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Can export tax be genuine climate policy? An analysis on China's export tax and export VAT refund rebate policies

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HIGHLIGHTS

EXPORT RESTRICTIVE MEASURES Export VAT refund rebate and export tax (EVRRET) measures have been adopted on energy-intensive products in recent years in China. They are proclaimed to be climate policy, yet there is no explicit and unique carbon cost set on export - the implicit export carbon tax rates vary dramatically across sectors and over different periods.

EXPLICIT EXPORT CARBON POLICY This paper provides a method of introducing an explicit and unique carbon cost into the current EVRRET. By setting a comparable carbon cost (20$/t$CO_2$ and 30$/t$CO_2$) for eight major energy-intensive sectors to which the EVRRET are massively applied, it derives the corresponding ad valorem average rate for each sector.

WHICH OPTION? This paper finds that the introduction of a carbon cost into export VAT refund rebate policy would not increase the current export VAT refund rebate rate (except for the chemical sector), but would simply define a ceiling, while the same introduction into the export tax policy would lead to an overall increase in sectoral export tax rates. This paper concludes by examining competitiveness and WTO concerns, suggesting that the better option for introducing a carbon cost into Chinese exports would be through reforming export VAT refund rebate policy.

IMPLICATIONS The domestic carbon tax or cap and trade system could be expected more in the mid and long term. Therefore, the export carbon taxation that this paper proposes could serve as a transitional measure until the implementation of a domestic carbon tax or cap and trade system. China is one of the major concerns for carbon leakage and competitiveness issues currently being debated in the EU. The proposal made by this paper could present an opportunity for the EU to increase the scale of quota auctioning under the EU ETS.

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Abstract:

Export VAT refund rebate and export tax (EVRRET) measures have been adopted on energy-intensive products in recent years in China. They are proclaimed to be climate policy, yet there is no explicit and unique carbon cost set on export - the implicit export carbon tax rates vary dramatically across sectors and over different periods. This paper provides a method of introducing an explicit and unique carbon cost into the current EVRRET. By setting a comparable carbon cost (20$/tCO2 and 30$/tCO2) for eight major energy-intensive sectors to which the EVRRET are massively applied, it derives the corresponding ad valorem average rate for each sector. This paper finds that the introduction of a carbon cost into export VAT refund rebate policy would not increase the current export VAT refund rebate rate (except for the chemical sector), but would simply define a ceiling, while the same introduction into the export tax policy would lead to an overall increase in sectoral export tax rates. This paper concludes by examining competitiveness and WTO concerns, suggesting that the better option for introducing a carbon cost into Chinese exports would be through reforming export VAT refund rebate policy.

Key words: carbon tax, export tax, export VAT refund rebate, climate change, China

JEL classification: F13, F18, H23

Introduction

Exports have become a major contributor to economic growth in recent years in China (Liu et al., 2002; Shan and Sun, 1998). However, they have aggravated the environmental and resource overexploitation problems that have drawn the attention of the Chinese government. Export restrictive measures, particularly, export VAT refund rebate and export tax (EVRRET) policies, have been implemented in order to curb exports from energy-intensive, resource-consuming and polluting sectors. In the white paper entitled *China's National Climate Change Programme,* published in 2007, China clearly stated that it would "*deepen institutional reform of foreign trade in controlling export of energy-intensive, pollution-intensive and resource-intensive products, so as to formulate an import and export structure favorable to promote a cleaner and optimal energy mix.*" The use of EVRRET to such an end was proposed. In the communication entitled *China's Policies and Actions for Addressing Climate Change*, published in 2008, emphasis was placed on the fact that "*by adjusting tax rebates for exports and customs duties, the government is working to restrain the export of high energy-intensive, pollution-intensive and resource-intensive products.*" In the 2009 version, *China's Policies and Actions for Addressing Climate Change - The Progress Report 2009,* China promised to "*continue to restrict the export of the energy extensive, pollution extensive and resource-based products*" by strengthening the EVRRET policy in order to heighten "*the efforts to phase out of the backward production capacities in the power, iron and steel, building materials, electrolytic aluminum, ferroalloy, calcium carbide, coke, coal, and flat glass industries.*"

Presented as climate policies, export restrictive policies may also be deemed to serve China's domestic development strategies, which aim to curb energy intensity and pollution and to promote the development of high value-added sectors. Their economic concerns are presumably more important than genuine climate change considerations. A good example can be found in China's energy intensity (EI) target, which aims to reduce EI by 20% by the end of 2010 compared to the 2005 level. Under circumstances aggravated by an energy intensity increase of 3.2% and 0.09% respectively in the first trimester and semester of 2010, which made achieving the total energy intensity target more difficult than ever, China cancelled the export VAT refund for 406 energy-intensive products on 15 July 2010 (circular Cai Shui (2010) No. 57, see table A1 of the Annex).

In addition to the domestic level, the EVRRET also has several implications at the international level. It helps to reduce, to a certain degree, concerns about carbon leakage and competitiveness in Europe, where border measures are widely discussed as a solution for preventing carbon leakage (Quirion and Monjon, 2010). It also ensures consumer responsibility for embedded or direct CO_2 emissions engendered by China's export (for example, Lin and Sun, 2010; Yan and Yang, 2010; Guan et al., 2008; Kahrl and Roland-Holst, 2008; Wang and Watson, 2008; Weber et al., 2008; Shui and Harriss, 2006). However, there is so far no explicit carbon price signal sent by such policy (Wang and Voituriez, 2009). In addition to fuelling international criticism and suspicion regarding China's actual intentions, this could engender deadweight losses that could dampen policy efficiency.

