The European Union's Proposed Carbon Equalisation System: Some Implications for India's Exports

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Abstract: In 2009, the European Union (EU) proposed to use border carbon measures, which could take the form of a direct or indirect "carbon tax", against imports from its partner countries that were not following its emission norms. While the stated objective of the proposal was to prevent "carbon leakage", or migration of industries to the so-called "pollution havens", its real intent is to protect industries based in the territories of the EU Member States against foreign competition. The proposal could have wide ramifications for it could affect market access possibilities of a very large segment of the industries in the EU's partner countries. This paper analyses the possible impact of the proposed measures on India's exports through a very detailed examination of the available data.

INTRODUCTION

The proposed use of border carbon measures by the European Union (EU) Member States has been among the most contentious issues in the trade and environment debates. The EU proposal is to use border carbon adjustment (BCA) against imported products, whose producers do not conform to the emission norms followed by the EU Members States. According to the EU, the use of BCA or the carbon equalisation system (CES) would have two positive outcomes for its Member States. First, enterprises based in their territories have been facing the burden of adjustment arising from the imposition of the EU-wide emission norms. Imposition of the BCA, the argument goes, would help level the playing field vis-a-vis producers of competing products in other countries. The second argument in favour of BCA or CES is that it would help mitigate the risk of "carbon leakge" or in

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other words, the migration of industries to the so-called "pollution havens". While such a border carbon adjustment or carbon equalisation system[1] could conceivably work in conjunction with any domestic climate change regime, the ongoing discussions on these measures have predominantly focused on BCA to be introduced in conjunction with either a domestic carbon tax or a cap-and-trade scheme. In the case of a carbon tax, for instance, BCA could charge a covered imported good the equivalent of what it would otherwise have to pay had it been produced domestically. In the case of a cap-and-trade scheme, on the other hand, a border measure could require the importers or foreign exporters of a covered good to buy emission permits as do the domestic producers of the same (or similar) good.[2] It is widely argued by developing countries that such border measures on imports if, adopted by developed countries, would be akin to protectionism in the garb of combating climate change. Serious concerns have been raised by the so-called 'emerging economies' (such as China and India), which apparently are the key targets of such border measures, that these measures could act as a discriminatory market access barrier affecting their exports to the developed countries concerned in energy intensive sectors that may come under the ambit of such border measures.[3]

This paper undertakes an in-depth assessment of the impact of the proposed measures on India's exports to the EU. The empirical exercise is based on the EU List released in December 2009 in which the bloc has identified 164 sectors/sub-sectors (activities) at a significant risk of carbon leakage. In order to determine the product items as per HS (6-digit)[4] classification corresponding to the EU List, a concordance table has been prepared for the present study. The first part of the empirical exercise is based on the 'Full EU List' comprising 164 sectors, whereas the second part undertakes a deeper assessment of the sectors corresponding to the 'Truncated EU List' comprising only 47 sectors/sub-sectors. The latter list has been arrived at by removing from the 'Full EU List', 117 highly trade-intensive but low carbon-intensive sectors. This is based on the premise that the sectors belonging to the 'Truncated EU List' have a higher likelihood of being covered under any future carbon equalisation system in the EU. The study explores India's absolute exposure and also considers its relative exposure *vis-à-vis* other three BASIC countries (namely, Brazil, China and

South Africa) in the items corresponding to the 'Truncated EU List'. The exercise is based on trade data for the period 2003-07.

Although it is not known at this juncture as to which sectors would eventually be covered under any future border measure in the EU, should the EU decide to put this system in place, in view of the fact that the HS 6-digit items that are found to correspond to the 'Full EU List' comprise the lion's share of India's export to the EU, there is a very high probability of any future carbon equalisation system having a considerable impact on India's export to the EU. The study further finds that even if the EU decides to cover only the 47 sectors/sub-sectors belonging to the 'Truncated EU List', the overall vulnerability of India could be quite high, both in absolute terms as well as *vis-à-vis* other three BASIC countries.

The paper is organised as follows. The rest of the discussion in Section I touches upon some of the key issues around carbon leakage, such as what is carbon leakage; how big is the problem; and what are the policy options for addressing it. Section II provides a brief overview of the EU List of 164 sectors deemed to be exposed to a significant risk of carbon leakage. Section III undertakes a critical assessment of the methodology followed by the EU in arriving at the aforesaid list. Section IV presents the findings from the empirical exercise, while Section V discusses certain caveats underlying the study. Finally, Section VI provides some concluding remarks.

What is Carbon Leakage?

Carbon leakage refers to the effect that a part of the carbon dioxide (CO_2) reduction that is achieved by countries that abate carbon dioxide emissions is offset by an increase in carbon dioxide emissions in non-abating countries. Carbon leakage may be defined at the sector or at the country level. At the sector level, the IPCC (Intergovernmental Panel on Climate Change) defines carbon leakage as a ratio of the increase in emissions from a sector in the non-carbon constrained country (or region) as a result of foreign domestic mitigation action to the decrease in emissions of the carbon constrained sector as a result of the carbon policy.[5] At the country level, given the implementation of climate policy in a carbon-abating Country 'A' and the resulting rise in carbon dioxide emissions in non-abating country

'NA', carbon leakage can be defined as the ratio of the policy-induced increase of emissions from country 'NA' to the reduction of emissions by Country A.[6] So long as emissions are displaced as a result of the asymmetric climate policy, this is defined as carbon leakage.[7] This causality condition (i.e. policy-induced) makes direct measurement of carbon leakage rather difficult. However, as noted by Sijm *et al.* (2004), while it is not particularly difficult to measure the increases in carbon dioxide emissions in any one country, it is more difficult to decompose such increases into (i) increases that are the result of carbon abatement policies in foreign countries, and (ii) increases that are the result of all other driving forces, including autonomous shifts in the international allocation of carbon-intensive industries.[8]

In the literature, a number of distinct mechanisms or channels of carbon leakage have been identified. The three most important channels of carbon leakage are: (i) the short term competitiveness channel, where carbon-constrained industrial products lose international market shares to the benefit of unconstrained competitors; (ii) the investment channel, where differences in returns on capital associated with unilateral mitigation action provide incentives for firms to relocate capital to countries with less stringent climate policies; and (iii) the fossil fuel price channel, where reduction in global energy prices due to reduced energy demand in climate-constrained countries triggers higher energy demand and greenhouse gas emissions elsewhere, *cet. par*.[9] The first two channels are interlinked. The differences in cost of mitigating greenhouse gases could render carbon-constrained industrial products in developed countries less-competitive *vis-à-vis* their counterparts produced in non-carbon-constrained countries or in countries with less stringent carbon constraints, eventually leading to loss of market share for the carbon-constrained industrial products. The loss of market share may occur either through an increase in import to meet domestic demand, or through a reduction in export to other markets. This shift may be triggered both by the demand side (i.e. consumers' purchase of goods made abroad, which are cheaper than carbon constrained products) and the supply side (i.e. producers' sourcing of semi-finished emission-intensive goods from non-carbon constrained countries).[10] In the longer run, this loss of competitiveness (as indicated by loss of market share) could influence investment decisions of the affected industries in the carbon-constrained

countries by inducing them to relocate to countries with less stringent climate measures. It is these potentially interlinked effects of the competitiveness-driven carbon leakage on the energy-intensive, trade-export sectors of some of the major developed countries like the EU or US that have been at the centre-stage of the climate change discourse in the recent past. These developed countries are concerned that in the energy intensive, trade-exposed sectors, the carbon costs imposed by their domestic climate policies (e.g., carbon tax or cap-and-trade scheme) would put their own producers at a competitive disadvantage *vis-à-vis* producers in developing countries that are not imposing comparable carbon constraints.[11] The allowance requirement, for instance, can increase a firm's production costs, both through the cost of switching to less emission-intensive processes and through the cost of having to surrender valuable allowances to cover the remaining emissions associated with producing the firm's goods. The impact of a cap and trade system (say, the EU emission trading scheme) on the competitiveness of a given sector would depend upon policy decisions relating to the price and allocation of emission allowances, and upon the sector's potential exposure. A sector's potential exposure, in turn, would depend upon the proportion of energy as a component in its overall production costs,[12] and its ability to pass through costs to the consumers through an increase in product prices, without inducing loss of market share. As noted by Reinaud (2009), the factors influencing pass-through include market concentration, tight market (i.e. available production for the export market), exposure to international competition and the degree of product differentiation.

It is argued by the developed countries that as a result of carbon leakage, the emission reduction achieved in carbon-constrained countries would be offset to a great extent by an increase in emissions in the non-carbon-constrained countries. Thus, according to them, carbon leakage could end up undermining the environmental integrity of the carbon constraining domestic policy measures adopted by them and create 'carbon havens' in the non-carbon-constrained countries. Another issue underscored by the developed countries in this context is that production (re)location in favour of non-carbon-constrained regions could have detrimental social consequences with job losses.[13]

How Big is the Problem of Carbon Leakage?

Several climate modelling studies have attempted to measure the potential extent of carbon leakage. These studies differ in terms of the scope of the analysis – whether the analysis is at a sector or country (or region, say the EU) level. As noted by Reinaud (2008), in both cases, determining the potential rate of carbon leakage following the implementation of a carbon constraint requires establishing projections on the baseline or the counterfactual scenario (i.e. what would have happened in the absence of the carbon constraint).[14] The analysis of carbon leakage at the country level involves aggregating all sectors of the economy and the costs of each domestic policy aimed at mitigating climate change. It requires calculating the emissions abatement achieved in that same country that is offset by an increase in emissions outside.[15]

Notably, the general equilibrium models that are used in the country-level studies generally cover all three channels of carbon leakage (cited above) and not only the competitiveness-driven carbon leakage.[16] Although such models provide useful, *albeit* abstract, tools for climate policy analysis, they are ridden with several problems and limitations. These include, among others, the problems with respect to model pre-selection, parameter specification, statistical testing or empirical validation. In fact, a lot of debate and controversy has cropped up on the veracity of most of the key parameters in the general equilibrium models on carbon leakage.[17] Furthermore, these models are essentially constrained by their excessive reliance on parameters that are quantifiable, and fail to incorporate the qualitative drivers of industrial decision-making in a comprehensive manner.[18] Another shortcoming is that most general equilibrium models on carbon leakage do not isolate specific industry sectors (or sub-sectors), as the underlying databases are not disaggregated enough. As a result, industry aggregation masks sector differences. However, as noted by Grubb *et al.* (2009), the competitiveness concerns arise because industrial greenhouse gas emissions are heavily concentrated in a few primary resource–based sectors. Thus, only a very few industries stand out for their potential cost exposure.[19] This leads to the need for undertaking sector-level studies.

Sector specific analysis usually involves partial equilibrium modelling, with a focus on markets of primary importance for the sector, everything else being held constant.[20] At the sector level, analysis of carbon leakage potential requires looking at sectors in a country or region (e.g., the EU) and the implications of the carbon mitigation policy on the competitive position of the domestic sector *vis-à-vis* its competitors in the rest of the world. In the modelling exercises, the baseline includes the effects of technology developments and improvements in energy efficiency that can be expected on the basis of government policies already enacted within a specific sector but also in others. It also includes assumptions on other elements in the economy (e.g., exchange rates, prices of energy, etc.).[21] As noted by Reinaud (2008: 29), "leakage rates simulated at the level of an economy are traditionally much smaller than sector-specific estimates that focus on most vulnerable activities."

Several applied general equilibrium (AGE) modelling exercises have attempted to estimate the potential size of carbon leakage between the Annex I and non-Annex I countries of the UNFCCC due to the implementation of the Kyoto protocol. Assessing the findings from a number of such modelling exercises, Sijm *et al.* (2004) observe that studies on carbon leakage provide no consensus on the *size* and *distribution* of the leakages generated by the implementation of the Kyoto Protocol. Most of these model-based estimates of the global rate of carbon leakage vary between 5 per cent and 20 per cent of the required projected emission reductions in Annex I countries to meet their Kyoto commitments. While some observers expect a lower rate of carbon leakage owing to the implementation of emissions trading or other cost-saving measures by Annex I countries to prevent industrial relocation, others predict a significantly higher rate due to the non-participation of major Annex I countries, such as the US and Australia, and non-binding targets for Eastern Europe and the former Soviet Union. Some of these studies expect that the incidence of carbon leakage will be more significant in the long run (due to the relocation of trade and production factors) depending on the stringency of post-Kyoto mitigation commitments, the number of abating versus non-abating countries, the sectors subjected to stringent abatement policies, and the incidence of induced technological change and other cost-reducing measures to prevent industrial relocation.[22] As reported by Sijm

et al. (2004: 45) a few studies also find that incidence of carbon leakage will be higher in some specific energy-intensive sectors that are vulnerable to global competition, such as the chemicals or iron and steel. Three climate policy models focusing on estimating carbon leakage in the steel sector for instance, find that even moderate climate policies – resulting in abatement cost levels of 10-25 US$/t$CO_2$ – lead to high rates of carbon leakage, varying between 25-45 per cent of the sectoral emissions reduction in the abating countries.[23]

Reinaud (2008) provides a comparative assessment of some of the sectoral studies on cement, iron and steel, and primary aluminium. These three sectors are at the centre stage of the discussion on carbon leakage not only due to their high energy and carbon intensity, but also owing to the fact that the fairly homogenous nature of these products allows for high substitutability between products of different origin in the context of international trade (e.g., foreign and domestically produced products in a carbon constrained country). The studies reviewed by Reinaud (2008) model the impact of either a carbon tax or different modes of allocation under an emissions trading scheme. Reinaud (2008) summarises the main findings from these studies as follows:[24]

- At a EUR20/tCO_2 price applied to the EU-27, leakage rates range between 0.5 per cent to 25 per cent in the iron and steel sector and between 40-70 per cent in the cement sector;
- At a USD21/tCO_2 tax applied in Japan and the EU-15, the leakage rate reaches 55 per cent in the iron and steel sector;
- At a USD25/tCO_2 tax applied in to the OCED, the leakage rate reaches 45 per cent for the iron and steel sector;
- When the carbon price is applied to a larger region, the leakage rate decreases; and
- The inclusion of intra-sectoral discrepancies shows different leakage rates.

According to Reinaud (2008: 39), these studies underscore that the estimated leakage rates vary greatly with the models and assumptions used: price elasticity of demand, price elasticity of imports depending on product differentiation across regions, transport costs and other trade barriers, to

name a few. The leakage rates are also sensitive to the level of carbon cost pass-through, as well as to the mode of allocation of allowances.[25] It is argued that if full auctioning of allowances became the general rule of allocation, for some of the most carbon-intensive industries such as cement, blast-furnace steel and some basic chemicals, carbon leakage impact could be significant enough to warrant countervailing policy intervention.

Grubb (2007) focuses on the competitiveness and carbon leakage issues for the third phase of the EU ETS, i.e. beyond 2012, in the context of the UK. The analysis covers 159 activities that comprise the majority of UK manufacturing emissions and value-added in UK manufacturing. The study finds that the EU ETS and other carbon control measures up to 2020 will have negligible impact on the international competitiveness of more than 90 per cent of UK manufacturing activities. Overall, the EU ETS can extend with deeper emission cutbacks in Phase III, without damaging UK or European competitiveness, but issues around a few key activities do merit policy attention. These key activities account for less than 1 per cent of total UK GDP, yet constitute over 50 per cent of manufacturing CO_2 emissions. The study finds that companies that receive substantial free allocation but pass carbon costs on to their consumers will generally maintain or increase their profits. However, the resulting loss of market share for the most exposed sectors, such as cement and steel, leaks emissions abroad. Total leakage by 2020 is unlikely to exceed 1 per cent of the EU emissions, but it could be much higher from some sectors. Under a central case of €30/tCO_2 and 50 per cent cost pass-through, the analysis estimates that leakage from cement and steel sectors in Europe would amount to under 8 per cent each of their emissions even at the highest trade sensitivities found in the literature.

Carbon Trust (2010) undertakes further investigation of three sectors potentially most at risk from carbon leakage, namely steel, cement (particularly clinker production) and aluminium. It finds that if the EU actions were to remain entirely unilateral, but with no free allocation or other measures to address leakage, then by the middle of Phase III (2016), this 'maximum exposure' case could result in 5-10 per cent of EU steel and clinker being replaced by foreign production – maybe around 15 million tonnes of CO_2 (MtCO_2) and 10MtCO_2, respectively, with considerable uncertainty. Total

volume effects for aluminium are smaller and even more uncertain, being more plant and contract-specific. The three sectors could, in total, leak up to 30Mt CO_2 allowing for electricity used by the sectors. Compared to total EU emissions, this is less than 2 per cent. As a fraction of projected emission reductions in the affected sectors, up to 40 per cent of emission reductions in the EU steel production could be attributable to such leakage, and about 20 per cent in both aluminium and cement; around 10 per cent of the projected emission savings under the EU ETS could in fact be due to such 'offshoring'. The carbon price underpinning the reference conditions modelled is only €14.5/tCO_2 by 2016. It is argued that higher prices without other changes would increase leakage. However, in practice, decisions already taken in relation to free allocation could reduce leakage (though they would also increase the carbon price). Also, actions of trading partners (such as the US) to incorporate carbon costs would tend to reduce leakage, depending in part on the design of their schemes.[26]

Interestingly, the empirical literature on competitiveness, relocation and carbon leakage tends to indicate that the *ex-post* evidence of the problems is much less pronounced that what has been projected in most of the *ex-ante* climate modelling exercises (as discussed above). The first question that arises in any empirical analysis of carbon leakage is what would provide empirical evidence of carbon leakage. As observed by Reinaud (2008: 5-6), in the short term, an indicator of carbon leakage is a *change in international trade flows* of carbon constrained products. These trade flows should then be matched with other economic parameters to evaluate whether carbon policy played a role. This requires understanding the sector-specific parameters that need to be taken into account for each sector, so as to single out leakage. Over the long run, the main indicators of carbon leakage are *changes in investment patterns*. The CO_2 cost will affect investment decisions – mostly because profit margins erode in the case where a sector cannot pass-through its cost increase. Yet there are multiple drivers of investment, including among others, exchange rates, energy prices, labour and capital costs and so on. Hence, the possible influence of CO_2 cost needs to be singled out from other factors influencing any relocation decision, which makes the exercise rather challenging.

Assessing the empirical literature on the factors affecting the

international relocation of production structures in the energy-intensive industry, Sijm *et al.* (2004) find that in the past, environmental policy has generally not been a significant driver for the location of investments in the energy-intensive industry and, hence, it does not represent a major determinant for such investments in the developing world. In general, compliance costs of environmental policy are found to be limited even in pollution intensive industries, and other cost factors seem to be more decisive investment criteria, with the most important ones being market size and growth (regional demand) and the wage level. Hence, industries with increasing returns to scale will not relocate easily if the pollution abatement costs do not exceed a certain high threshold level.

Similar findings may be observed in several other studies, as well. World Bank (2008) finds that cement is the only sector for which the data suggests any loss of the EU production due to carbon controls. The analysis further finds that most other industrial sectors had increased output in regions that had imposed a carbon cost, probably due to over-compensation of these sectors through free allocation or other means. This, it is argued, would correspond to the pattern of over-allocation to most sectors in the EU ETS.[27]

According to Grubb *et al.* (2009), in stark contrast to the strong industrial opposition to the EU ETS before its launch, the evidence is that the EU ETS has increased the overall profitability in all participating sectors, though impacts on individual companies may vary. This, according to them, is for two reasons. One is that most sectors have surplus allowances. All except power generators have thus, in principle, been able to sell their allowances, with the value of these sales exceeding the cost of any abatement efforts. The other factor is that the full carbon costs tend to be passed through to prices anyway, particularly (but not exclusively) in competitive power markets.

