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Globalization and the Gains from Variety: The Case of a Small Open Economy

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Abstract

Since the pioneering work of Krugman (1980) economists try to quantify the welfare gains from an increase in traded variety. The seminal work of Feenstra (1994) and its application to the U.S. of Broda and Weinstein (2006) allowed this quantification for the first time using highly disaggregated trade data. In this paper it is argued that size and openness of a country are important factors in determining these welfare gains. The gains from traded variety of a small open economy are calculated and compared to those of the U.S.; the differences between the countries are then analysed carefully. To achieve this, the methodology of Feenstra (1994) is extended. While the Armington definition of a variety forces the researcher to assume no growth at the extensive margin, in this paper the Feenstra ratios are reinterpreted in a way that allows for full growth at the extensive margin. The resulting two polar cases will influence the country comparison with respect to the gains from variety: Depending on how much growth at the extensive margin a researcher is willing to assume, the relative gains from variety of a small open economy compared to a larger economy like the U.S. are changed. It is also argued that this result may hold generally for other small and large OECD economies.

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1 Introduction

This paper empirically quantifies and compares the gains from variety for Switzerland, a small open economy (SOE), and the U.S. between 1990 and 2006. The main approach is taken from the seminal work of Feenstra (1994) which is extended by Broda and Weinstein (2006). Applying this methodology, using a monopolistic competition model as in Krugman (1980), highly disaggregated trade data is used to estimate elasticities of substitution for every product category available. By computing an import price index that is corrected for net variety growth, the gains from imported variety are calculated.

There is however one important issue that is left open by the existing literature: Despite the monopolistic competition model that in principle allows for growth at the extensive margin, the disaggregated trade data sets that are available force the researcher to assume the Armington (1969) definition of a variety: That is, every country exports exactly one single variety per product category. Thus, there is no growth at extensive margin at the level of Armington varieties possible. This has already been recognized by Feenstra (1994) and, more recently, by Hummels and Klenow (2005), who argue that the definition of the extensive margin is a central issue.

I extend the approach of Feenstra (1994) by reinterpreting the Feenstra ratios: A case with full growth at the extensive margin of an Armington variety is proposed. Hence, two bounds of the gains from traded variety are set up: One where only growth at the intensive margin of a variety is possible. This is the benchmark case originally proposed by Feenstra (1994). And a second one where only growth at the extensive margin of a variety is possible. It then is argued that the true gains from variety lie within these bounds since the true growth of variety is not observable.

The gains from variety are then calculated empirically for Switzerland and the U.S. using both bounds: For the period of 1990 to 2006, these welfare gains lie between 0.3% and 7.7% of the GDP in Switzerland. For the U.S., the gains account to between 0.4% to 4.9% of the GDP.

It is then analyzed where the differences in the gains from imported varieties between Switzerland and the U.S come from: They can be attributed to three different sources: The import share, the variety growth and the magnitude of the elasticities of substitution. The variety growth and the elasticities determine the bias in the import price index. This bias is always lower in the U.S., an outcome which is mainly due to the higher variety growth in U.S. imports. This result has the following interesting implication in the light of current theoretical trade contributions: If natural barriers to trade, as for example fixed export costs, result in relatively low imported variety in SOEs, then this matters for the consumers of these countries from a welfare perspective.

Despite the lower bias in the price index, the gains from imported variety may be higher in Switzerland due to the higher import share. It is then argued that the higher the assumed growth at the extensive margin, the more likely is Switzerland to exhibit higher gains from variety. Thus, the magnitude of the extensive margin seems not only to be important for the total size of the gains but also for the relative gains between countries. Furthermore, using data from other OECD economies it is illustrated that all these results may hold quite generally for other small and large OECD countries.

The paper is structured as follows: In the next section the existing theory and empirical evidence about the evaluation of the gains from variety is reviewed. Section 3 first reviews the methodology used to determine the gains from imported variety, referring to Feenstra (1994) and Broda and Weinstein (2006). In the second part of the section the extensions of the model are proposed. Section 4 presents the gains from variety in Switzerland and the U.S. between 1990 and 2006. Finally, in Section 5 Switzerland is compared to the U.S. and the differences of the gains from variety are analyzed and attributed to the different sources. Section 6 concludes.

2 Gains from Variety - Theory and Empirical Evidence

In the empirical literature, gains from trade liberalization almost never top a few percent of the GDP even when trade barriers are significantly reduced. An overview over some results is for example given in Feenstra (1992). While this may be surprising, many authors have pointed out that most approaches do not incorporate the changes in traded variety that occur upon trade liberalization.

It can be stated from a theoretical standpoint that the incorporation of a change in product variety is quite troublesome using an economic model. The traditional demand theory as in Arrow and Debreu (1954) uses a fixed set of goods by construction. Changing the number of goods means, in principle, changing the utility specification with all relationships between all goods. Hotelling (1929) and Lancaster (for example 1966 and 1975) provide some approaches to incorporate new goods. Lancaster (1966) presents a whole new theory, which he calls the New Demand Theory. The essence of his approach is that there is a fixed number of characteristics that a good can have. New goods with different levels of these characteristics can then be added easily. The substitutability between the new goods and the existing ones is defined by the characteristics *ex ante*. A qualitative assessment of welfare effects of new goods for developing countries is available from James and Stewart (1981). Unfortunately, demand systems are difficult to get using this approach. As a consequence it never had a large impact on the empirical literature. Nonetheless, conceptually this approach can be useful to bear in mind.

Taking another approach, Hausman (1981), based on Hicks (1940), shows that using microdata, the value of new goods for the consumer can be calculated as the area under the demand function that is added if the price of a variety falls from its reservation price to its actual price. Unfortunately, to estimate the reservation prices, highly detailed data is needed. Consequently, the empirical evidence is restricted to a few single goods like breakfast cereals (Hausman (1994)) or cell phones (Hausman (1997)). To calculate the gains from imported variety in all product categories this method is not appropriate.

A much larger impact had the theory developed by Spence (1976), Dixit and Stiglitz (1977), and, applied to trade, by Krugman (1979, 1980). Within a monopolistic competition setting, consumers value additional varieties depending on the substitutability between varieties. This substitutability is captured by one parameter, the elasticity of substitution. Thus, instead of having to deal with many characteristics, one parameter incorporates all relationships between varieties. Of course, this greatly simplifies the analysis and explains the empirical success of these models. Within these models, trade leads to more varieties available in every country and therefore to gains for the consumers stemming from this “love of variety”.

Applying such a model, Romer (1994) makes a numerical example where there are fixed costs to introduce a new product into a foreign market. As a consequence of trade barriers and the fixed costs, some goods are not profitable enough to be exported when trade barriers are too high and this may lead to a smaller variety in the importing country. The gains from trade liberalization can then account to up to 20% of the GDP if many goods are prevented from being imported.

Klenow and Rodríguez-Clare (1997) provide further evidence for the calibration exercise of Romer (1994). In their paper, the gains from trade liberalization using Costa Rican data can account for up to 2% of the GDP. These gains incorporate the gains from variety which raise the overall gains from trade by 50% to 300%, depending on the specification. Hence, although the gains from trade liberalization still seem small, the increase in the number of varieties is an important contribution to these gains.

The most influential work to date however is done by Feenstra (1994): He develops a price index for imports that is corrected for new and disappearing varieties based on Krugman’s monopolistic competition model. New varieties lower the unit-costs, depending on their substitutability with other varieties and their expenditure share. The difference between a conventional price index and the import price index taking the variety growth into account can then be used to compute the gains from imported variety. This approach is applied by Broda and Weinstein (2006) to estimate the gains from variety for the U.S. between 1972 and 2001. They find that the upward bias of the conventional import price index is 1.2 percent per year. This leads to a gain from imported variety of 2.6% of the GDP over the whole period.

Considering the fact that SOEs have import shares that are many times larger than the one of the U.S., one could imagine larger gains from variety for these economies. On the other hand, if SOEs do have disadvantages regarding the import of new varieties, the gains could turn out to be lower. This is an interesting issue in the light of current theoretical trade literature: A very modern approach to model variety effects is Melitz (2003). In his and other models, heterogeneous firms face fixed costs of exporting and decide whether to enter a foreign market or not. Higher fixed costs can then lead to a lower imported variety since some firms decide not to enter this particular market. This seems to be especially true for SOEs, since the fixed costs are more important if only small quantities can be sold in the domestic market. The relative gains between an SOE and a large economy are estimated and analyzed in this paper, to shed some light onto this issue.

3 Modelling, Empirical Strategy, and Estimation

In this section, the methodology used to estimate the gains from imported variety as developed by Feenstra (1994) and Broda and Weinstein (2006) is reviewed first. The utility model, the exact price index and the stochastic specification are derived in turn. In the second part of this section, some extensions to the standard methodology are proposed. They will prove to be useful for the cross-country comparison.

3.1 Review of the Standard Model

3.1.1 A Three-Level Utility Model

Imported varieties are grouped into goods (1), while these goods are then aggregated into a composite import good (2) which is consumed alongside a composite domestic good (3). The three levels of utility are

$$M_{gt} = \left(\sum_{c \in C} d_{gct}^{1/\sigma_g} m_{gct}^{(\sigma_g - 1)/\sigma_g} \right)^{\sigma_g/(\sigma_g - 1)} \quad ; \quad \sigma_g > 1 \; \forall g \in G. \tag{1}$$

$$M_t = \left(\sum_{g \in G} M_{gt}^{(\gamma - 1)/\gamma} \right)^{\gamma/(\gamma - 1)} \quad ; \quad \gamma > 1, \tag{2}$$

$$U_t = \left(D_t^{(\kappa - 1)/\kappa} + M_t^{(\kappa - 1)/\kappa} \right)^{\kappa/(\kappa - 1)} ; \quad \kappa > 1, \tag{3}$$

where κ, γ and σ_g are the elasticities of substitution between the goods or varieties of the respective level. G is the set of goods and C is the set of varieties. d_{gct} is a taste or quality parameter. Utility is separable and homothetic. The unit-cost function for every level of utility is derived:

$$\phi_{gt}^M(I_{gt},\vec{d}_{gt}) = \left(\sum_{c\in I_t} d_{gct} p_{gct}^{1-\sigma_g}\right)^{1/(1-\sigma_g)}, \tag{4}$$

$$\phi_t^M(G) = \left(\sum_{g\in G} (\phi_{gt}^M)^{1-\gamma}\right)^{1/(1-\gamma)}, \tag{5}$$

$$p_t = \left[(p_t^D)^{1-\kappa} + (\phi_t^M)^{1-\kappa}\right]^{1/(1-\kappa)}, \tag{6}$$

where I_{gt} is the set of varieties available at time t, p_{gct} is the unit price of an imported variety, and p_t^D is the unit price of the domestic good. These unit cost functions are the building blocks for the price index. Also, they demonstrate the love of variety approach: Suppose a number of varieties exist and all taste parameters are equal to 1. Then, an increase of the number of varieties for given prices implies a decrease of the unit-costs.

