer to heterogeneous industries. The latter may be preferable when linking imported intermediate inputs to employment data by industry from the national accounts, for which industries are always heterogeneous. But the difference between heterogeneous and homogeneous industries tends to become small when there is a great industry and product detail available.

As mentioned above, three alternative variables have been used in the literature as denominator for computing the imported intermediate input share.[43] We prefer output or total intermediate inputs to value added because the latter leads to very strong fluctuations in the share of imported intermediate inputs over time. Our tables almost exclusively report the share of imported intermediate inputs in output and we will often refer to this simply as the imported intermediate input share. Moreover, most authors exclude energy from intermediate inputs since increasing energy imports may not be treated as offshoring. We have decided to do so as well and left out the following products: crude petroleum and natural gas (CPA 11) and manufactured gas (CPA 40.2). But we have refrained from excluding refined petroleum products (CPA 23.2), electricity (CPA 40.1) and other minor energy products as they are – at least partially – produced in Belgium.

Table 7 Share of non-energy imported intermediate inputs in total output and in total non-energy intermediate inputs, total economy, all products, current and constant prices (base year 2000), Belgium, 1995 and 2000

	1995	2000	absolute change[a]	growth rate
Share in output				
value	15.0%	18.8%	3.8%	25.4%
volume	16.8%	18.8%	2.0%	11.9%
Share in intermediate inputs				
value	30.5%	33.8%	3.3%	10.8%
volume	31.9%	33.8%	1.9%	6.1%
Memo item				
Share in output including energy products (volume)	18.2%	20.2%	2.0%	11.3%

Source: Own calculations

a. Absolute change in percentage points

Table 7 provides evidence of a rise in the share of non-energy imported intermediate inputs in output for the total economy in both current and constant prices between 1995 and 2000. The

[43] Among the papers quoted earlier on, Feenstra and Hanson (1996, 1999), Amiti and Wei (2005, 2006) and OECD (2007a, 2007b) use total intermediate inputs; Hijzen et al. (2004) and Hijzen (2005) use value added; all others use output.

rise turns out to be weaker in constant prices, which implies that output prices have on average grown at a slower pace than intermediate input prices. The share in constant prices was just below 17% in 1995 and reached almost 19% in 2000. The growth rate of the share in constant prices was 12%. As shown in the lower part of Table 7, including energy products raises the level for the share, but does not alter the trend in any significant way. Furthermore, we would have come to similar conclusions in terms of the trend when using the share of imported intermediate inputs in total intermediate inputs.

Although we know that our imported intermediate input data have not been computed through imputation, it proves interesting to do as if and look at the trends in the two components of this share, i.e. imports and intermediate inputs. According to this line of reasoning, the rise in the imported intermediate input share could be due to a rise in imports or to a rise in the use of intermediate inputs. More specifically, we examine the constant price share of total non-energy imports in output and the share of total intermediate inputs – both domestic and imported – in output. We find that the former increases by 2.5 percentage points between 1995 and 2000. Moreover, our data reveal that the share of total intermediate inputs in output is on the rise, too. The combination of these two increases explains in a very mechanical way the rise in the imported intermediate input share.

Table 8 Share of non-energy imported intermediate inputs in total output, all products, constant prices (base year 2000), Belgium, 1995 and 2000

	1995	2000	absolute change[a]	growth rate
Total economy	16.8%	18.8%	2.0%	11.9%
Private sector	18.3%	20.2%	2.0%	10.9%
Manufacturing industry	34.7%	35.2%	0.5%	1.4%
Market services	8.9%	12.4%	3.5%	38.6%

Source: Own calculations

a. Absolute change in percentage points

From this point onwards, we will refer exclusively to constant price data. In Table 8, we have refined the analysis in terms of industries. This highlights that the level in the share for the total economy is largely determined by the private sector. The share of imported intermediate inputs of the private sector industries in their total output amounts to more than 20% in 2000, and it has grown by two percentage points between 1995 and 2000. The share is higher than for the total economy, but the absolute value of the increase is the same. This means that the share of the public sector is lower over the period 1995-2000. Moreover, the private sector can be split into several industry groups: agriculture and fishing (NACE 01-05), mining and quarrying (NACE 10-14), manufacturing (NACE 15-37), electricity, gas and water (NACE 40-41), construction (NACE 45), and market and non-market services (NACE 50-95). We focus on the two main industry groups, which are manufacturing and market services.[44] The last two lines in Table 8 indicate that the non-energy share of imported intermediate inputs in output is much higher in manu-

[44] We have split market services from non-market services.

facturing industries (35.2% in 2000) than in market services (12.4% in 2000). But while this share increases only slightly in manufacturing industries over the years 1995-2000, we observe a very strong rise in this share in market services over the same period.