This paper provides a method that explicitly defines a comparable carbon price for exports from major energy-intensive sectors and assures easy short-term implementation, compatible with the original nature and efficiency of EVRRET policies. We focus on eight energy-intensive sectors, since they are mentioned in official plans and have the highest energy intensity according to Wang et al. (2010). The rationale of taxing only the export of energy-intensive products for energy-saving and climate change purposes instead of taxing all exports is at least threefold. First, EVRRET policies, if accounted on the direct CO2 emissions of a product, could engender a significant increase in ad valorem export tax rates for such sectors and therefore generate visible climate effects. For other non energy-intensive sectors, however, the export tax would only create a negligible marginal effect, as the share of carbon cost in total value added is low. Second, the export of certain final products with higher value-added and technology contents are promoted despite the negative climate external cost they generate. Third, as mentioned above and as will be shown below, export tax and VAT refund rebate policies have already been massively implemented in energy-intensive sectors in recent years. The introduction of clear carbon pricing on such sectors requires no further tax creation, but only varies the tax rates or tax structure, which could dramatically facilitate the administrative process of introducing a carbon price.

This paper is organized as follows: section 1 reviews the background of EVRRET policies and adjustments to them; section 2 gives related methodologies for calculating implicit and explicit export tax and export VAT refund rebate rates; section 3 provides related data; section 4 examines the results; and section 5 discusses WTO compatibility issues before concluding.

1. Policy review

1.1 Export VAT refund

Value-added tax (17% for most products in China) applies to all activities of value formation including the production and distribution of goods and the provision of services. With the exception of some types of income such as interest, most (developed) countries apply a full VAT refund for exported products and services as an incentive for exports, since commodity prices to foreign customers are free of VAT. China, on the other hand, like certain developing countries, has implemented a partial export VAT refund policy since 1985 on most of its exports in order to safeguard part of its revenues. This engendered a tax burden (domestic VAT minus export VAT refund) on Chinese exporters compared to exporters in countries that refund all domestic VAT on export. Five major adjustments to export VAT refund policies have taken place over the last 20 years due to various reasons, such as increasing fiscal revenue, adjusting to international market fluctuations and committing to joining the WTO. (Wang and Voituriez, 2009).

During China's tenth Five Year Plan (FYP) (2001-2005), emerging environmental and natural resource problems led to frequent discussions on using export measures to limit the export of energy-intensive and resource-consuming products. This concept was formalized after a circular was published (Fa Gai Jing Mao (2005) No.2595) by seven ministries in 2005. Guidelines were written, yet no specific measures were provided. Since then, export VAT refund rebate policy on energy-intensive sectors has been massively adopted (See Table A1 of annex). In 2010, energy-intensive sectors receive a much smaller refund on export compared to other (promoted) sectors (See Table A2 of the Annex).

1.2 Export tax

Export tax is theoretically equivalent to the reduction in export VAT refunds. It was extensively adopted by newly independent economies in the 1960s and 1970s in Africa, Asia and Latin America with several potential goals (Devarajan et al., 1996). Piermartini (2004) examined the rationale of the export tax on primary commodities adopted by large countries: the more the home country aims to cut export quantities and to increase world market prices, the more the cost of an export tax will be borne by foreign consumers. Piermartini (2004) also listed the arguments for implementing export taxes in the large country case[1]. However, environmental concerns rarely appear explicitly among the different justifications for an export tax in economic literature. Wang and Voituriez (2009) studied the equivalent CO2 quota price generated by China's export tax and VAT refund rebate for the steel, cement and aluminium sector, and Müller and Sharma (2005) discussed in a general manner the role of China's export tax in fighting global climate change.

The relation between export tax and export VAT refund rebate policies is complementary in China. Export tax is usually used as an auxiliary measure for products submitted to zero export VAT refund. Compared to export VAT refund, export taxes are set on a more temporary basis in China. The Customs Tariffs Commission of the State Council, together with the Ministry of Finance and the State Administration of Taxation, publishes annual export tariffs in December for the following year. As table A3 of the Annex shows, export tax has been massively implemented in recent years both on EI sectors and other sectors. Adjustments to export tariffs and taxed commodities could take place during a year as a response to potential dramatic changes in the domestic and international market.

2. Method

2.1 Direct emissions caused by export

We assume that the technology and energy mix of production for domestic consumption and for export purposes are identical. Therefore, the direct CO_2 emissions engendered by the export of sector i DE_i can be given by equation (1),

$$DE_i = S_i \sum_j E_{ij} \times C_j \times rb_j \qquad (1)$$

where S_i denotes the share of the gross value of export for sector i in total sector output, E_{ij} denotes the consumption of jth type fossil fuel for sector i, C_j denotes the carbon contents of that fossil fuel and rb_j denotes the combustion rate of that fossil fuel.

In this paper, DE_i is used as the base for determining the export carbon tax rate. First, it is a fair and commonly used tax base. For example, CO_2 emission quotas are allocated to industrial sectors based on their direct emissions under the European Union Emission Trading System (EU ETS), which aims to set a price for CO_2 emissions in Europe. Second, embedded emissions (life cycle) are less accurate than direct emissions, given the high degree of globalization and technology diversity. Further, even if embedded emissions could be correctly calculated, it is still unjust to use them as the climate tax base as long as the indirect CO_2 emissions are not strictly complementary to direct CO_2 emissions. For example, for one unit reduction of steel exported, the corresponding electricity supply used for the production of this unit of steel could be substituted to other sectors, which would generate no additional CO_2 emissions reduction in the electricity supply sector.