3.1.2 Derivation of an Exact Price Index

A cost of living index (COLI) measures the total cost for the consumer to achieve his highest possible utility level given a level of income. Therefore, a COLI depends on the cost function given a specific income. With homothetic preferences however, the cost function for every consumer is independent of his income. Thus, a price index of good g can be defined as in Konüs (1924):

$$P_g^M(\vec{p}_{gt},\vec{p}_{gt-1},\vec{x_{gt}},\vec{x}_{gt-1},I_g) = \frac{\phi_{gt}^M(I_g,\vec{d}_g)}{\phi_{gt-1}^M(I_g,\vec{d}_g)}, \tag{7}$$

where $\phi_{gt}^M(I_g,\vec{d}_g)$ are the unit-costs of that good at time t. Note that for the moment a constant set of varieties, I_g, henceforth called the *common set* is used. It is a remarkable feature that the price index does not depend on the taste parameters as Diewert (1976) shows. The intuition for this result is that all the information contained in the taste parameters is captured by the expenditure shares.

Sato (1976) and Vartia (1976) have derived the *exact* price index for the CES unit-cost function. For a price index to be exact it must equal the ratio of the unit-costs. This is true for the following price index:

$$\frac{\phi_{gt}^M(I_g,\vec{d}_g)}{\phi_{gt-1}^M(I_g,\vec{d}_g)} = P_g(\vec{p}_{gt},\vec{p}_{gt-1},\vec{x}_{gt},\vec{x}_{gt-1},I_g) = \prod_{c\in I_g}\left(\frac{p_{gct}}{p_{gct-1}}\right)^{w_{gct}}, \quad \text{where} \tag{8}$$

$$
\begin{aligned}
w_{gct}(I_g) &= \frac{(s_{gct} - s_{gct-1})/(\ln s_{gct} - \ln s_{gct-1})}{\sum_{c \in I_g}((s_{gct} - s_{gct-1})/(\ln s_{gct} - \ln s_{gct-1}))}, \\
s_{gct}(I_g) &= \frac{p_{gct}x_{gct}}{\sum_{c \in I_g} p_{gct}x_{gct}}.
\end{aligned}
$$

Thus, the price index is a geometric mean of all the price changes. The weights depend on the expenditure shares s_{gct}. The exact price index defined above demands that all the goods are available at all periods. It is due to Feenstra (1994) that the exact price index for a non-constant set I_{gt} is known:

$$
\pi_g(\vec{p}_{gt}, \vec{p}_{gt-1}, \vec{x}_{gt}, \vec{x}_{gt-1}, I_g) = \frac{\phi^M_{gt}(I_{gt}, \vec{d}_g)}{\phi^M_{gt-1}(I_{gt-1}, \vec{d}_g)}, \tag{9}
$$

$$
= P_g(\vec{p}_{gt}, \vec{p}_{gt-1}, \vec{x}_{gt}, \vec{x}_{gt-1}, I_g) \left(\frac{\lambda_{gt}}{\lambda_{gt-1}} \right)^{1/(\sigma_g - 1)}, \text{ where} \tag{10}
$$

$$
\lambda_{gt} = \frac{\sum_{c \in I_g} p_{gct}x_{gct}}{\sum_{c \in I_{gt}} p_{gct}x_{gct}}, \tag{11}
$$

$$
\lambda_{gt-1} = \frac{\sum_{c \in I_g} p_{gct-1}x_{gct-1}}{\sum_{c \in I_{gt-1}} p_{gct-1}x_{gct-1}}. \tag{12}
$$

Hence, the exact or *corrected* price index *with variety change* is a conventional price index times an additional term, henceforth called the *lambda or Feenstra ratio*. Note that the numerators of λ_{gt} and λ_{gt-1} comprise the expenditure on the common varieties, i.e. those varieties that are available at t *and* $t-1$. In the denominator of λ_{gt} the new varieties are included additionally while in the denominator of λ_{gt-1}, the disappearing varieties are included additionally. Thus, the lambda ratio gets smaller if there are many new varieties and it gets larger if there are many disappearing varieties. This is determined entirely by the *expenditure* for these new and disappearing varieties. This ratio is then weighted by a term negatively related to the elasticity of substitution. Thus, the price index gets corrected by more if the elasticity is low. If the elasticity is high however, the lambda ratio converges to one. Now that the exact price indices for the imported goods are known, they are aggregated into the aggregate exact import price index:

$$\Pi^M(\vec{p}_t, \vec{p}_{t-1}, \vec{x}_t, \vec{x}_{t-1}, I) = \frac{\phi_t^M(I_t, \vec{d})}{\phi_{t-1}^M(I_{t-1}, \vec{d})}, \tag{13}$$

$$= \prod_{g \in G} \left[P_g(I_g) \left(\frac{\lambda_{gt}}{\lambda_{gt-1}} \right)^{1/(\sigma_g - 1)} \right]^{w_{gt}}, \tag{14}$$

$$= CIPI(I) \prod_{g \in G} \left(\frac{\lambda_{gt}}{\lambda_{gt-1}} \right)^{w_{gt}/(\sigma_g - 1)}, \tag{15}$$

where, $CIPI(I)$ is a conventional import price index that does not account for the change in varieties. The ratio of the corrected import price index and the conventional price index expresses the bias from ignoring the change in variety. This ratio is called the *the endpoint ratio (EPR)* and it is defined as

$$EPR = \frac{\Pi^M}{CIPI(I)} = \frac{CIPI(I)}{CIPI(I)} \prod_g \left(\frac{\lambda_{gt}}{\lambda_{gt-1}} \right)^{w_{gt}/(\sigma_g - 1)} = \prod_g \left(\frac{\lambda_{gt}}{\lambda_{gt-1}} \right)^{w_{gt}/(\sigma_g - 1)}. \tag{16}$$

Thus, the EPR is the weighted average of the lambda ratios weighted by a term incorporating the elasticity of substitution.

Assuming a simple Krugman (1980) structure, the overall price index of the economy can be written as

$$\Pi = \left(\frac{p_t^D}{p_{t-1}^D} \right)^{w_t^D} (\Pi^M)^{w_t^M}, \tag{17}$$

where w_t^M is the log-change weight of the imports and w_t^D is the weight of the domestic sector. Then, the gains from variety can be written as

$$GFV = \frac{\Pi^{con}}{\Pi^{cor}} - 1 = \frac{\left(\frac{p_t^D}{p_{t-1}^D} \right)^{w_t^D}}{\left(\frac{p_t^D}{p_{t-1}^D} \right)^{w_t^D}} \frac{CIPI(I)^{w_t^M}}{(\Pi^M)^{w_t^M}} - 1 = \left[\prod_g \left(\frac{\lambda_{gt}}{\lambda_{gt-1}} \right)^{-w_{gt}/(\sigma_g - 1)} \right]^{w_t^M} - 1, \tag{18}$$

$$= \left[\frac{1}{EPR} \right]^{w_t^M} - 1, \tag{19}$$

Thus, the welfare gains can be calculated by weighting the inverse of the weighted aggregate lambda ratios with the fraction of imported goods relative to total economic activity.

3.1.3 Deriving the Stochastic Model

To determine the exact price indices that account for the change in varieties, an elasticity of substitution, σ_g, has to be estimated for every good. First, the demand of a particular variety is derived from the unit-cost function. The specifics are available from Feenstra (1991). Shares instead of quantities are used because this eases the measurement errors due to unit-values:[1]

$$\Delta \ln s_{gct} = \varphi_{gt} - (\sigma_g - 1)\Delta \ln p_{gct} + \epsilon_{gct}, \tag{20}$$

where the difference in the unit-costs is a constant for all varieties c of good g and is summarized by φ_{gt}. The change in unobserved taste parameter, $\Delta \ln d_{gct}$, is assumed to be the stochastic element. Next, defining ω as the inverse supply elasticity, the inverse supply can be written quite generally as

$$\Delta \ln p_{gct} = \psi_{gt} + \frac{\omega_g}{1+\omega_g}\Delta \ln s_{gct} + \delta_{gct}. \tag{21}$$

By choosing a reference variety and taking differences, the unobservable terms φ_{gt} and ψ_{gt} are eliminated:

$$\Delta^k \ln s_{gct} = -(\sigma_g - 1)\Delta^k \ln p_{gct} + \epsilon^k_{gct}, \quad \text{and} \tag{22}$$

$$\Delta^k \ln p_{gct} = \frac{\omega_g}{1+\omega_g}\Delta^k \ln s_{gct} + \delta^k_{gct}, \tag{23}$$

where $\Delta^k \ln s_{gct} = \Delta \ln s_{gct} - \Delta \ln s_{gkt}$ with k as the reference variety. Making the assumption $E(\epsilon^k_{gct}\delta^k_{gct}) = 0$, u_t is defined as $\epsilon^k_{gct}\delta^k_{gct}$:

$$\left(\Delta^k \ln p_{gct}\right)^2 = \theta_{1g}\left(\Delta^k \ln s_{gct}\right)^2 + \theta_{2g}\left(\Delta^k \ln p_{gct}\Delta^k \ln s_{gct}\right) + u_{gct} \quad \text{or} \tag{24}$$

$$Y_{gct} = \theta_{1g}X_{1gct} + \theta_{2g}X_{2gct} + u_{gct}, \tag{25}$$

with the obvious definitions for θ_{g1} and θ_{g2}. Following Feenstra (1994), the σ's can be calculated from the estimated θ's as follows:

[1] See for example Kemp (1962).

