

Prehn, Sören; Brümmner, Bernhard

Working Paper

Estimation issues in disaggregate gravity trade models

Diskussionsbeitrag, No. 1107

Provided in Cooperation with:

Department for Agricultural Economics and Rural Development, University of Goettingen

Suggested Citation: Prehn, Sören; Brümmner, Bernhard (2011) : Estimation issues in disaggregate gravity trade models, Diskussionsbeitrag, No. 1107, Georg-August-Universität Göttingen, Department für Agrarökonomie und Rurale Entwicklung (DARE), Göttingen

This Version is available at:

<https://hdl.handle.net/10419/50550>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.



Institut für Agrarökonomie
Georg-August Universität Göttingen

September
2011

Diskussionspapiere

Discussion Papers

Estimation Issues in Disaggregate Gravity Trade Models

Department für Agrarökonomie und
Rurale Entwicklung
Universität Göttingen
D 37073 Göttingen
ISSN 1865-2697

Diskussionsbeitrag 1107

Estimation Issues in Disaggregate Gravity Trade Models*

Sören Prehn[†], Bernhard Brümmer

Department of Agriculture Economics and Rural Development

Georg August Universität Göttingen

Abstract

French (2011) can analytically show that the standard Anderson and van Wincoop (2003) gravity trade model is only correctly specified for disaggregate data; gravity trade model analysis should be done at product level and then estimation results should be reaggregated. If however gravity trade model analysis is to be done at product level then also estimation issues in disaggregate gravity trade models should come to the fore. As is shown, previous estimators suffer under different statistical problems. This paper proposes a zero-inflated Poisson Quasi-Likelihood (PQL) and a Gamma Two-Part Model (G2PM) as reliable alternatives. Estimated within a Generalised Estimating Equation (GEE) framework, both estimators are consistent and have more or less conservative test statistics. Further, for model selection a Quasi-Likelihood under the Independence Model Criterion (QIC) is recommended since this statistic is conform with GEE approaches. Both estimators PQL and G2PM and the model selection technique QIC should become standard tools for disaggregate gravity trade model estimation.

Keywords: Gravity Model, Excess Zeros, Poisson Quasi-Likelihood, Gamma Two-Part Model, Generalised Estimating Equation Approach

* Prehn gratefully acknowledges financial support from the Georg Christoph Lichtenberg Stiftung of the State Lower Saxony.

[†] Corresponding author. Georg August Universität Göttingen, Lehrstuhl für Landwirtschaftliche Marktlehre, Platz der Göttinger Sieben 5, 37073 Göttingen, Germany. Phone: +49 (0) 551 39 4982.
Email address: sprehn@gwdg.de (Sören Prehn)

1 Introduction

Recently research focus in gravity trade model analysis shifted from an aggregate to a disaggregate gravity trade model. This shift was first empirically motivated, policy evaluation is better done at a disaggregate than at an aggregate level but now there is also a statistical interest. In a recent paper Anderson and Yotov (2010) hint at the significant downward aggregation bias which is immanent when comparing disaggregate with aggregate gravity trade model estimates.¹ An analytical explanation therefor is given by French (2011) who analytically shows that aggregation of disaggregate gravity trade models over all product categories does not converge to the standard aggregate Anderson and van Wincoop (2003) (AvW) gravity trade model. It turns out that the outward multilateral resistance term of the AvW Model is wrongly specified; it should be non-constant varying by importer. French's results emphasise the importance to do gravity trade model analysis always at product level and then to reaggregate estimation results.

If however gravity trade model analysis is to be done at product level then also estimation issues in disaggregate gravity trade models, in particular the appropriate treatment of excess zeros should come to the fore. Although there are applications of gravity trade models to disaggregate data there are only few papers which explicitly deal with estimation issues. A notable exemption is the paper by Burger, van Oort, and Linders (2009). Here, the authors partly follow Santos Silva and Tenreyro (2006) that logarithmising leads to biased gravity trade model estimates but for disaggregate gravity trade models the authors instead recommend a zero-inflated Poisson / Negative Binomial Pseudo Maximum Likelihood (ZIPPML / ZINBPML). Contrary to the standard approach, i.e. Poisson Pseudo Maximum Likelihood (PPML) former approaches deal with the problem of excess zeros (and overdispersion).²

