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Varietal Utility and Patriotic Preference: the Case of European Agriculture

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Préférence pour la variété et les produits nationaux : le cas de l'agriculture européenne

Mots-clés :

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Varietal utility and patriotic preference : the case of European agriculture

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Résumé – Selon les auteurs, les évaluations conventionnelles du coût économique de la Politique agricole commune (PAC) peuvent conduire à surestimer ce coût. Les gains potentiels dus à une allocation plus efficace des ressources communautaires, qui résulterait d'une libéralisation des marchés agricoles de l'Union européenne (UE), pourraient en effet être compensés par une perte de bien-être des consommateurs suite à une réduction de la diversité des produits alimentaires nationaux. Cet argument découle d'une application directe au secteur agricole communautaire du résultat théorique qui stipule qu'en présence de différenciation des produits et d'une préférence biaisée pour les produits nationaux, protéger l'industrie nationale peut induire un gain de bien-être économique global pour le pays considéré. Pour l'illustrer, nous utilisons un modèle d'équilibre général calculable dans lequel le secteur de la transformation alimentaire est en situation de concurrence imparfaite. Nous y introduisons la possibilité de préférences asymétriques des consommateurs, biaisées en faveur d'une variété nationale, et les divers instruments de politique agricole en vigueur. Nous montrons que la préférence biaisée pour les produits alimentaires nationaux dans l'UE génère un « effet de la variété » positif qui peut être suffisant pour compenser le coût économique de la PAC tel que mesuré de façon conventionnelle. Cet « effet de la variété » positif est plus prononcé pour le secteur de la transformation des viandes qui bénéficie d'une protection tarifaire élevée. Toutefois, il ne compense pas totalement le coût économique de la PAC, résultant d'une allocation non efficace des ressources, car ce dernier est plus important en présence de préférences asymétriques biaisées en faveur des produits nationaux que dans le cas conventionnel. En outre, lorsque l'on applique l'hypothèse de préférences asymétriques biaisées en faveur des produits alimentaires nationaux à tous les pays, les résultats suggèrent que la PAC impose un coût supplémentaire pour le reste du monde. Ce coût supplémentaire résulte du fait que la PAC tend à y réduire la diversité des produits alimentaires nationaux. Même si, au niveau du global, « l'effet de la variété » est négligeable, les effets redistributifs associés entre pays sont beaucoup plus importants. En conséquence, les défenseurs de la PAC qui voudraient arguer de « l'effet de la variété » comme un bénéfice de cette politique doivent considérer les implications d'un tel effet au niveau global.

Summary – We suggest that opportunity cost estimates of the Common Agricultural Policy (CAP) may be overstated, with potential allocative efficiency gains offset by negative utility effects associated with the loss of domestic food varieties. This is based on an application of the theoretical result that protection of an industry in the presence of product differentiation and home-bias can be welfare-improving. To illustrate the effects of varietal diversity in foods on the economic cost of the CAP, we incorporate asymmetry in consumers' preferences, based on region of origin and characterised by a single preferred (domestic) variety, in a CGE trade model with imperfectly-competitive food processing sectors and explicit representation of policy interventions. We show that consumer preference for domestically produced foods can create varietal utility in the EU sufficient to balance the economic cost of the CAP as conventionally measured. This varietal effect is most pronounced in meat processing which benefits from high levels of tariff protection. However, an enlarged allocative efficiency loss to the EU economy means that the overall cost of the CAP is not eliminated. Moreover, whilst a varietal effect may mitigate the cost to the EU, universal application of the preference structure imposes an additional cost of the CAP on the rest of the world, arising effectively from a global redistribution of varietal utility. Thus, for the world as a whole, the net impact of the varietal effect is negligible, though the distributional impact is much greater. Protagonists of the CAP who may wish to cite varietal utility as a benefit hitherto overlooked, need to be mindful of the global implications.

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THE economic inefficiency of the Common Agricultural Policy (CAP) of the European Union (EU) is well known and documented. That a policy is the cause of an economic cost implies the existence of at least one unaccounted benefit, either economic or non-economic. One such benefit of the CAP may be the assurance of available food supplies to European consumers. Over the course of a generation the EU moved from the threat of food scarcity to a situation of abundance. Closely related is the possibility that greater diversity in food varieties is a source of additional utility hitherto overlooked. This notion is associated with product differentiation (Dixit and Stiglitz, 1977; Krugman, 1979; Helpman, 1981) and, in the current context, raises the question as to whether there are realistic conditions under which positive varietal effects could eliminate the net cost of the CAP as conventionally measured.

To explore this question, consider the notion of asymmetry in preferences, which exists when consumers rank varieties differently. One type of asymmetric preference structure proposed by Lancaster (1984) is the 'interleaved' case, where for every domestic variety there is an adjacent foreign variety on the consumer's preference spectrum, which implies that both domestic and foreign varieties are close substitutes. Contrary to conventional wisdom, Lancaster predicts that a small country *gains* by imposing an unilateral tariff on differentiated product lines. Specifically, the tariff creates domestic short run profits that entice new firms, and therefore new varieties, into the domestic market. The utility gain to domestic consumers favouring new varieties, as well as the ensuing price fall (the larger number of substitutes increases the price elasticity), outweighs the loss to those domestic consumers who favour foreign varieties¹. Similarly, Venables (1987) demonstrated that patriotic asymmetries in demand specifications might result in additional welfare losses when domestic protection is cut in imperfectly competitive industries, due to the exit of firms from those industries. Based on these findings, it is reasonable to hypothesise, *a priori*, that the opportunity cost estimates of the CAP may be overstated, with allocative efficiency gains offset by negative utility effects associated with a loss of domestic food varieties.