Empirical evidence of carbon leakage shows that the EU-ETS has not triggered changes in trade flows or production patterns for cement products, iron and steel, refineries or aluminium. Had the ETS had an impact, the EU would be importing more, cheaper products from unconstrained regions, and exporting less to the rest of the world. This is attributable to the fact that in practice the EU ETS was introduced unilaterally with some form of

rebate for industrial sectors to accommodate competitiveness concerns and stranded costs. In other words, total costs were modest for emission-intensive sectors as allowances were distributed for free and often over-allocated in the manufacturing sector compared to the cap. Moreover, for electricity-intensive sectors, the still functioning long-term electricity contracts softened the blow of rising electricity prices.

Following Sijm *et al.* (2004) the significant differences between the projections made in the various climate modelling studies, on the one hand, and the empirical evidence, on the other, may at least partially be attributable to the following factors. First, model results are subject to major uncertainties and may not always be fully reliable due to a lack of empirical validation and calibration of the model parameters. Second, whereas the empirical studies are focused mainly on assessing the impact of past environmental policies on the relocation of energy-intensive industries, the model based studies try to estimate the impact of future climate policies on the incidence of carbon leakage of these industries. Hence, these studies are aimed at assessing different parameters which, although related, are not fully comparable.[28]

It is argued by some commentators that the empirical evidence from the analysis of this relatively recent climate policy should nonetheless be treated with care. According to Reinaud (2009), higher prices for traded products (e.g., aluminium, steel and refinery products) as well as the relatively short time span of the EU ETS policies did not allow for full observation of carbon leakage potential. Yet even with empirical evidence covering many years of data it may be very difficult to identify the isolated effect of carbon prices on investment and production decisions. By way of analysing the trends in regional production structures of energy-intensive bulk materials (steel, paper, aluminium, cement and fertilisers), Sijm *et al.* (2004) find that industrialised countries have been losing global market shares in the production of these materials over the past three decades. This loss in global market shares, however, has been predominantly demand-driven, i.e. caused by the development of new markets and increasing demand in developing countries, rather than by an overall shift of competitive advantage from the industrialised countries towards the developing countries. The most difficult challenge, therefore, is how to single out the effects of climate policy from the

effects of other factors. In the specific case of the European Union, how does one detect, in the rapid industrial production growth outside the EU, the actual effect of the EU's climate policy and the resulting loss of competitiveness and industrial relocation? This essentially requires the establishment of a counterfactual scenario of industry developments in the absence of climate policies, to identify which factors may have caused what changes in industrial operations on a global basis and the exact role of a carbon policy cost. Such disentangling, however, proves analytically difficult and so does the design of policies to deal with the possible effects on competitiveness.[29]

Reinaud (2008) further stresses that past observation of carbon leakage does not mean that there will not be any leakage in the future, as countries move towards more ambitious mitigation commitments.[30] She argues that to build a robust evaluation of the impacts of a climate policy such as the EU ETS, it will be critical to confront both *ex-ante* and *ex-post* studies on the assumptions and data used. Theory should be checked against observations to refine projections on long run impacts.[31]

Policy Options for Addressing Carbon Leakage

Many options have been proposed to address the problem of carbon leakage. These include, among others: to negate the net carbon costs from domestic production; to deal with the differential at the border; or to seek agreement to add similar carbon costs to production of equivalent goods globally.[32]

Given that the problem of carbon leakage is conceived in a world of unequal carbon prices, one option to address any such leakage is of course to level up carbon costs – that is, a world in which all major countries impose carbon costs on production in the relevant sectors, and particularly on goods for international export. However, implementation of this option is fraught with several practical difficulties. There are fundamental issues of historical responsibility, equitable sharing of the global atmospheric space, right to development of developing countries and so on - that inherently crop up when this question of 'levelling up' arises. In view of all this, efforts to tackle the problem of carbon leakage in the developed countries are mainly focusing either on levelling costs down, and/or on dealing with the cost differentials at the border – at least for a transitional period.[33]

There are several options that can be used to 'level down' costs: labour taxes or other costs can be lowered to compensate for a cost of carbon; subsidies for specific investments can be given; or emissions allowances can be allocated for free. Among these, the most direct instrument is free allocation of emission allowances, which offsets the direct cost of emissions.[34] Free allocation is the approach that has so far been regarded as the preferred route by the EU to address the competitiveness and carbon leakage concerns.

As regards border levelling, trade-exposed industries with a high impact of carbon cost could be compensated at the border for the same. Border measures may be imposed either on import or on export. The economic rationale underlying border levelling is that if leakage occurs because domestic producers face higher carbon prices, then leakage can be avoided when imports and exports are adjusted for the carbon price difference. The price facing consumers for specific high-carbon goods inside the country would reflect carbon costs, irrespective of the country of origin of the product consumed. As noted before, the form of border levelling that is lately attracting increasing attention is the extension of domestic (or regional like the EU ETS) emissions trading schemes to imported carbon-intensive goods by requiring importers to purchase and surrender emission allowances. Such proposals have been included in the post-2012 climate change and energy package finalised by the EU in April 2009[35] (henceforth the climate-energy package) as well as in several US bills including the American Clean Energy and Security Act of 2009 (henceforth Waxman-Markey Bill), as approved by the US House of Representatives in June 2009.[36] The primary focus of this study is on the border carbon adjustment proposals included in the EU climate change and energy package.

Relevant Provisions in the Post-2012 Climate Change and Energy Package of the EU

The EU Emission Trading Scheme (henceforth, EU ETS)[37] is a 'cap and trade' system that was launched on 1 January 2005 as the key tool for the bloc to achieve, in a cost-effective manner, its emissions reduction commitments under the Kyoto Protocol. It caps the overall level of emissions allowed, but within that limit allows participants in the system to buy and sell allowances

as they require. The EU ETS requires companies to surrender allowances equivalent to their levels of CO_2 emissions. These allowances are the common trading 'currency' at the heart of the system. One allowance gives the holder the right to emit one tonne of CO_2. The cap on the total number of allowances is what creates scarcity in the market. While the first phase of the EU ETS, 2005-07, was seen as an experimental phase, the second phase, 2008-12,[38] coincides with the first commitment period of the Kyoto protocol. In January 2008, the European Commission unveiled a package of proposals *inter alia* on amending the EU ETS in the third phase, i.e. beyond 2012, which was finally approved in April 2009 (henceforth referred to as the 2009 Directive[39] or the climate-change energy package). The climate change-energy package of the EU *inter alia* aims at achieving at least a 20 per cent reduction in greenhouse gas emissions from 1990 levels by 2020, with provision for raising the target to 30 per cent in the event of an international agreement (under the UNFCCC) committing other developed countries to comparable emissions reductions and economically more advanced developing countries to contributing adequately according to their responsibilities and respective capabilities. With this aim in view, the 2009 Directive includes, among other things, an array of measures towards strengthening and expanding the EU ETS beyond 2012 and improving its functioning. These measures include *inter alia* the following: (i) a much larger share of allowances to be auctioned in the third phase of the ETS (2013-20) instead of being allocated for free, which is the predominant practice under the first two phases;[40] (ii) the scope of the ETS to be extended with the inclusion of a number of new sectors like aluminium and ammonia, as well as two more greenhouse gases (nitrous oxide and perfluorocarbons) under its purview (in addition to the hitherto included carbon dioxide). Sectors covered by the ETS are classified in one of three categories: power generation, manufacturing industry, and sectors indentified as being at risk of leakage. These three groups will each face different allocation provisions in Phase III, as laid out in Table 1.

Table 1: Allocation Methodologies for Sectors in Phase III of the EU ETS

Sector	Power Generation	Manufacturing industry	Sectors at risk of carbon leakage
Allocation methodology	Full auctioning of EUAs from 2013.	Free allocation defined as a share of a declining cap based on 2005-2007 emissions. From 80 per cent of the emissions that would be emitting in 'best practice' 2013 to 30 per cent in 2020.	May receive 100 per cent free allocation of the emissions that a 'best practice' producer would emit, adjusted for the declining cap or alternative measures such as a global sectoral agreement, state aid or the requirement for importers to buy allowances.

Source: Reproduced from Dröge and Cooper (2010), Table 2.3.

The implications of increased auctioning of emission allowances in the third phase of the EU ETS, particularly for competitiveness of the EU industries and the concomitant problem of carbon leakage, dominated much of the domestic debates in the EU on the post-2012 climate-energy package ever since the proposals were unveiled by the European Commission in January 2008. In fact, the concerns expressed by the industry lobbies regarding these issues went on to play a significant role in the shaping of the final version of the package that was finally adopted on 23 April 2009.[41] The 2009 Directive includes two alternative strategies towards addressing the problem of carbon leakage, namely, free allocation and border measures.[42] On the proposed carbon equalisation system, the package envisages that "(s)uch a system could apply requirements to importers that would be no less favourable than those applicable to installations within the Community, for example by requiring the surrender of allowances". As for free allocation, it has been decided that the Community will allocate free allowances at 100 per cent of the benchmark to sectors or sub-sectors meeting the relevant criteria.[43]

According to the 2009 Directive, by 31 December 2009 (and every five years thereafter), the European Commission is required to determine a list of the sectors or sub-sectors deemed to be exposed to a significant risk of carbon leakage, on the basis of the criteria included in paragraphs 14 to

17 of Article 10a of the Directive.[44] It is stipulated that such determination would be based on an assessment of the extent to which it is possible for the sector to pass on the direct cost of the required allowances and the indirect costs from higher electricity prices resulting from the implementation of this Directive into product prices, without significant loss of market share to less carbon efficient installations outside the Community.[45]

The List of Sectors Determined by the EU to be at Risk of Carbon Leakage

As per the requirement enshrined in the 2009 Directive, the European Commission brought out the first list of sectors and sub-sectors deemed to be exposed to a significant risk of carbon leakage in December 2009 (henceforth, the EU List). This list applies for the years 2013-14, subject to the outcome of the international negotiations. It has been stipulated that every year the Commission may, at its own initiative or at the request of a Member State, add a sector or subsector to this list on the basis of new information, if it can be demonstrated in an analytical report that the sector or sub-sector concerned satisfies the relevant criteria laid out in the Directive. It is further stipulated that a list of sectors at the risk will be determined every five years.

Focus of the Present Study

The starting point of the empirical exercise carried in this paper is the aforesaid list brought out by the European Commission, i.e. the EU List. It needs to be underscored at this juncture that as of now, the EU is planning to use free allocation as the key instrument to deal with the problem of carbon leakage. As pointed out by EU (2010a), the Commission has examined the situation of energy-intensive industries with regard to the risk of 'carbon leakage'. The key conclusion is that the existing measures to prevent carbon leakage from these industries - free allowances and access to international credits – remain justified. However, it further states that the Commission will continue to monitor closely the risk of carbon leakage and that "(a)mong the potential measures that merit continued examination is the inclusion of imports in the EU ETS". In other words, though free allowances seem to be the preferred route for the time being, the possibility of using the border measures in the future has not been ruled out by the EU entirely. It must also be noted that some of

the EU members like France and Italy have continuously been pushing for use of border measures on imports. Hence, border carbon adjustment continues to remain an option that the EU may choose to use in the future, depending on how the post-2012 global climate regime shapes up. As observed by Carbon Trust (2010), "(t)he debate in Europe about how to tackle carbon leakage … … is far from over... …it is only just beginning."[46]

In case the EU opts for applying the border adjustment route, it is not known at this juncture as to which sectors would be covered by such a system. However, it is clear that the sectors that would be covered by any future carbon equalisation system in the EU would be among the list of sectors identified as deemed to be exposed to a significant list of carbon leakage. Hence, this paper takes the first such list released by the EU in December 2009 as the basis of the empirical analysis undertaken.

A Brief Overview of the EU List of Sectors at Risk of Carbon Leakage

As noted before, the post-2012 climate change-energy package was finally adopted in April 2009.[47] The Directive provides for free allocation of emission allowances at 100 per cent of a benchmark to sectors or sub-sectors determined to be exposed to a significant risk of carbon leakage and includes detailed guidelines for determination of sectors at risk. The first list of sectors deemed to be exposed to a significant risk of carbon leakage, released in December 2009 (referred to here as the EU List), has been determined as per these guidelines. The EU List is provided in Annexure I of this paper.

The main criteria for the identification of sectors for this purpose are defined in the Directive, particularly in its Articles 10a(15) and 10a(16). According to Article 10a (15), a sector or sub-sector shall be deemed to be exposed to a significant risk of carbon leakage if the sum of direct and indirect additional costs induced by the implementation of this Directive would lead to a cost increase of at least 5 per cent of its gross value added *AND* the sector concerned has a trade intensity with third countries[48] exceeding 10 per cent.

On the other hand, according to Article 10a(16), a sector or sub-sector is deemed to be exposed to a significant risk of carbon leakage if the sum of direct and indirect additional costs induced by the implementation of the directive would lead to a *particularly high cost increase* of at least 30 per cent of its gross value added; <u>OR</u> the sector concerned has a *particularly high trade intensity* with third countries exceeding 30 per cent.

Notably, the cost component has two parts: the direct cost of the required allowances and the indirect costs from higher electricity prices resulting from the implementation of the Directive. This is because, the installations covered by the EU ETS have to face cost increases both directly as well as indirectly. First, the covered installations are required to either reduce their emissions themselves or to cover their emission gaps by acquiring a corresponding amount of permits from the relevant markets. The direct costs emanating from either of these two options are proportional to the CO_2 price as well as to the installations' direct emissions.[49] The installations' emission intensity (i.e. CO_2 emissions per unit of production) is a good proxy for the direct emissions from the industrial production process. Second, the covered installations (particularly the energy intensive ones) have to pay a higher price for the electricity, which is increased by the market value of the allowances passed through by the energy generators. These indirect costs are proportional to the marginal increase of the electricity price and to the industrial process' indirect emissions.[50] The installations' electricity intensity (MWh per tonne of production) is a good proxy for the indirect emissions[51] from electricity consumption.[52]

A sector's direct costs increase has been estimated assuming that all the emissions would have been covered by acquiring permits at a price of 30 Euro/tonne.[53] Indirect costs have been estimated multiplying the amount of electricity consumed by the marginal increase of electricity price under the assumption that the 30 Euro/tonne price is fully passed through into electricity prices.[54]

As for the estimation of direct additional cost induced by the implementation of the Directive, since the 'benchmarks' for allocation of free allowances were yet to be decided, it was not possible for the European

Commission to know at the time of determination of the list of sectors the precise quantity of allowances which would be given out for free. Hence, it was based on the 'best estimates for 2013 and 2014' according to which around 75 per cent of allowances for non-exposed sectors will be purchased in 2013-14.[55]

As regards the data sources, the data on greenhouse gas emissions have primarily been collected from the Community Independent Transaction Log[56] for the calculation of direct cost. For the process emissions of new activities and greenhouse gases added in the Annex I of the 2009 Directive, data has been collected from Member States and their national greenhouse gas inventories. The data on electricity consumption for the calculation of indirect cost from higher electricity prices have been obtained from the Member States. For the estimation of gross value added, data from the Eurostat Structural Business Statistics[57] have been used. The trade data as well as the data on the total annual turnover in the Union have been taken from the Comext database[58] of the Eurostat. Depending on availability, the data from the three most recent years for each sector have been used. As a general rule, the trade data has been taken for 2005-07 and the CO_2 cost for 2005-06.

In line with the directions provided in the Directive,[59] a comprehensive quantitative analyses for all the 258 sectors in Mining and Manufacturing has been carried out at NACE-4[60] level, as in principle any of them could have an installation, which is already covered under the ETS or is supposed to be covered with effect from 2013. Out of the 258 sectors, 146 have been found to meet the criteria specified for carbon leakage risk determination. Among these, 27 sectors have _BOTH_ CO_2 cost above 5 per cent and trade intensity above 10 per cent;[61] two sectors have CO_2 cost above 30 per cent of the gross value added with trade intensity below 10 per cent;[62] and 117 sectors have a trade intensity above 30 per cent.[63]

For some particularly heterogeneous sectors that were not found to be exposed to a significant risk of carbon leakage at the NACE-4 level, more detailed analyses have been carried out for at Prodcom-6 or-8 levels.[64] As a result of this analysis, another set of 13 sub-sectors/products have been added to the list of sectors at risk.[65]

In addition, a qualitative assessment[66] has been carried out for seven out of the 112 sectors that were not found to be at risk at the NACE-4 level.[67] From this analysis, another five sectors have been found to be at risk.[68]

To sum up, the list of sectors/sub-sectors deemed to be exposed to a significant risk of carbon leakage contains 151 sectors at NACE-4 level and another 13 sub-sectors/product groups at Prodcom-6 or -8 levels.

It is indeed striking that out of the 258 NACE 4-digit level sectors as many as 151 (59 per cent) have been found to be at a significant risk of carbon leakage. It may be noted that such a wide coverage is largely attributable to the dominating influence of the high trade intensity criteria. As mentioned above, among the 151 NACE 4-digit sectors included in the EU List, as many as 117 (77 per cent) have been included only on grounds to their particularly high trade intensity with third countries (> 30 per cent), despite not having any significant cost impact from the implementation of the Directive. The methodology followed by the European Commission in determining the list of sectors at a significant risk of carbon leakage, particularly the use of the single threshold of >30 per cent trade intensity may be criticised on several counts, as elaborated in the next section.

A CRITICAL LOOK AT THE EU METHODOLOGY FOR CARBON LEAKAGE RISK DETERMINATION

The European Commission has classified 164 sectors – representing over three-quarters of manufacturing emissions under the EU ETS – as "deemed to be exposed to a significant risk of carbon leakage". It has been argued that if all of these sectors were granted free allowances to compensate them for this "risk", the economic incentives to invest in low carbon manufacturing would be greatly weakened.[69] Importantly, as per the findings of Carbon Trust (2010: 2), the EU's list of 164 sectors includes many sectors that are unlikely to suffer significant leakage. This not only underscores the need to pay a careful attention to the proposed counter measures, but also raises serious questions about the methodology adopted by the European Commission for determining the list of sectors at the risk of leakage.

As discussed before, the *quantitative* methodology adopted by the European Commission to assess the risk of carbon leakage faced by a sector is based on two different approaches. According to one approach, a sector is deemed to be exposed to a significant risk of carbon leakage if the sum of direct and indirect additional costs induced by the ETS is found to result in a particularly high cost increase of at least 30 per cent of its gross value added (henceforth referred to as the high cost increase criterion); *OR* if the value of its exports (to third countries) and imports (from third countries) divided by the total value of its turnover and imports (from third countries) is found to exceed 30 per cent (henceforth referred to as the high trade intensity criterion). Thus, according to this approach, an ETS sector is considered to be at risk if it satisfies *ONLY ONE* among the two criteria: high cost increase or trade intensity. This approach may be called the 'separated approach'.[70]

Under the other *quantitative* approach followed by the European Commission, a sector is deemed to be exposed to a significant risk of carbon leakage if the sum of direct and indirect additional costs induced by the implementation of the Directive would lead to a cost increase of at least 5 per cent of its gross value added, *AND* the sector's trade intensity with third countries exceeds 10 per cent. This approach may be called the 'integrated approach' since under this approach, a sector is taken to be exposed to the risk of carbon leakage only if *BOTH* the aforesaid criteria are satisfied simultaneously.[71]

To sum up, the two alternative *quantitative* approaches adopted by the European Commission differ substantially. The integrated approach takes into account both the cost increase criterion and the trade intensity criterion simultaneously. On the contrary, according to the separated approach, carbon leakage is assessed *EITHER* on a cost increase basis *OR* on a trade intensity basis. Above the 30 per cent cost increase threshold, a sector automatically qualifies for inclusion in the list irrespective of its exposure to international competition. Similarly, above the 30 per cent trade intensity threshold a sector qualifies for inclusion in the list irrespective of the extent to which the ETS impacts its production costs. The aforesaid *quantitative* criteria, particularly, the adoption of the 'separated approach' is fraught with certain fundamental flaws, some of which are discussed below.