Despite being state of the art, there are still some shortcomings with ZIPPML / ZINBPML why a further discussion of alternative estimators is worthwhile. In the literature two different kinds of statistical models are distinguished which deal with excess zeros: (1) zero-inflated Count Data Models and (2) Two-Part Models. Each of these models itself encompasses a set of different estimators. A potential new estimator belonging to the former class of zero-inflated Count Data Models is a zero-inflated Poisson Quasi-Likelihood (PQL) (Staub and Winkelmann, 2011). This estimator is not only consistent in the presence of excess zeros but also practically unaffected by unobserved heterogeneity (Staub and Winkelmann, 2010, pg. 10); additionally, PQL is not faced with a scale dependence problem. Another potential new estimator belonging to the latter class of Two-Part Models is a Gamma Two-Part Model (G2PM) (Lee, Xiang, and Hirayama, 2010). This estimator is insofar promising as it overcomes major weaknesses of standard Tobit models and compared to other Two-Part Models it flexible adjusts to different right-skew distri-

¹The potential aggregation bias in gravity trade model estimation is extensively discussed in Anderson and van Wincoop (2004).

²For statistical details on excess zeros and overdispersion see below.

butions and deals appropriately with heteroskedasticity. So far, both new estimators are not applied to (disaggregate) gravity trade model analysis.

For the empirical part two additional aspects are to be considered: (1) in practise not Pseudo Maximum Likelihood (PML) approaches are applied but Generalised Estimating Equation (Liang and Zeger, 1986) (GEE) approaches, PML approaches are too restrictive to fully account for heteroskedasticity (Santos Silva and Tenreyro, 2006), and (2) for model selection a Quasi-Likelihood under the Independence Model Criterion (Pan, 2001) (QIC) is to be calculated not a standard Akaike Information Criterion (AIC), the latter is based on a Likelihood function whereas a Quasi-Likelihood function is provided by a GEE approach. Implicitly, all this is already done in practice but the GEE approach is only mentioned in a few papers, the QIC statistic is not even mentioned in a single paper. These methodological aspects are of importance as well since significance levels of estimators and model selection results are affected hereof; in end effect economic inference is affected.³

As indicated above disaggregate gravity trade model analysis becomes more important, thus also estimation issues connected herewith should become more important. Given the shortcomings of previous estimators, this paper proposes PQL and G2PM as reliable alternatives; here, both new estimators PQL and G2PM are applied to disaggregate data (i.e. intra-European piglet trade) to evaluate their empirical performance and applicability. The analysis is done in a GEE framework and model selection is based on QIC.

Since the focus of this paper is methodological, so for the theoretical model homogeneous firms trade models (Felbermayr and Kohler, 2010; Egger and Larch, 2011) are chosen, but not further discussed. Homogeneous firms trade models have the advantage to share the same properties as heterogeneous firms trade models (Helpman, Melitz, and Rubinstein, 2008), but not to require firm heterogeneity. For many applications these simpler models should suffice (Felbermayr and Kohler, 2010).

This paper is organised as follows. The first section deals with the appropriate specification of the theoretical model; here, homogeneous firms trade models are compared with heterogeneous firms trade models and one-part models with two-part models. In the second section then methodological aspects of disaggregate gravity trade model estimation are discussed. The advantages of PQL and G2PM are sketched. The next section then applies both new estimators to intra-European piglet trade. The paper concludes with some recommendations for future disaggregate gravity trade model estimation.

³GEE approaches should also be relevant in other applications, e.g. production economics. Recently, Sun, Henderson, and Kumbhakar (2011) argue that production functions should better be estimated multiplicative than log-linear; the authors recommend PML approaches. However, if the variance structure is wrongly specified a PML approach would lead to biased variance estimates; instead, GEE estimates would be asymptotically consistent.

2 Model Specification

Starting point of every gravity trade model analysis is the specification of an appropriate theoretical model. Here the Anderson and van Wincoop (2003) (AvW) Model is standard for aggregate data.⁴ For disaggregate data however the AvW Model does not fit perfectly. The AvW Model neither deals with zero trade flows which are manifold at product level nor it deals with asymmetric trade flows which are caused by different degrees of specialisation (Helpman, Melitz, and Rubinstein, 2008). Helpman, Melitz, and Rubinstein instead propose a heterogeneous firms trade model which simultaneously deals with zero and asymmetric trade flows. However, given that firm heterogeneity is only significant for products with low elasticities of substitution (Belenkiy, 2010)⁵, for many applications heterogeneous firms trade models are overspecified, i.e. simpler models should suffice. Recently, Felbermayr and Kohler (2010) and Egger and Larch (2011) develop homogeneous firms trade models.⁶ These models have the advantage not only to deal with zero and asymmetric trade flows but also not to require firm heterogeneity.