With regard to consumers' purchasing behaviour, the literature reveals a burgeoning of studies investigating the importance of region of

¹ Note that the importance of this result rests on Lancaster's assumption that existing foreign firms remain in the domestic market after the imposition of the tariff, to preserve the high substitution possibilities of the interleaved structure. If foreign firms withdrew, product variety may fall and the subsequent increase in monopoly power of domestic firms would increase long run prices.

origin (ROO). In the context of agricultural trade, this work is particularly significant given that the availability and exchange of proliferating food varieties is becoming increasingly associated with the globalisation of food markets. In the economics literature, McCallum (1995) employs trade data between the US and Canada to demonstrate the prevalence of 'home-bias' at the regional level, a result that is supported by similar European based trade studies (Nitsch, 2000; Head and Mayer, 2000). Additionally, in characterising 'home bias', Obstfeld and Rogoff (2000) note that trade flows are relatively unresponsive to changes in relative regional production costs. Indeed, Feuerstein (2002) suggests that 'home bias' is more symptomatic of demand considerations (*i.e.*, patriotic preference), which Torstensson (1999) posits may act as a form of 'preference barrier' to trade.

Earlier investigations within the consumer behaviour literature on patriotic preference for non-food products (Anderson and Cunningham, 1972; Gaedeke, 1973; Bannister and Saunders, 1978; White, 1979; Bilkey and Nes, 1982) reveal that the ROO cue is a highly significant part of the product mix (*i.e.*, nutritional safety, quality, taste, etc.), although no consistent purchasing patterns (*i.e.*, patriotism) are generally discernable. Whilst also confirming that ROO is highly influential on consumer perceptions, a significant number of recent studies focusing on consumer attitudes toward *specific food products* even support the notion of ethnocentric behaviour toward food products, where perceptions are typically skewed toward the domestic variety (Juric *et al.*, 1996; Guerro, 1998; Pecher and Tregear, 2000, Scarpa *et al.*, 2001)².

Accordingly, in drawing on Lancaster (*op. cit.*) and Venables (*op. cit.*) to examine the effects of variety on the economic cost of the CAP, we incorporate asymmetry in *food* preferences, characterised by a *single* preferred (domestic) variety. Whilst we demonstrate that the CAP supports a hitherto unaccounted varietal benefit, which may mitigate its negative image in Europe, we also note that universal application of the preference structure imposes an additional cost on the rest of the world. The remainder of the paper is organised as follows: the first section gives a brief introduction to CGE modelling and outlines the main features of the preference structure; the next section discusses the motivation behind the simulation design; the last sections present our results and conclusions.

² Pecher and Tregear (2000) speculate that up until fairly recently, the relative dearth of literature examining the importance of ROO in specific food product perceptions may have been due to the fact that, «...researchers tend to regard food purchases as low involvement/low risk items. As such, they believe these purchases do not entail protracted deliberations by consumers, thereby limiting the extent to which country of origin variables are implicated».

METHODOLOGY

Computable General Equilibrium modelling

Computable General Equilibrium (CGE) models employ neo-classical behavioural concepts such as utility maximisation and cost minimisation to characterise the workings of the economy. To ensure a general equilibrium (*i.e.*, simultaneous market clearance in all sectors), a large system of accounting identities are introduced to guarantee that households and producers remain on their budget and cost constraints, respectively, and that long-run zero profits prevail in all production sectors. While the standard model frameworks are fairly straightforward in structure (perfect competition, constant returns to scale), their mathematical basis offers modellers the opportunity to incorporate a broad range of more complex economic theory (dynamic savings-investment behaviour, imperfectly competitive structures, differentiated demands, factor immobility, explicit policy modelling, etc.). Once the model structure is formalised and calibrated to a given data set, specific macroeconomic or trade policy scenario questions may be addressed by imposing 'shocks' to key exogenous variables (taxes, subsidies, labour supply, etc.). The model responds with the interaction of economic agents within each market, where an outcome is characterised by a new set of interdependent equilibria.

The main strength of the CGE approach lies in its ability to characterise economic feedback effects not inherent in partial equilibrium studies. It has been employed to examine an array of issues including multilateral trade reform (for example, Francois *et al.*, 1996), economic integration (Frandsen and Jensen, 2000), environmental policy (Perroni and Wigle, 1997), taxation (Wehrheim, 1998), tourism (Sinclair and Stabler, 1997), transport economics (Oosterhaven and Knapp, 2000) and, of direct interest in the current context, the cost of the CAP (Weyerbrock, 1998).

Market structure and consumer preferences

Our characterisation of consumer choice builds on the Lancaster (1984, 1991) approach where consumers exhibit asymmetric preferences for varieties based on region of origin. However, we employ a modified interleaved 'preferred variety' structure and focus exclusively on food product patriotism, *i.e.*, asymmetric preferences are restricted to food with the domestic product as the single preferred variety (see Appendix 1). Thus, European produced food is the EU consumers' preferred variety, with all non-European varieties exhibiting equal relative preference. Likewise, for other countries and regions, domestically produced

food is preferred³. The strength of relative preference is a function of the proximity of the domestic variety to the ‘ideal’⁴, where the closer the variety lies to the ideal the more it is preferred. The notion of variety implies that firms exercise market power, which necessitates a model of imperfect competition. We follow the same Cournot conjectural variation approach employed in Harrison *et al.* (1995), where firms mark-up their price over marginal cost as a function of the seller’s market⁵.