2.2 Calculation of implicit export carbon tax

The export VAT refund rebate is equivalent to the export tax in that they both add costs to exports and generate revenue for the state. We assume that all the costs engendered by these two measures are passed on to the foreign importers. Based on the calculation approach defined by the state circular Cai Shui (2004) No.116, the implicit export carbon tax for each sector i $T^{CO_2}{}_i$ can be obtained by equation (2),

$$P_iQ_i \frac{T_i^{Ex}}{(1+T_i^{Ex})} + Pi \frac{Qi\,(VAT_i - T_i^{R})}{(1+T_i^{Ex})\,(1+VAT_1)} = T_1^{CO_2}\,DE_1$$

where, for a given sector i, P_i and Q_i denote respectively the (average) export (FOB) price and quantity, T_i^{Ex} denotes the average rate of export tax, VAT_i denotes the average VAT rate, and T_i^R denotes the average export VAT refund rate.

For a given sector i, the average export tax rate T_i^{Ex} is obtained by

1. For example, the terms-of-trade argument, stabilization of domestic prices, export revenues, control of inflationary pressures, the infant industry argument, retaliation to tariff escalation in export markets, easing the challenge of government revenue collection, increasing the income of the poor, etc.

$$T_i^{Ex} = \frac{\sum_j T_{ij}^{Ex} P_{ij} Q_{ij}}{\sum_j P_{ij} Q_{ij}} \quad (3)$$

where j denotes the jth sub-sector classified at HS-4 digit, T_{ij}^{Ex} denotes the average export tax rate of the sub-sector j, and P_{ij} and Q_{ij} denote respectively the export price and quantity of jth product. As exported goods are classified under HS-10 digit, T_{ij}^{Ex} is derived by the following equation (4),

$$T_{ij}^{Ex} = \sum_k \frac{T_{ijk}^{Ex}}{k} \quad 4)$$

where T_{ijk}^{Ex} denotes the export tax rate of kth product at HS-10 for a given jth sub-sector of a given ith sector. This simplified calculation of T_{ij}^{Ex} is motivated by the fact that for the sectors selected, most of the rates of EVRRET of HS-10 products in a given sub-sector (HS-4) are either identical or slightly different. Further, not all data on export volume at HS-10 level are available.

The average export VAT refund rate for a given sector i T_i^R can also be obtained following the same method,

$$T_i^R = \sum_j \frac{T_{ij}^R P_{ij} Q_{ij}}{\sum_j P_{ij} Q_{ij}} \quad (5)$$

where T_{ij}^R denotes the average export VAT refund rate of sub-sector j (HS-4). And based on equation (4), we have

$$T_{ij}^R = \sum_k \frac{T_{ijk}^R}{k} \quad (6)$$

where T_{ijk}^R denotes the export VAT refund rebate of kth product at HS-10 for a given jth sub-sector of a given ith sector.

2.3 Explicit export carbon taxation

We now consider that a unique carbon price is allocated to the export of major energy-intensive products that already receive export tax and/or export VAT refund rebate. Therefore, this explicit carbon policy can be implemented either by export tax or by export VAT refund by defining a unique and stable carbon cost based on direct emissions of export goods.

2.3.1 Explicit climate VAT refund rebate

The equivalent rate of export VAT refund to a given carbon price is determined by equalizing the cost engendered by CO_2 emissions for the export product of a sector and the cost that the export VAT refund rebate engenders. For a sector i,it can be given by

$$P_i \frac{Q_i (VAT_i - T_i^{R,Op})}{(1 + T_i^{Ex})(1 + VAT_i)} = T^{Op, CO_2} DE_1 \quad (7)$$

where $T_i^{R,Op}$ denotes the explicit export VAT refund rate for climate change purposes that we calculate, and T^{Op, CO_2} denotes the given carbon tax rate.

2.3.2 Export carbon tax

We can also obtain the explicit export tax rate for climate change purposes by equalizing the CO_2 emissions cost and the cost generated by export tax for a given sector. For a certain sector i, it can by written by

$$P_i Q_i \frac{T_i^{Ex,Op}}{(1 + T_i^{Ex})} = T^{Op, CO_2} DE_1 \quad (8)$$

where $T_i^{Ex,Op}$ denotes the explicit export carbon tax rate corresponding to the given (unique) carbon tax rate.

3. Data

3.1 Sector fossil fuel consumption

We use 2007 data in this study, so as to use the most recent and updated energy consumption data, while discarding possible biases induced by the subsequent world economic crisis. The sector final fossil fuel consumption is available from both the Statistical Yearbook of China (SY) and the China Energy Statistical Yearbook (ESY). However, contrary to OECD standards, final energy consumption includes not only end-use energy consumption, but also the energy consumption and transformation loss for energy industries as well as the non-energy use of fossil fuels in China (Wu, 2009). Therefore, there is a certain degree of incomparability for final energy consumption between the Chinese standard and the international one, even though the divergence may be very small. We obtain a physical quantity for sector fossil fuel consumption, which is available from both SY 2009 and ESY 2008. Table 1 lists

Table 1. Conversion factors from physical unit to coal equivalent of fossil fuels (kgce/kg)

Raw coal	Coke	Crude oil	Fuel oil	Gasoline	Kerosene	Diesel	Natural Gas (kgce/cu.m)
0.7143	0.9714	1.4286	1.4286	1.4714	1.4714	1.4571	1.33

Source: China Energy Statistical Yearbook 2008.

Table 2. Unit carbon content and combustion rate of major fossil fuels in China

	Coal	Coke	Oil	Gasoline	Kerosene	Diesel	Fuel Oil	Natural gas
Carbon content (tC/TJ)*	25.8	29.2	20	18.9	19.6	20.2	21.1	15.3
Combustion rate**	0.9	0.9	0.98	0.98	0.98	0.98	0.98	0.99

Source: *: IPCC Guidelines for National Greenhouse Gas Inventories, 2006, Volume 2 Energy: table 1.4. **: Ou et al., 2009.