Homogeneous firms trade models consist of two parts. The first part deals with the extensive trade margin whereas the second part deals with the intensive trade margin. In other words, the first part asks the question whether trade occurs (yes or no), and the second part discusses the question to which extent trade takes place. The two parts can either be estimated together or separately.

To specify the corresponding stochastic models, first in advance following definitions are to be made: X_{ij} denotes the import value of importer j from exporter i and β_0 a constant which also captures the effect of total sector production Y ; $\lambda_i = y_i + (\sigma - 1) \pi_i$ and $\chi_j = e_j + (\sigma - 1) p_j$ are exporter and importer fixed effects which capture the effects of exporter i 's production Y_i and outward multilateral resistance Π_i and importer j 's expenditure E_j and inward multilateral resistance P_j , respectively (Anderson, 2010); and \mathbf{d}_{ij} denotes the gravitational distance.⁷

The stochastic model for the non-separate model then looks as follows

$$[1] \quad E(X_{ij} | \lambda_i, \chi_j, \mathbf{d}_{ij}) = \exp(\beta_0 + \lambda_i + \chi_j + \mathbf{d}_{ij})$$

and the one for the separate model as

⁴See French (2011) for a general discussion why gravity trade models should not even be estimated at an aggregate level but at a disaggregate level with subsequent reaggregation of estimation results. Aggregation leads to a downward aggregation bias (Anderson and Yotov, 2010).

⁵Belenkiy (2010) can analytically show that as the Helpman, Melitz, and Rubinstein Model is constructed the significance of the firm heterogeneity term is inversely related to the size of the elasticity of substitution; so, for manufacturing firm heterogeneity should be significant whereas for agriculture firm heterogeneity should be insignificant.

⁶Felbermayr and Kohler (2010) develop a Corner Solutions Model specification of the homogeneous firms trade model and Egger and Larch (2011) a Two-Part Model specification.

⁷All small roman (greek) letters indicate logarithms and **bold** letters vectors.

$$[2] \quad \Pr (X_{ij} > 0 | \lambda_i, \chi_j, \mathbf{d}_{ij}) = \Phi (\beta_0 + \lambda_i + \chi_j + \gamma \mathbf{d}_{ij})$$

$$[3] \quad E(X_{ij} > 0 | \lambda_i, \chi_j, \mathbf{d}_{ij}) = \exp (\beta_0 + \lambda_i + \chi_j + \gamma \mathbf{d}_{ij})$$

where equation [2] corresponds to the extensive trade margin and equation [3] to the intensive trade margin.

3 Implementation and Estimation Issues

The second step in gravity trade model analysis is the econometric implementation of the theoretical model and its appropriate estimation. For disaggregate gravity trade model analysis, the problems of excess zeros, overdispersion, and heteroskedasticity are often existent. Excess zeros correspond to the empirical observation that there are more zeros in the data than predicted by the statistical model. Overdispersion is existent when the observed variance is higher than the variance of the statistical model, and heteroskedasticity when the observed variance is non-constant. Non-consideration of each would lead to inconsistent and / or inefficient estimates.

In their seminal paper Santos Silva and Tenreyro (2006) argue gravity trade models should not be estimated in log-linear form but in multiplicative form. Taking logarithms could lead to inconsistent estimates. If heteroskedasticity is present, Jensen's Inequality (i.e. $\ln[E(x)] \neq E[\ln(x)]$) would apply which then would render estimates inconsistent. They instead propose a Poisson Pseudo Maximum Likelihood (PPML), i.e. the endogenous y is to be modeled by a Poisson Model

$$[4] \quad f^P (y|\lambda) = \frac{\exp(-\lambda) \lambda^y}{y!} \quad , \lambda > 0$$

where the mean parameter is defined as $\lambda = \exp(x'\beta)$. PPML is consistent even in the presence of heteroskedasticity and it has the appeal to deal with zero trade flows.

Burger, van Oort, and Linders (2009) extend this framework for disaggregate data. The authors partly follow Santos Silva and Tenreyro (2006) that logarithmising leads to biased gravity trade model estimates but they claim that for disaggregate gravity trade models PPML is not appropriate. PPML suffers under the problems of excess zeros and overdispersion. These problems have to be treated separately since they are caused by different reasons; excess zeros is caused by disaggregation which naturally increases the number of zero trade flows and overdispersion is caused by unobserved heterogeneity which usually corresponds to an omitted variable problem (Greene, 1994).