Within a multi-region CGE framework, each variety is identified at the regional level, as a composite or ‘representative’ variety, where firms in each region produce a unique variant of this representative variety⁶. Any changes in industry conditions resulting in a proliferation in the number of firms (product variants) in a given region result in that region’s representative variety moving closer to the ideal (Vousden, 1990). It is this process that characterises the ‘variety effect’ and adds an endogenous region-of-origin dimension to the model. This concept is illustrated graphically in Figure 1, which shows the relationship between varietal utility (Z) and the degree of relative patriotic preference (V). Thus, proliferations in the number of domestic firms/variants is equivalent to strengthening domestic preference and is captured as an increase in the value of V along the horizontal axis. Accordingly, an increase in V in any of the varietal utility functions is associated with an increase in varietal utility (Z)⁷.

As well as characterising preference for domestic representative varieties of food, we also capture the degree to which the consumer identifies with varietal choice, or *preference heterogeneity*. Thus, the relationship between a given proliferation (reduction) in product variants from a particular region and the subsequent varietal utility gain (loss) is governed by the size of the heterogeneity parameter γ in the varietal utility function (see Figure 1).

³ In the non-food manufacturing and service sectors, preference homogeneity is assumed throughout and therefore no variety effects arise. Whereas there is a substantial body of literature supporting the notion of *home-bias* in food consumption, this is not necessarily the case with non-food products. Country-of-origin can be of importance in manufactures and services, but in the absence of any systematic pattern at the aggregate level we treat preferences for these products as homogeneous.

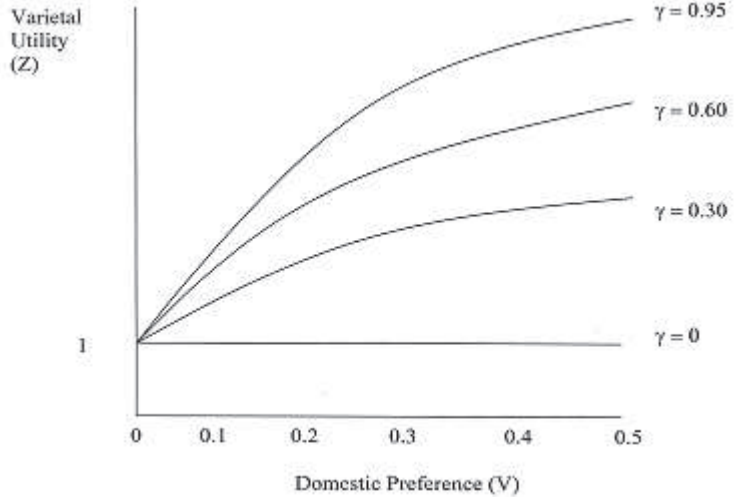
⁴ In Lancaster’s treatment, the ‘ideal’ is a fictional utopia of the perfect variety, which is never realised due to a limit on the number of *available* varieties.

⁵ For a full discussion of mark-ups, costs and entry and exit of firms/varieties, see Appendix 2.

⁶ There are two reasons for this approach. First, from an economic point of view, a new firm is more likely to succeed in the industry by producing a new variant instead of duplicating an existing one (*i.e.*, firms are trying to capture a niche in the product space). Secondly, a firm producing more than one variant would imply a different mark-up pricing rule for each, significantly enhancing model complexity.

⁷ See Appendix 1 for a mathematical interpretation of Figure 1.

Figure 1.
Schematic
representation of the
varietal utility
function



If $\gamma = 0$, all representative varieties have the same absolute varietal utility value which implies preference homogeneity. It is plausible to assume that marginal varietal utility falls as a representative variety moves closer to the ideal (*i.e.*, concavity of the varietal utility function). This implies $0 < \gamma < 1$.

We experiment with different combinations of food patriotism (V) and preference heterogeneity (γ), to explore the interrelationship between these parameters and their effect on the economic cost of the CAP.

DATA AND SIMULATION DESIGN

The model simulations employ version 4 of the GTAP (Global Trade Analysis Project) database (McDougall *et al.*, 1998), which consists of 45 regions/countries and 50 sectors. The key behavioural parameters are the primary factor and trade substitution elasticities, where estimates are based on the SALTER (Jomini *et al.*, 1991) dataset. Substitution elasticities for differentiated demands are taken from Swaminathan and Hertel (1996). Our aggregation focuses on the EU, and for simplicity all remaining regions are aggregated into a composite rest-of-the-world (ROW). Industry sectors are aggregated to 17, highlighting agriculture and food processing⁸. The food processing, manufacturing and services sectors are all characterised as imperfectly competitive, although varietal effects occur *only* for food, both in the EU and ROW. Primary sectors are modelled as perfectly competitive.

⁸ The sectors are wheat, other grains, oilseeds, sugar, milk, cattle and sheep, pigs and poultry, other agriculture, other primary, cattle meat processing, other meat processing, vegetable oils and fats, milk processing, sugar processing, other food processing, manufacturing and services.

A treatment of varietal diversity in globalised food markets cannot realistically be characterised without incorporation of the Uruguay Round (UR) trade agreement, which to date has been the most far reaching in terms of agricultural liberalisation. Thus, UR commitments are incorporated in the form of reductions to output subsidies, import tariffs⁹ and export subsidies and volumes¹⁰. To capture the time frame within which these commitments are to be implemented, the GTAP database is projected ten years to 2005, employing shocks on factor endowments, real GDP and total factor productivities (see Table 1).

Table 1. Annual growth rates, 1995-2005

Regions	Factor Accumulation			GDP	Total Factor Productivity			Pop.
	Unskilled labour	Skilled labour	Capital		Crops	Livestock	Non-primary*	
EU	-0.17	2.60	3.11	2.08	2.00	2.25	2.04	0.10
ROW	1.23	3.49	4.18	3.49	1.74	2.07	3.01	1.51

Sources: Frandsen *et al.* (1998) and authors' own calculations

* calculated endogenously from within the model solution.