In the absence of any policy measure aimed at addressing the carbon leakage (such as, free allocation of emission allowance or border measure), the extent to which a domestic cap-and-trade scheme would potentially lead to emission leakage in a particular sector would depend on (a) the extent to which such a scheme would affect the sector's domestic production costs; and (b) on the extent to which a given change in those costs would lead to increased imports (from third countries) or reduced exports (to third countries).

The primary determinants of a cap-and-trade scheme's effect on a sector's production costs include the emission allowance price; the emission-intensity of the sector's production (taking into account both its direct emissions and its indirect emissions); and the sector's ability to shift to less emission-intensive production methods. The higher the allowance price, the more emission-intensive the sector's production, and the less able the sector is to shift to less emission-intensive production methods, the greater would be a cap-and trade scheme's impact on the sector's production costs.

However, it is important to recognise that impacts on production costs do not directly translate into impacts on industry profitability, competitiveness, and carbon leakage. Sectors that are not exposed to international competition may be able to pass on the increased costs to the final market price without losing market share substantially. Thus, even among those sectors that experience the same percentage increase in production costs, differences in competitive conditions may allow some of them to pass on a higher share of the increased costs to consumers than others, resulting in varying impacts on sectoral profitability.[72] Thus, it becomes necessary to assess the extent to which the effective exposure to international competition prevents the sector from passing through the increased costs to the final product price without any substantial loss of market share. First, a definition of the relevant market and, second, the assessment of the elasticity of the relevant market demand to marginal changes in prices would be required to measure appropriately the pass-through possibility in a particular sector.

Besides, since profit margins (as a percentage of revenue) vary across sector, a given impact on production costs may have different impact on

profitability of different sectors depending on profit margin. Moreover, many emission-intensive sectors have the various characteristics that make them relatively immobile in the face of small changes in production costs that might encourage firms to relocate to other countries.[73]

In fine, the high cost increase criterion _ALONE_ may not provide the extent of carbon leakage risk confronting a particular sector. In a similar vein, it may be argued that the high trade intensity criterion _ALONE_ is not necessarily indicative of a risk of carbon leakage if products from a sector within a carbon pricing area are highly differentiated and carbon intensity is low. Even among those emission-intensive sectors that are considered to be trade-exposed, several factors may influence the extent to which a given sector is susceptible to international competition. As a result, in the face of similar increases in domestic costs, some trade-exposed sectors may experience far smaller increases in imports or reductions in exports than others. The extent to which a sector is susceptible to relocation may also vary. A few examples of these factors are discussed briefly below:[74]

Existing cost advantages: Due to access to inexpensive raw materials, advanced technologies, highly skilled labour, or other advantages, some domestic industries or firms in the EU may already enjoy a cost advantage relative to their international competitors that would continue to exist even in the face of an increase in domestic production costs resulting from the implementation of the Directive.

Fixed plant costs: Firms with a significant share of their investments in large, fixed physical structures, such as large manufacturing plants, may be less sensitive to increases in production costs, because the costs of relocation may outweigh the gains to relocating in a less stringent regulatory environment. For the same reason, they may be less exposed to international competition from other firms in the face of increased domestic costs, if the capital investments required to build new capacity in foreign countries are large compared with the increase in domestic production costs.

Transportation costs: Because of transportation costs, sectors that produce products with a relatively low value per unit of weight may be less

affected by a given increase in domestic production costs than those that produce products with a relatively high value per unit of weight.

Availability of spare international production capacity: In the short run, an increase in domestic production costs may not have a significant effect on the competitive position of a domestic industry in the EU, if globally there is little spare production capacity.

Uncertainty about future conditions: In the energy intensive, trade exposed sectors that are also capital intensive, foreign competitors may be reluctant to make significant investments in response to increases in production costs in the EU, if there are significant uncertainties regarding future market conditions, including the regulatory regimes in those foreign countries. Given the long lifetimes of these capital investments and the relative level of capital abundance in developed countries like the EU, a brief period of differentiation in the domestic climate policies may not justify expansion by foreign competitors.

Agglomeration economies: As a result of agglomeration economies[75] firms may have an incentive to locate near one another. Thus, sectors with significant agglomeration economies may be insensitive to increases in production costs to a great extent, if the gain from remaining close to other firms in the sector outweighs the gains from relocating to a region with less stringent climate policies.

It is clear from the aforesaid discussion that the risk of carbon leakage that a sector faces depends on a complex interaction of a range of factors, many of which are often case and context-specific. In view of such complexities, Dröge and Cooper (2010: 27) maintain that the two *quantitative* criteria that have been used by the European Commission cannot take into account the fundamental differences between sectors and, as a consequence, the nature of the leakage risk they face. According to them, the quantitative criteria should have been supplemented by qualitative analysis in order to explore whether a particular sector that met the *quantitative* criteria should be taken off the list on grounds that other characteristics of the sector revealed that it was not at risk. According to the European Commission's methodology,

however, the sectors that qualified under the *quantitative* criteria did not have to pass any other tests. Qualitative analysis was used by the Commission only to determine whether those sectors that did not qualify on the basis of the quantitative criteria, or for which there were severe data problems, could also be considered as at a significant risk of carbon leakage.

As shown in Annexure II of this paper, a vast majority of the sectors that have been included in the EU List on grounds of high trade intensity (>30 per cent) *ALONE*, have very low carbon intensity (as indicated by the cost increase as a percentage of gross value added). Many of these sectors would face a cost increase lower than 1 per cent of their respective gross value added. As noted by Carbon Trust (2010: 25), "(m)any of these are minor sectors with specialised products – the trade being often driven by such specialisation and facilitated by low transport costs relative to value. These tend not to be very carbon intensive sectors." The inclusion of the vast majority of sectors in the EU List based solely on grounds of high trade intensity, therefore, raises serious questions about the EU methodology. According to Cló (2010), the 'separated approach' - based *EITHER* on the high cost increase criterion *OR* on the high trade intensity criterion - is not sufficiently economically grounded. He observes that "(i)t looks more like the final result of a political compromise aimed at limiting the impact of the European regulation – via exemption from auctioning – to the vast majority of the regulated sectors independently on their effective exposure to Carbon Leakage."

Another criticism is that the industry data is aggregated at the EU-27 level for the leakage analysis. Such aggregation fails to take into account the important differences among national industry structures within the bloc.

As for the thresholds adopted, the European Commission does not explain why the chosen thresholds should be tailored to evaluate the risk of carbon leakage. It is not clear whether the 5 per cent, 10 per cent and 30 per cent thresholds have been set arbitrarily or whether they have been specified according to some economic principles. According to Dröge and Cooper (2010: 25), analysis to support the choice of thresholds would have been particularly useful for the single criteria thresholds. Cló (2010: 2428)

argues that deciding on a threshold basis whether permits should be assigned for free or auctioned out, implying that sectors can either be fully exempted from auctioning or not exempted at all, would impose a regulatory measure, which is not proportional to the sectors' effective exposure to the risk of carbon leakage and might give them a distortive incentive to adopt opportunistic behaviour. For instance, fully exempting a sector whose carbon and trade intensities are 5.1 per cent and 10.1 per cent, respectively, while at the same time not exempting at all a sector whose carbon and trade intensities are 4.9 per cent and 9.9 per cent, respectively, might not induce effective behaviour on the part of the non-exempted sector, which could increase its emissions aiming at passing the given threshold.

The European Commission's assessment is not the only methodological approach that can be used to identify sectors at risk of carbon leakage. However, a number of different methodological approaches, assessment criteria and thresholds could be used. Dröge and Cooper (2010) provide a host of criteria that may be applied for this purpose. Their criteria are classified under four broad categories: (a) cost structures, (b) pass-through ability, (c) abatement potential, and (d) institutional factors. According to them, the different reactions of sectors to a carbon price become more transparent if more criteria are applied. Hence, adding additional assessment criteria can give a more accurate insight into the decision making process of the firms that face an increasing carbon price.

The risk of carbon leakage could also be estimated by means of economic modelling techniques, such as general equilibrium models. As discussed earlier, there are several limitations of general equilibrium models on carbon leakage, which have attracted significant criticisms. However, the methodology adopted by the European Commission is also not free from limitations either. Interestingly, the number of sectors officially identified by the Commission as exposed to a significant risk of carbon leakage is considerably higher than those identified in all of the modelling studies undertaken thus far. Collating the findings of some of the most recent modelling studies Dröge and Cooper (2010) report that the sectors found to be at the risk of carbon leakage include (in no particular order of risk): steel; cement (and lime); some basic chemical sub-sectors (inorganic, organic, fertilisers); aluminium; pulp and paper; and refineries.

Given that some of the modelling studies have been financed by the European Commission itself, Cló (2010) raises questions as to why they have not been taken into consideration while determining the sectors at risk of carbon leakage. He is of the view that given the time constraints imposed by the political agenda, the European Commission designed a simplified methodology to assess the exposure of the European sectors to non-EU competition based on the trade flows.

Notably, there is an inherent trade-off between complexity and comprehensiveness of the assessment criteria. Modelling studies would usually include only a few variables, which they believe capture the majority of the production location decisions made by the firm.[76] Moreover, changing the modelling assumptions (e.g., carbon price, allocation methodology), the assessment criteria and the thresholds used would also affect the number of sectors which are identified as being at risk of carbon leakage.[77] According to Dröge and Cooper (2010), "(s)ubjectivity is inherent with the selection of thresholds and weighting of different criteria. It is a political task to determine where to draw this line as some carbon leakage seems unavoidable given the lack of full information on the sectoral behaviour under the future EU ETS and the interaction of carbon pricing with other economic developments."

According to Carbon Trust (2010), measures to tackle leakage should be limited to specific exposed sectors, because both the main approaches to tackling carbon leakage (namely, levelling down the carbon cost and border carbon adjustments) carry serious drawbacks. For instance, 'levelling down' the carbon cost faced by a sector through free allocation may not prevent carbon leakage and could retard low carbon investment and innovative solutions for the exposed sectors, increasing the cost of meeting carbon targets for the rest of the economy.[78] Adjusting for cost differentials at the border of the carbon pricing zone, on the other hand, may open a Pandora's box involving ticklish questions about WTO legality, potential to trigger trade war, as well as the various other complex implementation and governance issues.

THE STUDY

The starting point of the empirical exercise carried in this paper is the EU List of sectors/sub-sectors deemed to be exposed to a significant risk of carbon leakage. This first list of sectors at risk was brought out by the European Commission in December 2009 (which is referred to as the EU List) as per the requirement enshrined in the 2009 Directive. As discussed above, although allocation of free allowance seems to be the preferred route in the EU to deal with the carbon leakage problem, at least for the time being, the possibility of using the carbon equalisation system on future has not been ruled out entirely. Hence, the carbon equalisation system, as proposed in the post-2012 climate change-energy package of the EU, continues to remain an option that the EU may choose to implement in the future. Should the EU decide to opt for using the carbon equalisation system route, it is difficult to delineate at this juncture as to which sectors would be covered by such a system. However, it may safely be expected that the sectors that may eventually be covered under any future carbon equalisation system in the EU would be among those included in the EU List. In this light, the EU List has been considered as the basis for identifying the items of India's export interest, which are potentially likely to come under the purview of the carbon equalisation system in the EU. The extent of India's exposure to the EU markets in these items has also been analysed.

Data Sources and Methodology

At the first stage of the empirical exercise, a concordance table has been prepared corresponding to the EU List with the aim of identifying the HS 6-digit product items corresponding to the List. The concordance table is based on the correspondence tables available on the web portal of the United Nations Statistics Division.[79] As discussed earlier, among the 164 sectors/sub-sectors included in the EU List, 151 have been identified at NACE 4-digit level, while the remaining 13 sub-sectors/product groups have been identified at Prodcom 6-digit or 8-digit levels. The European Commission has used the NACE Rev. 1.1 and Prodcom 2002 classifications for this purpose.

For the NACE 4-digit sectors included in the EU List, the concordance table has been prepared at three levels using the correspondence tables already available on the UNSTATS portal. The three levels are as follows:

Level (i): NACE Rev 1.1 to ISIC Rev 3.1[80]
Level (ii): ISIC Rev 3.1 to CPC Ver 1.1[81]
Level (iii): CPC Ver 1.1 to HS 2002.

For the 13 Prodcom items belonging to the EU List, the correspondence table for Prodcom 2002 to HS 2002 available on the UNSTATS web portal has been used.

In this context, it deserves to be mentioned that there are certain unavoidable difficulties that crop up in preparation of any concordance table that involves going from an activity-based classification (e.g., NACE) to a product-based classification (e.g., HS). This is particularly relevant for the present exercise, since barring the case of the few Prodcom items, a *three level* concordance exercise had to be carried out to eventually arrive at the set of HS 6-digit items corresponding to the EU List. Certain steps have been followed in the course of preparation of the concordance table with the aim of minimising the errors. At the first stage, a preliminary concordance table has been prepared based on correspondence tables available on the UNSTATS portal. After preparing this table, each item at each level of the concordance exercise has been individually checked once again in order to minimise on omission of relevant items (Type-I error) as well as inclusion of irrelevant items (Type-II error) to arrive at the final concordance table corresponding to the EU List.

Relevant trade data have been extracted from the UN COMTRADE database.[82] Notably, apart from country-level data, the COMTRADE database includes trade data for EU 25 as a bloc, and not for EU 27. Hence, the data for the remaining two countries in the EU 27 bloc, namely Bulgaria and Romania had to be added to each export/import data for the EU 25 to arrive at the data for the EU 27.

The study is based on the trade data for the period 2003-07 (annual years). Although trade data for the year 2008 were already available when the study was undertaken, 2008 was not included in the time period of the study for two reasons. First, 2007 is the latest year for which the trade data have been used by the EU in determining the list of sectors at a significant risk of carbon leakage. Second, 2008 was an abnormal year since the financial crisis had already started impacting trade flows. Signs of the sharp deterioration in trade were evident in the latter part of 2008 as demand sagged and production slowed. Although world trade grew by 2 per cent for the whole of 2008 it tapered off during the last six months and was well below the 6 per cent growth rate recorded in 2007.[83] Table 2 shows the extent to which the trade flows of the EU 27 and India were affected in 2008.

Table 2: GDP and Merchandise Trade (2006-08)
[Annual per cent change at constant prices]

	GDP			Exports			Imports		
	2006	2007	2008	2006	2007	2008	2006	2007	2008
World	3.7	3.5	1.7	8.5	6	2	8	6	2
EU 27	3	2.8	1	7.5	3.5	0	7	3.5	-1
India	9.8	9.3	7.9	11	13	7	8	16	12.5

Source: http://www.wto.org/english/news_e/pres09_e/pr554_e.htm.

Results and Analysis Based on the 'Full EU List'

The analysis carried out in this section is based on the 'Full EU List' of 164 sectors/sub-sectors contained in six sub-lists (as reproduced in the Annexure I of this paper).

4010 HS 6-digit Items corresponding to the 'Full EU List'

From the concordance table prepared for this study, 4010 HS 6-digit items have been identified as corresponding to the 'Full EU List' of sectors/sub-sectors that are deemed to be exposed to a significant risk of carbon leakage. The large number of HS 6-digit items is quite in tune with the overwhelming coverage of sectors in the 'Full EU List'. HS chapter-wise distribution of these 4010 items is provided in Annexure III. It shows the number of HS 6-digit items under each chapter, which have been found from the concordance table as corresponding to the 'Full EU List'. In Annexure

III, the HS chapters are arranged in a descending order as per the number of HS 6-digit items corresponding to each chapter. Annexure III shows that these 4010 items are spread across 84 chapters. This reflects that the spread of the sectors that comes under the ambit of 'Full EU List' is quite wide and diverse. As indicated earlier, the broad-based coverage of the 'Full EU List' is primarily attributable to the inclusion of a large number of sectors on grounds of their high trade intensity with third countries (exceeding 30 per cent), notwithstanding their low carbon intensity.

Coverage of India's Exports in the 4010 Items Corresponding to the 'Full EU List'

Among the aforementioned 4010 HS 6-digit items, India did not have any exports to the EU in 159 items during 2003 to 2007. In other words, there are 3851 items in which India had exports for at least one year of the time period of the study (henceforth, the '3851 List').

India's Exports in the Items Included in the '3851 List'

It could be observed from Annexures IV and V that India's export both to the EU and the World in these 3851 items, as a whole, had recorded upward trends during this period. Moreover, the share of India's export to the EU in these items in India's total EU export basket, as well as the share of India's global export in these items in India's total global export basket was in the range of 82 per cent to 84 per cent. In fine, these 3851 items, as a whole, are not only significant for India's EU export basket, but also for India's World export basket.

Although it is not known at this juncture as to which sectors would eventually be covered under any future carbon equalisation system in the EU, should the EU decide to put this system in place, in view of the fact that the HS 6-digit items that are found to correspond to the 'Full EU List' comprise the lion's share of India's export to the EU, there is a very high probability of any future carbon equalisation system having a considerable impact on India's export to the EU.

India's Exports in the Items Included in the 'Above 10 List', 'Above 33 List' and 'Above 50 List'

Among these 3851 items, there are a large number of items for which significant fluctuations could be observed in India's export to the EU for the time period of the study. A closer look at the export data revealed that there were many items in which India's export to the EU was showing significant fluctuations from one year to another. In view of such fluctuations the '3851 List' has been narrowed down to arrive at a subset of HS 6-digit items in which India's export to the EU exceeds 10 per cent of India's export to the World *in that item*, for all the five years. The aim was to arrive at a list of items in which India had a reasonably high exposure to the EU markets (of above 10 per cent) consistently for all the five years of the study. By following this approach, a list of 1227 items has been arrived at (henceforth, the 'Above 10 List'). In a similar vein, with the aim of identifying the items with an increasing extent of vulnerability, consistently for all the five years of the study, the 'Above 10 List' has subsequently been narrowed down further in two stages to arrive at the 'Above 33 List'[84] and the 'Above 50 List'.[85]

India's exports to the EU and the World, respectively, in the 1227, 328 and 96 items included in the 'Above 10 List', 'Above 33 List' and 'Above 50 List', respectively could be observed from Annexures IV and V.

Results and Analysis based on the 'Truncated EU List'

The analysis in Section IV.2 has been based on the 'Full EU List' covering 164 sectors/sub-sectors. As mentioned earlier, it is not known at this juncture as to which sectors would be covered by any future carbon equalisation system in the EU, though there is little doubt that the sectors would be chosen from among those included in the EU List. However, it seems unrealistic to assume that the EU would choose to apply any future carbon equalisation system regime to all the sectors included in the EU List. For one, free allocation of allowance has already been declared by the EU to be the preferred route to address the problem of carbon leakage. Moreover, it has also been officially recognised by the EU that "(i)t could be hard to implement a system which sought to define in detail the carbon content of each individual category of goods, but such precision might be required:

this suggests that the system could at best only be envisaged for a limited number of standardised commodities…'[86]

The question then is, in case the EU decides to implement the carbon equalisation system only for a small subset of sectors included in the EU List, which sectors are potentially more likely to come under the purview of the measure? As discussed above, among the 164 sectors included in the EU List, as many as 117 have been included only on grounds of their very high trade intensity with third countries (exceeding 30 per cent). These are the sectors that are included in the EU Sublist No. 1.4 (refer List I.1.4 in Annexure I of this paper). Notably, these 117 sectors have low carbon intensities, by definition. Because, these are the sectors for which the sum of the direct and indirect additional costs induced by the EU ETS leads to a cost increase of 'less than 5 per cent of its Gross Value Added'. As may be observed from Annexure II, a large number of sectors included in the Sublist 1.4 would face a (direct +indirect) cost increase lower than 1 per cent of their respective Gross Value Added. It seems plausible to argue that given the small cost burden imposed on these sectors by the EU ETS and in view of the administrative and methodological costs involved in covering any sector under the carbon equalisation system, the EU may prefer to address the problem of carbon leakage in these 117 sectors through other means than opting for covering them under the carbon equalisation system. It may be noted here that by analysing the suitability of alternative means of addressing the problem of carbon leakage in different types of sectors, Carbon Trust (2010: 63) argued that for the highly trade-intensive sectors with relatively low direct and indirect cost exposures, which may still be classified as 'at risk of carbon leakage' under the EU proposals, any residual impacts could be addressed by reducing other costs confronting the businesses (e.g., corporate or labour taxes), with any Treasury revenue losses being offset by auction revenues. However, there is no case for invoking border levelling until costs become far more substantial.