Table 3. Sector division and components

Sector	Components (HS-4)
Iron and steel	HS7201-7229
Basic chemical	HS2801-2853
Petrochemical	HS2701-2716
Non-metallic products	HS2504, 2506-2508, 2520-2525, 6808-6814, 6901-6914, 7001-7020
Non-ferrous metal	HS7106, 7108, 7110, 7401-7415, 7501-7508, 7601-7609, 7801, 7802, 7804, 7806, 7901-7905, 7907, 8001-8003, 8007, 8101-8112
Chemical fibre	HS5401-5408, 5501-5516
Pulp and paper	HS4701-4707, 4801-4823
Rubber	HS4001-4017

the conversion factors from physical unit to coal equivalent.

3.2 Carbon content and combustion rate of fossil fuels

The carbon content and combustion rate of each fossil fuel are assumed to be unique. Table 2 lists the related data.

3.3 Gross value of export and total output

The gross value of export and total output of each sector can be obtained from the 2007 input-output (IO) table for the Chinese economy (Zhang and Zhao, 2009). The competitive IO table, which does not distinguish domestic and imported inputs, is sufficient for the estimation method of this paper, since it is assumed that the a sector's production for domestic consumption and for export uses the same technology and has an identical energy mix.

3.4 Sector division and related data

Table 3 lists the sub-sector components (HS-4) of each selected sector. Sectoral and sub-sectoral annual export volume (P_iQ_i and $P_{ij}Q_{ij}$ in the above equations) is available from Customs-Info[2], a database that provides original official Chinese Customs data. Export tax rates and export VAT refund rebate rates for related products (at HS-10) are obtained from the 2007 Customs Import and Export Tariff of the People's Republic of China. Finally, among these energy-intensive sectors, VAT is only below 17% for a few products. For simplicity of calculation, 17% is adopted as domestic VAT for all selected sectors.

4. Results

4.1 Implicit export carbon tax

Table 4 gives the average sectoral export tax rates and export VAT refund rebate rates (columns 1 and 2) as well as the computed implicit export carbon tax (last column). As mentioned above, the difference between the export VAT refund rate and the domestic VAT rate (17%) is assumed to be borne by the foreign importers. For example, 10.11% for

2. See http://www.customs-info.com for more information.

Table 4. Related results on implicit export carbon tax in China

	Sectoral export tax rate (T_i^{Ex} T_i^{Ex}) (%)	Sectoral export VAT refund (T_i^R T_i^R) (%)	Sectoral direct CO_2 emissions from export (DEi) (Mn t CO_2)	Implicit sectoral export carbon tax rate (2007 US$/t$CO_2$)
Iron and steel	1.61	6.89	96.81	41.64
Basic chemical	0.44	8.77	39.81	18.38
Petrochemical	0.56	1.18	10.01	292.11
Non-metallic products	0.012	10.2	20	46.82
Non-ferrous metal	1.81	6.92	4.31	494.24
Chemical fibre	0	11	0.98	764.59
Pulp and paper	0	7.15	2.06	294.09
Rubber	0	13	2.26	151.62

the iron and steel sector (as a result of 17% minus 6.89%) is supposed to be borne in its entirety by foreign importers and to induce no changes in domestic prices for this sector. Table 4 also shows that the iron and steel, basic chemical and non-metallic products sectors are the major source of export CO_2 emissions due to their relatively high export quantities and sectoral energy intensities.

As Wang and Voituriez (2009) showed for the steel, aluminium and cement sectors, the result of this paper again proves the lack of a unique carbon price for EVRRET policies in major energy-intensive sectors. According to table 4, the implicit export carbon tax rates that export tax and export VAT refund rebate policies engendered in 2007 diverge substantially among sectors. Two reasons may be highlighted in order to explain such high implicit export carbon tax rates. First, the lower the sector's direct CO_2 emissions from export and/or the higher the sector's export volume, the higher the implicit export carbon tax rate according to the calculation approach provided in this paper. Second, it is assumed that all costs engendered by EVRRET are borne by foreign importers, while this may not necessarily be the case in the real world. Domestic producers or exporters could also partially pass on the incremental cost to foreign exporters, which would reduce the implicit export carbon tax rate calculated by the approach of this paper.

4.2 Explicit export carbon taxation measures

Table 5 lists the sectoral ad valorem rates for export tax or export VAT refund under explicit carbon pricing on exports. Two options are therefore available: first, an export VAT refund rate corresponding to a unique carbon cost may be used as the maximum refund rate for each sector. The export VAT refund rate could be reduced based on this maximum level for other domestic or export policy needs. Export tax, in this case, could still be implemented and adjusted periodically for non-climate ends in case of zero export VAT refund. Second, export tax rates corresponding to a given unique carbon cost could be fixed as a minimum export carbon tax level. Export VAT refund rebate and export tax (in case of zero export VAT refund rate) could be adjusted for non-climate purposes.

Comparing tables 4 and 5, the explicit and comprehensive export taxation policy would require a general increase in export tax rates and the implementation of export tax on many products that are not currently taxed. This risks causing domestic resistance due to concerns regarding competitiveness. On the other hand, the implementation of export VAT refund rebate as climate taxation will only require a reduction in the current export VAT refund rate in chemical sectors, whereas for other sectors it merely aims to set a clear division on the actual export VAT refund rebate rate, but does not modify the tax revenue. This process would be similar to the Swedish experience of implementing a domestic carbon tax, which was introduced by splitting the existing energy tax into half energy tax and half carbon tax without adjusting the final tax burden[3].