As long as $\theta_{1,g} > 0$,

$$\text{a) if} \quad \widehat{\theta}_{2,g} > 0 \quad \text{then} \quad \widehat{\rho}_g = \tfrac{1}{2} + \left(\tfrac{1}{4} - \tfrac{1}{4(\widehat{\theta}_{2,g}^2/\widehat{\theta}_{1,g})}\right)^{1/2},$$
$$\text{b) if} \quad \widehat{\theta}_{2,g} < 0 \quad \text{then} \quad \widehat{\rho}_g = \tfrac{1}{2} - \left(\tfrac{1}{4} - \tfrac{1}{4(\widehat{\theta}_{2,g}^2/\widehat{\theta}_{1,g})}\right)^{1/2},$$

and in either case,

$$\widehat{\sigma}_g = 1 + \left(\frac{2\widehat{\rho}_g - 1}{1 - \widehat{p}_g}\right)\frac{1}{\widehat{\theta}_{g2}}. \tag{26}$$

Note that since these equations are quadratic, complex numbers can occur. Furhermore, if $\theta_{1,g} < 0$, then $\widehat{\sigma}_g < 1$: Then, no elasticity that is compatible with the utility model can be obtained.

3.1.4 Estimation

There is a simultaneity bias present in the stochastic model above. Normally this is attacked by defining additional instruments. However, instruments for the prices and the shares in the above stochastic model cannot be found easily. The panel structure of the data allows for another solution: It can be used to get unbiased estimators without the use of external instruments.[2] Intuitively, the data is averaged over time and weighted with the number of periods available. This is equivalent to running an OLS on

$$\bar{Y}_{gc} = \theta_1 \bar{X}_{1gc} + \theta_2 \bar{X}_{2gc} + \bar{u}_g, \tag{27}$$

where $\bar{X}_{gc}$ is the mean over time. By defining moment conditions, Hansen's (1982) GMM can also be applied and is an equivalent estimator.

3.2 Extension I: Proposing two Bounds for the Gains from Variety

Having estimated the elasticities of substitution, the corrected import price indices can be calculated applying equations (8) to (17). As mentioned above, this has been done by Feenstra (1994) and Broda and Weinstein (2006).

As will get clear in the empirical section below, the gains from variety depend heavily on the *definition of a variety* and so do the relative gains between countries: Using disaggregated trade data sets, varieties are always defined as a particular good stemming from distinct countries of origin. This Armington (1969) definition, although widely used, is special and has its weaknesses: One country is always providing one variety of a specific good. There is *no growth at the extensive margin at the level of an Armington variety.*

[2]See for example Hsiao (1985) or Griliches and Hausman (1986)

More specifically, the problem is that if rising expenditures are observed for the imports of a particular Armington variety, this can have two reasons: Either there is growth at the intensive margin, i.e. existing varieties are imported at higher values, or there is growth at the extensive margin, i.e. more *actual*[3] varieties are imported. The Armington definition of a variety only allows for growth at the intensive margin. In this section I will propose the opposite case: I will set up slightly different lambda ratios that can be interpreted as allowing full growth at the extensive margin.[4] It is then argued that the true gains from variety lie between these two polar cases.

This fundamental issue is already adressed by Feenstra (1994). He shows that the lamda ratios as described in the section above do not provide the true correction of the import price index if there is a change in the number of actual varieties. An example can be used to illustrate this point: One variety using this data may be toys from China. In reality however, many actual varieties of toys are imported from China. If this number of actual varieties increases (decreases) over time, this may cause a rise (fall) in the expenditure that is due to more (less) variety. However, this will not be reflected in the lambda ratios: Since toys from China are imported *in 1990 as well as in 2006*, the expenditures on Chinese toys cancel out from equations (11) and (12). Hence, they do not contribute to a decrease (increase) of the lambda ratio even though they should.[5]

Feenstra (1994) then shows that Armington varieties that experience a change in *actual* variety should be *excluded from the common set*, that is from the numerators of equations (11) and (12). Intuitively, this means that those varieties should be treated as *new and disappearing* at the same time. This allows the extensive margin of varieties to increase or decrease over time: A change in the expenditure changes the lambda ratio. It means full growth at the extensive margin in the following sense: A rise in the expenditure on a specific Armington variety is always interpreted as a corresponding growth in actual variety.[6]

The problem in practice is the identification of these Armington varieties since the actual varieties are unobserved: In the U.S. there are over 60'000 varieties that are available in 1990 *and* in 2006. In principle this means that a researcher had to decide for each of these varieties whether to include or exclude it from the common set. Obviously, this is not possible in an objective way.

This problem is difficult to solve. It is addressed in this paper by using two cases without any discretion: One where all varieties possible are included into the common set. This is the benchmark

[3]With actual varieties the unobserved true number of imported varieties is meant. This is in contrast to the Armington varieties that are observed in disaggregated trade data sets.

[4]With full growth at the extensive margin, it is meant that increases of the expenditure for an Armington variety are always due to growth at the extensive margin and never to growth at the intensive margin.

[5]In adddition, quality changes are also ignored. A variety which is available in a better quality can be seen as a *new* variety as well. Thus, changes in quality should in principle also be reflected in changes of the lambda ratios. Again, these changes are ignored when including a variety into the common set.

[6]Feenstra partly uses this approach in his 1994 contribution: In one specification, he excludes the varieties from the developing countries and Japan from the common set.

case reviewed above that was proposed by Feenstra (1994), and it will here be called the *lower bound case*. It corresponds to the case with no extensive margin growth at the level of an Armington variety. The second case with no discretion is to exclude as many varieties as possible from the common set. This leads to an *upper bound* of the import price index bias and can be interpreted as the case with full growth at the extensive margin. Proposition 1 defines this upper bound case:

Proposition 1 *In the upper bound case, the lambda ratio is defined as*

$$\frac{\lambda_{gt}}{\lambda_{gt-1}} = \frac{\sum_{c \in I_{gt-1}} p_{gct-1} x_{gct-1}}{\sum_{c \in I_{gt}} p_{gct} x_{gct}}. \tag{28}$$

The difference to the standard Feenstra ratio is that the set I_g in equations (11) and (12) contains but one artificial variety with constant expenditure. Therefore, the expenditures of the common sets cancel out and as a result the lambda ratio is simplified as displayed in Proposition 1.[7] Hence, the proposed upper bound is just reinterpretation of the Feenstra ratio. Also note that this simplified ratio is now independent of the Armington definition of a variety.[8] All that is needed to calculate the lambda ratio is the total expenditure for a product category.

This interpretation of the lambda ratio contains some nice intuition: Note that equation (28) is the ratio of total expenditures on one good in the final period over all expenditures on this good in the first period. This means that the lambda ratio lowers the price index whenever expenditures raise over time. This is what is meant by full growth at the extensive margin. For example, doubling the expenditures will result in a lambda ratio of 0.5 regardless of the product group one is looking at.[9] This is also the reason for calling it the upper bound: If we are confronted with raising expenditures for imports over time, this definition will yield higher gains from traded variety.

Certainly, the resulting gains from variety will most likely be too high since not every increase in the expenditure reflects a growth in variety.[10] On the other hand, using the benchmark case where *all* varieties are put into the common set, the gains from variety may be too small since increases in the *actual* variety are not considered.[11] As a consequence, I argue that the true gains from variety will lie

[7]To assume an artificial variety may seem arbitrary at first sight. However, what could be done is to exclude all varieties from the common set except the one with the smallest change in expenditure over time. Then, the terms would "almost" cancel out. It is then only a small step to assume an artificial variety with constant expenditure.

[8]Thus, despite using the same trade data the measure for variety growth is now independent of the Armington definition. A merit which is due to the expenditure shares in the Feenstra ratio.

[9]Note that this is not the whole story: To obtain the import price index bias, the lambda ratio gets weighted by a term incorporating the elasticity of substitution. Thus, if the elasticity is large, the price index will not be corrected by much; a feature that is desirable.

[10]Additionally there is a problem with inflation: If positive inflation is present, then this artificially increases the expenditures and leads to a correction of the import price index that is too large. Note however that this is not a problem of the upper bound proposed here but an issue that is also present in Feenstra (1994).

[11]Furthermore, changes in quality are also neglected.

whithin these two values.[12] Already note here, that there are countless inbetween cases possible when some varieties are included into and some are excluded from the common set.

3.3 Extension II: Decomposition of the Gains from Variety

The methodology developed by Feenstra (1994) allows for a very simple decomposition of the gains from variety with respect to countries of origin and product categories. Especially for cross-country comparisons it will be interesting to see what trading partners are the most important ones regarding the gains from variety: Depending on the geographical and the political location, results are expected to be quite different between countries. Furthermore, different technology, resource endowments and the resulting differences in the import structure hint at differences in the relative importance of different product categories between countries.

3.3.1 Which Countries Contribute Most to the Gains from Variety?

To split up the gains from variety with respect to countries of origin, each lambda ratio is weighted by the share a particular country owns on that good. Then, these country-weighted lambda ratios are aggregated over all goods for each country. Proposition 2 summarizes:

Proposition 2 *The EPR of a single country i can be written as*

$$EPR_i = \prod_g \left[\left(\frac{\lambda_{gt}}{\lambda_{gt-1}} \right)^{(w_{gt}/(\sigma_{g-1}))W_{igt}} \right], \tag{29}$$

where W_{igt} is the ideal log-change weight of country i on good g.

The contribution of a single country relative to the whole gains from variety is then defined as $(1 - EPR_i)/(1 - EPR)$, where EPR is the EPR of the aggregated indices used above. Note that multiplying all the biases, the EPR from equation (16) results:

$$EPR = \prod_i EPR_i. \tag{30}$$

[12] Technically speaking, the terms *lower* and *upper* bound are not entirely correct: Since there are varieties that exhibit *decreasing* expenditures over time, *excluding* varieties from the common set could also *lower* the bias of the aggregate import price index. Thus, theoretically the upper bound bias can be lower than the lower bound bias. In practice however, when increasing expenditures for imported goods are observed, the upper bound case will yield the higher bias. Thus, as a practical terminology, I think these terms are appropriate.