On the basis of the aforesaid discussion, it may reasonably be argued that, in case the EU chooses to apply any future carbon equalisation system only to a small subset of sectors included in the EU List, then the 117 sectors included in the Sublist 1.4 on grounds of above 30 per cent trade intensity

alone are much less likely to be covered under the carbon equalisation system. In other words, the 47 sectors/sub-sectors included in the rest of the five sub-lists (see Annexure I) could be expected to have a greater likelihood of being covered under the carbon equalisation system. This pruned list of 47 sectors/sub-sectors is referred to as the 'Truncated EU List'. If it is assumed that the EU would bring all these 47 sectors/sub-sectors under the purview of the carbon equalisation system, which items of export interest of India are potentially most likely to be affected by such a system? The analysis carried in this section attempts to address this question.

1399 HS 6-digit Items corresponding to the 'Truncated EU List'

By pruning the concordance table corresponding to the 'Full EU List' a truncated concordance table has been arrived at, which correspond to the 47 sectors/sub-sectors included in the 'Truncated EU List'. It is found that there are 1399 HS 6-digit items that correspond to this pruned list of sectors. The HS chapter-wise distribution of these 1399 items is provided in Annexure VI, which indicates the number of HS 6-digit items under each chapter, which have been obtained from the truncated concordance table corresponding to the 'Truncated EU List'. These 1399 items are spread across 46 HS chapters. In this annexure, the chapters are arranged in a descending order as per the number of items corresponding to each chapter. It may be noted that the top 20 chapters (as per the number of items included in the concordance table) include some of the most energy-intensive sectors, such as Iron and steel; Chemicals; Glass; Pulp and Paper; Aluminium; Copper; Cement, and Refined petroleum products, among others.

Coverage of India's Exports in the 1399 Items corresponding to the 'Truncated EU List'

Among the 1399 HS 6-digit items that have been found to correspond to the 'Truncated EU List', in 78 items India did not have any export to the EU for the time period of this study. In other words, there are 1321 items in which India had export to the EU for at least one year of the study.

India's Exports in the 1321 Items

Annexures VII and VIII provide chapter-wise distribution of India's exports

to the EU and the World, respectively, in the aforesaid 1321 items. It could be observed from these two tables and also from Fig. 1 that India's exports both to the EU and to the World in these items, as a whole, had shown a steady rise between 2003 and 2007. An upward trend could also be observed for the share of India's export to the EU in these items in the country's total export to the bloc (increasing from 17 per cent to 29 per cent); as well as in the share of India's export to the World in these items in the country's total global export (increasing from 23 per cent to 35 per cent). Thus, these items taken together seem to assume an increasing significance not only for India's EU export basket, but also for India's World export basket. Figure 1 further depicts that the share of the EU in India's total global export in these 1321 items was hovering around 17 per cent-19 per cent. Thus, the

Figure 1: India's Export to the EU and World in 1321 HS6 Items
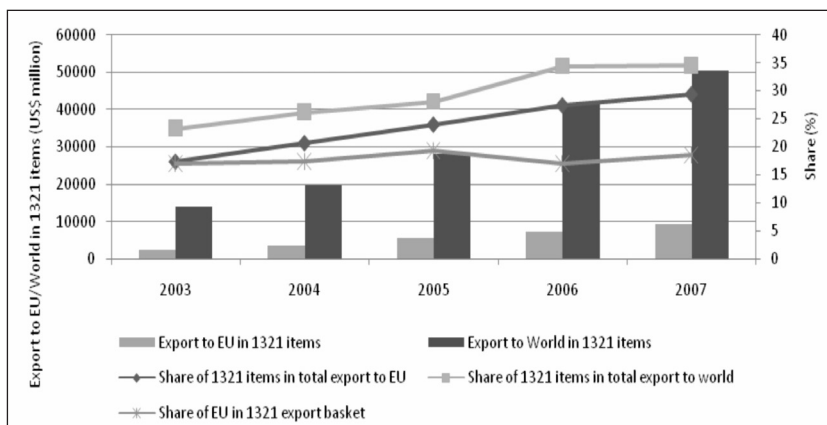
EU alone accounted for close to 1/5th of India's export in these 1321 items, as a whole, which implies a fairly high exposure of India to the EU markets for this export basket.

As mentioned earlier, these 1321 items are spread across 45 chapters. In Annexure IX, these chapters are arranged in a descending order as per India's export to the EU in the year 2007, i.e. the latest year considered in this study. Interestingly, the top 20 chapters according to this ranking

comprise as many as 1075 items and account for around 99 per cent of India's export to the EU in the 1321 items in 2007. It could also be observed that for most of the chapters, India's exports to both the EU and the World had recorded upward trends during 2003-07. So, it may be argued that among the 45 chapters corresponding to the 1321 list of items, the top 20 chapters identified in Annexure IX seem to be more important than the rest.

In line with the approach followed in analysing India's export in the items corresponding to the 'Full EU List', in case of the 'Truncated EU List' also the list of the corresponding HS 6-digit items has been further narrowed down to arrive at the 'Truncated Above 10 List', the 'Truncated Above 33 List' and finally the 'Truncated Above 50 List'. These narrowed down lists contain those HS 6-digit items (among the aforesaid 1321 items) for which India's export to the EU is greater than 10 per cent, 33 per cent, and 50 per cent, respectively, of India's global export *in that item*, for all the five years of the study. It is found that 308, 81 and 21 HS 6-digit items, respectively, qualify for inclusion in these three narrowed down lists.

India's exports to the EU and the World, respectively, in the items included in the 'Above 10 List', 'Above 33 List' and 'Above 50 List', respectively could be observed from Annexures X and XI.

India's Exposure to the EU Markets *vis-à-vis* other BASIC Countries in the Items Included in the 'Truncated EU List'

The empirical study carried in this paper has focused so far on India alone. This sub-section attempts to analyse the exposure of India to the EU markets *vis-à-vis* other three BASIC countries, namely Brazil, China and South Africa, in the 1399 HS 6-digit items corresponding to the 'Truncated EU List'. It deserves to be mentioned at this juncture that apparently, the other three BASIC countries are also among the key targets of the border carbon measures being contemplated in the EU (or the US for that matter). It may also be noted that the BASIC countries have also joined forces to oppose these border measures at the UNFCCC negotiations.[87]

While the empirical exercise has been based so far on export data, the rest of the analysis uses the statistics on the EU's imports from each of

the BASIC countries.[88] Annexure XII provides chapter-wise distribution of the EU's import from each of the four BASIC countries in the 1399 items corresponding to the 'Truncated EU List'. Annexure XIII provides the EU's imports in these 1399 items, as a whole, from each of the BASIC countries, as well as the share of these items in the EU's respective total imports from these countries. It may be observed from Annexure XIII and also Figure 2 that in terms of the value of import, China is far more exposed to the EU markets compared to the other three countries. The EU's import from China had also shown a very high and steady growth during this period. South Africa occupied the second position during 2003-05 in terms of the value of the EU's import. However, in the subsequent two years, Brazil

Figure 2: EU Import from BASIC Countries in 1399 HS6 Items Corresponding to the Truncated EU List
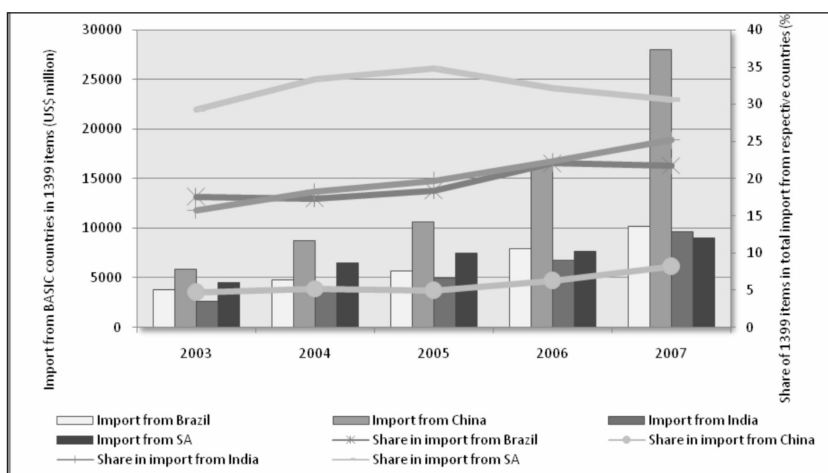
overtook South Africa to occupy the second position. However, both for South Africa and Brazil the EU imports in these items show steadily rising trends. Although a similar upward trend may be observed for the EU's import from India as well, in terms of value India always remained in the very last position. In other words, in terms of the value of the EU's import in these 1399 items, it seems that India would be the least affected among the BASIC countries, should the EU bring all these items under the purview of the carbon equalisation system.

However, a very different picture of relative vulnerability emerges when judged in terms of the share of these 1399 items in the EU's respective total imports from these countries. In this respect, South Africa tops the list with these items covering around 30 per cent of the EU's total import from the country, though this share had shown a slightly declining trend. India and Brazil come very close to South Africa, while China seems to be the least vulnerable. The respective share of India, Brazil and China also shows a more or less rising trend.

To sum up, in case the EU decides to bring all these 1399 items corresponding to the 'Truncated EU List' under the purview of its carbon equalisation system on future, India may turn out to be the least vulnerable among the BASIC countries in terms of the value of the EU's imports from these countries. As for the shares of these items in the EU's respective total imports from these countries, except for China, subtantial shares of the imports from all the other three BASIC countries are likely to get affected. In terms of this share, India appears to be the second-most vulnerable (after South Africa). The share for India also shows a steadily rising trend over the period of the study covering more than 25 per cent of the EU's import from India in 2007.

SELECT CAVEATS OF THE STUDY

In the empirical exercise carried in this paper, the identification of the sectors that are potentially likely to be covered by any future carbon equalisation system in the EU has been based on the concordance table prepared on the basis of the EU List of sectors/sub-sectors deemed to exposed to a significant risk of carbon leakage, released in December 2009. Most of these sectors/ sub-sectors have been identified by the EU at the NACE 4-digit level. The HS 6-digit items corresponding to these NACE 4-digit items have been obtained on the basis of a three-level concordance exercise using the correspondence tables available on the UNSTATS web portal. There are certain inherent difficulties in any conversion from an activity-based classification (e.g., NACE) to a product-based classification (e.g., HS). It is difficult to find an exact match between these two types of classifications. This is particularly true for the present exercise since for most of the items the concordance

exercise has been done at three levels. However, certain steps have been followed in the course of preparation of the concordance table with the aim of minimising the errors.

The analysis is based on trade data at HS 6-digit level. It would have been more accurate to base the exercise on HS 8-digit level data. However, any further disaggregation would have made the analysis unwieldy. Moreover, a comparative assessment of the BASIC countries would have been rather complicated to undertake beyond 6-digit level, because classifications may differ by country due to lack of harmonisation beyond HS 6-digit level.

The findings of the present study are based only on what was revealed by the trade data for the five-year period of the study: 2003 to 2007. However, it remains that a change in the time period of the study may result in a significant alteration in the resuls.

It also deserves to be mentioned that the vulnerability of a particular item of export interest to India to any future border measure in the EU would not only depend on the the relative exposure of India in this item in the EU markets *vis-à-vis* other export destinations, but would also depend on the carbon intensity of the product, in case the EU decides to base the measure on the actual carbon intensity of import. This applies also to the issue of relative vulnerability of India in this particular item *vis-à-vis* other source countries of import into the EU. However, due to a dearth of adequate data on carbon intensity, it would have been difficult to explore this issue at this juncture. Moreover, in case the EU decides to implement a carbon equalisation system, it is not known as of now as to how such a system would be designed. For instance, instead of basing such a system on actual carbon intensity of import, the EU may decide to base it on some kind of averaging, or on the best available technology in the home market approach, or some other method. Given all these difficulties in venturing into any anlysis based on carbon intensity, the present study has confined its scope to determing the vulnerability of India to any future carbon equalisation system in the EU only to the extent depicted by the trade flows.

Concluding Remarks

This paper has presented an empirical exercise with the aim of identifying the export items of India's interest that may be covered under any future carbon equalisation system in the EU and the extent of India's exposure to the EU markets in these items, as revealed by the trade data for the period 2003 to 2007. The empirical exercise is based on the EU List released in December 2009 in which the bloc has identified 164 sectors/sub-sectors as deemed to be exposed to a significant risk of carbon leakage. In order to determine the product items as per HS 6-digit classification corresponding to the EU List, a concordance table has been prepared for the study. The study has been carried out in two parts. The first part is based on the 'Full EU List' comprising 164 sectors/sub-sectors, whereas the second part undertakes a deeper assessment of the HS 6-digit items corresponding to the 'Truncated EU List' containing only 47 sectors/sub-sectors. Notably, the 'Truncated EU List' has been arrived at by leaving aside the 117 highly trade-intensive but low carbon-intensive sectors from the 'Full EU List'. It is argued in this paper that given the small cost burden imposed on these 117 sectors by the EU ETS and in view of the administrative and methodological costs involved in covering any sector under a carbon equalisation system, the EU may prefer to address the problem of carbon leakage in these sectors through other means than applying border measures. In other words, the 47 sectors/sub-sectors included in the 'Truncated EU List' could be expected to have a greater likelihood of being covered by any future border measure in the EU.

In the first part, as many as 4010 HS 6-digit items have been identified as corresponding to the 164 sectors/sub-sectors included in the 'Full EU List', according to this concordance table. The share of India's export to the EU in these items in India's total EU export basket, as well as the share of India's global export in these items in India's total global export basket was in the range of 82 per cent to 84 per cent. Although it is not known at this juncture as to which items would eventually come under the purview of any future border measure in the EU, given that the items corresponding to the 'Full EU List' comprise the lion's share of India's export to the EU, there is a very high likelihood of any future carbon equalisation system in the EU having a considerable impact on India's export to the bloc.

In the second part of the empirical exercise pertaining to the 'Truncated EU List', it is found that 1399 HS 6-digit items correspond to the 47 sectors/ sub-sectors covered therein. The value of India's export both to the EU and to the World in these items, as a whole, had shown a steady rise between 2003 and 2007. An upward trend could also be observed for the share of these items, as a whole, in India's total export to the EU and also to the World. Moreover, the EU alone accounted for close to 1/5th of India's export in these items taken together, which implies a fairly high exposure of India to the EU markets for this export basket.

The study not only explores India's absolute exposure, but also considers its relative exposure *vis-à-vis* other three BASIC countries, namely, Brazil, China and South Africa, in the items corresponding to the 'Truncated EU List'. The exercise indicates that should the EU decide to bring all the 1399 items corresponding to the 'Truncated EU List' under the purview of its carbon equalisation system in future, India may turn out to be the least vulnerable among the BASIC countries in terms of the value of the EU's imports from these countries. When judged in terms of the shares of these items in the EU's respective total imports from these countries, however, India appears to be the second-most vulnerable, after South Africa. In fine, even if the EU decides to apply border measures only on the items corresponding to the 'Truncated EU List', the overall vulnerability of India could be quite high, both in absolute terms as well as *vis-à-vis* other three BASIC countries.

Endnotes

[1]   Different terms have been used in the existing discourse to refer to these proposed border measures in the context of climate change. These include 'border carbon adjustment', 'carbon tariff', 'carbon border adjustment' and so on. The EU legislation has used the term 'carbon equalisation system'. The present study uses the terms 'border carbon adjustment', 'carbon equalisation system', and 'border measure' interchangeably.

[2]   See Cosbey (2008).

[3]   For a number of years, the EU has been linking its own commitments to reduce greenhouse gas emissions with the actions that other devleoped countries and advanced developing countries take in this regard. In March 2007, European Council endorsed an EU objective to effect a 30 per cent reduction in greenhouse gas emissions by 2020, "provided other developed countries commit themselves to comparable emission reductions and economically more advanced countries contribute adequately according to their responsibilities and respective capacities." (Commission of European Communities, 2008)

[4]   The Harmonised Commodity Description and Coding System generally referred to as "Harmonised System" or simply "HS" is a multipurpose international product nomenclature developed by the World Customs Organisation (WCO). It comprises about 5,000 commodity groups; each identified by a six digit code, arranged in a legal and logical structure and is supported by well-defined rules to achieve uniform classification. The system is used by more than 200 countries and economies as a basis for their Customs tariffs and for the collection of international trade statistics. Over 98 per cent of the merchandise in international trade is classified in terms of the HS.

[5]   As cited in Reinaud (2008).

[6]   Sijm *et al.* (2004).

[7]   Reinaud (2008).

[8]   Sijm *et al.* (2004).

[9]   Reinaud (2008).

[10]   Reinaud (2008).

[11]   As observed by WTO-UNEP (2009): 'It should be noted, however, that studies to date find generally that the cost of compliance with an emission trading scheme is a relatively minor component of a firm's overall costs, which include exchange-rate fluctuations, transportation costs, energy prices and differences across countries in the cost of labour. Of course, the carbon constraint in future emission trading schemes (for example, in Phase III of the EU-ETS) is expected to be more stringent, with a lower capped limit and fewer free allowances. This may therefore increase the potential impact of carbon costs on the competitiveness of a number of industrial sectors.'

[12]   Carbon Trust (2004).

[13]   Reinaud (2009).

[14]   Reinaud (2008).

[15]   Reinaud (2008).

[16]   Reinaud (2008).

[17]   Sijm, *et al*. (2004).

[18]   Reinaud (2008).

[19]   Grubb *et al*. (2009).

[20]   Reinaud (2008).

[21]   Reinaud (2008).

22   Sijm, *et al*. (2004).

23   Sijm, *et al*. (2004).

24   Reinaud (2008).

25   Reinaud (2008).

26   Grubb and Counsell (2010).

27   World Bank (2008) as referred to by Grubb, *et al.* (2009).

28   Sijm, *et al*. (2004).

29   Reinaud (2008).

30   Reinaud (2008).

31   Reinaud (2008).

32   Carbon Trust (2010).

33   Reinaud (2008).

34   Carbon Trust (2010).

35   The package was proposed by the European Commission on 23 January 2008 [see EC (2008)]. A revised (watered-down) version of the package was adopted as the final Directive on 23 April 2009 [see EU (2009a)]. The package proposed a 20-20-20 targets for the EU to achieve by 2020: a 20 per cent reduction in GHG emissions from 1990 levels; increasing the share of renewables in the EU's energy mix to 20 per cent from 8.5 per cent today; and a 20 per cent cut in energy use through improved energy efficiency.

36   The U.S. House of Representatives on 26 June 2009 passed the 'American Clean Energy and Security Act' (also referred to as the Waxman-Markey Bill), which included provisions on unilateral border measure on climate change grounds, under its International Reserve Allowance Programme. However, the senate version could not be passed till date, despite the fact that several bills have been proposed at the Senate. These include, among others, the 'Clean Energy Jobs and American Power Act' (also known as Kerry-Boxer Bill), which was introduced in September 2009. In May 2010, this version was replaced by the 'American Power Act' (also called the Kerry-Lieberman Bill). These bills also included provisions for border measures.