The individual private sector industries with the highest imported intermediate input shares in 2000 were all manufacturing industries. The top five industries with shares above 50% were: 'Manufacture of jewellery' (NACE 36.2), 'Manufacture of motor vehicles' (NACE 34.1), 'Manufacture of television and radio receivers' (NACE 32.3), 'Manufacture of electronic valves and tubes' (32.1), and 'Manufacture of paints' (NACE 24.3). The highest shares among market service industries could be observed for several transport industries. However, in terms of the rise in percentage points some industries from the category 'Other business services' (NACE 74) were among the frontrunners. Nonetheless, it was 'Manufacture of jewellery' (NACE 36.2) that had the strongest increase in its imported intermediate input share in absolute value.

Table 9 Share of imported intermediate manufacturing and service inputs in total output, constant prices (base year 2000), Belgium, 1995 and 2000

	Manufactured goods				Services			
	1995	2000	Δ	g	1995	2000	Δ	g
Private sector	13.2%	14.1%	0.8%	6.4%	3.7%	5.0%	1.3%	34.1%
Manufacturing industry	29.8%	30.0%	0.2%	0.8%	2.3%	2.9%	0.6%	26.5%
Market services	3.5%	5.1%	1.6%	46.3%	5.3%	7.1%	1.8%	34.7%

Source: Own calculations

Δ: Absolute change in percentage points

g. Growth rate

Table 9 brings further insights in terms of products. Just as for industries the data from our SUT database allow us to look at the imported intermediate input shares for certain product groups.[45] We have decided to focus on manufactured goods (CPA 15-37) and services (CPA 50-95). The first line of Table 9 shows the shares of imported intermediate inputs of manufactured goods and of services in total output for the private sector. Note that in both cases we divide by total output of the private sector. Hence, we may add up the shares. When comparing the sum with the total share of imported intermediate inputs in output for the private sector, we find – unsurprisingly – that they make up most of this share. The remainder corresponds to the product categories that we have left out.[46] For the private sector, the share of total intermediate manufacturing inputs in total output amounts to 14.1% in 2000. It is much higher than the share of imported intermediate service inputs in total output, which reaches only 5.0%. Both shares are on the rise, but the growth rate is much stronger for imported intermediate service inputs.

[45] Note that SUT are industry by product tables, whereas IOT are either industry by industry or product by product tables.

[46] These are agricultural products (CPA 01-05), mining and quarrying products (CPA 10-14), electricity, gas, steam and water (CPA 40-41), and construction work (CPA 45).

In the second and third lines of Table 9 we consider manufacturing industries and market service industries separately. Remember that the shares always refer to the total output of the respective group of industries. In terms of levels, it can be seen that the group of manufacturing industries has the highest share of imported intermediate manufacturing inputs (30.0% in 2000) and that the group of market service industries has the highest share of imported intermediate service inputs (7.1% in 2000). However, while the share of imported intermediate manufacturing inputs stagnates between 1995 and 2000 for the manufacturing industry, it is strongly on the rise for the market service industries, i.e. the latter import an increasing share of their intermediate manufacturing inputs. Furthermore, Table 9 reports high growth rates over the period 1995-2000 for the share of imported intermediate service imports for both groups of industries: manufacturing and market services. Finally, in the light of the findings of section 3.4 on services, we have taken a look at the product category 'Business services' (CPA 72-74). The share of imported intermediate inputs of such services in total output goes up quite substantially between 1995 and 2000: from 1.0% to 1.7% for the private sector industries as a whole, from 0.5% to 1.0% for the group of manufacturing industries, and from 1.5% to 2.3% for the group of market service industries.