Following Burger, van Oort, and Linders the problem of excess zeros alone can be tackled by a zero-inflated Poisson Pseudo Maximum Likelihood (ZIPPML). In the additional presence of overdispersion a zero-inflated Negative Binomial Pseudo Maximum Likelihood (ZINBPML) is appropriate. It is important to mention here that Burger, van Oort, and Linders do not develop an asymptotic theory!

An asymptotic theory is just recently developed by Staub and Winkelmann (2011). Utilising the framework of Gourieroux, Monfort, and Trognon's (1984a; 1984b) seminal papers on Pseudo Maximum Likelihood (PML) Staub and Winkelmann can show that ZIPPML / ZINBPML are inconsistent if not the underlying model is correctly specified, i.e. the empirical distribution fits with the assumed distribution of the statistical model. This finding is not totally unexpected so the second theorem of Gourieroux, Monfort, and Trognon's (1984a) paper already states that a necessary condition for consistency of a PML estimator is its membership in the linear exponential family (LEF). Since both distributions zero-inflated Poisson and zero-inflated Negative Binomial are not included in the LEF inconsistency of their PML estimators is expected. For value data ZINBPML is even inappropriate suffering under a scale-dependence problem (Bosquet and Boulhol, 2010).⁸ Staub and Winkelmann further show that PPML is still consistent even in the presence of excess zeros, but the variance covariance matrices are invalid. In their paper the authors instead recommend a zero-inflated Poisson Quasi-Likelihood (PQL).

PQL is a Poisson Model shifted by a constant zero-inflation parameter π .⁹ A comparison of the corresponding conditional expectation functions (CEF) exemplifies this statistical relation. Shifting the CEF of a Poisson Model $E(y|x) = \lambda = x'\beta$ by following constant term $\ln(1 - \pi)$ yields the CEF of a PQL

$$[5] \quad E(y|x) = (1 - \pi) \lambda = \exp(\ln(1 - \pi) + x'\beta).$$

Here it is important to consider that the zero-inflation parameter π is not separately identifiable. It is only estimable in conjunction with the constant term β_0 of the Poisson Model, i.e. $\tilde{\beta}_0 = \ln(1 - \pi) + \beta_0$. This however is of minor importance as the interpretations of the other semi-elasticities $\partial [E(y|x) / E(y|x)] / \partial x_k$ are not affected hereof (Staub and Winkelmann, 2011).¹⁰

Table 1 once again exemplifies the reasons why PQL is preferable. Contrary to other estimators PQL is consistent even under model misspecifications and beyond that prac-

⁸Bosquet and Boulhol (2010) show that in dependence of the value unit NBPML either converges against a PPML or a Gamma Pseudo Maximum Likelihood.

⁹In their paper Staub and Winkelmann (2011) develop two zero-inflated Poisson Quasi-Likelihood one with a constant zero-inflation parameter and the other one with a non-constant zero-inflation parameter. Here only the constant zero-inflated Poisson Quasi-Likelihood is applied given convergence problems of the other estimator.

¹⁰One important property of PQL is that its estimates are identical with those of PPML only the variance covariance matrices are different.

Table 1: Comparison Pseudo / Quasi Maximum Likelihood Estimators

	PPML	ZIPML	ZINBPM	PQL
Excess Zeros	0	+	+	+
Heteroskedasticity	+	+	+	+
Overdispersion	0	-	+	+
Model Misspecification	+	-	-	+
Scale Dependence	+	+	-	+

Notes: + = robust; - = vulnerable; 0 = robust but invalid variance covariance matrix.

tically unaffected by unobserved heterogeneity (Staub and Winkelmann, 2010, pg. 10). Also PQL is scale-independent (Bosquet and Boulhol, 2010). As other estimators PQL deals properly with excess zeros and heteroskedasticity.

Staub and Winkelmann’s (2011) findings are important since they question Burger, van Oort, and Linders’s (2009) statements!

Another strand in the literature, also dealing with excess zeros focuses on Two-Part Models and Tobit Models. For moderately disaggregate data standard Tobit estimators are appropriate. In the presence of excess zeros, Two-Part Models however are statistically more reliable; the relaxation of any left tail-probability constraint renders these models superior to Tobit Models. For Tobit Models the assumed left tail-probabilities do not fit with excess zeros, the actual sample proportions of zeros significantly exceed the theoretical predicted proportions (Chai and Bailey, 2008). In consequence corresponding Tobit estimators are inconsistent.