37   The EU ETS was introduced by the Directive 2003/87/EC of the European Parliament and of the Council.

38   From the start of 2008 the EU ETS applies not only to the 27 EU Member States but also the other three members of the European Economic Area – Norway, Iceland and Liechtenstein. It currently covers over 12,000 installations in the energy and industrial sectors which are collectively responsible for close to half of the EU's emissions of CO_2 and 40 per cent of its total GHG emissions.

39   See EU (2009a).

40   Share of auctioning in total allowances distributed is proposed to be increased from less than 4 per cent in phase 2 (2008-12) of the EU ETS to more than half in phase 3 (2013-20).

41   The final version, which was widely criticised by the environmentalists as a 'watered-down' one, stipulates that for sectors that are not exposed to the risk of carbon leakage, the level of auctioning of allowances will increase in a linear manner, quite in line with the Commission proposals; but rather than reaching 100 per cent auctioning by 2020 as proposed by the Commission, the final version envisages 70 per cent auctioning by 2020, with a view to reaching 100 per cent by 2027.

42   It states that: "Energy-intensive industries which are determined to be exposed to a significant risk of carbon leakage could receive a higher amount of free allocation or an effective carbon equalisation system could be introduced with a view to putting installations from the

Community which are at significant risk of carbon leakage and those from third countries on a comparable footing."

43 Free allowances will in principle be allocated based on product-specific benchmarks for each relevant product. The starting point for the determination of benchmarks is the average of the 10 per cent most efficient installations in a sector, in terms of GHG emissions, and it is to take into account the most efficient techniques, substitutes and alternative production processes. The benchmarks are to be multiplied by a historical production figure, and some other factors that are needed to ensure the respect of the annually declining total cap. The effect of the list of sectors exposed to a significant risk of carbon leakage is that for the sectors mentioned on the list, the free allocation will be multiplied by a factor 1 (100 per cent), while for other sectors the allocation will be multiplied by a lower figure (0.80 in 2013, and reduced every year to reach 0.30 in 2020). Notably, given the concept of the benchmarks, only the most efficient installations would have any chance of receiving all of its needed allowances for free (http://ec.europa.eu/clima/policies/ets/leakage_en.htm).

44 The Commission draft (of 23 January 2008) included the deadline of 31 June 2010 for this purpose. However, in view of the urgency demonstrated by the stakeholders the final version the Directive (of 23 April 2009) preponed the deadline.

45 As observed by WTO-UNEP (2009): 'The effects of climate change measures on the competitiveness of sectors will depend on a number of factors that relate to: (i) the specific c characteristics of the sector (e.g., its trade exposure; how energy intensive or CO_2 emission intensive it is; its direct and indirect carbon costs;(footnote omitted) its production costs; the ability to pass on cost increases through prices; the market structure; transportation costs; its capacity to reduce emissions and/or energy consumption; the possibility to evolve towards cleaner production technologies and processes); (ii) the design of the regulation (e.g., the amount of the carbon charge; the stringency of the regulation; the availability of alleviations and exemptions; and in the case of an emission trading scheme the allocation method for allowances); and (iii) other policy considerations (e.g., energy and climate policies adopted by other countries). (footnote omitted) The influence of each of these factors may be industry specific and quite complex to determine. Two of these factors have been at the centre of discussions on the effects on competitiveness of recent emission trading schemes and of those under consideration: the "cost pass-through capability" of companies, and their trade exposure.'

46 Carbon Trust (2010).

47 See the 2009 Directive [EU (2009a)].

48 A 'third country' refers to a country outside the EU 27 bloc. The third-country trade intensity is defined as total value of third-country exports and third-country imports divided by the total value of the sector's turnover and third-country imports.

49 An installations' direct emissions mainly depend on the fuel mix, technology efficiency, the amount of self-produced electricity and the industrial process emissions.

50 The indirect emissions mainly depend on the consumption of electricity and on the fuel mix used to generate the purchased electricity.

51 It is worth noticing that indirect emissions are not related only to electricity consumption, but to all the phases composing the product life-cycle: from the raw material extraction and transportation to the product distribution and final disposal. In principle, it would be more appropriate to count for the product life-cycle direct and indirect emissions. The 2009 Directive, however, takes into account only the indirect emissions from the consumption of electricity in the production process. This, according to Cló (2010:2424), is because the European climate policy is mainly production based (rather than consumption-based), regulating only the emissions from production (which can be easily monitored), while not taking into account

the whole product life-cycle and the whole product emissions linked to consumption.

[52]   Cló (2010).

[53]   Article 10a (14) of the 2009 Directive states that the assessment should be based on an average carbon price determined by the Commission's impact assessment accompanying the climate change-energy package. This price was 30 Euro per tonne of CO_2, and has been used in all calculations related to this issue [EU (2009c)].

[54]   Cló (2010).

[55]   The Commission services initially based their assessment on a simplified assumption of 100 per cent auctioning and the preliminary results from this exercise were presented to the Member States and stakeholders at the ad-hoc meetings of the European Climate Change Programme in April and July of 2009. However, based on the comments received at these meetings and following a detailed legal assessment and taking into account the list's period of application, the Commission felt that the term "additional costs induced by the implementation of this Directive" in Articles 10a(15) and 10a(16), required it to base the calculations of direct costs on its best estimate of the additional cost of the allowances in 2013 and 2014. Hence, in the final determination, costs were based on best estimates for 2013 and 2014, taking into account: (i) the declining share of free allowances; (ii) the required stringency of the benchmarks; and (iii) the linear factor of the cap. The best estimates resulted in the figure that around 75 per cent of allowances would be auctioned out. However, no sector was removed from the list due to the change in assumption on auctioning from 100 per cent to 75 per cent.

[56]   The EU Community Independent Transaction Log handles responsibilities for verifying transactions conducted by registries located in Europe. The EU Community Independent Transaction Log maintains an electronic accounting system that assists in tracking emission allowances and carbon credits of entities participating in carbon markets.

[57]   Structural business statistics (SBS) cover industry, trade and services. They describe the behaviour (structure, conduct and performance) of businesses across the European Union (EU) – data are available for the EU-27 and for the Member States. The statistics can be broken down to a very detailed sectoral level (several hundred economic activities).

[58]   Eurostat's COMEXT database contains the official European Foreign Trade Statistics. It includes detailed statistics on the intra- and extra-trading in goods of all EU member states. Aggregated data for the EU12, EU15, EU25, EU27, EU10 (NMS) and EU12 (NMS+Romania+Bulgaria) is available. Trade goods are classified by the 8-digit European Harmonised System (CN8, Combined Nomenclature) as well as NACE (up to 4 digits) and SITC Rev. 3 (up to 5 digits).

[59]   As set in recital 24 of the Directive, in order to establish the list of sectors and sub-sectors, which are deemed to be exposed to a significant risk of carbon leakage should be assessed, as a starting point, at a 3-digit level (NACE-3 level) or, where appropriate and where the data is available, at a 4-digit level (NACE-4 level).

[60]   NACE is the acronym used to designate the various statistical classifications of economic activities developed since 1970 in the European Union. NACE provides the framework for collecting and presenting a large range of statistical data according to economic activity in the fields of economic statistics (e.g., production, employment, national accounts) and in other statistical domains. Statistics produced on the basis of NACE are comparable at European and, in general, at world level. The use of NACE is mandatory within the European Statistical System.

[61]   See Annexure Tables I.1.1 and I.1.2 of this paper.

[62]   See Annexure Table I.1.3 of this paper.

[63]   See Annexure Table I.1.4 of this paper.

64   Prodcom is the European Union's standard classification of production statistics. Prodcom provides statistics on the production of manufactured goods. Prodcom uses the product codes specified on the Prodcom List, which contains about 4500 different types of manufactured products. Products are identified by an 8-digit code: the first four digits are the classification of the producing enterprise given by the Statistical Classification of Economic Activities in the European Community (NACE; the first six correspond to the CPA (Classification of Products by Activity); and the remaining digits specify the product in more detail.

65   See Annexure Table I.2 of this paper.

66   According to article 10a (17) of the Directive, the list of sectors/sub-sectors that are determined to be exposed to a significant risk of carbon leakage as per Articles 10a(15) and 10a(16) may be supplemented after completion of a qualitative assessment, taking into account both the sectors' technological potential to reduce either emissions or electricity consumption and on the sectors' current and projected market characteristics. The relevant criteria are: (a) the extent to which it is possible for individual installations in the sector or sub-sector concerned to reduce emission levels or electricity consumption, including the increase in production costs that the related investment may entail, for instance on the basis of the most efficient techniques; (b) current and projected market characteristics, including when trade exposure or direct and indirect cost increase rates are close to one of the thresholds mentioned in paragraph 16 of Article 10(a); (c) profit margins as a potential indicator of long-run investment or relocation decisions.

67   The triggers for such additional investigations included absence of data for one of the indicators, doubts about accuracy or coverage of quantitative data (e.g., discrepancy in gross value added vs. emissions), or integrated production processes [Dröge and Cooper (2010)].

68   These are included in Annex 3 of EU (2009b).

69   Carbon Trust (2010).

70   See Cló (2010).

71   See Cló (2010).

72   USEPA (2009).

73   USEPA (2009).

74   This discussion draws on USEPA (2009).

75   While the sources of agglomeration economies are varied (e.g., knowledge spillovers, labour market pooling, proximity to firms that produce inputs or purchase outputs), their effect is the same — firms will have an incentive to locate near one another.

76   Dröge and Cooper (2010).

77   Dröge and Cooper (2010).

78   For instance, given the current EU emissions target, granting free allowances to cement, steel and aluminium could increase the carbon price faced by the rest of industry by 10-30 per cent; whilst cement sector profits could rise by £0.7bn – £3.4bn annually during Phase III, depending on how the sector responds, without necessarily preventing leakage.

79   http://unstats.un.org

80   The International Standard of Industrial Classification of All Economic Activities (ISIC) code was developed by the UN as a standard way of classifying economic activities. The ISIC code groups together enterprises if they produce the same type of goods or service or if they use similar processes (i.e. the same raw materials, process of production, skills or technology). The ISIC system is now used widely by governments and international bodies as a way if classifying data according to economic activity. One key purpose of the code is to standardise data collection and promote international comparability.

81   The central product classification (CPC) is a classification based on the physical characteristics of goods or on the nature of the services rendered. Each type of good or service distinguished in the CPC is defined in such a way that it is normally produced by only one activity as defined in ISIC. The CPC covers products that are an output of economic activities, including transportable goods, non-transportable goods and services. Conversely, each activity of the ISIC is defined in such a way that it normally produces only one type of product as defined in the CPC (where each type of product may have a number of individual products coded under it).

82   The United Nations Commodity Trade Statistics Database (UN Comtrade) contains detailed imports and exports statistics. Containing over 1.1 billion records, the UN Comtrade Database is considered to be the most comprehensive trade database available. The database is continually updated and whenever trade data are received from the national authorities they are standardised by the UN Statistics Division, using the UN/OECD CoprA internal processing system, and then added to UN Comtrade. Commodities are classified according to SITC (Rev.1 from 1962, Rev.2 from 1976 and Rev.3 from 1988), the Harmonised System (HS) (from 1988 with revisions in 1996 and 2002) and Broad Economic Categories (BEC).

83   http://www.wto.org/english/news_e/pres09_e/pr554_e.htm

84   This list includes the HS 6-digit items in which India's export to the EU exceeds 33 per cent of India's export to the World *in that item*, for all the five years.

85   This list includes the HS 6-digit items in which India's export to the EU exceeds 50 per cent of India's export to the World *in that item*, for all the five years.

86   EU (2010b).

87   In the Fifth BASIC Ministerial meeting on climate change held in Tianjin, China, on the 10-11 October 2010, just after the UNFCCC meeting (4-9 October), the ministers from these countries rejected the notion of unilateral actions against products and services of developing countries on grounds of combating climate change, including tax and non-tax, or other fiscal and non-fiscal border or other measures, which according to them, are incompatible with the principles and provisions of the UNFCCC and will seriously jeopardise international collaboration on climate change and international trade. The importance of addressing the issue was also stressed in the Sixth BASIC Ministerial meeting on climate change, which was held in New Delhi on 26-27 February 2011 to exchange views on the outcome of the Cancun Conference and on the approach to be taken to the future work in the run-up to Durban.

88   Discrepancies may be observed in India's total exports in the items corresponding to the 'Truncated EU List' presented in Annexure XIII and the EU's total import from India in these items presented in Annexure XIII. Such discrepancies may crop up due to several reasons. They include, among others, the following: (a) freight and insurance, which increase the c.i.f. values above f.o.b. values; (b) time lags between the f.o.b. stage in the exporting country and the c.i.f. stage in the importing country; (c) differences in the reporting periods of the statistics; and (d) differing valuation practices at the customs services of different countries.

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Annexure I: Lists of Sectors and Sub-sectors which are Deemed to be Exposed to a Significant Risk of Carbon Leakage according to the European Commission

I.1: AT THE NACE-4 LEVEL

I.1.1. Based on the Quantitative Criteria set out in Paragraphs 15 and 16 of Article 10a of the 2009 Directive

NACE code	Description
1010	Mining and agglomeration of hard coal
1430	Mining of chemical and fertilizer minerals
1597	Manufacture of malt
1711	Preparation and spinning of cotton-type fibres
1810	Manufacture of leather clothes
2310	Manufacture of coke oven products
2413	Manufacture of other inorganic basic chemicals
2414	Manufacture of other organic basic chemicals
2415	Manufacture of fertilizers and nitrogen compounds
2417	Manufacture of synthetic rubber in primary forms
2710	Manufacture of basic iron and steel and of ferro-alloys
2731	Cold drawing
2742	Aluminium production
2744	Copper production
2745	Other non-ferrous metal production
2931	Manufacture of agricultural tractors

I.1.2. Based on the Quantitative Criteria set out in Paragraph 15 of Article 10a of the 2009 Directive

ACE code	Description
1562	Manufacture of starches and starch products
1583	Manufacture of sugar
1595	Manufacture of other non-distilled fermented beverages
1592	Production of ethyl alcohol from fermented materials
2112	Manufacture of paper and paperboard
2320	Manufacture of refined petroleum products
2611	Manufacture of flat glass
2613	Manufacture of hollow glass
2630	Manufacture of ceramic tiles and flags
2721	Manufacture of cast iron tubes
2743	Lead, zinc and tin production

I.1.3. Based on the Quantitative Criteria set out in Point (A) of Article 10a(16) of the 2009 Directive

NACE code	Description
2651	Manufacture of Cement
2652	Manufacture of Lime

I.1.4. Based on the Quantitative Criteria set out in Point (B) of Article 10a(16) of the 2009 Directive

NACE code	Description
1110	Extraction of crude petroleum and natural gas
1310	Mining of iron ores
1320	Mining of non-ferrous metal ores, except uranium and thorium ores
1411	Quarrying of ornamental and building stone
1422	Mining of clays and kaolin
1450	Other mining and quarrying n.e.c.
1520	Processing and preserving of fish and fish products
1541	Manufacture of crude oils and fats
1591	Manufacture of distilled potable alcoholic beverages
1593	Manufacture of wines
1712	Preparation and spinning of woollen-type fibres
1713	Preparation and spinning of worsted-type fibres
1714	Preparation and spinning of flax-type fibres
1715	Throwing and preparation of silk, including from noils, and throwing and texturing of synthetic or artificial filament yarns
1716	Manufacture of sewing threads
1717	Preparation and spinning of other textile fibres
1721	Cotton-type weaving
1722	Woollen-type weaving
1723	Worsted-type weaving
1724	Silk-type weaving
1725	Other textile weaving
1740	Manufacture of made-up textile articles, except apparel
1751	Manufacture of carpets and rugs
1752	Manufacture of cordage, rope, twine and netting

1753	Manufacture of non-wovens and articles made from non-wovens, except apparel
1754	Manufacture of other textiles n.e.c.
1760	Manufacture of knitted and crocheted fabrics
1771	Manufacture of knitted and crocheted hosiery
1772	Manufacture of knitted and crocheted pullovers, cardigans and similar articles
1821	Manufacture of workwear
1822	Manufacture of other outerwear
1823	Manufacture of underwear
1824	Manufacture of other wearing apparel and accessories n.e.c.
1830	Dressing and dyeing of fur; manufacture of articles of fur
1910	Tanning and dressing of leather
1920	Manufacture of luggage, handbags and the like, saddlery and harness
1930	Manufacture of footwear
2010	Sawmilling and planing of wood; impregnation of wood
2052	Manufacture of articles of cork, straw and plaiting materials
2111	Manufacture of pulp
2124	Manufacture of wallpaper
2215	Other publishing
2330	Processing of nuclear fuel
2412	Manufacture of dyes and pigments
2420	Manufacture of pesticides and other agro-chemical products
2441	Manufacture of basic pharmaceutical products
2442	Manufacture of pharmaceutical preparations
2452	Manufacture of perfumes and toilet preparations
2463	Manufacture of essential oils
2464	Manufacture of photographic chemical material
2465	Manufacture of prepared unrecorded media
2466	Manufacture of other chemical products n.e.c.

2470	Manufacture of man-made fibres
2511	Manufacture of rubber tyres and tubes
2615	Manufacture and processing of other glass, including technical glassware
2621	Manufacture of ceramic household and ornamental articles
2622	Manufacture of ceramic sanitary fixtures
2623	Manufacture of ceramic insulators and insulating fittings
2624	Manufacture of other technical ceramic products
2625	Manufacture of other ceramic products
2626	Manufacture of refractory ceramic products
2681	Production of abrasive products
2722	Manufacture of steel tubes
2741	Precious metals production
2861	Manufacture of cutlery
2862	Manufacture of tools
2874	Manufacture of fasteners, screw machine products, chain and springs
2875	Manufacture of other fabricated metal products n.e.c.
2911	Manufacture of engines and turbines, except aircraft, vehicle and cycle engines
2912	Manufacture of pumps and compressors
2913	Manufacture of taps and valves
2914	Manufacture of bearings, gears, gearing and driving elements
2921	Manufacture of furnaces and furnace burners
2923	Manufacture of non-domestic cooling and ventilation equipment
2924	Manufacture of other general purpose machinery n.e.c.
2932	Manufacture of other agricultural and forestry machinery
2941	Manufacture of portable hand held power tools
2942	Manufacture of other metalworking machine tools
2943	Manufacture of other machine tools n.e.c.

2951	Manufacture of machinery for metallurgy
2952	Manufacture of machinery for mining, quarrying and construction
2953	Manufacture of machinery for food, beverage and tobacco processing
2954	Manufacture of machinery for textile, apparel and leather production
2955	Manufacture of machinery for paper and paperboard production
2956	Manufacture of other special purpose machinery n.e.c.
2960	Manufacture of weapons and ammunition
2971	Manufacture of electric domestic appliances
3001	Manufacture of office machinery
3002	Manufacture of computers and other information processing equipment
3110	Manufacture of electric motors, generators and transformers
3120	Manufacture of electricity distribution and control apparatus
3130	Manufacture of insulated wire and cable
3140	Manufacture of accumulators, primary cells and primary batteries
3150	Manufacture of lighting equipment and electric lamps
3162	Manufacture of other electrical equipment n.e.c.
3210	Manufacture of electronic valves and tubes and other electronic components
3220	Manufacture of television and radio transmitters and apparatus for line telephony and line telegraphy
3230	Manufacture of television and radio receivers, sound or video recording or reproducing apparatus and associated goods
3310	Manufacture of medical and surgical equipment and orthopaedic appliances
3320	Manufacture of instruments and appliances for measuring, checking, testing, navigating and other purposes, except industrial process control equipment
3340	Manufacture of optical instruments and photographic equipment
3350	Manufacture of watches and clocks
3511	Building and repairing of ships
3512	Building and repairing of pleasure and sporting boats
3530	Manufacture of aircraft and spacecraft
3541	Manufacture of motorcycles

3542	Manufacture of bicycles
3543	Manufacture of invalid carriages
3550	Manufacture of other transport equipment n.e.c.
3621	Striking of coins
3622	Manufacture of jewellery and related articles n.e.c.
3630	Manufacture of musical instruments
3640	Manufacture of sports goods
3650	Manufacture of games and toys
3661	Manufacture of imitation jewellery
3662	Manufacture of brooms and brushes
3663	Other manufacturing n.e.c.