4.3 Setting ad valorem rates for products

Three options are available for setting ad valorem rates under export carbon taxation on products (HS-10) for each sector. First, the optimal carbon tax rates for exported products may be obtained based on the direct CO_2

3. More information can be found at http://www.sweden.gov.se/sb/d/2062.

Table 5. Ad valorem rates of export tax or export VAT refund rebate under explicit export carbon taxation policy (%)

	20$/t CO_2		30$/t CO_2	
	Export tax ($T_i^{Ex, Op}$)	Export VAT refund ($T_i^{R, Op}$)	Export tax ($T_i^{Ex, Op}$)	Export VAT refund ($T_i^{R, Op}$)
Iron and steel	5.67	11.24	8.5	8.36
Basic chemical	9.48	7.48	14.21	2.72
Petrochemical	1.12	15.87	1.68	15.31
Non-metallic products	2.91	14.09	4.37	12.63
Non-ferrous metal	0.48	16.51	0.73	16.26
Chemical fibre	0.16	16.84	0.24	16.76
Pulp and paper	0.67	16.33	1	16
Rubber	0.53	16.47	0.79	16.21

emissions of each product. This requires a complex accounting system that is unavailable in the short term. However, an emission accounting mechanism at the sub-sectoral level (HS-4) may be technically feasible in the following way: extending the ongoing capacity building process for GHG emissions from fossil fuel inventories in order to obtain related energy consumption information at the sub-sectoral level, or using estimation measures that enable the tax to approach real emissions. Second, ad valorem rates of carbon taxation for export products can be obtained using weighting measures based on current export tax and VAT refund rebate rates. Several choices are available for the weighting units, for example the share of the export (in volume or in physical quantity) of a product in the total export of the sector, or the share of the rate of the export tax or export VAT refund of a product in the sum of the export tax rates or VAT refund rebate rates of a sector, etc. Finally, for simplicity, an identical rate can be applied to all products for a given sector.

5. EVRRET and the WTO

Introducing a carbon cost into export VAT refund rebate policy is preferred to export tax under the WTO laws. In general, EVRRET policies are compatible with WTO laws as long as they are not discriminatory (see Art. III of the GATT 1994) and do not infringe on China's commitments under its Accession Protocol. When compared with export VAT refund rebates, which are generally accepted as long as the total VAT refund does not surpass domestic VAT, export taxes are more likely to trigger trade disputes. This can be illustrated by an example: in 2009, the European Union, the US and Mexico filed a dispute at the WTO against China's export restrictions, particularly an export tax, on certain raw materials, such as bauxite, coke, fluorspar, silicon carbide and zinc, etc[4]. They claimed that these restraints caused divergences between domestic and world prices, thereby resulting in unfair competition between domestic Chinese and foreign companies importing these raw materials. Secondly, China, like certain new members of the WTO, is subject to the so-called WTO-plus constraint, which limits the use of export taxes. The use of export taxes risks violating China's pledge under its Accession Protocol to the WTO (WT/L/432) where Art. 11.3 states that "*China shall eliminate all taxes and charges applied to exports unless specifically provided for in Annex 6 of this Protocol or applied in conformity with the provisions of Article VIII of the GATT 1994*". In this Annex 6, 84 products (HS-8) are listed, of which 69 are energy-intensive.

However, the end note of Annex 6 provides certain marginal flexibilities for further implementation of export taxes: "*China confirms that the tariff levels included in this Annex are maximum levels which will not be exceeded. China confirmed furthermore that it would not increase the presently applied rates, except under exceptional circumstances. If such circumstances occurred, China would consult with affected members prior to increasing applied tariffs with a view to finding a mutually acceptable solution*". Therefore, the introduction of a unique carbon cost into the current export tax policy requires detailed consulting procedures within the WTO and risks being rejected by affected members.

4. See http://www.wto.org/english/news_e/news09_e/dsb_21dec09_e.htm.

6. Conclusion and discussion

This paper has provided an approach to implementing a comparable and explicit carbon price through actual export VAT refund rebate and export tax policies for energy-intensive sectors in China. The introduction of a unique and explicit carbon cost into export VAT refund rebate seems to be preferable to export taxes given competitiveness and WTO concerns. However, export carbon taxes may also be feasible if competitiveness concerns and the WTO requirement are met.

As far as the administrative procedure is concerned, the implementation of such policy requires the authorization of the State Council, but does not need further approval at the People's Congress where the implementation of new laws is usually debated. This makes the introduction of a unique carbon cost into EVRRET policies feasible in the short term. Specifically, this may be done by publishing a circular by related ministries, such as the National Development and Reform Commission, the Ministry of Finance and the State Administration of Taxation.

Several points may need further discussion.

(1) **Export carbon taxation on energy-intensive sectors as a transition measure.** The approach discussed in this paper is a second best solution in terms of economic efficiency to combat climate change in China. A more effective measure is undoubtedly to implement a domestic carbon tax or cap and trade system of CO_2 emission quotas. However, such measures usually require implementing new laws that could not be adopted in the short term. Moreover, China still declares itself to be a developing country and favours economic development. The domestic carbon tax or cap and trade system could be expected more in the mid and long term. Therefore, the export carbon taxation that this paper proposes could serve as a transitional measure until the implementation of a domestic carbon tax or cap and trade system.

(2) **Relation with the legalization of export restrictive measures on climate change grounds.** The approach proposed by this paper will, to a certain degree, place a burden on the customs taxation system by setting various ad valorem export tax or export VAT refund rebate rates. It may be argued that the actual legalization of export restrictive measures for climate change purposes may be sufficient as a transitional measure instead of setting divergent ad valorem rates for different sectors and products. However, the implementation efforts needed could be relatively small compared with the importance of stabilizing a carbon cost signal in an explicit and comprehensive way.

(3) **Implication for the EU ETS.** China is one of the major concerns for carbon leakage and competitiveness issues currently being debated in the EU. The proposal made by this paper could present an opportunity for the EU to increase the scale of quota auctioning under the EU ETS. However, export carbon taxation is ineffective in preventing carbon leakage in the case where the export of European industries is for China's domestic consumption. European industries based in Europe that export to China could relocate to China, facing a stricter carbon price in Europe. Further studies are needed here, focusing in particular on China's domestic market share of European industries for energy-intensive products.