In trade literature Hillberry (2002) is the first proposing a standard log-normal Two-Part Model (2PM). Due to log-transformation this model however is also faced with the critique of Jensen’s Inequality (i.e. $\ln[E(x)] \neq E[\ln(x)]$); hence, in the presence of heteroskedasticity corresponding log-linearised estimators are inconsistent (Santos Silva and Tenreyro, 2006). A more general Two-Part Model is looked for, in particular the problematic log-transformation is to be circumvented. A Gamma Two-Part Model (G2PM) (Lee, Xiang, and Hirayama, 2010) is here a promising alternative; the properties of the Gamma Distribution, flexible to adjust to different right-skew distributions and to deal with heteroskedasticity are important criteria.¹¹

As with other Two-Part Models, the first part of a G2PM is estimated via a Binary Model (i.e. Logit or Probit Model) and the second part via a Gamma Model. The corresponding statistical model of the latter is

¹¹Mullahy (1998) proposes another generalized Two-Part Model, the so called Modified Two-Part Model (M2PM). Here, the first part is to be estimated via a Binary Model (i.e. Logit or Probit Model) and the second part via a Poisson Model.

$$[6] \quad f(y|k, \theta) = y^{k-1} \frac{e^{-y/\theta}}{\theta^k \Gamma(k)} \quad \text{for } y \geq 0; k, \theta > 0$$

where y again indicates an endogenous and Γ a Gamma function. k and θ are the corresponding shape and scale parameters of a Gamma Distribution.

As PQL so G2PM deals with afore mentioned weaknesses of other models. By construction G2PM naturally deals with excess zeros and heteroskedasticity, but it is also scale-independent (Bosquet and Boulhol, 2010) and its PML estimators are consistent as well given that the Gamma Distribution belongs to the LEF.

Another aspect, most important for the empirical part is that both estimators PQL and G2PM can be nested in a Generalised Estimating Equation (Liang and Zeger, 1986) (GEE) framework. This is insofar important as in practise not PML approaches are applied but GEE approaches. This is done since the assumption of the proportionality of the variance and the expectation value (i.e. $V[y_i|x] \propto E[y_i|x]$) underlying each PML approach is too restrictive to fully account for heteroskedasticity (Santos Silva and Tenreyro, 2006). GEE approaches are insofar different to PML approaches that no specific variance covariance structures are specified. Under GEE approaches just working variance covariances matrices¹² are specified whose property it is to lead to variance covariance estimators not smaller than their true counterparts (i.e. $\widehat{\text{cov}}(\beta) \geq \text{cov}(\beta)$). This contrasts with PML approaches where the predefined variance covariance structures can either lead to smaller or greater variance covariance estimators (i.e. $\widehat{\text{cov}}(\beta) \gtrless \text{cov}(\beta)$). GEE approaches lead to consistent estimators and more or less conservative test statistics.

Likewise, for model selection standard techniques as the Akaike Information Criterion (AIC) and its extensions do not apply. These techniques are based on likelihood functions and hence not applicable to GEE approaches (Pan, 2001). Pan instead recommends a Quasi-Likelihood under the Independence Model Criterion (QIC), an approach mimicking the AIC but basing on quasi-likelihood functions. The corresponding test statistic is calculable as follows

$$[7] \quad \text{QIC} = -2Q(\hat{\mu}|I) + 2p$$

where Q represents a quasi-likelihood function and I the corresponding assumed variance covariance structure. Further $\hat{\mu} = g^{-1}(X'\beta)$ where $g^{-1}()$ indicates an inverse link function.

¹²GEE approaches belong to the class of semiparametric estimators. So, for variance covariance estimation sandwich estimators are applied which lead to consistent estimates; the price payed for this consistency is an increase in variance (Kauermann and Carroll, 2001).

4 Application: Intra-European Piglet Trade

The previous section discusses the statistical superiority of PQL over ZIPPM / ZINBPML and G2PM over 2PM, respectively. PQL and G2PM are now applied to intra-European piglet trade to illustrate their empirical performance and applicability.¹³ The data set consists of roughly 80 % zero trade flows so a problem of excess zeros is immanent.

Estimation is done within a GEE framework; the corresponding estimation results are presented in Table 2.¹⁴ The homogeneous firms trade model is once estimated via PQL and once via G2PM. PQL is applied to a one-part model framework and G2PM to a two-part model framework. The benchmark model (i.e. the standard AvW gravity trade model (Anderson and van Wincoop, 2003)) is estimated via Ordinary Least Squares (OLS). A fixed effects structure with importer, exporter and time fixed effects is assumed for each model.