I.2: Beyond NACE-4 Level Based on the Quantitative Criteria set out in Paragraphs 15 and 16 of Article 10a of the 2009 Directive

Prodcom code	Description
15331427	Concentrated tomato puree and paste
155120	Milk and cream in solid forms
155153	Casein
155154	Lactose and lactose syrup
15891333	Dry bakers' yeast
24111150	Hydrogen (including the production of hydrogen in combination with syngas)
24111160	Nitrogen
24111170	Oxygen
243021	Prepared pigments, opacifiers and colours, vitrifiable enamels and glazes, engobes, liquid lustres and the like; glass frit
24621030	Gelatin and its derivatives; isinglass (excluding casein glues and bone glues)
261411	Slivers, rovings, yarn and chopped strands, of glass fibre
26821400	Artificial graphite, colloidal, semi-colloidal graphite and preparations
26821620	Exfoliated vermiculite, expanded clays, foamed slag and similar expanded mineral materials and mixtures thereof

I.3: At NACE-4 Level Based on the Qualitative Criteria set out in Paragraph 17 of Article 10a of the 2009

NACE code	Description
1730	Finishing of textiles
2020	Manufacture of veneer sheets; manufacture of plywood, laminboard, particle board, fibre board and other panels and boards other panels and boards
2416	Manufacture of plastics in primary forms
2751	Casting of iron
2753	Casting of light metals

Source: EU (2009b).

Annexure II: Results of the Quantitative Analysis at NACE-4 Level for List 1.4

NACE-4 code	Direct costs/ GVA	Indirect costs/ GVA	Total costs/ GVA	Trade	Significant risk of CL
1110	0,7%	0,2%	0,8%	60,2%	YES
1310	<5%	<5%	<5%	84,9%	YES
1320	0,3%	1,5%	1,8%	86,2%	YES
1411	0,8%	1,2%	2,0%	44,2%	YES
1422	0,6%	2,8%	3,3%	49,0%	YES
1450	1,3%	2,3%	3,6%	182,0%	YES
1520	0,4%	0,8%	1,2%	49,7%	YES
1541	1,9%	0,8%	2,7%	49,4%	YES
1591	0,4%	0,2%	0,5%	53,6%	YES
1593	<5%	0,3%	<5%	31,5%	YES
1712	<5%	<5%	<5%	40,5%	YES

Annexure II continued...

Annexure II continued...

1713	<5%	2,6%	<5%	40,5%	YES
1714	<5%	<5%	<5%	40,5%	YES
1715	<5%	2,4%	<5%	40,5%	YES
1716	<5%	<5%	<5%	40,5%	YES
1717	<5%	<5%	<5%	40,5%	YES
1721	0,2%	1,0%	1,2%	58,3%	YES
1722	<5%	2,3%	<5%	58,3%	YES
1723	<5%	<5%	<5%	58,3%	YES
1724	<5%	1,9%	<5%	58,3%	YES
1725	<5%	1,1%	<5%	58,3%	YES
1740	0,1%	0,4%	0,5%	46,7%	YES

1751	0,2%	0,6%	0,8%	31,2%	YES
1752	0,2%	0,8%	1,0%	34,1%	YES
1753	<5%	1,8%	<5%	30,9%	YES
1754	0,1%	0,7%	0,8%	37,4%	YES
1760	<5%	0,8%	<5%	47,7%	YES
1771	<5%	0,7%	<5%	39,3%	YES
1772	<5%	0,5%	<5%	63,9%	YES
1821	<5%	0,3%	<5%	44,7%	YES
1822	0,0%	0,2%	0,2%	70,6%	YES
1823	<5%	0,3%	<5%	75,6%	YES
1824	0,2%	0,2%	0,4%	99,4%	YES
1830	0,2%	0,2%	0,3%	101,9%	YES
1910	<5%	1,1%	<5%	47,5%	YES
1920	0,1%	0,2%	0,2%	87,5%	YES
1930	0,1%	0,3%	0,4%	59,7%	YES
2010	0,0%	1,0%	1,6%	30,8%	YES
2052	<5%	<5%	<5%	36,5%	YES
2111	2,9%	<5%	<5%	46,1%	YES
2124	<5%	0,9%	<5%	38,7%	YES
2215	<5%	<5%	<5%	37,2%	YES
2330	<5%	<5%	<5%	44,3%	YES
2412	0,7%	1,4%	3,2%	43,1%	YES
2420	1,2%	0,4%	1,6%	41,1%	YES
2441	0,4%	0,9%	1,3%	85,8%	YES
2442	0,0%	0,2%	0,3%	58,6%	YES

2452	<5%	0,3%	<5%	45,3%	YES
2463	<5%	0,3%	<5%	77,0%	YES
2464	0,3%	1,1%	1,4%	65,7%	YES
2465	<5%	<5%	<5%	105,1%	YES
2466	1,0%	0,8%	1,8%	49,6%	YES
2470	1,5%	2,8%	4,3%	32,8%	YES
2511	0,5%	0,9%	1,4%	37,1%	YES
2615	0,8%	1,6%	2,4%	49,1%	YES
2621	1,2%	0,7%	1,8%	57,0%	YES
2622	0,9%	0,5%	1,4%	30,2%	YES
2623	1,4%	1,0%	2,4%	34,5%	YES
2624	0,7%	0,4%	1,2%	54,6%	YES
2625	0,9%	0,6%	1,5%	49,1%	YES
2626	1,9%	1,0%	2,8%	37,2%	YES
2681	<5%	0,5%	<5%	40,5%	YES
2722	0,6%	0,7%	0,9%	45,2%	YES
2741	<5%	<5%	<5%	73,9%	YES
2861	0,1%	<5%	<5%	64,6%	YES
2862	0,1%	0,3%	0,4%	42,5%	YES
2874	<5%	0,5%	<5%	36,2%	YES
2875	<5%	0,3%	<5%	37,1%	YES
2911	0,3%	0,3%	0,6%	51,0%	YES
2912	<5%	0,3%	<5%	47,4%	YES
2913	<5%	0,3%	<5%	47,2%	YES

2914	0,0%	0,5%	0,5%	39,0%	YES
2921	<5%	0,2%	<5%	56,8%	YES
2923	0,0%	0,1%	0,2%	34,5%	YES
2924	<5%	0,2%	<5%	46,4%	YES
2932	<5%	0,2%	<5%	31,1%	YES
2941	<5%	0,2%	<5%	73,4%	YES
2942	<5%	0,2%	<5%	48,5%	YES
2943	<5%	0,2%	<5%	48,1%	YES
2951	<5%	0,3%	<5%	42,1%	YES
2952	0,1%	0,2%	0,3%	63,0%	YES
2953	0,1%	0,1%	0,2%	43,6%	YES
2954	<5%	<5%	<5%	71,7%	YES
2955	<5%	0,2%	<5%	46,6%	YES
2956	0,0%	0,1%	0,1%	48,7%	YES
2960	0,2%	0,3%	0,5%	33,6%	YES
2971	<5%	0,3%	<5%	40,7%	YES
3001	0,3%	0,3%	0,9%	87,8%	YES
3002	0,1%	0,2%	0,3%	83,5%	YES
3110	<5%	0,3%	<5%	43,5%	YES
3120	<5%	0,2%	<5%	39,3%	YES
3130	0,1%	0,9%	1,0%	32,6%	YES
3140	0,5%	1,4%	1,9%	54,3%	YES
3150	<5%	0,3%	<5%	41,3%	YES
3162	0,1%	0,4%	0,5%	44,8%	YES
3210	0,0%	0,7%	0,8%	81,4%	YES

3220	0,0%	0,2%	0,2%	76,8%	YES
3230	<5%	0,2%	<5%	70,5%	YES
3310	0,0%	0,1%	0,2%	72,7%	YES
3320	0,1%	0,2%	0,2%	59,6%	YES
3340	0,1%	0,3%	0,4%	66,1%	YES
3350	<5%	0,2%	<5%	107,4%	YES
3511	<5%	0,6%	<5%	69,6%	YES
3512	0,1%	0,2%	0,3%	62,0%	YES
3530	0,0%	0,2%	0,3%	79,7%	YES
3541	<5%	<5%	<5%	52,7%	YES
3542	<5%	0,3%	<5%	50,4%	YES
3543	<5%	0,2%	<5%	35,0%	YES
3550	<5%	0,4%	<5%	36,6%	YES
3621	<5%	<5%	<5%	49,4%	YES
3622	<5%	<5%	<5%	102,6%	YES
3630	<5%	0,1%	<5%	78,2%	YES
3640	<5%	0,4%	<5%	66,6%	YES
3650	0,1%	0,4%	0,4%	76,1%	YES
3661	<5%	<5%	<5%	88,2%	YES
3662	<5%	0,5%	<5%	43,3%	YES
3663	0,3%	0,8%	1,1%	60,4%	YES

Source: European Union (2009c).

Annexure III: Chapter-wise Distribution of 4010 HS 6-digit Items Corresponding to the 'Full EU List'*

HS chapter	Chapter heading	No. of HS6 items under a chapter
84	Nuclear reactors, boilers, machinery and mechanical appliances; parts thereof	447
29	Organic chemicals	340
85	Electrical machinery and equipment and parts thereof; sound recorders and reproducers, television image and sound recorders and reproducers, and parts and accessories of such articles	270
28	Inorganic chemicals; organic or inorganic compounds of precious metals, of rare-earth metals, of radioactive elements or of isotopes	181
72	Iron and steel	164
90	Optical, photographic, cinematographic, measuring, checking, precision, medical or surgical instruments and apparatus; parts and accessories thereof	162
52	Cotton	127
62	Articles of apparel and clothing accessories, not knitted or crocheted	119
61	Articles of apparel and clothing accessories, knitted or crocheted	116
55	Man-made staple fibres	113
73	Articles of iron or steel	82
25	Salt; sulphur; earths and stone; plastering materials, lime and cement	71
48	Paper and paperboard; articles of paper pulp, of paper or of paperboard	71
54	Man-made filaments	67
82	Tools, implements, cutlery, spoons and forks, of base metal; parts thereof of base metal	66
39	Plastics and articles thereof	58
74	Copper and articles thereof	58
63	Other made up textile articles; sets; worn clothing and worn textile articles; rags	56

Annexure III continued...

3	Fish and crustaceans, molluscs and other aquatic invertebrates	53
91	Clocks and watches and parts thereof	53
70	Glass and glassware	51
81	Other base metals; cermets; articles thereof	51
71	Natural or cultured pearls, precious or semi-precious stones, precious metals, metals clad with precious metal and articles thereof; imitation jewellery; coin	47
38	Miscellaneous chemical products	46
44	Wood and articles of wood; wood charcoal	46
96	Miscellaneous manufactured articles	45
60	Knitted or crocheted fabrics	44

95	Toys, games and sports requisites; parts and accessories thereof	43
15	Animal or vegetable fats and oils and their cleavage products; prepared edible fats; animal or vegetable waxes	42
58	Special woven fabrics; tufted textile fabrics; lace; tapestries; trimmings; embroidery	41
33	Essential oils and resinoids; perfumery, cosmetic or toilet preparations	36
40	Rubber and articles thereof	36
76	Aluminium and articles thereof	36
27	Mineral fuels, mineral oils and products of their distillation; bituminous substances; mineral waxes.	35
32	Tanning or dyeing extracts; tannins and their derivatives; dyes, pigments and other colouring matter; paints and varnishes; putty and other mastics; inks	34
56	Wadding, felt and nonwovens; special yarns; twine, cordage, ropes and cables and articles thereof	33
30	Pharmaceutical products	31
51	Wool, fine or coarse animal hair; horsehair yarn and woven fabric	30
37	Photographic or cinematographic goods	29
64	Footwear, gaiters and the like; parts of such articles	29
69	Ceramic products	28

41	Raw hides and skins (other than furskins) and leather	27
31	Fertilisers	26
87	Vehicles other than railway or tramway rolling-stock, and parts and accessories thereof	26
53	Other vegetable textile fibres; paper yarn and woven fabrics of paper yarn	23
57	Carpets and other textile floor coverings	23
92	Musical instruments; parts and accessories of such articles	23
26	Ores, slag and ash	22
59	Impregnated, coated, covered or laminated textile fabrics; textile articles of a kind suitable for industrial use	21
93	Arms and ammunition; parts and accessories thereof	21
42	Articles of leather; saddlery and harness; travel goods, handbags and similar containers; articles of animal gut (other than silk-worm gut)	20
47	Pulp of wood or of other fibrous cellulosic material; recovered (waste and scrap) paper or paperboard	20
22	Beverages, spirits and vinegar	17
75	Nickel and articles thereof	17
89	Ships, boats and floating structures	17
68	Articles of stone, plaster, cement, asbestos, mica or similar materials	16
88	Aircraft, spacecraft, and parts thereof	16
16	Preparations of meat, of fish or of crustaceans, molluscs or other aquatic invertebrates	14
17	Sugars and sugar confectionery	14
34	Soap, organic surface-active agents, washing preparations, lubricating preparations, artificial waxes, prepared waxes, polishing or scouring preparations, candles and similar articles, modelling pastes, "dental waxes" and dental preparations with a basis of plaster	14
23	Residues and waste from the food industries; prepared animal fodder	12
94	Furniture; bedding, mattresses, mattress supports, cushions and similar stuffed furnishings; lamps and lighting fittings, not elsewhere specified or included; illuminated signs, illuminated name-plates and the like; prefabricated buildings	12

65	Headgear and parts thereof	10
78	Lead and articles thereof	10
79	Zinc and articles thereof	10
83	Miscellaneous articles of base metal	10
11	Products of the milling industry; malt; starches; inulin; wheat gluten	9
43	Furskins and artificial fur; manufactures thereof	8
50	Silk	8
80	Tin and articles thereof	8
49	Printed books, newspapers, pictures and other products of the printing industry; manuscripts, typescripts and plans	7
66	Umbrellas, sun umbrellas, walking-sticks, seat-sticks, whips, riding-crops and parts thereof	7
67	Prepared feathers and down and articles made of feathers or of down; artificial flowers; articles of human hair	7
35	Albuminoidal substances; modified starches; glues; enzymes	6
45	Cork and articles of cork	6
46	Manufactures of straw, of esparto or of other plaiting materials; basketware and wickerwork	5
4	Dairy produce; birds' eggs; natural honey; edible products of animal origin, not elsewhere specified or included	3
12	Oil seeds and oleaginous fruits; miscellaneous grains, seeds and fruit; industrial or medicinal plants; straw and fodder	2
5	Products of animal origin, not elsewhere specified or included	1
14	Vegetable plaiting materials; vegetable products not elsewhere specified or included	1
19	Preparations of cereals, flour, starch or milk; pastrycooks' products	1
20	Preparations of vegetables, fruit, nuts or other parts of plants	1
21	Miscellaneous edible preparations	1
36	Explosives; pyrotechnic products; matches; pyrophoric alloys; certain combustible preparations	1
All 84 chapters		4010

Note: *The HS chapters have been arranged in a descending order by the number of HS 6-digit items corresponding to each chapter (that have been found to correspond to the 'Full EU list').
Source: Based on the concordance table prepared by the author.

Annexure IV: India's Export to the EU in the HS 6-digit Items Included in the Various Lists Identified corresponding to the 'Full EU List'

List	No. of HS6 items in a list	No. of corres-ponding HS chapters	Export to the EU in the HS 6-digit items included in a list (US$ million)					Export to the EU in the HS 6-digit items included in a list as % of total export to the EU				
			2003	2004	2005	2006	2007	2003	2004	2005	2006	2007
3851 List	3851	84	11109.9	13757.5	18903.68	21730.05	26485.65	82.26	82.21	83.58	83.79	83.76
Above 10' List	1227	64	9716.15	11526.78	16505.48	18154.68	21224.16	71.94	68.88	72.97	70	67.12
Above 33' List	328	51	4388.54	5314.58	6830.46	7473.86	8702.71	32.49	31.76	30.2	28.82	27.52
Above 50' List	96	31	1728.53	2100.44	2479.36	2757.03	3276.6	12.8	12.55	10.96	10.63	10.36

Annexure V: India's Export to the World in the HS 6-digit Items Included in the Various Lists Identified corresponding to the 'Full EU List'

List	No. of HS6 items in a list	No. of corres-ponding HS chapters	Export to the World in the HS 6-digit items included in a list (US$ million)					Export to the World in the HS 6-digit items included in a list as % of total export to the World				
			2003	2004	2005	2006	2007	2003	2004	2005	2006	2007
3851 List	3851	84	49291.41	62835.61	83761.16	102161.64	121355	83.04	82.78	83.47	84.29	83.18
Above 10' List	1227	64	33738.13	40114.58	54057.18	62362.2	72275.26	56.84	52.85	53.87	51.45	49.54
Above 33' List	328	51	8879.22	10278.64	12977.07	14237.52	15957.13	14.96	13.54	12.93	11.75	10.94
Above 50' List	96	31	2520.12	2962.29	3479.14	3908.71	4572.69	4.25	3.9	3.47	3.22	3.13

Annexure VI: Chapter-wise distribution of 1399 HS 6-digit Items Corresponding to the 'Truncated EU List'

HS chapter	Chapter heading	No. of HS6 items under a chapter
29	Organic chemicals	266
28	Inorganic chemicals; organic or inorganic compounds of precious metals, of rare-earth metals, of radioactive elements or of isotopes	176
72	Iron and steel	164
48	Paper and paperboard; articles of paper pulp, of paper or of paperboard	67
39	Plastics and articles thereof	58
74	Copper and articles thereof	58
81	Other base metals; cermets; articles thereof	51
52	Cotton	47
73	Articles of iron or steel	41
70	Glass and glassware	40
76	Aluminium and articles thereof	36
55	Man-made staple fibres	31
27	Mineral fuels, mineral oils and products of their distillation; bituminous substances; mineral waxes.	30
32	Tanning or dyeing extracts; tannins and their derivatives; dyes, pigments and other colouring matter; paints and varnishes; putty and other mastics; inks	30
44	Wood and articles of wood; wood charcoal	30
31	Fertilisers	26
25	Salt; sulphur; earths and stone; plastering materials, lime and cement	24

Annexure VI continued...

47	Pulp of wood or of other fibrous cellulosic material; recovered (waste and scrap) paper or paperboard	20
38	Miscellaneous chemical products	19
51	Wool, fine or coarse animal hair; horsehair yarn and woven fabric	19
22	Beverages, spirits and vinegar	17
75	Nickel and articles thereof	17
53	Other vegetable textile fibres; paper yarn and woven fabrics of paper yarn	16
17	Sugars and sugar confectionery	14
40	Rubber and articles thereof	14
78	Lead and articles thereof	10
11	Products of the milling industry; malt; starches; inulin; wheat gluten	9
79	Zinc and articles thereof	9
54	Man-made filaments	8
69	Ceramic products	8
80	Tin and articles thereof	8
35	Albuminoidal substances; modified starches; glues; enzymes	5
50	Silk	5
65	Headgear and parts thereof	5
87	Vehicles other than railway or tramway rolling-stock, and parts and accessories thereof	4
4	Dairy produce; birds' eggs; natural honey; edible products of animal origin, not elsewhere specified or included	3
15	Animal or vegetable fats and oils and their cleavage products; prepared edible fats; animal or vegetable waxes	3
42	Articles of leather; saddlery and harness; travel goods, handbags and similar containers; articles of animal gut (other than silk-worm gut)	2
71	Natural or cultured pearls, precious or semi-precious stones, precious metals, metals clad with precious metal and articles thereof; imitation jewellery; coin	2
19	Preparations of cereals, flour, starch or milk; pastrycooks' products	1

20	Preparations of vegetables, fruit, nuts or other parts of plants	1
21	Miscellaneous edible preparations	1
26	Ores, slag and ash	1
68	Articles of stone, plaster, cement, asbestos, mica or similar materials	1
85	Electrical machinery and equipment and parts thereof; sound recorders and reproducers, television image and sound recorders and reproducers, and parts and accessories of such articles	1
94	Furniture; bedding, mattresses, mattress supports, cushions and similar stuffed furnishings; lamps and lighting fittings, not elsewhere specified or included; illuminated signs, illuminated name-plates and the like; prefabricated buildings	1
Total		1399

Source: Based on the concordance table prepared by the author.