3.6.3. Results for other countries

How do our results compare to those found in the literature? They are indeed similar to those put forward in the papers quoted above. But it must be kept in mind that the results reported in the literature are in current prices. The comparison is easiest with the results in Ekholm and Hakkala (2005). For Sweden, they find a current price share of non-energy imported intermediate inputs in output of 8,8% for 1995 and 9,6% for 2000[47], which is lower than the shares we have computed for Belgium. This may to some extent be due to the greater openness of the Belgian economy, but there is also a methodological explanation for this difference. Ekholm and Hakkala (2005) mention that for Sweden imports of intermediate inputs make up 40% of total imports.[48] It is very likely that this ratio is strongly influenced by the share of intermediate inputs in total supply because it is obtained through imputation. For Belgium, this is different due to the method developed by Van den Cruyce (2003) for compiling the use table of imports. Here, the share of imports of intermediate inputs in total imports of 50% or more for the years 1995 and 2000 is considerably higher than the share of intermediate inputs in total supply, which amounts to a bit more than 40%. This has a positive impact on the share of imported intermediate inputs in total output.

OECD (2007a) and OECD (2007b) identify Belgium as one of the frontrunners among a series of OECD countries in terms of the share of imported intermediate inputs in total intermediate inputs for both services and goods in 1995 and 2000. The data they use come from the OECD Input-Output Database and the share has been computed through imputation. The overall share reported for Belgium in OECD (2007a) is slightly higher than 30% in 1995 and close to 35% in

47 See Ekholm and Hakkala (2005), Table 1, p.7.
48 See Ekholm and Hakkala (2005), p.6.

2000.[49] This is consistent with the results we obtain from our data when calculating this share as a percentage of total intermediate inputs rather total output.

Most other papers report results for manufacturing and services separately. This is the case in Amiti and Wei (2005): on the one hand, they show for the UK that the share of imported intermediate service inputs in total intermediate inputs is still relatively small but increasing over the period 1992-2001. On the other hand, the share of imported intermediate manufacturing inputs is much higher but remains rather stable over the same period. This is comparable to our results. A comparison of the results of Amiti and Wei (2005) with those for UK manufacturing in Hijzen (2005) is not possible since those data refer to the period 1974-1995 and the latter computes the share as a percentage of value-added. Other European countries that have been analysed with a focus on manufacturing are France, Austria and Spain. Strauss-Kahn (2003) provides evidence of a growing share of imported intermediate inputs in total output for France between 1977 and 1993. The descriptive statistics in Egger and Egger (2003) are scarce, but a small rise in this share for Austria over the period 1990-1998 is mentioned. Gomez et al. (2005) also find an increase in this share for Spain between 1993 and 2002.

For the US, Amiti and Wei (2006) produce the same type of data as Amiti and Wei (2005) for the UK. The period covered is 1992-2000. The levels of the shares of imported intermediate manufacturing and service inputs in total intermediate inputs are lower than for the UK or Belgium. This is not really surprising given the difference in the size and openness of the economy. What is more striking is that for the US the share is still growing for imported intermediate manufacturing inputs during this period. Note that Feenstra and Hanson (1996, 1999) also find a rise in this share for the US for the period 1972-1990.

3.6.4. Advantages and shortcomings

This overview shows that our results are in line with those found in the literature for other countries as well as for Belgium. The question is whether the share of imported intermediate inputs in total output can be taken as a measure of offshoring. Whatever the definition of offshoring that is chosen, there are several advantages in using this share. First of all, the underlying data describe the actual uses of imported products, i.e. the combination of input-output and trade data introduces a direct link with production. Secondly, the data cover both goods and services making comparisons between the two possible. Thirdly, data on imported intermediate inputs "allow one to simultaneously analyse developments across industries and time".[50] Even if the data on imports of intermediate inputs are obtained through imputation, the possibility of cross-industry comparisons is a major advantage. Finally, our dataset has the specific extra advantage of containing both current and constant price data.

[49] See OECD (2007a), p.36.
[50] See Hijzen (2005), p.48.