The representation of the CAP follows Frandsen *et al.* (1998) in that we strip out de-coupled area – and headage-payments from the cereals and livestock output subsidy wedges in the standard GTAP database and recalibrate these as input subsidies¹¹. Set-aside payments to arable crops production are characterised as a totally de-coupled payment to a fictional 'agricultural household' and is thus treated as a provision for land owners rather than the productive sector¹². Finally, set-aside is modelled by shocking the 'arable land' endowment (Blake *et al.*, 1999) and production quotas in sugar and milk are characterised employing the standard CGE technique of swapping sectoral output with a quota rent variable (Jensen *et al.*, 1998). Thus, the economic cost of the CAP is then estimated by comparing this projected database for 2005 with a counterfactual that includes additional shocks to simulate the removal of all CAP protection. This provides a measure of the cost of the CAP in 2005, post UR, and is explored under different combinations of values of domestic preference (V) and preference heterogeneity (γ).

⁹ The tariff reductions account for 'dirty tariffication' effects.

¹⁰ The simultaneous export subsidy and volume reductions are incorporated using complementary slack conditions following Bach and Pearson (1996).

¹¹ It is not possible to introduce a new input subsidy, whilst leaving the remainder of the database unchanged as this disrupts the internal consistency of the database.

¹² The agricultural household receives payments from all factor payments employed in the agriculture sector net of depreciation on capital assets, plus flows of money pertaining to EU agricultural policies.

RESULTS

The results in Tables 2 and 3 show a decomposition of the impact of the removal of the CAP in 2005, for the EU and ROW, respectively. In the baseline scenario in each table, varietal effects are absent, *i.e.*, the results relate to preference *homogeneity* across *all* varieties¹³. In the other scenarios, the decomposition is presented for a range of domestic preference values ($V = 0.1$ to 0.5) in both regions under three different values of preference heterogeneity ($\gamma = 0.3, 0.6, 0.95$).

Table 2. The impact on the EU of CAP abolition in 2005

Preference heterogeneity	Baseline	$\gamma = 0.3$		$\gamma = 0.6$		$\gamma = 0.95$	
Domestic preference	$V = 0.0$	Range between $V = 0.1$ and $V = 0.5$					
Net gain	17,036	16,205	13,829	15,342	10,382	14,335	6,319
Composition of net gain							
Allocative effect	28,635	29,143	30,694	29,674	33,137	30,311	36,564
Terms of Trade	-8,668	-8,800	-9,224	-8,942	-9,889	-9,116	-10,834
Varietal effect							
Meat processing	0	-693	-2,762	-1,403	-5,850	-2,256	-9,881
Other meat processing	0	-16	-61	-33	-130	-49	-194
Vegetable oils & fats	0	-8	-31	-16	-67	-26	-114
Milk processing	0	-103	-389	-210	-797	-333	-1,301
Sugar processing	0	-108	-402	-217	-805	-343	-1,362
Other food processing	0	-259	-947	-519	-1,919	-825	-3,090
Total food processing	0	-1,187	-4,592	-2,398	-9,568	-3,832	-15,942
Pro-competitive effect	-144	-153	-183	-162	-243	-173	-384
Other*	-2,787	-2,798	-2,866	-2,830	-3,055	-2,855	-3,085

All values in US\$1995 millions (m).

* 'Other' indicates changes in endowments, technology, population, capital depreciation and marginal utility effects from the non-homothetic CDE private demand function.

In the absence of varietal effects in the baseline scenario, the net gain to the EU from CAP abolition in 2005 is US\$ 17,036 m (Table 2). A large positive allocative effect (US\$ 28,635 m) is reduced by a negative terms of trade effect (US\$ -8,668 m). In the remaining scenarios, domestic EU food varieties are preferred to foreign substitutes, and as EU food markets are opened there is a reduction in the number of domestic food processing variants, causing a fall in varietal utility. This is most pronounced in meat processing, accounting for approximately 60 % of the total varietal utility loss across all scenarios. For food processing in total, the loss reaches a maximum of

¹³ The varietal utility function is of the form: $Z = (1 + V)^\gamma$. Thus, if all varieties have a preference value (V) of zero, this implies preference homogeneity, and varietal effects will be zero across different values of γ .

US\$ -15,942 m ($\gamma = 0.95$, $V = 0.5$), equal to 94 % of the overall net gain under the baseline scenario. However, a consequence of the varietal effect is that stronger patriotism and preference heterogeneity act to enhance the positive allocative effect, because larger falls in domestic varietal utility in food result in larger resource shifts into the non-food sectors. Thus, under our strongest preference parameters, the overall net gain to the EU falls by 'only' 63 % from its value under the baseline scenario, to US\$ 6,319 m.

Table 3. The impact on the ROW of CAP abolition in 2005

Preference heterogeneity	Baseline	$\gamma = 0.3$		$\gamma = 0.6$		$\gamma = 0.95$	
Domestic preference	$V = 0.0$	Range between $V = 0.1$ and $V = 0.5$					
Net gain	9,101	10,016	12,616	11,000	16,641	12,167	22,120
Composition of net gain							
Allocative effect	-2,370	-2,390	-2,430	-2,410	-2,500	-2,430	-2,570
Terms of Trade	8,651	8,785	9,222	8,930	9,902	9,108	10,854
Varietal effect							
Meat processing	0	465	1,756	952	3,894	1,550	7,051
Other meat processing	0	0	11	4	43	9	96
Vegetable oils & fats	0	-1	-3	-2	-3	-3	-2
Milk processing	0	160	556	318	1,085	499	1,675
Sugar processing	0	97	345	194	707	308	1,199
Other food processing	0	70	224	134	379	201	484
Total food processing	0	791	2,889	1,600	6,105	2,564	10,503
Pro-competitive effect	-32	-31	-32	-31	-33	-30	-39
Other*	2,820	2,861	2,967	2,911	3,167	2,955	3,372

All values in US\$1995 millions (m).