Annexure VII: Chapter-wise Distribution of India's Export to the EU in 1321 HS 6-digit Items corresponding to the 'Truncated EU List'

HS chapter	Chapter heading	No. of HS6 items in the 1321 list	Export to the EU in 1321 HS 6-digit items by chapter (US$ million)					Export to the EU in 1321 HS 6-digit items (by chapter) as % of total export to the EU				
			2003	2004	2005	2006	2007	2003	2004	2005	2006	2007
4	Dairy produce; birds' eggs; natural honey; edible products of animal origin, not elsewhere specified or included	3	0.17	0.91	1.40	0.94	0.01	0.00	0.01	0.01	0.00	0.00
11	Products of the milling industry; malt; starches; inulin; wheat gluten	9	0.07	0.15	0.09	0.11	0.16	0.00	0.00	0.00	0.00	0.00
15	Animal or vegetable fats and oils and their cleavage products; prepared edible fats; animal or vegetable waxes	3	0.02	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00
17	Sugars and sugar confectionery	13	13.78	6.68	8.69	30.85	68.81	0.10	0.04	0.04	0.12	0.22
19	Preparations of cereals, flour, starch or milk; pastrycooks' products	1	0.04	0.12	0.12	0.10	0.16	0.00	0.00	0.00	0.00	0.00
20	Preparations of vegetables, fruit, nuts or other parts of plants	1	0.05	0.01	0.01	0.04	0.06	0.00	0.00	0.00	0.00	0.00
21	Miscellaneous edible preparations	1	0.00	0.07	0.02	0.04	0.01	0.00	0.00	0.00	0.00	0.00
22	Beverages, spirits and vinegar	16	2.09	1.62	1.59	3.27	15.85	0.02	0.01	0.01	0.01	0.05
25	Salt; sulphur; earths and stone; plastering materials, lime and cement	20	17.98	4.95	7.47	7.43	8.52	0.13	0.03	0.03	0.03	0.03

27	Mineral fuels, mineral oils and products of their distillation; bituminous substances; mineral waxes.	22	421.01	541.71	2093.68	2174.28	3124.37	3.12	3.24	9.26	8.38	9.88
28	Inorganic chemicals; organic or inorganic compounds of precious metals, of rare-earth metals, of radioactive elements or of isotopes	166	38.13	40.65	58.91	79.57	124.76	0.28	0.24	0.26	0.31	0.39
29	Organic chemicals	255	562.19	687.60	899.53	1216.42	1398.27	4.16	4.11	3.98	4.69	4.42
31	Fertilisers	24	0.60	0.98	1.51	0.49	2.68	0.00	0.01	0.01	0.00	0.01
32	Tanning or dyeing extracts; tannins and their derivatives; dyes, pigments and other colouring matter; paints and varnishes; putty and other mastics; inks	30	176.85	171.26	234.16	280.25	338.56	1.31	1.02	1.04	1.08	1.07
35	Albuminoidal substances; modified starches; glues; enzymes	5	7.66	14.13	13.60	15.66	36.21	0.06	0.08	0.06	0.06	0.11
38	Miscellaneous chemical products	19	26.06	30.60	52.90	47.12	64.15	0.19	0.18	0.23	0.18	0.20
39	Plastics and articles thereof	58	56.94	142.46	144.07	181.22	254.59	0.42	0.85	0.64	0.70	0.81
40	Rubber and articles thereof	13	1.82	3.39	8.17	8.16	5.16	0.01	0.02	0.04	0.03	0.02
42	Articles of leather; saddlery and harness; travel goods, handbags and similar containers; articles of animal gut (other than silk-worm gut)	2	225.57	258.02	264.90	255.09	267.21	1.67	1.54	1.17	0.98	0.84
44	Wood and articles of wood; wood charcoal	30	4.02	5.87	6.25	7.08	7.11	0.03	0.04	0.03	0.03	0.02

47	Pulp of wood or of other fibrous cellulosic material; recovered (waste and scrap) paper or paperboard	15	0.06	0.14	0.01	0.09	0.57	0.00	0.00	0.00	0.00	0.00
48	Paper and paperboard; articles of paper pulp, of paper or of paperboard	65	9.57	12.11	20.77	26.09	33.29	0.07	0.07	0.09	0.10	0.11
50	Silk	5	3.63	5.08	7.23	5.61	5.84	0.03	0.03	0.03	0.02	0.02
51	Wool, fine or coarse animal hair; horsehair yarn and woven fabric	16	11.74	25.70	26.29	27.95	35.97	0.09	0.15	0.12	0.11	0.11
52	Cotton	40	211.95	219.42	285.63	344.51	370.41	1.57	1.31	1.26	1.33	1.17
53	Other vegetable textile fibres; paper yarn and woven fabrics of paper yarn	15	27.65	29.09	22.00	24.15	18.78	0.20	0.17	0.10	0.09	0.06
54	Man-made filaments	8	12.15	15.61	10.71	14.26	5.70	0.09	0.09	0.05	0.06	0.02
55	Man-made staple fibres	31	105.30	123.23	111.68	128.87	143.24	0.78	0.74	0.49	0.50	0.45
65	Headgear and parts thereof	5	1.23	1.28	1.41	1.46	1.65	0.01	0.01	0.01	0.01	0.01
68	Articles of stone, plaster, cement, asbestos, mica or similar materials	1	0.00	0.06	0.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00
69	Ceramic products	8	1.21	1.10	1.30	1.67	1.48	0.01	0.01	0.01	0.01	0.00
70	Glass and glassware	40	16.84	16.24	18.61	39.12	33.50	0.12	0.10	0.08	0.15	0.11
71	Natural or cultured pearls, precious or semi-precious stones, precious metals, metals clad with precious metal and articles thereof; imitation jewellery; coin	2	0.25	0.11	0.00	0.23	0.14	0.00	0.00	0.00	0.00	0.00
72	Iron and steel	154	222.56	835.01	755.70	1385.03	2082.03	1.65	4.99	3.34	5.34	6.58
73	Articles of iron or steel	41	65.43	117.85	163.43	196.19	295.04	0.48	0.70	0.72	0.76	0.93

74	Copper and articles thereof	58	58.15	85.04	110.95	192.27	154.42	0.43	0.51	0.49	0.74	0.49
75	Nickel and articles thereof	16	2.21	2.56	6.88	11.45	15.15	0.02	0.02	0.03	0.04	0.05
76	Aluminium and articles thereof	36	33.39	45.55	66.07	89.68	138.47	0.25	0.27	0.29	0.35	0.44
78	Lead and articles thereof	9	0.34	2.02	2.52	4.46	7.10	0.00	0.01	0.01	0.02	0.02
79	Zinc and articles thereof	9	1.23	2.65	7.33	282.24	208.93	0.01	0.02	0.03	1.09	0.66
80	Tin and articles thereof	8	2.21	3.34	2.18	13.39	1.52	0.02	0.02	0.01	0.05	0.00
81	Other base metals; cermets; articles thereof	42	1.60	3.79	7.56	14.31	17.14	0.01	0.02	0.03	0.06	0.05
85	Electrical machinery and equipment and parts thereof; sound recorders and reproducers, television image and sound recorders and reproducers, and parts and accessories of such articles	1	0.30	0.70	0.37	0.09	0.35	0.00	0.00	0.00	0.00	0.00
87	Vehicles other than railway or tramway rolling-stock, and parts and accessories thereof	4	2.71	1.61	1.67	6.64	9.78	0.02	0.01	0.01	0.03	0.03
94	Furniture; bedding, mattresses, mattress supports, cushions and similar stuffed furnishings; lamps and lighting fittings, not elsewhere specified or included; illuminated signs, illuminated name-plates and the like; prefabricated buildings	1	0.16	0.26	0.08	0.25	0.41	0.00	0.00	0.00	0.00	0.00
Total		1321	2346.92	3460.75	5427.79	7118.15	9297.57	17.38	20.68	24.00	27.45	29.40

Source: Author's calculation based on the COMTRADE data.

Annexure VIII: Chapter-wise Distribution of India's Export to the World in 1321 HS 6-digit Items corresponding to the 'Truncated EU List'

HS chapter	Chapter heading	No. of HS6 items in the 1321 list	Export to the World in 1321 HS 6-digit items by chapter (US$ million)					Export to the World in 1321 HS 6-dgt items (By chapter) as % of total export to the World				
			2003	2004	2005	2006	2007	2003	2004	2005	2006	2007
4	Dairy produce; birds' eggs; natural honey; edible products of animal origin, not elsewhere specified or included	3	16.97	37.82	123.48	87.88	102.32	0.03	0.05	0.12	0.07	0.07
11	Products of the milling industry; malt; starches; inulin; wheat gluten	9	2.28	7.09	5.06	5.16	8.01	0.00	0.01	0.01	0.00	0.01
15	Animal or vegetable fats and oils and their cleavage products; prepared edible fats; animal or vegetable waxes	3	0.14	0.05	0.06	0.07	0.28	0.00	0.00	0.00	0.00	0.00
17	Sugars and sugar confectionery	13	400.24	61.23	56.08	654.48	1039.57	0.67	0.08	0.06	0.54	0.71
19	Preparations of cereals, flour, starch or milk; pastrycooks' products	1	0.57	0.69	1.46	1.17	1.34	0.00	0.00	0.00	0.00	0.00
20	Preparations of vegetables, fruit, nuts or other parts of plants	1	0.12	0.10	0.12	0.14	0.08	0.00	0.00	0.00	0.00	0.00

21	Miscellaneous edible preparations	1	2.79	2.25	2.08	2.33	1.71	0.00	0.00	0.00	0.00	0.00
22	Beverages, spirits and vinegar	16	23.22	26.09	45.14	58.71	72.09	0.04	0.03	0.04	0.05	0.05
25	Salt; sulphur; earths and stone; plastering materials, lime and cement	20	195.12	215.37	302.74	345.14	276.37	0.33	0.28	0.30	0.28	0.19
27	Mineral fuels, mineral oils and products of their distillation; bituminous substances; mineral waxes.	22	3510.89	6016.78	10330.77	17742.27	23203.39	5.91	7.93	10.29	14.64	15.90
28	Inorganic chemicals; organic or inorganic compounds of precious metals, of rare-earth metals, of radioactive elements or of isotopes	166	360.26	578.54	721.36	834.66	738.54	0.61	0.76	0.72	0.69	0.51
29	Organic chemicals	255	2030.17	2815.85	3880.65	5151.34	5663.31	3.42	3.71	3.87	4.25	3.88
31	Fertilisers	24	6.52	9.36	14.36	11.58	15.71	0.01	0.01	0.01	0.01	0.01
32	Tanning or dyeing extracts; tannins and their derivatives; dyes, pigments and other colouring matter; paints and varnishes; putty and other mastics; inks	30	567.71	583.34	707.50	846.60	1038.92	0.96	0.77	0.71	0.70	0.71
35	Albuminoidal substances; modified starches; glues; enzymes	5	56.25	65.26	112.02	102.92	183.72	0.09	0.09	0.11	0.08	0.13
38	Miscellaneous chemical products	19	55.09	59.76	108.02	100.81	146.83	0.09	0.08	0.11	0.08	0.10

39	Plastics and articles thereof	58	645.96	1238.75	1332.58	1619.23	1488.92	1.09	1.63	1.33	1.34	1.02
40	Rubber and articles thereof	13	12.92	11.05	28.23	26.26	22.45	0.02	0.01	0.03	0.02	0.02
42	Articles of leather; saddlery and harness; travel goods, handbags and similar containers; articles of animal gut (other than silk-worm gut)	2	291.34	333.86	341.95	325.70	333.07	0.49	0.44	0.34	0.27	0.23
44	Wood and articles of wood; wood charcoal	30	25.22	43.05	51.94	55.34	69.86	0.04	0.06	0.05	0.05	0.05
47	Pulp of wood or of other fibrous cellulosic material; recovered (waste and scrap) paper or paperboard	15	0.66	1.18	1.26	1.08	2.78	0.00	0.00	0.00	0.00	0.00
48	Paper and paperboard; articles of paper pulp, of paper or of paperboard	65	137.44	182.00	240.89	254.74	246.08	0.23	0.24	0.24	0.21	0.17
50	Silk	5	8.71	9.73	16.62	16.13	12.69	0.01	0.01	0.02	0.01	0.01
51	Wool, fine or coarse animal hair; horsehair yarn and woven fabric	16	32.96	45.72	53.19	57.95	71.90	0.06	0.06	0.05	0.05	0.05
52	Cotton	40	1162.12	1341.58	1388.28	1615.14	1790.35	1.96	1.77	1.38	1.33	1.23
53	Other vegetable textile fibres; paper yarn and woven fabrics of paper yarn	15	58.71	79.37	74.86	71.37	53.32	0.10	0.10	0.07	0.06	0.04
54	Man-made filaments	8	35.62	35.37	37.14	37.23	25.18	0.06	0.05	0.04	0.03	0.02
55	Man-made staple fibres	31	325.21	368.31	352.14	408.28	543.83	0.55	0.49	0.35	0.34	0.37
65	Headgear and parts thereof	5	3.91	3.16	3.16	3.01	3.85	0.01	0.00	0.00	0.00	0.00

68	Articles of stone, plaster, cement, asbestos, mica or similar materials	1	0.03	0.13	0.45	0.02	0.06	0.00	0.00	0.00	0.00	0.00
69	Ceramic products	8	32.78	26.03	30.78	47.41	53.30	0.06	0.03	0.03	0.04	0.04
70	Glass and glassware	40	125.93	112.61	107.04	134.33	170.35	0.21	0.15	0.11	0.11	0.12
71	Natural or cultured pearls, precious or semi-precious stones, precious metals, metals clad with precious metal and articles thereof; imitation jewellery; coin	2	0.54	0.36	0.33	0.37	0.42	0.00	0.00	0.00	0.00	0.00
72	Iron and steel	154	2398.11	3491.25	4328.34	5180.85	5959.59	4.04	4.60	4.31	4.27	4.08
73	Articles of iron or steel	41	279.32	623.38	1035.20	1399.13	2233.58	0.47	0.82	1.03	1.15	1.53
74	Copper and articles thereof	58	504.39	846.57	1318.92	2801.00	2901.35	0.85	1.12	1.31	2.31	1.99
75	Nickel and articles thereof	16	5.91	7.57	17.93	23.70	28.94	0.01	0.01	0.02	0.02	0.02
76	Aluminium and articles thereof	36	359.65	410.61	657.00	770.07	1037.81	0.61	0.54	0.65	0.64	0.71
78	Lead and articles thereof	9	2.11	7.32	16.04	17.46	40.15	0.00	0.01	0.02	0.01	0.03
79	Zinc and articles thereof	9	9.45	32.19	28.36	514.04	382.95	0.02	0.04	0.03	0.42	0.26
80	Tin and articles thereof	8	12.20	8.21	10.19	30.80	17.20	0.02	0.01	0.01	0.03	0.01
81	Other base metals; cermets; articles thereof	42	5.86	13.70	21.73	37.55	31.97	0.01	0.02	0.02	0.03	0.02
85	Electrical machinery and equipment and parts thereof; sound recorders and reproducers, television image and sound recorders and reproducers, and parts and accessories of such articles	1	0.78	1.28	0.98	0.41	0.93	0.00	0.00	0.00	0.00	0.00

87	Vehicles other than railway or tramway rolling-stock, and parts and accessories thereof	4	80.37	99.59	213.99	226.92	342.62	0.14	0.13	0.21	0.19	0.23
94	Furniture; bedding, mattresses, mattress supports, cushions and similar stuffed furnishings; lamps and lighting fittings, not elsewhere specified or included; illuminated signs, illuminated name-plates and the like; prefabricated buildings	1	0.80	0.66	0.35	0.48	0.98	0.00	0.00	0.00	0.00	0.00
Total		1321	13787.37	19854.14	28120.77	41621.26	50358.67	23.23	26.16	28.02	34.34	34.52

Source: Author's calculation based on the COMTRADE data.

Annexure IX: Top 20 Chapters in terms of India's Export to the EU in 2007 in the 1321 HS 6-digit Items corresponding to the 'Truncated EU List'

HS chapter	No. of HS6 items in the 1321 list	Export to the EU in 1321 HS 6-digit items by chapter (US$ million)					Export to the World in 1321 HS 6-digit items by chapter (US$ million)					Share of the EU in 1321 export basket of India (%)				
		2003	2004	2005	2006	2007	2003	2004	2005	2006	2007	2003	2004	2005	2006	2007
27	22	421.01	541.71	2093.68	2174.28	3124.37	3510.89	6016.78	10330.77	17742.27	23203.39	11.99	9.00	20.27	12.25	13.47
72	154	222.56	835.01	755.70	1385.03	2082.03	2398.11	3491.25	4328.34	5180.85	5959.59	9.28	23.92	17.46	26.73	34.94
29	255	562.19	687.60	899.53	1216.42	1398.27	2030.17	2815.85	3880.65	5151.34	5663.31	27.69	24.42	23.18	23.61	24.69
52	40	211.95	219.42	285.63	344.51	370.41	1162.12	1341.58	1388.28	1615.14	1790.35	18.24	16.36	20.57	21.33	20.69
32	30	176.85	171.26	234.16	280.25	338.56	567.71	583.34	707.50	846.60	1038.92	31.15	29.36	33.10	33.10	32.59
73	41	65.43	117.85	163.43	196.19	295.04	279.32	623.38	1035.20	1399.13	2233.58	23.42	18.91	15.79	14.02	13.21
42	2	225.57	258.02	264.90	255.09	267.21	291.34	333.86	341.95	325.70	333.07	77.42	77.28	77.47	78.32	80.23
39	58	56.94	142.46	144.07	181.22	254.59	645.96	1238.75	1332.58	1619.23	1488.92	8.81	11.50	10.81	11.19	17.10
79	9	1.23	2.65	7.33	282.24	208.93	9.45	32.19	28.36	514.04	382.95	13.02	8.24	25.85	54.91	54.56
74	58	58.15	85.04	110.95	192.27	154.42	504.39	846.57	1318.92	2801.00	2901.35	11.53	10.04	8.41	6.86	5.32
55	31	105.30	123.23	111.68	128.87	143.24	325.21	368.31	352.14	408.28	543.83	32.38	33.46	31.72	31.56	26.34
76	36	33.39	45.55	66.07	89.68	138.47	359.65	410.61	657.00	770.07	1037.81	9.28	11.09	10.06	11.65	13.34
28	166	38.13	40.65	58.91	79.57	124.76	360.26	578.54	721.36	834.66	738.54	10.58	7.03	8.17	9.53	16.89
17	13	13.78	6.68	8.69	30.85	68.81	400.24	61.23	56.08	654.48	1039.57	3.44	10.92	15.50	4.71	6.62
38	19	26.06	30.60	52.90	47.12	64.15	55.09	59.76	108.02	100.81	146.83	47.31	51.21	48.97	46.74	43.69
35	5	7.66	14.13	13.60	15.66	36.21	56.25	65.26	112.02	102.92	183.72	13.62	21.65	12.14	15.22	19.71
51	16	11.74	25.70	26.29	27.95	35.97	32.96	45.72	53.19	57.95	71.90	35.63	56.22	49.42	48.24	50.02
70	40	16.84	16.24	18.61	39.12	33.50	125.93	112.61	107.04	134.33	170.35	13.37	14.42	17.39	29.12	19.67
48	65	9.57	12.11	20.77	26.09	33.29	137.44	182.00	240.89	254.74	246.08	6.97	6.65	8.62	10.24	13.53
53	15	27.65	29.09	22.00	24.15	18.78	58.71	79.37	74.86	71.37	53.32	47.09	36.65	29.39	33.83	35.22
TOP 20 chapters	1075	2292.00	3405.00	5358.91	7016.56	9191.01	13311.22	19286.94	27175.14	40584.90	49227.38	17.22	17.65	19.72	17.29	18.67
Other 25 chapters	246	54.92	55.75	68.88	101.59	106.56	476.15	567.20	945.63	1036.36	1131.29	11.53	9.83	7.28	9.80	9.42
All 45 chapters	1321	2346.92	3460.75	5427.79	7118.15	9297.57	13787.37	19854.14	28120.77	41621.26	50358.67	17.02	17.43	19.30	17.10	18.46

Source: Author's calculation based on the COMTRADE data.