Nonetheless, there are also some shortcomings of this measure: just like the purely trade-based measures, it is an indirect measure that reports trade flows that may have been caused by a cross-border shift in activity, but not the shift in activity itself. Thus, we cannot be sure that all imports of intermediate inputs are really due to the offshoring of the corresponding activity. However, the fact that only intermediate inputs are considered makes it more likely that a rise in the share of imports is due to a shift in activity, although this means that the measure is limited to offshoring of intermediate production stages. Moreover, it also lacks a geographical dimension.[51]

If we adopt the short-cut definition of offshoring as defined in chapter 2 and take the imported intermediate input share as a measure of offshoring, we may reformulate the conclusions for Belgium from Tables 7-9 in terms of offshoring – as has been done by most authors in the literature. First of all, it has reached a level that is comparable to other European countries. Secondly, it is much higher in the manufacturing industry than in market services. Thirdly, growth of offshoring is faster in market services than in manufacturing industries. Fourthly, in terms of the offshoring of parts of the production process, it turns out that there is strong growth in the offshoring of service functions, i.e. service product categories, in both the manufacturing industry and in market service industries. Finally, the substantial increase in the offshoring of manufactured goods by market service industries is also noteworthy.

However, in the light of the analysis of the definition of offshoring in chapter 2, interpreting the level of the imported intermediate input share as offshoring raises some doubts. This share is certainly a good measure for the extent of the international fragmentation of the production chain. But offshoring taken as a shift in activity is a one-time process that is not really reflected in the level of this share. Hence we believe that it is rather a rise in this share that may – at least to some extent – be interpreted as a sign of offshoring.

3.6.5. Shift-and-share analysis

In line with Strauss-Kahn (2003), it is possible to refine the analysis through a shift-and-share decomposition. In fact, a rise in the overall imported intermediate input share may be due either to a rise in this share for each industry or to a shift in the composition of total output towards industries with a higher imported intermediate input share. Those are, respectively, the within and between effects of a shift-and-share analysis. We would normally not think of the latter as offshoring, and therefore be interested in isolating the former. The shift-and-share decomposition of the change in the overall imported intermediate input share, which we have called ΔOff, can be written as follows:

$$\Delta Off = \sum_i \overline{Off_i} \Delta S_i + \sum_i \overline{S_i} \Delta Off_i \qquad (1)$$

[51] Some authors such as Egger and Egger (2003) introduce this geographical dimension by distributing imported intermediate inputs according to the proportion of countries in total imports.

given that

$$Off = \sum_i \frac{III_i}{O_i}\frac{O_i}{O} = \sum_i Off_i S_i$$

and where O_i stands for output of industry i, Off_i the imported intermediate input share for industry i, and S_i the share of industry i in total output. Note that a bar indicates the mean of a variable over the period considered. The first term on the right-hand side of (1) is the between-industry effect and the second is the within-industry effect, which we consider to reflect offshoring more accurately than the total change in the share of imported intermediate inputs. The results of this decomposition applied to our constant price data are shown in the last three columns of Table 10.

Table 10 Shift-and-share decomposition of the change in the overall constant price share of imported intermediate inputs in output, Belgium, 1995-2000

	Within-industry			Between-industry	Total
	Within-product	Between-product	Total		
1995-2000	*0.0134*	*0.0026*	0.0160	0.0039	0.0199

Source: Own calculations

Between 1995 and 2000, *Off* has grown by two percentage points. The within-industry effect largely dominates the between-industry effect. This means that the rise in the overall imported intermediate input share is entirely due to an increase in the individual shares of the industries. Hence, the shift-and-share analysis leads us to conclude that the rise in the overall share indicates that there is offshoring going on since this rise is not blurred by changes in the output shares of industries. This comes closer to the idea of a cross-border shift in activity. Given this feature of our results, the imported intermediate input share appears as an appropriate measure not only when the short-cut definition is adopted, but also when offshoring is defined in a more restrictive way.