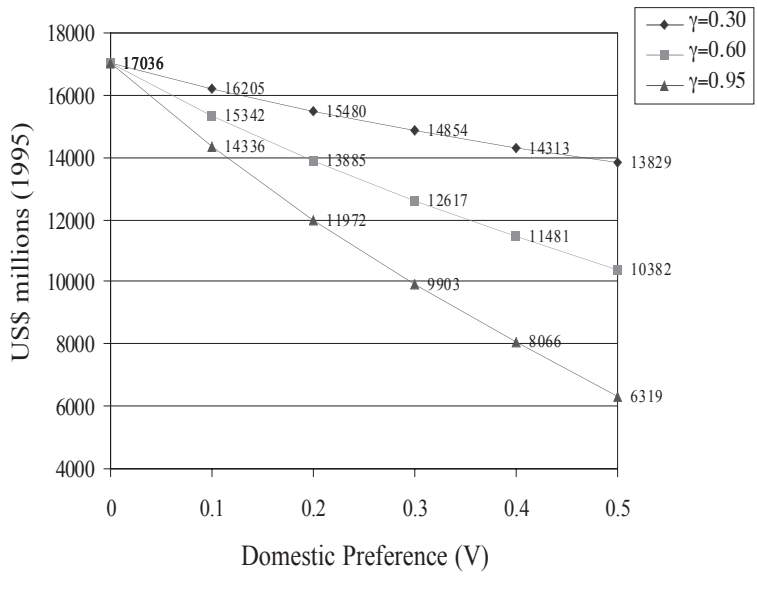
* 'Other' indicates changes in endowments, technology, population, capital depreciation and marginal utility effects from the non-homothetic CDE private demand function.

In the ROW the net gain from CAP abolition under the baseline scenario is US\$ 9,101m, most of which is due to a positive terms of trade effect (Table 3). That this gain is small, and that the allocative effect surprisingly is negative, probably results from the amalgam of distortionary policies that are used to either protect or tax agriculture in many of the countries that comprise this highly aggregate region. However, more interesting is that the net potential gain is more than doubled to US\$ 22,120 m under the largest values of γ (0.95) and V (0.5), as consumers in the ROW benefit from greater domestic varietal diversity.

In both regions, the varietal effect prevails more strongly with increases in the benchmark domestic preference (V) for a given value of preference heterogeneity (γ). Similarly, the effect of a larger preference heterogeneity parameter is to 'magnify' the varietal losses/gains for given

reductions/increases in product variants, resulting in a wider range of utility loss/gain for a given range of preference values. The way in which the different values of patriotic preference and preference heterogeneity combine to affect the economic cost of the CAP to the EU is represented schematically in Figure 2. The cost falls to US\$ 6,319 m, or 0.07 % of EU GDP, when patriotic preference and preference heterogeneity are strong.

Figure 2.
The economic cost of the CAP under varying conditions of domestic preference and preference heterogeneity (γ)



While the impact of the varietal effect is to mitigate the cost of the CAP to the EU, the impact on the rest of the world is the opposite. The cost to the ROW increases with higher values of domestic preference and preference heterogeneity; the potential net gain from abolition of the CAP more than doubles under our strongest preference parameters. In effect, varietal utility is being redistributed globally. For the world *as a whole*, the potential net gain increases only marginally from US\$ 26,137 m (EU US\$ 17,036 m; ROW US\$ 9,101 m) in the baseline scenario of preference homogeneity to US\$ 28,439 m (EU US\$ 6,319 m; ROW US\$ 22,120 m) under our strongest preference settings, but the distributional effects, as might be expected, are much greater.

The impact on sector output, the number of firms (and therefore varieties), output per firm and the mark-up in the EU, under the extremes of the benchmark scenario and the strongest preference settings ($V = 0.5$ and $\gamma = 0.95$), are shown in Table 4. With abolition of the CAP, output declines in all six food processing sectors under the benchmark scenario, the largest falls being in meat and sugar processing which suffer the loss of high levels of tariff protection. Output in

manufacturing and services increases as resources are reallocated. All impacts are magnified under the strong preference settings, resulting in an enhanced allocative efficiency effect (see Table 2). The number of firms (varieties) also falls in all food processing sectors, with again meat and sugar processing showing the largest reductions. There are small increases in the number of firms in manufacturing and services, and impacts across all sectors are magnified under the strong preference settings. Output per firm is less clear cut, although it can be intuitively explained by changes in the structure of industry costs and reference to Appendix 2. Contractions in meat and sugar sectors result in total industry cost falls which are proportionately *greater* than the reduction in industry fixed costs (due to falling varieties/firms – see Appendix 2)¹⁴.

Table 4. The impact of CAP abolition in 2005 on sector output, number of firms, output per firm and mark-up in the EU (percentage point difference from the baseline run)

Variable	Sector output		Firms/Varieties		Output per firm		Mark-up	
	Baseline	$\gamma = 0.95$	Baseline	$\gamma = 0.95$	Baseline	$\gamma = 0.95$	Baseline	$\gamma = 0.95$
Domestic preference	V = 0.0	V = 0.5	V = 0.0	V = 0.5	V = 0.0	V = 0.5	V = 0.0	V = 0.5
Sector								
Meat processing	-62.6	-80.7	-50.7	-64.4	-11.9	-16.3	18.1	22.2
Other meat processing	-1.3	-2.3	-1.6	-3.7	0.3	1.4	-0.2	-0.6
Vegetable oils & fats	-2.3	-3.1	-3.1	-4.3	0.8	1.2	-1.1	-1.3
Dairy	-7.4	-8.6	-9.3	-11.2	1.9	2.6	-4.9	-5.2
Sugar processing	-29.0	-32.6	-20.8	-20.4	-8.2	-12.2	9.7	10.9
Other food processing	-3.0	-3.7	-3.2	-4.0	0.2	0.3	-0.1	-0.2
Manufacturing	0.5	0.6	0.7	0.8	-0.2	-0.2	0.3	0.4
Services	0.3	0.5	0.6	1.0	-0.3	-0.5	0.1	0.2