3.3.2 Which Goods Contribute Most to the Gains from Variety?

To find out which aggregated good g[13] contributes the largest share to the gains from variety, the lambda ratios of the more disaggregated goods k[14] have to be aggregated.

Proposition 3 *For every aggregated good g the EPR can be calculated as*

$$EPR_g = \prod_k \left[\left(\frac{\lambda_{gkt}}{\lambda_{gkt-1}} \right)^{(w_{gkt}/(\sigma_{gkt}-1))} \right], \tag{31}$$

where k as a sub-category of good g and w_{gkt} is the ideal log-change weight of the sub-category.

Again, $(1 - EPR_g)/(1 - EPR)$ delivers the contribution of good g relative to the total gains from variety. And,

$$EPR = \prod_g EPR_g \tag{32}$$

holds.

4 Estimating the Gains from Variety

In this section, the methodology laid out in Section 3 is applied to Swiss and U.S. data. The lower and the upper bounds of the gains from variety are calculated. The calculation of these gains can be divided into three parts: First, the elasticities of substitution are estimated. In a second step, the lambda ratios are computed and the corrected import price index is calculated. Then, the gains from imported variety for the whole economy are computed by accounting for the domestic sector. Furthermore, the decomposition of these gains is carried out.

4.1 Data

The Swiss trade data are available from the Swiss Federal Customs Administration.[15] The data include import values and imported quantities for all HS-8 country pairs. This allows the calculation of unit prices. For the U.S., data is available from the Center of International Trade Data at UC Davis.[16] The U.S. data is available at an even more disaggregated level, namely HS-10. The definition of goods and varieties follows directly from the data: Goods are defined as HS product categories and varieties are defined as good - country pairs.

[13]For example, one could be interested in the contribution of every HS-2 product category. This will be done in the empirical section below.
[14]For example HS-8 product categories, depending on the disaggregation of the data available.
[15]See *www.admin.ezv.ch*.
[16]They are provided by Robert C. Feenstra. Visit *http://cid.econ.ucdavis.edu/*.

4.2 The Growth in Imported Variety

In the last 20 years the fraction of imports of goods compared to the GDP has risen from 30% to 40% in Switzerland. The value of all imports of goods has risen from roughly 80 billion Swiss Francs to over 170 billion, an annual growth rate of over 4% while the GDP has risen by only 1.8% per year.[17]

Less attention has been given to the fact that during the same period not only the import values have risen, but also the imported product variety. Table 1 displays these remarkable changes between 1990 and 2006 for Switzerland. Column (1) shows that the total number of imported goods has risen from 4'944 to 5'124 within twenty years.[18] 4'470 goods were imported in 1990 as well as in 2006, i.e. these are common goods of both periods. This means that some goods disappeared in the last twenty years and even more goods were imported for the first time as can be seen in the last two rows of column (1).

Table 1: Variety of Swiss Imports 1990-2006

	Year	Number of HS goods	Median no. of countries per good	Mean no. of countries per good	Total no. of varieties (goods)	Share of total imports (goods)	Total no. of varieties	Share of total imports (varieties)
		(1)	(2)	(3)	(4)	(5)	(6)	(7)
All goods (1990)	1990	4944	10	13.82	68327	1.00	68327	1.00
All goods (2006)	2006	5124	11	17.85	91439	1.00	91439	1.00
Common (1990)	1990	4470	11	14.11	63083	0.86	49382	0.83
Common (2006)	2006	4470	13	18.54	82868	0.83	49382	0.78
1990 not in 2006	1990	474	8	11.06	5244	0.14	18945	0.17
2006 not in 1990	2006	654	7	13.11	8571	0.17	42057	0.22

A good is defined after HS-6. A variety is defined as a good from a particular country. This table is similar to the one in Broda and Weinstein (2006).

Columns (2)-(4) of Table 1 display statistics about the varieties comprised in the goods of column (1). The number of imported varieties has risen from 68'327 in 1990 to 91'439 in 2006. This is an increase of about 34%. Since varieties are defined as goods stemming from different countries, it can be stated that in 1990 one good originated from an average of 13.82 countries whereas 17 years later the average number of supplying countries has risen to 17.85. Column (5) reveals that a large share of total imports, about 17%, can be attributed to new goods. Columns (6) and (7) abstract from the goods and consider the varieties imported. In column (6) the total varieties are again displayed in the first two rows. The second two rows show how many *common varieties*[19] were imported in 1990 and 2006. The last two rows display the new and disappearing varieties. Thus, 27% of all varieties imported in 1990 have disappeared whereas 49% of all varieties present in 2006 have not been imported in 1990. Column (7) shows that about 22%

[17]In real terms. The data is taken from the Swiss Federal Statistical Office, *http://www.bfs.admin.ch*

[18]In tables 1 and 2, HS-6 is chosen as the definition of a good. The reason is that at the 6th digit level, the trade statistics are harmonized and consequently the imported variety can be compared across countries. At more disaggregated levels, each country can use its own definitions.

[19]As opposed to the *varieties of common goods* displayed in column (4).

of the total import value can be attributed to new varieties. All the above stresses the changing pattern of Swiss imports in the last 20 years: Imports originate from more and from different countries today compared to 17 years ago. Secondly, there are not only many new varieties, but also many disappearing ones.

Table 2: Variety of U.S. Imports 1990-2006

	Year	Number of HS goods	Median no. of countries per good	Mean no. of countries per good	Total no. of varieties (goods)	Share of total imports (goods)	Total no. of varieties	Share of total imports (varieties)
		(1)	(2)	(3)	(4)	(5)	(6)	(7)
All goods (1990)	1990	4987	14	18.46	92048	1.00	92048	1.00
All goods (2006)	2006	5182	18	25.32	131191	1.00	131191	1.00
Common (1990)	1990	4518	14	18.79	84872	0.86	67163	0.85
Common (2006)	2006	4518	18	26.10	117928	0.84	67163	0.79
1990 not in 2006	1990	469	11	15.30	7176	0.14	24885	0.15
2006 not in 1990	2006	664	14	19.97	13263	0.16	64028	0.21

A good is defined after HS-6. A variety is defined as a good from a particular country. This table is similar to the one in Broda and Weinstein (2006).

For the U.S. the pattern of imported variety is very similar, although even more accentuated as Table 2 shows. As a consequence of the harmonized HS-6 product categories, the number of goods as displayed in column (1) is very similar to Switzerland. However, the U.S. import these goods from more countries on average: In 1990, the average good is imported from 18.46 countries whereas in 2006, an average of 25.32 countries supplied the U.S. This is between 30% and 40% higher than the average in Switzerland. Column (4) reveals that this leads to many more imported varieties in the U.S. compared to Switzerland. In 1990, the U.S. imported 92'048 varieties, 35% more than Switzerland. In 2006, this number raises to 131'191, 43% more than Switzerland. Also, the U.S. imported 53% more *new* varieties than Switzerland, 13'263 compared to 8'571. This means that the difference in imported variety even became larger between the two countries in the last 17 years. This is shown in Table 3. Switzerland experienced a growth in total variety of roughly 34%, the U.S. one of 43%. The number of goods remained relatively stable in both countries.

Table 3: Growth in Varieties: U.S. and Switzerland 1990-2006

	Switzerland	U.S.
Growth in all goods	3.64%	3.91%
Growth in all varieties	**33.83%**	**42.52%**
Growth in varieties of common goods	31.36%	38.95%

4.3 Estimating the Elasticities of Substitution

I use the linear WLS approach to estimate the elasticities of substitution as in Feenstra (1994).[20] And as in Feenstra (1994), equation (27) is estimated with a constant to account for simple measurement errors.[21] To use all available data, a variety is defined as HS-8 for Switzerland and HS-10 for the U.S.[22]

Table 4: Sigmas for Different Levels of Aggregation

	Switzerland			U.S.		
	SITC-3	SITC-5	HS-8	SITC-3	SITC-5	HS-10
Elasticities estimated	248	2784	7842	235	2607	14522
Mean	5.84	11.54	11.07	6.23	7.26	12.00
Standard Error (Mean)	0.27	4.84	1.55	1.82	1.61	1.67
Median	**4.48**	**4.12**	**4.07**	**2.85**	**3.04**	**3.40**
Maximum elasticity	29.84	13447.17	7685.96	409.21	4085.17	15263.29
Minimum elasticity	1.33	1.07	1.05	1.60	1.11	1.01

Swiss and US data from 1990-2006 is used for all estimates. A variety is defined at the HS-8 level for Switzerland and the HS-10 level for The U.S. This table is similar to the one in Broda and Weinstein (2006).

Table 4 displays the estimated elasticities for different levels of aggregation.[23] The table shows that the elasticities of substitution are higher for the Swiss import goods, which is illustrated by the median.[24] Qualitatively, the results are slightly different. As Broda and Weinstein (2006) point out, it is expected that the elasticities decrease if goods are defined broader since then, the varieties comprised in these goods are more differentiated. The U.S. estimates exhibit this pattern as in Broda and Weinstein (2006). For the Swiss estimates however, the opposite pattern occurs.

Two main differences between Switzerland and the U.S. can already be noted here: First, Switzerland imports less varieties compared to the U.S. Secondly, the mean and the median elasticity of substitution is larger for Swiss imports. This will have implications for the aggregate price index.

[20]Broda and Weinstein (2006) use a non-linear GMM estimator: Since only sigmas that are greater than one are compatible with the CES utility function, the goods with sigmas estimated as being smaller than one or as being complex numbers will be excluded from the calculation of the gains from variety. Using a non-linear GMM, one could perform a grid search to find values above one for every estimated sigma as in Broda and Weinstein (2006). The exclusion of these goods can be interpreted as taking a cautious approach to estimate the gains from variety.

[21]Many thanks to Robert C. Feenstra who provided me with the STATA-files used for the estimation. I also thank Hui Huang who has written the STATA version of the code.

[22]The results are not sensitive to this: Using HS-8 data for the U.S., the results are very similar.