The reasoning may be pushed even further. As suggested in Strauss-Kahn (2003), the change in the imported intermediate input share of an individual industry may also be decomposed. In terms of our SUT data, this amounts to a decomposition by product category. It could indeed be that the imported intermediate input share of industry i, i.e. Off_i, increases because of a rise in the import shares of the products used by industry i for producing its output. But the increase may also stem from a shift in industry i's production structure towards a greater use of intermediate inputs with relatively high import shares. Again, these two effects may be referred to respectively as within effect and between effect. From our point of view, it is again the within effect that is associated with offshoring. The decomposition of the change in Off_i can be written as follows:

$$\Delta Off_i = \sum_j \overline{u_{ij}} \Delta m_{ij} + \sum_j \overline{m_{ij}} \Delta u_{ij} \qquad (2)$$

given that

$$Off_i = \sum_j \frac{III_{ij}}{I_{ij}} \frac{I_{ij}}{O_i} = \sum_j m_{ij} u_{ij}$$

and where III_{ij} is the amount of imported intermediate input of product j used by industry i, m_{ij} the import share for product j when used as intermediate input by industry i, and u_{ij} the share of product j used as intermediate input by industry i in its output.

The first term on the right-hand side of (2) is then the within-product effect and the second one is the between-product effect. While Strauss-Kahn (2003) keeps the two decompositions separated, we have decided to replace ΔOff_i in (1) by its expression described by (2):

$$\Delta Off = \sum_i \overline{S_i} \left(\sum_j \overline{u_{ij}} \Delta m_{ij} + \sum_j \overline{m_{ij}} \Delta u_{ij} \right) + \sum_i \left(\sum_j m_{ij} u_{ij} \right) \Delta S_i \qquad (3)$$

There are thus three effects: the within-industry within-product effect, the within-industry between-product effect and the between-industry effect. The sum of the first two is equal to the total within-industry effect. Table 10 shows that the within-industry within-product effect dominates the others. In other words, the rise in the overall share is due to a rise in individual shares. This result strengthens our previous conclusion regarding offshoring. There is some offshoring going on and the rise in the share of imported intermediate inputs in output is a good indicator of this since most of the rise occurs not only within industries, but also at a given production structure.

4. Conclusion

The analysis conducted in this paper has brought a number of insights. First of all, based on an overview of recent contributions to the literature we have updated the definition of offshoring found in earlier publications of the Federal Planning Bureau. We retain the core of the definition stating that offshoring – or relocation –is a cross-border transfer of economic activities. But some of the possible consequences of such a transfer – job losses or imports – should be excluded from the definition. For practical purposes, many authors adopt a short-cut definition based on imports of intermediate inputs. We prefer a definition based on the transfer of activities, but recognise that the short-cut definition proves useful given the problem of measurement.

The second part of the findings pertains to measuring offshoring. Direct measures of offshoring imply the availability of individual firm data on the transfer of activities abroad. Such data are scarce. As we did not have any individual firm data at our disposal for Belgium, we took a look at indirect measures of offshoring, which are generally trade-based. They do not directly refer to a transfer of activities, but rather to a possible consequence of offshoring: a rise in imports and sometimes also a fall in exports. We can never be sure that a transfer of activities has really occurred. This drawback has led to the adoption of the short-cut definition. However, when offshoring is defined in this way and measured through trade data, it becomes equivalent to concepts such as international production sharing or the fragmentation of the value chain.

The comparison of trade-based measures reveals that the share of imported intermediate inputs in output is the most appropriate one. It is a better measure than total trade by geographical areas, trade according to the Broad Economic Categories or processing trade, since it refers to combination of trade and production data and covers both goods and services. Through a shift-and-share analysis we show that a rise in the imported intermediate input share comes relatively close to measuring a cross-border transfer of activities when the growth in individual imported intermediate input shares dominates. Then, the imported intermediate input share becomes an appropriate measure of offshoring even when the more restrictive definition based on a transfer of activities is adopted.

For Belgium, the supply-and-use table database allows to calculate the imported intermediate input share for the years 1995 and 2000 in constant prices. We show that it is on the rise and that this rise is mainly driven by services. This means that some offshoring is going on for Belgium – at least in terms of the short-cut definition. Our results are in line with those in the literature for other countries as well as for Belgium. The shift-and-share analysis shows that we may even interpret this rise in the imported intermediate input share as a transfer of activities since it occurs within industries at a given production structure. The next step should then be the use of this measure to assess the consequences of offshoring – especially in terms of job losses.

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