Accordingly, mark-ups rise and output per firm falls (negative pro-competitive effects). On the other hand, in the remaining four food processing sectors, falling variety (fixed costs) leads to reduced mark-ups and positive changes in per firm output (positive pro-competitive effects). This is also evident in manufacturing and services, except in the opposite direction, with *rising* variety (fixed costs) and *falling* output per firm. Overall, negative pro-competitive effects in manufacturing, services, meat and sugar sectors, lead to a negative net regional pro-competitive effect for the EU (see Table 2).

As to be expected, EU imports (exports) of food products increase (decrease) with abolition of the CAP (Table 5). The effect of strong

¹⁴ Fixed costs are calibrated to total costs through the industry mark-up (see Appendix 2).

preference settings it to accentuate these impacts, because domestically-produced foods in the EU lose some of their preferential advantage over foreign substitutes, whilst the outcome in the ROW is the reverse, *i.e.*, domestically-produced foods in the ROW become more preferred.

Table 5.
The impact of CAP
abolition in 2005 on
sector imports and
exports in the EU
(percentage point
difference from the
baseline run)

Variable	Imports		Exports	
	Baseline	$\gamma = 0.95$	Baseline	$\gamma = 0.95$
Preference heterogeneity				
Domestic preference	V = 0.0	V = 0.5	V = 0.0	V = 0.5
Sector				
Wheat	6.2	24.0	7.1	4.3
Other grains	45.3	89.2	0.3	0.0
Oilseeds	14.7	15.0	-41.4	-44.9
Meat processing	354.6	562.6	-76.5	-92.1
Other meat processing	13.5	18.1	-0.4	-3.6
Vegetable oils & fats	7.5	9.9	-2.8	-3.4
Dairy	10.6	16.9	-29.9	-33.5
Sugar processing	178.9	206.6	-66.7	-68.5
Other food processing	25.3	36.4	-8.1	-8.7
Other primary	0.9	1.0	-0.4	-0.5
Manufacturing	-2.9	-4.2	2.8	3.3
Services	-4.6	-5.5	3.1	3.7

Note: Some percentage changes are taken from a small value base.

SUMMARY AND CONCLUSIONS

In this paper we combine Lancastrian asymmetric consumer preferences and the notion of a patriotic bias for food. Specifically, we investigate whether positive varietal utility effects can outweigh the costs of the CAP, as conventionally measured. A CGE model with an imperfectly competitive market structure and explicit representation of CAP interventions is used in conjunction with the GTAP database.

Results suggest that the magnitude of the varietal effect in the EU may indeed be equivalent to the net economic cost of the CAP. However, an enhanced allocative efficiency gain induced by the varietal effect prevents the cost from being eliminated. Moreover, it is shown that while the varietal effect may mitigate the cost of the CAP to the EU, it involves a global redistribution of varietal utility, such that the cost borne by the rest of the world is increased. That is, the EU's varietal utility gain is the rest of the world's varietal utility loss. Thus, protagonists of the CAP who might feel inclined to cite varietal utility effects as a benefit hitherto overlooked, need to be aware of the wider, global implications.

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APPENDIX 1

**Patriotic preference and varietal utility
within a linearised CGE framework**

Following Lancaster (1984 and 1991), (cardinal) varietal utility from the consumption of representative variety ‘ i ’ from region ‘ r ’ to the consumer in ‘ s ’, $Z_{i,r,s}$, is given as:

$$Z_{i,r,s} = [1 + V_{i,r,s}]^{\gamma_{i,s}} \quad \gamma_{i,s} > 0 \quad (1)$$

where $V_{i,r,s}$ is a relative measure of preference gauged in relation to the ideal and g is the preference heterogeneity parameter (see main text). Equation (1) is strictly increasing in V and « the effect of distance increases as products differ more and more from the ideal » (Lancaster, 1991, p. 3). Thus, varieties with higher relative preference values ($V_{i,r,s}$), yield greater levels of varietal utility ($Z_{i,r,s}$). To more easily isolate the effect of increasing relative patriotic preference, non-domestic varieties have a V value of zero under all simulation runs, implying that non-domestic varietal utility remains fixed at unity. Linearising equation (1) gives (where lowercase letters are percentage change variables of their uppercase counterparts):

$$Z_{i,r,s} = \left[\frac{\gamma_{i,s} V_{i,r,s}}{[1 + V_{i,r,s}]} \right] n_{i,r} \quad (2)$$

where increases (decreases) in the number of regional firms, or product variants, ($n_{i,r}$), proxy for improvements (deteriorations) in that region’s representative variety’s preference value ($V_{i,r,s}$).

Consumers’ preferences are approximated in an Armington structure using a CES cost minimisation procedure. However, in the case of the imperfectly competitive sectors, modified varietal Hicksian demands are based on a non-nested Armington structure, where domestic and foreign representative varieties compete *directly* with one another. The choice of non-nested preferences supports the notion that consumers are making direct comparisons between varieties from each region^{*i*}. Moreover, a nested Armington structure effectively dampens the imperfectly competitive tie between regions, since firms compete only through composite goods such that variety and pro-competitive effects are limited to the regional level. The non-nested specification allows domestic and foreign firms to compete directly through composite varieties which enlarges the size of the market and therefore the gains from specialisation, *i.e.*, imperfect competition is ‘global’ (Francois *et al.*, 1995).