[23]That is, different definitions of goods are used. For example, SITC-3 means that there are about 250 goods defined. The definition of a variety stays the same, namely HS-8 for Switzerland and HS-10 for the U.S. Note that for deriving the corrected import price index, only the sigmas of the last columns (HS-8) are used.

[24]Note that the means are heavily influenced by some outlier elasticities.

4.4 Deriving the Corrected Import Price Index

To compute the corrected aggregate price index as in equation (10), the lambda ratios are calculated.[25] Table 5 shows summary statistics of the lambda ratios under two specifications for Switzerland and the U.S.: The lower bound case and the upper bound case.

Note the differences in the lambda ratios between the two specifications: The medians are lower if more varieties are excluded from the common set. These varieties lower the lambda ratios since the expenditure is increasing for most of them. Comparing Switzerland with the U.S. it is apparent that under every specification the lambda ratios are lower in the U.S. This is a consequence of the many more new product varieties that were imported at high values by U.S. during these 17 years.

Table 5: Descriptive Statistics of the Lambda Ratios

	Switzerland	
Statistic	Lower Bound	Upper Bound
Number	2080	2080
Mean	1.51	3.20
Percentile 5	0.54	0.15
Median	**0.98**	**0.78**
Percentile 95	1.42	5.05
	U.S.	
Statistic	Lower Bound	Upper Bound
Nobs	1291	1291
Mean	1.52	1.92
Percentile 5	0.15	0.03
Median	**0.93**	**0.36**
Percentile 95	1.87	3.66

Using equations (8) to (15) and these lambda ratios, the conventional import price index as well as the corrected import price index can be computed. Table 6 displays the EPRs for both countries under the two specifications. The bias in the lower bound case is small. Within the last 17 years, ignoring the change in the set of imported varieties has led to an overestimation of the import price index of 0.88% in Switzerland, an annual bias of 0.05%. For the U.S. the total bias is 4.65%, 0.27% annually. The corrected import price index in the upper bound case however is 14.65% lower than the conventional import price index in Switzerland, an annual bias of 0.81%. For the U.S. the total bias amounts to 37.90%, 1.91% annually.

[25] Note that for HS-8 (SITC-5) goods the lambda ratio is not defined if there is no common variety in the start and in the end period. Where this requirement fails, the lambda ratio of the SITC-5 (SITC-3) good is used for all the HS-8 (SITC-5) goods within this SITC-5 (SITC-3) category. To get an elasticity for these aggregated goods, the geometric mean of the sigmas of the HS-8 (and only the HS-8) goods is used. For example for Switzerland there are not 7'752 lambda ratios defined, but only 2'080, a combination of SITC-3, SITC-5 and HS-8 goods. Note however, that *all* 7'752 sigmas are used for the calculation of the index. This is the way Broda and Weinstein (2006) implemented it. It leaves open the question *which* lambda ratios should be chosen in the upper bound case where an artificial variety is included into the common set. Using an artificial variety, in principle every lambda ratio could be defined. However, the most obvious choice is to use these lambda ratios that are defined in the lower bound case. This is very convenient since then the two specifications are comparable as they exhibit exactly the same lambda ratio structure.

Table 6: Bias in the Swiss and U.S. Import Price Indices

	Switzerland			U.S.		
	EPR	Total bias	Avg. bias	EPR	Total bias	Avg. bias
Lower Bound	0.991	**0.88%**	0.05%	0.954	**4.65%**	0.27%
Upper Bound	0.853	**14.65%**	0.81%	0.621	**37.90%**	1.91%

The total bias is defined as $TB = 1/EPR - 1$. Thus, it is the percentage by which the conventional price index is biased upwards. Average values are always per-annum averages.

4.5 The Gains from Variety in Switzerland and the U.S. 1990-2006

As laid out in Section 3, the bias in the import price index has to be weighted by the import share to obtain the gains from variety relative to the GDP. The problem here is that the imported goods also incorporate middle products and investment goods. It will hence be difficult to choose an appropriate measure for total economic activity. For a large, domestically oriented economy like the U.S this may not be very important. Broda and Weinstein (2006) use the share of the total imports on domestic consumption. They consequently get a share of the imports of around 10% for the period of 1990 to 2001. Doing the same for an SOE has more severe consequences: Imports as a fraction of domestic consumption amount to 47% on average between 1990 and 2006 in Switzerland using a log-change weight. However, using the GDP instead of just domestic consumption, the share of imports amounts to 36%. This may well be a consequence of many investment goods and middle products imported, used in the production process and then partially exported to other countries. These imported and exported goods may not play such an important role in the U.S., but for Switzerland they matter a lot. Because neither of the two shares can be justified convincingly, I assume that a sensible weight lies between 36% and 47% for Switzerland and between 8% and 10% for the U.S.

4.5.1 The Results

Using these weights and the three different biases of the price index above, the gains from variety can be calculated. Using the lower bound bias and the smaller weight, the gains from variety account to 0.32% of the GDP in Switzerland as Table 7 displays. Using the upper bound bias and the higher weights, the highest gains from variety account to 7.73% of the GDP in Switzerland. For the U.S. the gains from variety lie between 0.38% and 4.88% of the GDP depending on the specification. Hence, depending on the specification used, the gains from variety can be higher or lower in Switzerland relative to the U.S.

These gains from imported variety can be further analyzed: First, it can be assessed which trading partners contribute the largest part to these gains. Secondly, the gains from imported variety can be attributed to the different imported product categories.

Table 7: Gains from Imported Variety, Switzerland and U.S., 1990-2006

Switzerland				U.S.			
		Weights				Weights	
	EPR	36%	47%		EPR	8%	10%
Low	0.991	**0.32%**	0.41%	Low	0.954	**0.38%**	0.48%
High	0.853	5.87%	**7.73%**	High	0.621	3.89%	**4.88%**

4.5.2 The Contribution of Different Trading Partners

Considering Table 10 for the lower bound case and Table 11 for the upper bound case, Germany contributes by far the largest part to the gains from variety in Switzerland, namely around 40%. 60% to 70% of all the gains are due to imports from Switzerland's most important trading partners Germany, Italy and France. Austria, the United Kingdom, Japan, Spain, the Netherlands and the U.S. also appear on the first few ranks under both specifications. For the U.S., Canada is the most important trading partner regarding gains from imported variety with a 20% share on the total gains. Japan, Mexico, China, Germany, France, Italy, the U.K., Taiwan and South Korea are all in the top ten under both specifications. It is striking that Switzerland seems really dependent on its three large neighbouring countries whereas the gains from variety in the U.S. are more equally distributed among many major trading partners. The geographical and the political situation of the two countries is clearly reflected in these statistics: While Switzerland is highly integrated into the EU and located in the heart of Europe, for the U.S. the NAFTA partners and Japan are important while the rest of the World has a more equal share on the gains from variety.

Note that in the upper bound case, the contributions of those partner countries, which trade *high values* with Switzerland or the U.S. are higher. For example: Germany contributes 37.20% to the gains from variety in Switzerland in the lower bound case but 46.14% in the upper bound case. For a smaller country like Austria with lower trade *value*, this is just reversed: The contribution is higher in the lower bound case. This is a direct consequence of the upper bound that assumes that higher import values are related to a higher imported variety.

4.5.3 The Contribution of Different Product Categories

Tables 12 and 13 show the contribution of the 25 most important HS-2 products to the gains from variety in the lower and in the upper bound case. The ranking of goods in the two tables is quite similar. For the U.S., 18 out of 25 products that are ranked in the top 25 in the lower bound case are also ranked in the top 25 in the upper bound case. For Switzerland this is the case for 14 of 25 products. Also, most of the products shown in the Tables are assumingly differentiated, with some exceptions like Aluminium.[26] In

[26] Note however that according to the Rauch (1999) classification, most of the sub-categories comprised in the category "Aluminium and Articles thereof" are not classified as homogeneous goods but as reference priced ones.

Switzerland, Chemicals, Machinery, Clocks and Watches, Vehicles, Furniture, and some others contribute most to the gains from variety. In the U.S. the most important goods are Vehicles, Chemicals, Clothing, Machinery, Aircraft, Tools, Beverages, etc.

For a meaningful cross-country comparison, HS-2 product categories are still too disaggregated. Instead, Table 14 shows the results for the 21 HS sections: The results are not too different between the two countries. Switzerland seems to profit relatively more from the imports of chemical products while the gains in the U.S. are to a larger extent due to the imports of vehicles. Machinery is very important for both countries regarding the gains from variety.

5 Analyzing the Gains from Variety in the SOE Case

This section analyzes the differences in the gains from variety between the U.S. and Switzerland more closely. Specifically, the following questions shall be answered: What factors exactly determine the differences in the gains from variety between countries and what is the relative importance of these factors? And: When and under what circumstances are the gains from variety higher or lower in Switzerland, relative to the U.S.? Additionally, it is shown that the results that are found for Switzerland and the U.S. may hold generally for other small and large OECD countries.