(4) **Further work for a solid export taxation mechanism.** The definition of energy-intensive industries in this paper is sector-based. This risks taxing relatively clean or promoted products belonging to sectors in which the energy intensity is high at sectoral level, and missing certain energy-intensive products belonging to sectors that are not energy-intensive in general. Moreover, due to data unavailability, analysis at sub-sectoral level is not given (for example the basic chemical sector). Further studies would need to focus on carbon emissions from production at the product level. Second, domestic products and exported products are assumed to have the same technology and energy mix in this paper. Further work should focus on the energy mix and technology used for export production in order to provide a precise carbon emissions basis. ■

References

Devarajan, S., Go, D., Schiff, M., Suthiwart-Narueput, S., 1996. "The whys and why nots of export taxation", volume 1, Policy Research Working Paper of the World Bank 1684, the World Bank, Washington D.C.

Guan, D., Hubacek, K., Weber, C.L., Peters, G.P., Reiner, D.M., 2008. "The drivers of Chinese CO2 emissions from 1980 to 2030", *Global Environmental Change*, Vol. 18 (4), pp.626-634.

Kahrl, F., Roland-Holst, D., 2008. "Energy and exports in China", *China Economic Review*, 19 (4), pp.649-658.

Lin, B., Sun, C., 2010. "Evaluating carbon dioxide emissions in international trade of China", *Energy Policy*, 38 (1), pp.613-621.

Liu, X., Burridge, P., Sinclair, P.J.N., 2002. "Relationships between economic growth, foreign direct investment and trade: Evidence from China", *Applied Economics*, 34 (11), pp.1433-1440.

Monjon, S., Quirion, P., 2010. "How to design a border adjustment for the European Union Emissions Trading System?", *Energy Policy*, 38, 5199-5207.

Müller, B., Sharma, A., 2005. "Trade Tactic Could Unlock Climate Negotiations", SciDev.Net, link: http://www.scidev.net/en/opinions/trade-tactic-could-unlock-climatenegotiations.html, last accessed: August 2010.

Ou, X.M., Zhang, X.L., Chang, S.Y., 2009. "Alternative fuel buses currently in use in China: Life-cycle fossil energy use, GHG emissions and policy recommendations", *Energy Policy*, 38, pp.406-418.

Shan, J., Sun, F., 1998. "On the export-led growth hypothesis: the econometric evidence from China", Applied Economics, 30 (8), pp.1055-1065.

Shui, B., Harriss, R.C., 2006. "The role of CO2 embodiment in US-China trade", *Energy Policy*, 34 (18), pp.4063-4068.

Wang, T., Watson, J, 2008. "China's carbon emissions and international trade: Iimplications for post-2012 policy", *Climate Policy*, 8, pp.577-581.

Wang, X., Voituriez, T., 2009. "Can unilateral trade measures significantly reduce leakage and competitiveness pressures on EU-ETS-constrained industries? The case of China export taxes and VAT rebates", Climate Strategies, http://www.climatestrategies.org/our-reports/category/32/113.html.

Wang, X., Li, J.F., Zhang, Y.X., 2010. "An analysis on the short-term competitiveness impact of carbon tax in China", Working Paper, Institut du Développement Durable et des Relations Internationales (IDDRI), Paris, http://www.iddri.org/Publications/Collections/Ideespour-le-debat/An-analysis-on-the-short-term-sectoralcompetitiveness-impact-of-carbon-tax-in-China

Weber, C.L., Peters, G.P., Guan, D., Hubacek, K., 2008. "The contribution of Chinese export to climate change", *Energy Policy*, 36 (9), pp.3572-3577.

Wu, G.H., 2009. *A strategic study on energy conservation and emission reduction in China*, Economic Science Press, Beijing, 2009. (in Chinese)

Yan, Y., Yang, L., 2010. "China's foreign trade and climate change: a case study of CO2 emissions", *Energy Policy*, 38 (1), pp.350-356.

Zhang, Y.X., Zhao, K., 2009. "China's input-output table compilation and its extensions". Paper presented at the 17th International Input Output Conference, Sao Paulo, 2009. http://www.iioa.org/pdf/17th%20 Conf/Papers/492297253_090601_103024_ZHANGYAXIONG268.PDF

Appendix

Table A1. Export VAT refund rates (HS-10) in 2010

	Low rate		Medium rate		High rate				
Sectors	0%	5%	9%	13%	15%	16%	17%	Tot product Number	Related HS codes (HS-2)
Agriculture	299	868	0	159	444	0	0	1770	HS01-24
Mineral product	231	0	0	5	0	0	0	236	HS25-27
Chemical product	518	157	1798	327	158	0	11	2969	HS28-38
Plastic & Rubber	5	104	95	129	0	0	0	333	HS39-40
Skins & Leather	137	9	0	17	20	0	0	183	HS41-43
Pulp & Paper	113	3	0	75	0	0	0	191	HS47-49
Textiles	21	33	0	27	6	3320	0	3407	HS50-63
Plaster, Cement, etc.	23	97	21	68	0	0	0	209	HS68-70
Iron & Steel	75	6	77	54	0	0	0	212	HS72
Steel products	0	63	72	30	0	0	0	165	HS73
Aluminium	18	0	0	37	6	0	0	61	HS76
Other base metals	118	76	15	30	0	0	1	240	HS74,75,77-81
Tools of base metal	0	59	57	23	0	0	0	139	HS82,83
Wood product	243	24	62	41	0	0	0	370	HS44-46
Footwear, etc.	2	0	0	0	95	0	0	97	HS64-67
Pearl, precious metals, etc.	66	59	3	0	0	0	0	128	HS71
Machinery	11	0	0	123	542	0	1198	1874	HS84,85
Transport equipment	4	0	0	17	114	0	367	502	HS86-89
Optical, music instruments	27	0	0	109	200	0	111	447	HS90-92
Arms	22	0	0	14	0	0	0	36	HS93
Other manufactured articles	24	0	0	126	55	8	0	213	HS94-96
Arts and others	20	0	0	3	0	0	0	23	HS97,98

Source: Authors' rearrangement based on data of the State Administration of Taxation of China.