To incorporate varietal preferences within this model framework, minimise expenditure on all representative varieties ($r = s, r \neq s$), subject to a modified non-nested CES sub-utility function (see Lancaster, 1984):

$$U_{i,s} = A_{i,s} \left[\sum_r \delta_{i,r,s} Q_{i,r,s}^{-\rho_i} Z_{i,r,s} \right]^{-\frac{1}{\rho_i}} \quad (3)$$

where $U_{i,s}$ is the level of sub-utility from the consumption of differentiated commodity

^{*i*} All perfectly competitive sectors in the model retain the standard nested Armington framework, where non-domestic homogeneous products compete through a composite foreign variety.

' i ' in region ' s '; $Q_{i,r,s}$ is consumer demand in region ' s ' for representative variety ' i ' from region ' r '; $Z_{i,r,s}$ is varietal utility associated with the consumption of the representative variety (equation 1); $\delta_{i,r,s}$ is a CES share parameter; $A_{i,s}$ is a scale parameter; and ρ_i is an elasticity parameter. Linearising gives:

$$q_{i,r,s} = u_{i,s} - \sigma_i [p_{i,r,s} - \bar{p}_{i,s}] + \sigma_i z_{i,r,s} \quad (4)$$

$$\bar{p}_{i,s} = \sum_r S_{i,r,s} p_{i,r,s} + \frac{1}{\rho_i} z_{i,s} \quad (5)$$

$$z_{i,s} = \sum_r S_{i,r,s} z_{i,r,s} \quad (6)$$

where:

$$\rho_i = \frac{1}{\sigma_i} - 1 \quad (7)$$

Linearised bilateral differentiated Hicksian demands ($q_{i,r,s}$) in (4) are a function of total sub-utility ($u_{i,s}$), representative variety prices ($p_{i,r,s}$), composite price ($\bar{p}_{i,s}$) and bilateral varietal utility ($z_{i,r,s}$). In this formulation, composite price is an average of representative variety prices weighted by expenditure shares ($S_{i,r,s}$) but modified by composite varietal utility ($z_{i,s}$) (equation 5). Composite varietal utility is itself an expenditure share weighted average (equation 6), and hence changes in bilateral varietal utility of the more preferred representative varieties in region ' s ' have larger effects on the composite. In this specification, all *changes* in varietal utility are sourced from the preferred domestic variety, thus, $z_{i,s}$ and $z_{i,r,s}$ are equal. In other words, whilst foreign product variants may still enter the domestic market through composite differentiated product purchases ($q_{i,r,s}$), proliferations in foreign product variants have no impact on composite domestic varietal utility ($z_{i,s}$) since all foreign varieties remain equally preferred (*i.e.*, $V_{i,r,s} = 0$; $Z_{i,r,s} = 1$ ($r \neq s$)).

Finally, the elasticity parameter, ρ_i , is defined in (7) in relation to the elasticity of substitution (σ_i)ⁱⁱ. Thus, equations 2 and 4-7 encapsulate our treatment of varietal preferences within a linearised CGE model framework. With preference *homogeneity* (*i.e.*, $\gamma_{i,s} = 0$, $Z_{i,r,s} = 1$, $z_{i,r,s} = 0$), equations 2 and 6 drop out and equations 3, 4 and 5 revert to their standard Hicksian forms.

Varietal effects can be discussed in the context of this framework. In region ' s ', the effect of an increase in bilateral varietal utility ($z_{i,r,s}$) due to increases in product variants (firms) in region ' r ', will always have a positive effect *ceteris paribus* on the demand for that representative variety, $q_{i,r,s}$. Varietal effects may also occur at constant prices ($\bar{p}_{i,s}$) with increases in composite varietal utility. Thus, reference to the composite price equation (5) shows that an increase in composite varietal utility ($z_{i,s}$) has the effect of reducing the per unit expenditure ($\bar{p}_{i,s}$) necessary to acquire an extra unit of sub-utility ($u_{i,s}$). In other words, since sub-utility is a function of quantities *and* varietal utility (see equation 3), the availability of more variety at the aggregate level, *ceteris paribus*, allows the consumer to get closer to the 'ideal' (Vousden, 1990) on the varietal spectrum (higher varietal utility) at no extra cost. This is equivalent to reducing the consumer cost of an additional unit of sub-utility in the nest.

ⁱⁱ The elasticity of substitution (σ_i) in (7) needs to be greater than 1, implying that ρ_i is negative. If $\sigma_i \leq 1$, then ρ_i is zero or positive. In the former case, $1/\rho_i$ in the composite price equation prevents a model solution. In the latter case, a positive value for ρ_i would be counter intuitive with respect to changes in composite varietal utility in (5). Moreover, values of σ_i less than 2 yield foreign mark-ups which are much larger than the domestic mark-up, implying that firms always have a better 'foothold' abroad than at home, which is also counter intuitive.

Price effects are captured through relative movements in representative variety prices $(p_{i,r,s})$ and composite price $(p_{i,s})$ determining movements in demand $(q_{i,r,s})$. Thus, in this structure there are varietal and price effects contained within the Hicksian demands. Moreover, as in the Lancaster (1984) specification, it is possible to have the same level of demand for two representative varieties, where one variety has a lower preference value, $(V_{i,r,s})$, but also a lower price, $(p_{i,r,s})$.