5.1 Small vs. Large Country: What's the Difference?

First, the differences in the import price index bias, which is always larger in the U.S., are explained. Within the model, these differences can be attributed to two sources: There is the expenditure on new and disappearing varieties and there is the magnitude of the elasticities of substitution. The more new varieties imported at high values, the higher the bias in the import price index. The lower the elasticities of substitution, the larger the deviation from one of the lambda ratio. [27]

Table 8: Bias in the Swiss and US Import Price Indices Under Fixed Elasticities

	Switzerland					U.S.				
	variable	$\sigma = 2$	$\sigma = 4$	$\sigma = 8$	$\sigma = 15$	variable	$\sigma = 2$	$\sigma = 4$	$\sigma = 8$	$\sigma = 15$
Lower Bound	0.88%	3.50%	1.18%	0.51%	0.25%	4.65%	7.82%	2.68%	1.16%	0.58%
Upper Bound	14.65%	46.84%	18.99%	8.63%	4.41%	37.90%	71.93%	34.52%	16.60%	8.67%

To separate these two sources, the import price index bias is estimated under fixed elasticities of substitution. Thus, the resulting difference can only be due to the differences in the growth of variety. Table 8 below displays the results. The EPRs vary considerably with the choice of the fixed elasticities of

[27] Illustration: The lambda ratio is weighted by $1/(\sigma_g - 1)$, resulting in the term $\left(\frac{\lambda_{gt}}{\lambda_{gt-1}}\right)^{1/(\sigma_g-1)}$. For example, if $\frac{\lambda_{gt}}{\lambda_{gt-1}} = 0.8$, with a low elasticity, $\sigma = 1.5$, the mentioned term becomes $0.8^2 = 0.64$. With a higher elasticity, for example $\sigma_g = 5$, the term gets closer to one, $0.8^{0.25} = 0.95$.

substitution. Note however, that no matter which specification is used or how large the fixed elasticities are, *the bias in the import price index is always larger for the U.S.*

Table 9: Share of the Difference in the Bias Explained by the Lower Variety Growth in Switzerland

		Relative differences in the bias				% explained by lower imp. variety			
	variable	$\sigma = 2$	$\sigma = 4$	$\sigma = 8$	$\sigma = 15$	$\sigma = 2$	$\sigma = 4$	$\sigma = 8$	$\sigma = 15$
Lower Bound	-81.14%	-55.27%	-55.94%	-56.13%	-56.20%	**68.12%**	**68.94%**	**69.18%**	**69.27%**
Upper Bound	-61.34%	-34.89%	-44.99%	-48.00%	-49.13%	**56.87%**	**73.35%**	**78.25%**	**80.10%**

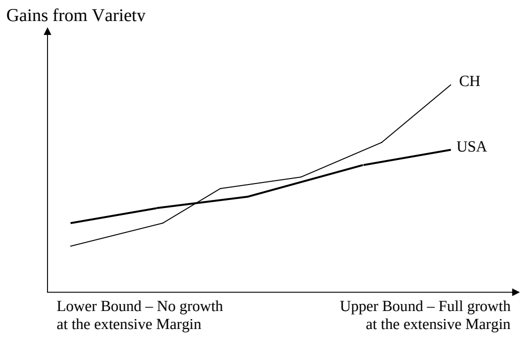
Table 9 shows the bias in the price index in Switzerland relative to the bias in the U.S. In the lower bound case for example, the bias in Switzerland if variable sigmas are used is 81.14% lower than the one in the U.S. If fixed sigmas are used, the bias in Switzerland is between 55.27% and 56.20% lower, depending on the size of the fixed sigmas. That means that for the lower bound case, between 68.12% and 69.27% of the difference in the price index bias between Switzerland and the U.S. is explained by lower imported variety in Switzerland as is displayed in the last 4 columns of Table 9. The rest, about 30% of the difference is explained by the higher elasticities of Swiss import goods. For the upper bound case, between 56.87% to 80.10% of the difference in the bias of the price index stems from the differences in variety growth, the rest is due to higher elasticities of substitution. Thus, depending on the specification, between 55% to 90% of the difference in the aggregate import price index bias between Switzerland and the U.S. is due to the fact that Switzerland imported less new varieties between 1990 and 2006. The rest which is always smaller than 45% is due to the higher elasticities of substitution of Swiss import goods.

Why is this result interesting or important? It says that the U.S. consumers profit more from the imported variety mainly because their choice increased by much more and not because the imported products are generally more differentiated. This is an interesting result in the light of the current literature: It says that the lower number of imported varieties in Switzerland, which *may* be a consequence of natural (or other) barriers to trade, matters from a welfare perspective. Said differently, the gains from variety in Switzerland would be much higher with the imported variety growth of the U.S.

The second point worth analyzing is presented in Table 7: It is striking that depending on the definition of the lambda ratios the gains from variety can be larger or smaller in Switzerland, relative to the U.S. Note that between the two polar cases there are thousands of possibilities of defining the lambda ratios differently by excluding some varieties from the common set and keeping some others in the common set. Figure 1 shows how this may look qualitatively.[28] The main point is, that since we do not know the true growth at the extensive margin, it is not clear whether Switzerland or the U.S. enjoy higher variety gains.

[28]This figure is "drawn by hand" for expositional purposes. Note that hundreds of different paths between the two bounds are possible depending on the order that the varieties are excluded from the common set. Also, the paths could intersect more than once.

Figure 1: Gains from Variety for Different Extent of Extensive Margin Growth



However, the figure shows that the more action is allowed at the extensive margin, the higher are the gains from variety in Switzerland relative to the U.S. This is no coincidence: Considering equation (18), the term in parantheses gets bigger, if more and more varieties are excluded from the common set. And the bigger this term, the larger is the effect of a higher import share w_t^M. In other words, if we assume more growth at the extensive margin, the higher import share in Switzerland (or any SOE) will more likely dominate the lower growth in variety. As a consequence the gains from variety in Switzerland can surpass those in the U.S.

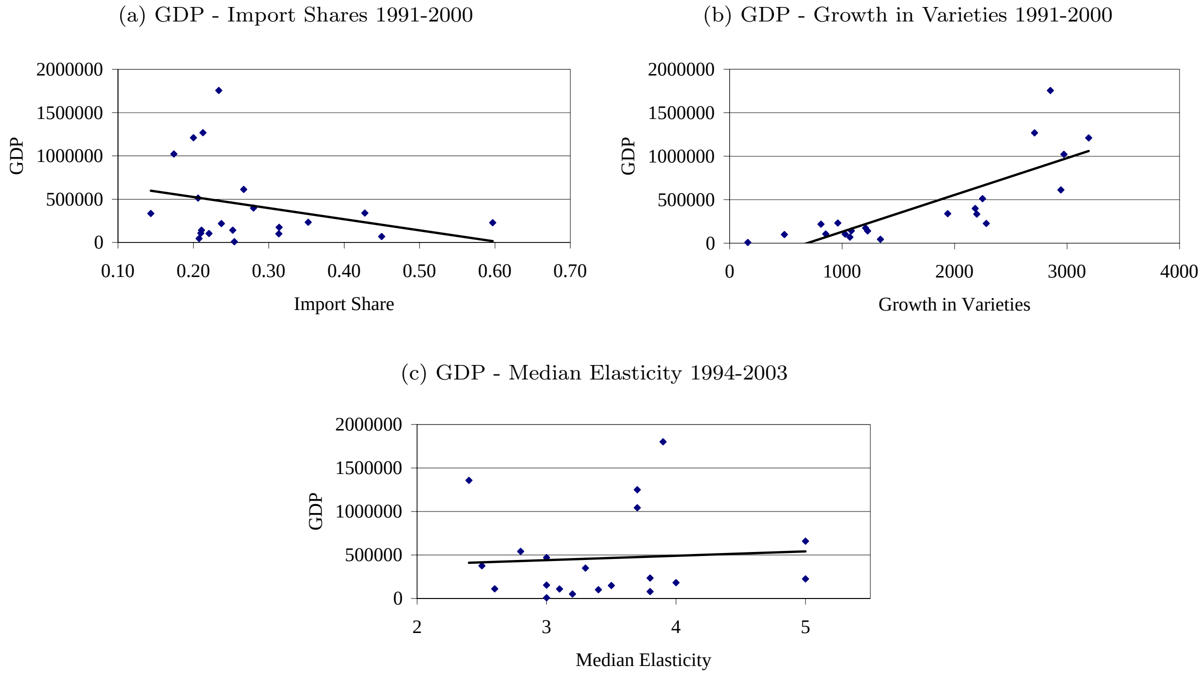
5.2 How General are these Results?

At least for Switzerland and the U.S., the following is found in the section above: In the SOE, the bias in the import price index is always lower. This is mainly due to the lower growth in imported variety in the SOE. It is also shown that the more happens at the extensive margin, the more likely is it for the SOE to exhibit higher gains from variety. Thus, two main ingredients are required to argue that these results are also valid for other small and large countries: SOEs should have higher import shares and less imported variety growth. The difference in the magnitude of the elasticities of substitution is not that important as shown above but will also be considered.

Using OECD data, Figures 2a to 2c display these relationships.[29] Not surprisingly, larger OECD countries exhibit generally a lower import share. Furthermore, one can find a clear positive relationship between the growth in imported varieties and the size of a country measured by its GDP.

[29] Only "fully developed" and industrialized countries are used: the Czech Republic, Hungary, Mexico, Poland, Slovakia and Turkey are excluded from the sample. Furthermore, the U.S. and Japan are excluded in the figures since with these two extreme outliers in the sample, there seems to be a negative relationship between the GDP and the median elasticity. The positive relationship between GDP and the growth in varieties and GDP and import share also holds when these two countries are included.

Figure 2: Imported Variety and OECD Countries



What remains to check is whether smaller countries exhibit higher elasticities of substitution in general. Broda et al. (2006) estimate sigmas for 73 countries. Figure 2c shows the median sigmas and the total GDP for the OECD countries. It does not seem to be the case that larger countries generally have lower median elasticities. Note that most countries are estimated to have median elasticities that lie between 3 and 4. Hence the differences in the price index bias resulting from differences in the median elasticities will generally be small.

As a conclusion, smaller (and more open) economies in the OECD will tend to have a lower bias in the import price index that is mainly due to the lower growth in imported variety. Since SOEs also have higher import shares, a relationship close to the one pictured in Figure 1 is likely to hold also for other small and large OECD countries. Furthermore, this “disadvantage” in importing varieties will be relevant from a welfare perspective. In the appendix, Table 15 shows some regression results to support the “eyeballing” of this section.

6 Concluding Remarks

In this paper, lower and upper bounds for the bias in the aggregate import price index of Feenstra’s (1994) seminal paper are proposed. The bounds are associated with the assumption of low and high growth at the extensive margin of imports. Using these bounds the gains from variety are estimated for Switzerland and the U.S. for the period of 1990 to 2006. In Switzerland, the gains amount to between

0.3% and 7.7% of the GDP while in the U.S. these gains lie between 0.4% and 4.9%.

These gains from variety can then be decomposed to the contributions of countries of origin and product categories: 60% to 70% of the gains from variety in Switzerland are due to imports stemming from Switzerland's direct neighbours, Germany, Italy and France. In the U.S. the gains are more equally distributed among many major trading partners. Looking at product categories, classical differentiated goods like Motor Vehicles contribute large shares to the gains from variety in both countries.