Table A2. Major adjustments to export VAT refund rates of energy-intensive products in China: 2004-2010

Circular	Date of validity	Type	Products	Corresponding HS codes
Cai Shui[2003] No.222	Jan. 1st 2004	Withdrawal	Oil products	HS27090000;HS27101911;12;21;22;29;91;92;93;99;HS27109100;9900
			Pulp and paper	HS47, HS4801-4816;
			Metals	HS7401, 7402, 7404, 7110, 7201, 7204, HS75089010;HS76020000;HS81019700;HS81102000
			Minerals	HS2601-2612;HS2614-2622;HS2510;04;08;HS28181000;2000;3000
			Chemicals	HS2826900010;HS29022000;
		Reduced to 8%	Chemicals	HS28047010;90
			Minerals	HS2613
			Metals	HS7502;7601 and HS72021100;1900;2100;2900;3000;4100;4900;
		Reduced to 5%	Minerals	HS27040010;HS27011210;HS2519;2526;2529;2511;HS2825;2841;2849;2846 and HS25309090
			Metals	HS7403
Cai Shui MD[2004] No.3	May 24th 2004	Withdrawal	Coke	HS27011210;HS27040010
Cai Shui[2004] No.214	Jan.1st 2005	Withdrawal	Metals	HS76011000;2000 and HS72021100;1900;2100;2900;3000;4100;4900;5000;6000;7000;8010;8020;9100;9200;9300;9900
			Chemicals	HS28047010;90 and HS28491000
Cai Shui[2005] No.57	Apr. 1st 2005	Withdrawal	Iron and steel	HS7203;7205-07;7218;7224
FaGaiJingMao[2005] No.2595	Jan. 1st 2006	Withdrawal	Coal tar	HS7606;7607
Cai Shui[2006] No.139	Sep. 15th 2006	Withdrawal	Salt; sulphur; stone, etc.	58 products at HS-8 level in HS25 excluding salt and cement
			Mineral fuels, oils	30 products at HS-8 level in HS27
			Inorganic chemicals	21 products at HS-8 level in HS28
			Organic chemicals	19 products at HS-8 level in HS29
			Skins and leather	13 products at HS-8 level in HS41
			Wood charcoal	HS44020000
			Stone, plaster, cement, etc.	16 products at HS-8 level in HS68
			Ceramic products	6 products at HS-8 level in HS69
			Copper	17 products at HS-8 level in HS74
			Nickel	5 products at HS-8 level in HS75
			Aluminium	HS76031000; HS76032000
			Lead	5 products at HS-8 level in HS78
			Zinc	6 products at HS-8 level in HS79
			Tin	5 products at HS-8 level in HS80
			Other base metals; cermets	34 products at HS-8 level in HS81

Circular	Date of validity	Type	Products	Corresponding HS codes
		Reduced to 11%	Cement	HS25231000;2100;2900;3000;9000
			Plastics	148 products at HS-8 in HS39
			Textile fabrics and products	40 products at HS-8 in HS59
			Glass and glassware	19 products at HS-8 in HS70
			Aluminium	11 products at HS-8 in HS76
		Reduced to 8%	Ceramic products	24 products at HS-8 in HS69
			Steel	142 products at HS-8 level in HS72
			Aluminium	4 products at HS-8 level in76
			Lead	HS78030000;HS78041100;HS78041900
			Zinc	HS79040000;HS79050000
			Tin	HS80030000;HS80040000;HS80050000
		Reduced to 5%	Copper	51 products at HS-8 in HS74
			Nickel	8 products at HS-8 in HS75
Cai Shui[2007] No.64	Apr. 15th 2007	Withdrawal	Iron and steel	83 products at HS-8 level in HS72
		Reduced to 5%	Iron and steel	76 products at HS-8 level in HS72
Cai Shui[2007] No.90	Jul. 1st 2007	Withdrawal	Cement	HS25231000;2100;2900;3000;9000
			Mineral fuels, oils	22 products at HS-8 level in HS27
			Inorganic chemicals	246 products at HS-8 level in HS28
			Organic chemicals	HS29102000;3000;HS29225000;HS29224220
			Fertilizers	30 products at HS-8 level in HS31
			Tanning or dyeings	61 products at HS-8 level in HS32
			Leather	10 products at HS-8 level in HS41
			Steel products	10 products at HS-10 level in HS73
			Aluminium	8 products at HS-10 level in HS76
		Reduced to 13%	Cyclic alcohols, etc.	All products under HS2906 except HS29061100 and HS29061990
		Reduced to 9%	Some chemicals	27 products at HS-8 level in HS34
		Reduced to 5%	Miscellaneous chemicals	127 products at HS-10 level in HS38
			Plastics	HS 39 except duty-free products
			Rubber	HS 40 except duty-free products
			Stone, plaster, cement, etc.	50 products at HS-8 level in HS68
			Ceramic products	26 products at HS-8 level in HS69
			Glass and glassware	All HS70
			Steel products	31 products at HS-8 level in HS73
			Nickel	9 products at HS-8 level in HS 75
			Lead	HS78041100;1900;HS78060010;0090
			Tin	HS80070030;HS80070090
			Other base metals; cermets	34 products at HS-8 level in HS81
Cai Shui[2008] No.144	Dec. 1st 2008	Increased to 13%	Chemicals	17 products at HS-10 level in HS29; HS3604100000-3604900000; HS3909301000
			Aluminium	HS7606112000-7606920000
		Increased to 11%	Glass products	HS7013100000-7013990000
		Increased to 9%	Chemicals	47 products at HS-10 level in HS29
			Copper tubes	HS7411101900-7411290000
Cai Shui[2009] No.43	Apr. 1st 2009	Increased to 17%	Copper	HS7410211000
		Increased to 13%	Mineral products	HS2804611700;HS2826300000
			Chemicals	25 products at HS-10 level in HS29; 9 products at HS-10 level in HS38
			Dyeing	HS3213100000;HS3213900000;HS3215901000;909000;
			Plastics	31 products at HS-10 level in HS39
			Rubber	7 products at HS-10 level in HS40