APPENDIX 2

The composition of costs, mark-ups and freedom of entry/exit of firms in imperfectly competitive industries (both food and non-food sectors)

Due to a lack of industry-specific data, it is assumed that all firms in the imperfectly competitive sectors are symmetric (*i.e.*, they have the same cost and technology structure and face the same demand conditions). This assumption allows the modeller to treat each firm as a micro-scaled version of the industry, which in turn allows the use of industry data. Secondly, in the food sectors, there is a one-to-one relationship between firms and domestic product variants where the *representative variety* 'i' from a given region 'r' is a composite of all product variants ($n_{i,r}$) in the industryⁱⁱⁱ. The representative variety price will be equal to each firm's product variant price, because each firm faces the same cost and demand structure (identical prices) and has an identical output share.

Mark-ups

Profit maximising behaviour in perfect competition yields marginal cost pricing. However, in imperfectly competitive industries, each firm is assumed to possess sufficient market power to mark-up output price (P) over marginal cost (MC), thus leading to short-run profits. Thus, each firm in the industry faces the same profit function :

$$\Pi_i = PQ_i - TC_i \quad (8)$$

where for each symmetric firm 'i': Π_i is profit; P is industry price; Q_i is firm output; and TC_i is total costs.

Under Cournot assumptions, profit maximisation involves employing output as the key strategic variable, where each symmetric firm anticipates, or conjectures, the output responses of rivals to changes in its own output^{iv}. Taking the derivative, ($\partial \pi_i / \partial Q_i$) and manipulating the resulting first order conditions gives the mark-up for each firm's price over marginal cost.

$$MARKUP = \frac{P - MC_i}{P} = \frac{\Omega_i}{N} \cdot \left| \frac{1}{\varepsilon} \right| \quad (9)$$

where :

$\Omega_i = \frac{\partial T}{\partial Q_i}$ is the conjectural variation parameter characterising changes in industry output (T) with respect to changes in firm output (Q_i); N is the number of firms in the industry; and $\left| \frac{1}{\varepsilon} \right|$ is the *absolute* value of the inverse elasticity of demand for the industry tradable.

Under the assumption of symmetry, $1/N$ is equivalent to Q_i/T . Thus, we can derive the conjectural variation elasticity :

ⁱⁱⁱ In the non-food imperfectly competitive sectors, it is assumed that preferences are homogeneous – see footnote (3).

^{iv} In international (perishable) food markets, the use of quantity as a strategic variable (Cournot assumption) is arguably more appropriate than that of price (Bertrand assumption).

$$\frac{\Omega_i}{N} = \frac{\partial T}{\partial Q_i} \frac{Q_i}{T} \quad (10)$$

In this paper, we employ the standard Cournot-Nash equilibrium, where Ω has a value of 1^v. Thus, firm 'i' believes that all rivals' outputs remain fixed, with percentage changes in industry output solely a function of output changes by firm 'i'. Note that the value of N is updated by changes in the number of firms entering/leaving the imperfectly competitive industry (see below). Further, the differentiation of mark-ups from region 'r' across foreign and domestic bilateral routes ('s') is a function of endogenous changes in the absolute value of the inverse elasticity of domestic ($r = s$) and foreign ($r \neq s$) demand^{vi}. The aggregate industry mark-up in region 'r' is a weighted sales share of each of the bilateral sales mark-ups to regions 's' ($r = s, r \neq s$).

The structure of costs

In the imperfectly competitive sectors, firms differentiate their products through expenditure on research and development and marketing activities, otherwise characterised as fixed costs, where the quantity demanded of fixed factors is directly proportional to the change in the number of product variants in the industry rather than the total sales of a particular variety. An examination of the mark-up expression (9), reveals that with constant returns to scale in production yielding constant average variable costs (equal to marginal costs), and long run zero profits in each imperfectly competitive sector, a mark-up of 0.3, implies that the average variable and fixed cost components constitute 70 % and 30 % of the output price (or average total cost) respectively. Thus, the aggregate (*i.e.*, domestic and foreign) mark-up for each imperfectly competitive sector is used to apportion *total* fixed and variable costs as fractions of total industry costs.

Entry/exit of firms/varieties

In the long run, profit is competed away through entry/exit of firms (product variants). Profit is largely a function of endogenous changes in the mark-up (mark-up effect) and changes in average fixed (and therefore total) costs due to changes in output per firm (scale effects)^{vii}. Thus, a fall (rise) in the mark-up will signal, *ceteris paribus*, falling (rising) profits and therefore an exodus (influx) of firms from (to) the industry. In linear terms, industry market clearing is given as:

$$qo_{i,r} = qofm_{i,r} + n_{i,r} \quad (11)$$

In the absence of changing industry output ($qo_{i,r}$), a reduction (rise) in firm numbers ($n_{i,r}$), will signal an increase (decrease) in output per firm ($qofm_{i,r}$) which is also consistent with the reduction (increase) in the mark-up. Finally, any change in the number of firms is used as a proxy for the change in consumer preference value ($V_{i,r,s}$) – see equation (2).

^v There is a range of different conjectural variation elasticities depending on the perceived response of other firms to changes in output by firm 'i'.

^{vi} A full derivation of the bilateral mark-ups can be obtained on request from the authors.

^{vii} In the traditional Dixit-Stiglitz monopolistically competitive representation, producer welfare effects are entirely attributed to changes in 'scale effects' where, *ceteris paribus*, average total costs fall with increases in output per firm, whilst mark-up ratios remain fixed. Under oligopolistic conjecture, mark-up ratios can also vary endogenously and constitute an additional source of welfare gain (*i.e.*, a measure of how far firms' pricing strategies differ from the perfectly competitive solution, $P = MC$). In the literature (Vosden, 1990; Hertel, 1994), the combination of both 'scale' and 'mark-up' effects is known as the 'pro-competitive' effect. Estimates of these combined effects are presented in Tables 2 and 3 in the main text.