The differences between an SOE and a larger economy regarding the gains from varieties are also analysed in this paper: The import price index bias is always lower in Switzerland. This difference can be attributed to two sources: The majority of the difference is due to the lower growth in imported variety. The rest is due to the higher elasticities of substitution of Swiss import goods compared to US import goods. However, the much higher import share can overcompensate the lower bias and may lead to higher welfare gains from imported variety in an SOE.

It is also argued that the more growth at the extensive margin of imports is assumed, the more likely is Switzerland to exhibit the higher gains from variety. Thus, the two bounds proposed are relevant for cross country comparisons. Finally it is argued that these results may hold quite generally for other small and large OECD countries since SOEs tend to have a lower imported variety growth and a higher share of imports.

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Appendix

Table 10: Contribution of Individual Countries to the Gains from Variety, Lower Bound Case

Switzerland			U.S.		
Country	Rank	Contr.	Country	Rank	Contr.
Germany	1	37.20%	Canada	1	20.11%
Italy	2	11.55%	Japan	2	13.02%
France	3	11.08%	Mexico	3	10.31%
Austria	4	6.07%	China	4	9.15%
United Kingdom	5	4.83%	Germany	5	7.62%
Netherlands	6	3.70%	France	6	5.23%
Japan	7	2.98%	United Kingdom	7	4.37%
Hong Kong	8	2.94%	Italy	8	3.97%
Belgium & Luxemburg	9	2.72%	Taiwan	9	3.62%
U.S.	10	2.70%	Korea (South)	10	2.14%
Ireland	11	2.38%	Brazil	11	2.11%
Sweden	12	2.13%	Hong Kong	12	1.91%
Saudi Arabia	13	1.56%	Ireland	13	1.77%
Finland	14	1.35%	Sweden	14	1.62%
Spain	15	1.14%	Netherlands	15	1.30%
China	16	1.14%	India	16	1.08%
Denmark	17	1.03%	Spain	17	0.93%
Thailand	18	0.86%	Indonesia	18	0.85%
Taiwan	19	0.61%	Belgium & Luxemburg	19	0.73%
Former Czechoslovakia	20	0.49%	Chile	20	0.69%

Contr. is the contribution of a country relative to the total gains from variety, expressed in percent. The contribution can also be negative.

Table 11: Contribution of Individual Countries to the Gains from Variety, Upper Bound Case

Switzerland			U.S.		
Country	Rank	Contr.	Country	Rank	Contr.
Germany	1	46.14%	Canada	1	23.77%
Italy	2	13.38%	Japan	2	14.27%
France	3	11.68%	China	3	11.52%
Austria	4	5.42%	Mexico	4	11.32%
U.S.	5	4.54%	Germany	5	8.87%
United Kingdom	6	4.39%	United Kingdom	6	4.90%
Netherlands	7	3.82%	Taiwan	7	4.66%
Belgium & Luxemburg	8	3.31%	France	8	4.05%
Japan	9	1.77%	Italy	9	3.93%
Spain	10	1.74%	Korea (South)	10	2.91%
Sweden	11	1.68%	Chile	11	2.02%
Denmark	12	1.10%	Brazil	12	2.00%
China	13	0.99%	Hong Kong	13	1.49%
Hong Kong	14	0.88%	South Africa	14	1.35%
Ireland	15	0.87%	Netherlands	15	1.34%
Finland	16	0.57%	Belgium & Luxemburg	16	1.30%
Former USSR	17	0.54%	Israel	17	1.21%
Thailand	18	0.52%	Sweden	18	1.19%
Taiwan	19	0.41%	India	19	1.17%
Canada	20	0.35%	Thailand	20	1.10%

Contr. is the contribution of a country relative to the total gains from variety, expressed in percent. The contribution can also be negative.

Table 12: Contribution of HS-2 goods to the Gains from Variety, Switzerland

Lower bound case			
HS-2	Rank	Contr.	Description
29	*1*	*12.85%*	*ORGANIC CHEMICALS*
85	*2*	*9.51%*	*ELECTRICAL MACHINERY AND EQUIPMENT AND PARTS THEREOF, ETC.*
84	*3*	*9.38%*	*NUCLEAR REACTORS, BOILERS, MACHINERY AND MECHANICAL APPLIANCES*
48	*4*	*8.25%*	*PAPER AND PAPERBOARD; ARTICLES OF PAPER PULP, ETC.*
91	*5*	*7.49%*	*CLOCKS AND WATCHES AND PARTS THEREOF*
92	6	7.18%	MUSICAL INSTRUMENTS; PARTS AND ACCESSORIES
87	*7*	*5.65%*	*VEHICLES OTHER THAN RAILWAY OR TRAMWAY AND PARTS, ETC.*
94	*8*	*5.15%*	*FURNITURE; BEDDING, MATTRESSES, ETC.*
28	9	4.59%	INORGANIC CHEMICALS; ETC.
39	*10*	*3.07%*	*PLASTICS AND ARTICLES THEREOF*
90	*11*	*2.81%*	*OPTICAL, PHOTOGRAPHIC, MEASURING, MEDICAL AND OTHER INSTR.*
73	*12*	*2.73%*	*ARTICLES OF IRON OR STEEL*
83	13	2.37%	MISCELLANEOUS ARTICLES OF BASE METAL
96	*14*	*2.31%*	*MISCELLANEOUS MANUFACTURED ARTICLES*
62	*15*	*2.23%*	*ART. OF APPAREL AND CLOTHING ACCESSORIES, NOT KNITTED, ETC.*
70	*16*	*1.93%*	*GLASS AND GLASSWARE*
71	*17*	*1.57%*	*NATURAL OR CULTURED PEARLS, PRECIOUS OR SEMI-PRECIOUS STONES*
64	18	1.47%	FOOTWEAR, GAITERS AND THE LIKE; PARTS OF SUCH ARTICLES
22	19	1.45%	BEVERAGES, SPIRITS AND VINEGAR
59	20	1.44%	IMPREGNATED, COATED, COVERED OR LAMINATED TEXTILE FABRICS
63	21	1.32%	OTHER MADE-UP TEXTILE ARTICLES; WORN CLOTHING AND TEXTILE ART.
18	22	1.15%	COCOA AND COCOA PREPARATIONS
20	23	1.11%	PREPARATIONS OF VEGETABLES, FRUIT, NUTS OR OTHER PARTS OF PLANTS
86	24	1.04%	RAILWAY OR TRAMWAY LOCOMOTIVES, RAILWAY OR TRAM AND PARTS
3	25	0.81%	FISH AND CRUSTACEANS, MOLLUSCS AND OTHER AQUATIC INVERTEBRATES
Upper bound case			
HS-2	Rank	Contr.	Description
30	1	23.42%	PHARMACEUTICAL PRODUCTS
84	*2*	*12.22%*	*NUCLEAR REACTORS, BOILERS, MACHINERY AND MECHANICAL APPLIANCES*
39	*3*	*7.53%*	*PLASTICS AND ARTICLES THEREOF*
85	*4*	*7.30%*	*ELECTRICAL MACHINERY AND EQUIPMENT AND PARTS THEREOF, ETC.*
94	*5*	*4.96%*	*FURNITURE; BEDDING, MATTRESSES, ETC.*
73	*6*	*4.44%*	*ARTICLES OF IRON OR STEEL*
87	*7*	*3.99%*	*VEHICLES OTHER THAN RAILWAY OR TRAMWAY AND PARTS*
76	8	3.44%	ALUMINIUM AND ARTICLES THEREOF
90	*9*	*3.29%*	*OPTICAL, PHOTOGRAPHIC, MEASURING, MEDICAL AND OTHER INSTR.*
74	10	3.13%	COPPER AND ARTICLES THEREOF
48	*11*	*2.74%*	*PAPER AND PAPERBOARD; ARTICLES OF PAPER PULP, ETC.*
91	*12*	*2.61%*	*CLOCKS AND WATCHES AND PARTS THEREOF*
49	13	2.54%	PRINTED BOOKS, NEWSPAPERS, PICTURES, ETC.
29	*14*	*2.46%*	*ORGANIC CHEMICALS*
71	*15*	*2.31%*	*NATURAL OR CULTURED PEARLS, PRECIOUS OR SEMI-PRECIOUS STONES*
62	*16*	*1.87%*	*ART. OF APPAREL AND CLOTHING ACCESSORIES, NOT KNITTED, ETC.*
72	17	1.76%	IRON AND STEEL
68	18	1.57%	ARTICLES OF STONE, PLASTER, CEMENT, OR SIMILAR MAT.
82	19	1.26%	TOOLS, IMPLEMENTS, CUTLERY, ETC.
38	20	1.24%	MISCELLANEOUS CHEMICAL PRODUCTS
33	21	1.21%	ESSENTIAL OILS AND RESINOIDS; PERFUMERY, COSMETICS, ETC.
70	*22*	*1.20%*	*GLASS AND GLASSWARE*
95	23	1.13%	TOYS, GAMES AND SPORTS REQUISITES; PARTS AND ACCESSORIES THEREOF
61	24	1.08%	ART. OF APPAREL AND CLOTHING ACCESSORIES, KNITTED OR CROCHETED
96	*25*	*1.04%*	*MISCELLANEOUS MANUFACTURED ARTICLES*

Contr. is the contribution of a good relative to the total gains from variety, expressed in percent. The contribution can also be negative.

Table 13: Contribution of HS-2 goods to the Gains from Variety, U.S.