Circular	Date of validity	Type	Products	Corresponding HS codes
			Iron and steel	54 products at HS-10 level majorly included from HS7219-7229 in HS72; 3 products in HS73
			Copper	14 products at HS-10 level in HS74
			Nickel, aluminium, titanium	HS7505120000;HS7505220000;HS7507120000;HS7604210000;HS7604290000;HS8108901010-909000
		Increased to 11%	Chemicals	HS2905110000;
			Plastics	33 products at HS-10 in HS39
		Increased to 9%	Mineral products	HS2811220000;HS2827200000;HS2836200000;HS2836300000
			Steel products	18 products at HS-10 in HS73
			Copper	13 products at HS-10 in HS74
			Titanium	HS8103901900;HS8103909090
		Increased to 5%	Mineral products	HS2828100000;
Cai Shui[2009] No.88	Jun. 1st 2009	Increased to 17%	Chemicals	HS2804611700
		Increased to 13%	Mineral products	HS2504109100;HS2836999000;
			Plastics	94 products at HS-10 in HS39
			Steel products	6 products at HS-10 in HS73
		Increased to 9%	Iron and steel	79 products at HS-10 ranging from HS7208 to HS7229 in HS72
			Steel products	52 products at HS-10 in HS73
Cai Shui [2010] No.57	Jul. 15, 2010	Withdrawal	Steel products Non-ferrous metal products Silver powder Alcohol, corn starch Chemicals Plastic, rubber and glass	406 products in total at HS-10.

Source: Ministry of Finance of China.

Table A3. Export tax rates on energy-intensive products and number of total taxed products in China: 2002-2010

Product		2002	2003	2004	2005	2006	2007	2008	2009	2010
Other base metals (HS81)	Number	1	1	1	1	1	11	15	15	15
	Rate (%)	5	5	5	5	5	5,10	5,10,15	5,10,15,20	5,10,15,20
Tin (HS80)	Number							2	2	2
	Rate (%)							10	10	10
Zinc (HS79)	Number						2	3	3	3
	Rate (%)						5	5,10,15	5,10,15	5,10,15
Lead (HS78)	Number							2	2	2
	Rate (%)							10	10	10
Aluminium (HS76)	Number				2	2	2	4	6	6
	Rate (%)				5,10	5,10	15	15	5,15	5,15
Nickel (HS75)	Number				1	2	3	5	5	5
	Rate (%)				2	2	15	5,10,15	5,10,15	5,10,15
Copper (HS74)	Number				3	10	10	13	13	13
	Rate (%)				5,10	5,10	5,10,15	5,10,15	5,10,15	5,10,15
Steel products (HS73)	Number							8		
	Rate (%)							15		
Iron & steel	Number	1		3	3	7	32	113	55	45
(HS72)	Rate (%)	7		5	5	5	10	5,10,15,20,25	5,10,15,20,25	10,15,20,25
Pulp & paper (HS47)	Number							16	16	16
	Rate (%)							10	10	10
Fertilizer (HS31)	Number				1	1	1	3	22	22
	Rate (%)				260yuan/t	*	**	***	75,****	7,30,b
Chemicals (HS28)	Number	1	1	1	1	1	20	47	61	55
	Rate (%)	10	10	10	10	10	5,10	5,10,15,25	5,10, 15,25,a	5,7,10,15,25
Mineral products (HS27)	Number						4	5	12	12
	Rate (%)						5	5,10,15,25	5,10,15,40	5,10,15,40
Mining (HS26)	Number	3	3	1	1	1	36	36	36	36
	Rate (%)	5,10,20	5,10,20	20	20	20	10,20	10,15,20	10,15,20	10,15,20
Total number of EI products		6	5	6	13	25	121	272	248	177
Total number of products taxed at export		7	7	7	14	26	137	296	310	265

Source: Customs House of China and Import Export Tariff of People's Republic of China of related year.

Note: For each sector (HS-2), "Number" indicates the total amount of exported products (HS-10) taxed and "Rate" indicates the export tax rates for related products.

Note: Export tax rates on certain products may vary during a year. The modification is made by the Customs Tariff Commission of the State Council.

Note: * 30% from Jan. 1st to Sep. 30th; 15% from Oct. 1st to Dec. 31st, 2006

** 30% from Jan. 1st to Sep. 30th; 15% from Oct. 1st to Dec. 31st, 2007

*** 30% from Jan. 1st to Mar. 31th; 30% from Apr. 1st to Sep. 30th; 20% from Oct. 1st to Dec. 31st, 2008 for HS31053000 and HS 31054000

30% from Jan. 1st to Mar. 31th; 35% from Apr. 1st to Sep. 30th; 25% from Oct. 1st to Dec. 31st, 2008 for HS31021000

**** 7 products at HS-8 level are given variable export tariff rates

a, special export tax rates 50% on 4 products and 75% on 5 products at HS-8 level.

b, special export tax rates 75% on 8 products at HS-8 level among which 4 products receive differentiated export tax rates by period.

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