Annex X: India's Export to the EU in the HS 6-digit Items Included in the Various Lists Identified corresponding to the 'Truncated EU List'

List	No. of HS6 items in a list	No. of corres-ponding HS chapters	Export to the EU in the HS 6-digit items included in a list (US$ million)					Export to the EU in the HS 6-digit items included in a list as % of total export to the EU				
			2003	2004	2005	2006	2007	2003	2004	2005	2006	2007
'Truncated Above 10 List'	308	31	1903.44	2367.96	4491.06	4994.72	5676.27	14.09	14.15	19.86	19.26	17.95
'Truncated Above 33 List'	81	22	653.68	790.96	938.99	1105.81	1341.79	4.84	4.73	4.15	4.26	4.24
'Truncated Above 50 List'	21	10	269.72	313.07	343.2	349.05	379	2	1.87	1.52	1.35	1.2

Annexure XI: India's Export to the World in the HS 6-digit Items Included in the Various Lists Identified corresponding to the 'Truncated EU List'

List	No. of HS6 items in a list	No. of corres-ponding HS chapters	Export to the World in the HS 6-digit items included in a list (US$ million)					Export to the World in the HS 6-digit items included in a list as % of total export to the World				
			2003	2004	2005	2006	2007	2003	2004	2005	2006	2007
'Truncated Above 10 List'	308	31	6659.16	9967.18	15129.01	21563.22	24762.78	11.22	13.13	15.08	17.79	16.97
'Truncated Above 33 List'	81	22	1198.89	1471	1774.05	2062.28	2509.26	2.02	1.94	1.77	1.7	1.72
'Truncated Above 50 List'	21	10	365.85	421.04	467.79	472.81	511.02	0.62	0.55	0.47	0.39	0.35

Annexure XII: Chapter-wise Distribution of the EU's Imports from the BASIC Countries in the 1399 HS 6-digit Items corresponding to the 'Truncated EU List'

HS chapter	Description	Source country	2003	2004	2005	2006	2007
			The EU's import in 1399 Items by chapter (US$ thousand)				
4	Dairy produce; birds' eggs; natural honey; edible products of animal origin, not elsewhere specified or included	Brazil	1.74	0.98	1.00	30.22	1.00
		China	0.05	0.55	1.95	18.47	0.00
		India	0.00	12.00	83.03	371.75	355.93
		South Africa	0.12	0.00	0.00	1.43	0.50
11	Products of the milling industry; malt; starches; inulin; wheat gluten	Brazil	1036.63	1578.04	1586.44	756.56	708.75
		China	432.26	457.67	307.97	1242.27	1538.68
		India	0.00	13.86	104.02	81.92	93.05
		South Africa	0.00	0.18	5.00	104.30	6.92
15	Animal or vegetable fats and oils and their cleavage products; prepared edible fats; animal or vegetable waxes	Brazil	5827.35	2824.01	4764.32	8530.01	11264.95
		China	71.32	20.15	88.40	224.34	47.72
		India	944.82	21.76	55.20	0.00	54.01
		South Africa	2.26	0.00	0.00	0.00	0.00
17	Sugars and sugar confectionery	Brazil	145012.82	191766.70	246404.08	337860.44	281872.54
		China	809.36	1940.72	2136.24	2672.87	5014.40
		India	17761.38	15398.23	9074.74	32305.46	134964.41
		South Africa	5268.33	7513.43	4860.68	3707.59	85.82

Annexure XII continued...

19	Preparations of cereals, flour, starch or milk; pastrycooks' products	Brazil	72.57	102.93	57.04	74.12	61.42
		China	963.84	1072.67	1471.06	1517.36	1691.38
		India	63.43	42.03	58.85	105.31	132.56
		South Africa	0.00	0.00	0.00	0.00	0.00
20	Preparations of vegetables, fruit, nuts or other parts of plants	Brazil	0.00	228.99	8.06	13.73	824.03
		China	93092.40	127855.45	92956.66	61086.80	136221.54
		India	83.95	156.69	112.03	79.32	68.09
		South Africa	2.45	0.00	0.93	0.00	0.00
21	Miscellaneous edible preparations	Brazil	16.48	123.07	45.51	41.61	51.57
		China	202.44	319.25	477.38	524.94	720.86
		India	2.26	0.00	0.00	70.06	0.90
		South Africa	2250.00	4018.61	3477.56	4093.32	5177.96
22	Beverages, spirits and vinegar	Brazil	26039.22	44522.26	112350.93	174684.29	287450.62
		China	20404.02	24573.19	26560.61	31139.57	33364.29
		India	1010.45	1492.00	1467.84	3511.42	9068.09
		South Africa	457838.97	542585.32	548173.13	506559.56	598196.03

25	Salt; sulphur; earths and stone; plastering materials, lime and cement	Brazil	224.87	1451.53	476.99	695.17	3052.12
		China	65327.35	84659.19	212904.45	474841.58	759226.18
		India	27854.48	19872.31	21722.14	11426.55	21962.81
		South Africa	14947.59	28249.43	45023.24	47614.87	56485.73
26	Ores, slag and ash	Brazil	530.06	2493.85	106.49	2145.74	4860.95
		China	402.14	683.90	474.43	482.52	515.65
		India	0.00	0.00	0.00	2429.27	0.00
		South Africa	127.86	20.60	15.59	13.30	6.24
27	Mineral fuels, mineral oils and products of their distillation; bituminous substances; mineral waxes.	Brazil	9901.93	108773.59	175604.41	373261.53	337788.33
		China	824562.44	1781235.51	1037924.73	856119.86	982441.81
		India	193794.74	471912.82	1199723.01	1631545.23	2090902.73
		South Africa	2117193.83	2971576.29	3744365.77	3466902.50	3654451.90
28	Inorganic chemicals; organic or inorganic compounds of precious metals, of rare-earth metals, of radioactive elements or of isotopes	Brazil	147397.32	160229.61	233011.94	246117.80	340996.93
		China	438882.41	589305.59	667610.92	875022.14	1094609.93
		India	41544.53	49955.86	54346.95	77542.31	184415.34
		South Africa	191242.62	216513.51	143527.96	142871.75	179267.12
29	Organic chemicals	Brazil	231578.27	270285.15	261699.84	387907.23	582135.73
		China	1113073.51	1427201.18	1856933.06	2288321.60	2946936.76
		India	704584.69	857061.42	944965.22	1249422.22	1588757.17
		South Africa	65091.06	84541.56	119908.25	110591.04	161848.31

31	Fertilisers	Brazil	1390.58	957.82	967.61	1530.43	1723.24
		China	6770.74	6434.27	9621.06	9466.60	9426.81
		India	787.48	1185.01	978.37	1234.18	2164.42
		South Africa	3276.85	5457.02	5177.05	4042.34	4626.71
32	Tanning or dyeing extracts; tannins and their derivatives; dyes, pigments and other colouring matter; paints and varnishes; putty and other mastics; inks	Brazil	19298.32	23348.09	19384.51	43197.51	38779.48
		China	241375.33	308008.79	368178.26	464412.79	549193.25
		India	199825.65	234203.02	250345.15	294393.02	401100.53
		South Africa	12731.53	10738.46	12061.73	15689.80	15055.68
35	Albuminoidal substances; modified starches; glues; enzymes	Brazil	42566.45	50192.17	53627.09	69697.11	61783.30
		China	24856.43	34836.34	35287.50	28958.70	50242.80
		India	9111.44	13088.83	14815.72	13074.02	35667.73
		South Africa	2882.97	4024.08	3013.01	3814.77	3644.46
38	Miscellaneous chemical products	Brazil	28790.29	28761.35	26539.96	41563.48	34086.95
		China	105102.74	108642.60	150580.68	267565.04	273476.39
		India	33405.91	33896.49	61754.13	71408.10	86525.28
		South Africa	6633.72	10545.45	11079.33	8786.29	11141.93
39	Plastics and articles thereof	Brazil	145038.17	121807.74	210767.82	276933.15	471043.22
		China	275477.21	213819.44	387282.19	410806.27	550188.46
		India	49020.90	88532.21	195435.40	162447.95	311114.94
		South Africa	10163.37	33216.52	56791.31	46986.64	37698.65

40	Rubber and articles thereof	Brazil	33318.45	40798.06	56240.18	59729.29	69237.42
		China	5900.25	8457.00	11063.68	20487.57	23475.35
		India	331.38	734.87	2059.41	1454.03	1752.82
		South Africa	15653.66	20308.23	22757.31	29283.98	33454.53
42	Articles of leather; saddlery and harness; travel goods, handbags and similar containers; articles of animal gut (other than silk-worm gut)	Brazil	241.25	362.01	257.55	149.10	217.94
		China	517169.54	525137.47	583369.74	611674.56	595491.62
		India	328638.15	333533.55	303594.56	291879.07	342929.23
		South Africa	162.78	196.95	112.28	23.79	175.22
44	Wood and articles of wood; wood charcoal	Brazil	356912.65	484413.65	418646.32	411691.64	520945.15
		China	74699.15	160440.65	328560.15	498942.46	856783.05
		India	6711.38	4996.83	5334.65	8157.97	8622.47
		South Africa	43411.07	46846.87	45042.50	33319.53	31128.29
47	Pulp of wood or of other fibrous cellulosic material; recovered (waste and scrap) paper or paperboard	Brazil	778285.21	933557.04	1206485.00	1637782.32	2115027.16
		China	2538.84	6483.72	8541.71	17086.30	28932.06
		India	6185.96	6895.25	4460.77	298.15	74.42
		South Africa	87684.52	136978.88	129220.86	105753.17	180467.98
48	Paper and paperboard; articles of paper pulp, of paper or of paperboard	Brazil	261980.89	270872.82	326870.10	324486.37	337458.55
		China	26163.86	44593.28	97240.87	142971.46	431307.53
		India	14363.21	16981.23	28973.39	27385.68	36588.48
		South Africa	156655.37	149195.12	141190.10	182530.49	252796.87

50	Silk	Brazil	3484.15	3904.19	6075.49	7258.66	8789.99
		China	116961.51	112414.62	126262.56	195323.74	153298.52
		India	4488.73	3368.31	4503.35	7822.13	10261.00
		South Africa	0.00	2.00	0.53	0.94	1.76
51	Wool, fine or coarse animal hair; horsehair yarn and woven fabric	Brazil	20898.76	12020.63	9720.67	12395.19	13105.12
		China	76716.10	105455.21	140281.02	215234.94	304047.89
		India	28183.12	40160.46	35487.63	39884.28	57463.22
		South Africa	72076.96	76063.48	66786.79	70989.53	68101.60
52	Cotton	Brazil	32664.14	15975.37	4549.10	2977.26	1706.81
		China	17123.58	16425.57	24723.08	76878.60	102994.32
		India	235719.78	258059.56	290774.77	359365.40	411708.09
		South Africa	599.66	1984.97	3810.44	3339.20	496.09
53	Other vegetable textile fibres; paper yarn and woven fabrics of paper yarn	Brazil	411.27	364.82	384.86	1157.04	3470.52
		China	27643.14	33204.94	66018.45	49780.69	62154.64
		India	36637.01	32201.76	32836.29	37663.96	41282.75
		South Africa	4927.27	8147.47	3455.07	34.65	412.40
54	Man-made filaments	Brazil	51.07	13.50	1.38	73.86	0.00
		China	18455.53	17386.59	14898.97	23289.25	37731.81
		India	2147.24	3676.61	4990.80	8364.02	9771.85
		South Africa	29.31	856.88	1496.21	473.42	214.48

55	Man-made staple fibres	Brazil	76.26	82.79	346.59	184.55	42.87
		China	12266.97	15241.38	23736.82	37303.59	51451.25
		India	148168.15	181967.87	147606.56	184186.20	204236.24
		South Africa	921.87	1295.25	2008.08	1602.45	452.89
65	Headgear and parts thereof	Brazil	44.58	102.74	158.78	199.35	145.56
		China	39961.95	46600.99	50550.83	64669.48	70479.18
		India	925.51	1079.39	844.79	1110.77	1297.03
		South Africa	208.25	186.19	185.34	229.30	329.56
68	Articles of stone, plaster, cement, asbestos, mica or similar materials	Brazil	0.00	14.92	0.00	0.00	155.70
		China	312.60	846.55	1148.40	918.51	1061.96
		India	3.32	0.00	76.86	45.92	41.75
		South Africa	6.00	13.69	60.07	102.84	159.80
69	Ceramic products	Brazil	20316.96	29655.59	36017.39	31690.33	30668.16
		China	40178.98	86123.30	162257.35	255544.95	448123.49
		India	1737.87	1582.58	1915.99	1866.84	2666.18
		South Africa	826.08	1150.42	612.44	809.32	1183.74
70	Glass and glassware	Brazil	60324.30	67274.74	63291.09	49224.60	56148.00
		China	406180.55	590247.51	753502.63	896047.32	1400643.75
		India	38483.58	41945.42	43847.13	60177.71	74578.14
		South Africa	33940.63	41014.84	49603.59	48027.51	57776.74

71	Natural or cultured pearls, precious or semi-precious stones, precious metals, metals clad with precious metal and articles thereof; imitation jewellery; coin	Brazil	108.08	42.00	37.84	46.73	72.40
		China	1432.63	2009.63	1900.30	1929.29	5384.85
		India	714.29	77.17	60.18	97.66	80.05
		South Africa	601.81	2.20	1.38	43.65	5.07
72	Iron and steel	Brazil	824461.40	956564.98	1229979.16	1563891.75	2319049.98
		China	314187.50	830851.69	1384283.84	4317794.99	9878772.25
		India	283598.48	871939.19	924384.25	1451048.68	2574408.82
		South Africa	1016992.93	1795191.30	1974643.96	2115409.43	2666747.47
73	Articles of iron or steel	Brazil	19828.24	22804.53	30460.28	36918.66	55403.28
		China	156781.03	238468.87	427009.79	803844.66	2012152.57
		India	78354.46	129070.18	191265.94	204892.13	333278.57
		South Africa	31810.34	42599.35	33029.28	35855.64	37508.52
74	Copper and articles thereof	Brazil	27346.20	13399.94	27868.55	276687.54	432901.09
		China	135340.81	255570.48	339267.33	627815.13	803561.11
		India	52094.79	64726.96	72684.61	236791.22	169294.85
		South Africa	32850.97	55055.48	57848.73	133996.66	162405.69
75	Nickel and articles thereof	Brazil	52707.12	103986.73	84263.31	125904.72	236372.45
		China	3884.13	9194.65	12270.68	15244.63	24453.65
		India	1674.41	3644.47	5256.42	6211.36	8704.91
		South Africa	10538.63	15209.18	15855.95	30952.33	145063.32

76	Aluminium and articles thereof	Brazil	489850.79	777172.49	809495.91	1315949.98	1387108.69
		China	214565.91	328755.73	495408.37	787660.08	1696580.28
		India	40117.20	58909.47	66808.89	102126.86	201225.88
		South Africa	61312.03	123365.03	198221.40	461278.72	610984.03
78	Lead and articles thereof	Brazil	45.79	0.07	193.95	55.39	3213.38
		China	30930.72	39497.85	15421.85	58701.63	26519.05
		India	159.88	1795.75	1001.32	2240.60	4507.53
		South Africa	639.26	93.97	51.87	155.38	2051.50
79	Zinc and articles thereof	Brazil	4440.91	7514.26	8842.63	71686.09	85292.34
		China	18076.16	5244.60	8631.25	102503.23	235313.31
		India	75.89	88.20	5955.79	151535.71	219848.49
		South Africa	105.64	29.93	125.29	58.23	4226.23
80	Tin and articles thereof	Brazil	1631.84	5412.99	15594.27	15754.79	40243.07
		China	76141.79	77006.32	52239.84	37625.56	106439.71
		India	478.31	1245.32	2194.14	2745.76	8045.57
		South Africa	33.23	48.10	41.32	343.08	577.18
81	Other base metals; cermets; articles thereof	Brazil	720.59	4748.63	9564.84	12786.79	25523.39
		China	287230.10	455525.89	619110.21	822877.54	1131405.99
		India	3458.61	3638.22	7647.97	9225.26	10935.32
		South Africa	18697.45	30025.35	51221.57	41339.58	47384.37

85	Electrical machinery and equipment and parts thereof; sound recorders and reproducers, television image and sound recorders and reproducers, and parts and accessories of such articles	Brazil	730.72	7346.47	4937.52	4350.81	2521.49
		China	1346.63	1266.95	1167.04	833.63	3956.59
		India	5.28	109.16	248.93	58.60	143.84
		South Africa	0.00	0.00	0.00	0.00	0.00
87	Vehicles other than railway or tramway rolling-stock, and parts and accessories thereof	Brazil	1290.45	398.70	3089.07	3091.61	3339.63
		China	3308.44	8249.46	16277.09	26173.94	42354.44
		India	905.29	1055.84	1159.50	6819.45	11238.33
		South Africa	154.02	173.98	153.60	591.30	680.76
94	Furniture; bedding, mattresses, mattress supports, cushions and similar stuffed furnishings; lamps and lighting fittings, not elsewhere specified or included; illuminated signs, illuminated name-plates and the like; prefabricated buildings	Brazil	790.92	648.24	271.89	205.66	525.48
		China	19704.51	25674.33	28067.69	33382.97	47104.52
		India	888.58	1108.93	826.75	753.37	1404.84
		South Africa	18.10	67.68	5.26	29.48	41.36

Source: Author's calculation based on the COMTRADE data.

Annexure XIII: The EU's Imports from the BASIC Countries in the 1399 HS 6-digit Items corresponding to the 'Truncated EU List'

Source Country	Sum of EU import from a country in 1399 HS 6-digit Items (US$ million)					EU's total import from a country (US$ million)					Share of EU import from a country in 1399 HS 6-digit Items in total EU import from that country (%)				
	2003	2004	2005	2006	2007	2003	2004	2005	2006	2007	2003	2004	2005	2006	2007
Brazil	3797.69	4768.90	5701.05	7931.37	10207.17	21581.30	27557.75	31089.52	35984.08	46996.52	17.60	17.31	18.34	22.04	21.72
China	5857.01	8757.44	10644.01	16516.96	27976.83	123852.66	169307.30	214131.78	263462.04	339741.02	4.73	5.17	4.97	6.27	8.23
India	2595.05	3851.44	4941.84	6755.66	9613.74	16463.14	21145.38	25038.34	30300.56	38225.39	15.76	18.21	19.74	22.30	25.15
South Africa	4480.51	6465.10	7495.02	7658.35	9032.52	15285.70	19388.22	21507.51	23820.73	29506.44	29.31	33.35	34.85	32.15	30.61

Source: Author's calculation based on the COMTRADE data.

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