HS-2	Rank	Contr.	Description
			Lower bound case
87	*1*	*25.11%*	*VEHICLES OTHER THAN RAILWAY OR TRAMWAY AND PARTS*
29	*2*	*7.93%*	*ORGANIC CHEMICALS*
62	*3*	*7.86%*	*ART. OF APPAREL AND CLOTHING ACCESSORIES, NOT KNITTED, ETC.*
85	*4*	*6.43%*	*ELECTRICAL MACHINERY AND EQUIPMENT AND PARTS THEREOF, ETC.*
90	*5*	*5.14%*	*OPTICAL, PHOTOGRAPHIC, MEASURING, MEDICAL AND OTHER INSTR.*
76	*6*	*3.89%*	*ALUMINIUM AND ARTICLES THEREOF*
84	*7*	*3.82%*	*NUCLEAR REACTORS, BOILERS, MACHINERY AND MECHANICAL APPLIANCES*
78	8	3.50%	LEAD AND ARTICLES THEREOF
30	9	3.46%	PHARMACEUTICAL PRODUCTS
61	*10*	*3.42%*	*ART. OF APPAREL AND CLOTHING ACCESSORIES, KNITTED OR CROCHETED*
88	*11*	*3.04%*	*AIRCRAFT, SPACECRAFT, AND PARTS THEREOF*
82	*12*	*2.97%*	*TOOLS, IMPLEMENTS, CUTLERY, ETC.*
22	*13*	*2.88%*	*BEVERAGES, SPIRITS AND VINEGAR*
73	*14*	*2.82%*	*ARTICLES OF IRON OR STEEL*
49	*15*	*2.49%*	*PRINTED BOOKS, NEWSPAPERS, PICTURES, ETC.*
74	*16*	*2.33%*	*COPPER AND ARTICLES THEREOF*
48	*17*	*2.00%*	*PAPER AND PAPERBOARD; ARTICLES OF PAPER PULP, ETC.*
39	*18*	*1.90%*	*PLASTICS AND ARTICLES THEREOF*
65	19	1.81%	HEADGEAR AND PARTS THEREOF
28	*20*	*1.66%*	*INORGANIC CHEMICALS; ETC.*
69	21	1.62%	CERAMIC PRODUCTS
64	22	1.47%	FOOTWEAR, GAITERS AND THE LIKE; PARTS OF SUCH ARTICLES
63	*23*	*1.19%*	*OTHER MADE-UP TEXTILE ARTICLES; WORN CLOTHING AND TEXTILE ART.*
38	24	0.90%	MISCELLANEOUS CHEMICAL PRODUCTS
44	25	0.84%	WOOD AND ARTICLES OF WOOD; WOOD CHARCOAL
			Upper bound case
HS-2	Rank	Contr.	Description
84	*1*	*14.80%*	*NUCLEAR REACTORS, BOILERS, MACHINERY AND MECHANICAL APPLIANCES*
87	*2*	*13.50%*	*VEHICLES OTHER THAN RAILWAY OR TRAMWAY AND PARTS*
85	*3*	*13.11%*	*ELECTRICAL MACHINERY AND EQUIPMENT AND PARTS THEREOF, ETC.*
94	4	7.13%	FURNITURE; BEDDING, MATTRESSES, ETC.
74	*5*	*5.72%*	*COPPER AND ARTICLES THEREOF*
71	6	5.02%	NATURAL OR CULTURED PEARLS, PRECIOUS OR SEMI-PRECIOUS STONES
39	*7*	*4.25%*	*PLASTICS AND ARTICLES THEREOF*
29	*8*	*4.19%*	*ORGANIC CHEMICALS*
76	*9*	*3.78%*	*ALUMINIUM AND ARTICLES THEREOF*
90	*10*	*3.70%*	*OPTICAL, PHOTOGRAPHIC, MEASURING, MEDICAL AND OTHER INSTR.*
28	*11*	*3.55%*	*INORGANIC CHEMICALS; ETC.*
73	*12*	*3.37%*	*ARTICLES OF IRON OR STEEL*
61	*13*	*2.80%*	*ART. OF APPAREL AND CLOTHING ACCESSORIES, KNITTED OR CROCHETED*
27	14	2.70%	MINERAL FUELS, MINERAL OILS, ETC.
62	*15*	*2.30%*	*ART. OF APPAREL AND CLOTHING ACCESSORIES, NOT KNITTED, ETC.*
22	*16*	*2.28%*	*BEVERAGES, SPIRITS AND VINEGAR*
49	*17*	*1.91%*	*PRINTED BOOKS, NEWSPAPERS, PICTURES, ETC.*
42	18	1.82%	ARTICLES OF LEATHER; SADDLERY; TRAVEL BAGS, ETC.
48	*19*	*1.81%*	*PAPER AND PAPERBOARD; ARTICLES OF PAPER PULP, ETC.*
82	*20*	*1.57%*	*TOOLS, IMPLEMENTS, CUTLERY, ETC.*
75	21	1.35%	NICKEL AND ARTICLES THEREOF
33	22	1.30%	ESSENTIAL OILS AND RESINOIDS; PERFUMERY, COSMETICS, ETC.
88	*23*	*1.23%*	*AIRCRAFT, SPACECRAFT, AND PARTS THEREOF*
81	24	1.21%	OTHER BASE METALS; CERMETS; ARTICLES THEREOF
63	*25*	*1.18%*	*OTHER MADE-UP TEXTILE ARTICLES; WORN CLOTHING AND TEXTILE ART.*

Contr. is the contribution of a good relative to the total gains from variety, expressed in percent. The contribution can also be negative.

Table 14: Contribution of HS sections to the Gains from Variety, Switzerland and U.S.

			Lower bound case
HS	Share CH	Share U.S.	Description
1	1.28%	-0.03%	LIVE ANIMALS, ANIMAL PRODUCTS
2	0.61%	1.08%	VEGETABLE PRODUCTS
3	0.02%	0.00%	ANIMAL OR VEGETABLE FATS OR OILS
4	5.29%	4.07%	PREPARED FOODSTUFFS, BEVERAGES
5	-0.08%	-2.51%	MINERAL PRODUCTS
6	17.61%	13.94%	PRODUCTS OF CHEMICAL INDUSTRIES
7	3.04%	2.12%	PLASTICS, RUBBER AND ARTICLES THEREOF
8	0.08%	0.37%	ARTICLES OF SKINS, LEATHER, TRAVEL GOODS, HANDBAGS
9	-1.58%	0.86%	WOODS AND ARTICLES OF WOODS, OF STRAW, BASKETWARE
10	8.21%	4.41%	PULP OF WOOD, PAPER, PAPERBOARD
11	4.87%	13.58%	TEXTILE AND TEXTILE ARTICLES
12	1.51%	3.22%	FOOTWEAR, HEADGEAR, UMBRELLAS, ETC.
13	3.11%	2.47%	ARTICLES OF STONE, PLASTER, CEMENT; CERAMIC AND GLASS PROD.
14	1.56%	0.13%	PEARLS, PRECIOUS OR SEMIPRECIOUS STONES, IMITATION JEWELRY
15	3.58%	15.60%	BASE METALS AND ARTICLES THEREOF
16	18.76%	10.02%	MACHINERY AND MECHANICAL APPLIANCES
17	6.69%	27.56%	VEHICLES, AIRCRAFT AND TRANSPORT EQUIPMENT
18	17.36%	4.91%	OPTICAL, PHOTOGRAPHIC, MEDICAL, SURGICAL AND OTHER INSTRUM.
19	0.03%	0.12%	ARMS AND AMMUNITION
20	7.97%	-1.90%	MISCELLANEOUS MANUFACTURED ARTICLES (FURNITURE, TOYS, ETC.)
21	0.07%	0.00%	WORKS OF ART, ANTIQUES
			Upper bound case
HS	Share CH	Share U.S.	Description
1	0.22%	0.46%	LIVE ANIMALS, ANIMAL PRODUCTS
2	0.36%	1.03%	VEGETABLE PRODUCTS
3	0.00%	0.25%	ANIMAL OR VEGETABLE FATS OR OILS
4	2.25%	2.75%	PREPARED FOODSTUFFS, BEVERAGES
5	0.25%	2.57%	MINERAL PRODUCTS
6	27.73%	10.09%	PRODUCTS OF CHEMICAL INDUSTRIES
7	7.91%	4.22%	PLASTICS, RUBBER AND ARTICLES THEREOF
8	0.20%	1.52%	ARTICLES OF SKINS, LEATHER, TRAVEL GOODS, HANDBAGS
9	0.91%	0.48%	WOODS AND ARTICLES OF WOODS, OF STRAW, BASKETWARE
10	4.90%	3.04%	PULP OF WOOD, PAPER, PAPERBOARD
11	1.22%	5.85%	TEXTILE AND TEXTILE ARTICLES
12	0.61%	0.54%	FOOTWEAR, HEADGEAR, UMBRELLAS, ETC.
13	3.11%	2.47%	ARTICLES OF STONE, PLASTER, CEMENT; CERAMIC AND GLASS PROD.
14	2.14%	4.19%	PEARLS, PRECIOUS OR SEMIPRECIOUS STONES, IMITATION JEWELRY
15	13.27%	15.36%	BASE METALS AND ARTICLES THEREOF
16	17.95%	22.74%	MACHINERY AND MECHANICAL APPLIANCES
17	4.72%	12.29%	VEHICLES, AIRCRAFT AND TRANSPORT EQUIPMENT
18	5.45%	3.86%	OPTICAL, PHOTOGRAPHIC, MEDICAL, SURGICAL AND OTHER INSTRUM.
19	-0.03%	0.10%	ARMS AND AMMUNITION
20	6.59%	6.69%	MISCELLANEOUS MANUFACTURED ARTICLES (FURNITURE, TOYS, ETC.)
21	0.13%	0.00%	WORKS OF ART, ANTIQUES

Contr. is the contribution of a good relative to the total gains from variety, expressed in percent. The contribution can also be negative.

Table 15: Regression Results OECD Countries

	OECD without USA, Japan			OECD with USA, Japan		
Depvar: GDP	Imp. Share	Var. Growth	Med. Elast.	Imp. Share	Var. Growth	Med. Elast.
	1a	1b	1c	2a	2b	2c
Coefficient	-0.065**	1.528***	0.990	-0.030***	0.427***	-1.243***
Stand. Err.	0.029	0.308	2.800	0.009	0.077	0.270
R-Squared	0.084	0.647	0.005	0.231	0.503	0.119

Significance levels: (**) means significant at the 5% level, (***) means significant at the 1% level. Only fully developed OECD countries are included: The Czech Republic, Hungary, Mexico, Poland, Slovakia and Turkey are excluded from the sample.