Import data (i.e. CN8-Code 01039110) are extracted from the Statistical Office of the European Union (Eurostat); physical distance data from the Centre d'Etudes Prospectives et d'Informations Internationales (CEPII); all other data are self-constructed. The data frequency is annual, starting from 2000 to 2009. Following Marquer (2010) the trade flow analysis concentrates on the eight most important exporters and importers, i.e. Austria, Germany, Denmark, Spain, Italy, The Netherlands, Poland and Romania (see Figure 1).

Gravitational distance is approximated by physical distance (DIST), presence of a common border (CONTIG), presence of a common language (COMLANG), a binary indicator for trade between member states and new member states before EU enlargement (NMS_inter) and a binary indicator for trade between new member states before EU enlargement (NMS_intra).¹⁵

Main signs of all models are in accordance. Market characteristics and market developments are adequately represented by estimation results. Striking at first are only the estimation results of physical distance (DIST) and common border (CONTIG); these estimates do not have the usual signs. This contradiction however is explainable if one considers the market structure of the European pig sector. As Figure 1 reveals the main exporters (i.e. Denmark and The Netherlands) are located in the middle of Europe whereas, except for Germany the main importers (i.e. Spain, Italy and Romania) are located at the southern or southeastern European periphery; location of hog production is not only explained by piglet prices but also by other factors like environmental regulations, land availability etc.. This explains why physical distance and also common border do not have the expected signs.

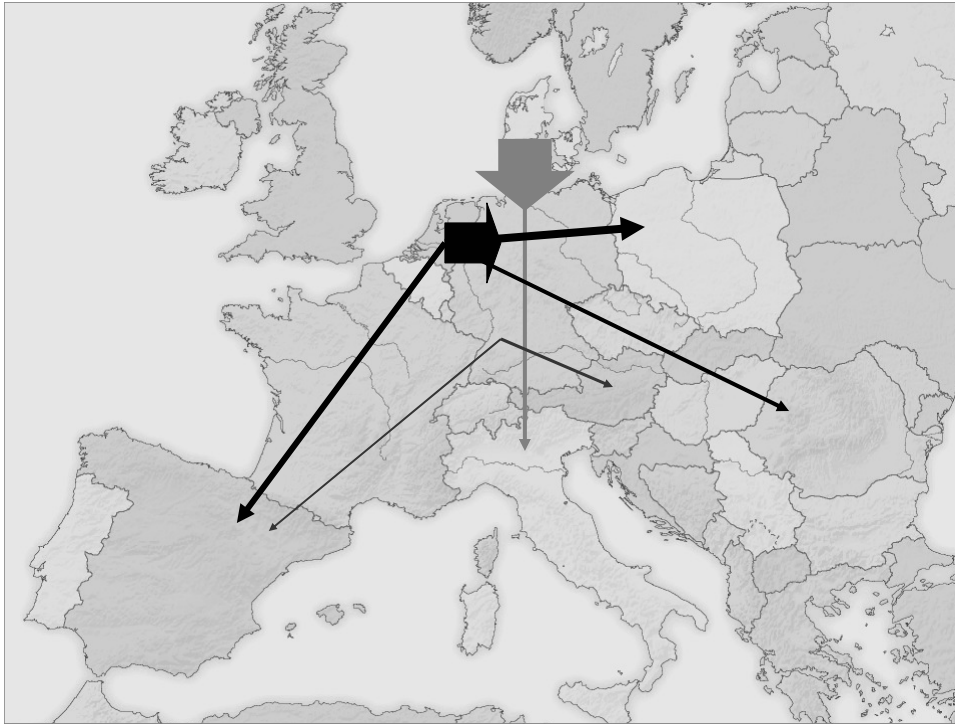
All other signs are in accordance. The downturn in trade indicated by the indicator NMS_inter fits well with market developments. After the EU enlargement large com-

¹³For details on European pig farming and recent developments see Marquer (2010).

¹⁴All estimations are done in STATA; for gravity trade model estimation the function xtgee is used. Program code is available on request.

¹⁵1 indicates trade before EU enlargement and 0 afterwards.

Figure 1: Intra-European Piglet Trade Flows (Major Exporters / Importers)



Source: Own representation leant on Marquer (2010).

mercial hog producers as Smithfield Foods, Inc. opened up commercial hog plants in Easteurope what decreases exports to member states of the EU15 as indicated. The other indicator NMS_intra indicates that piglet trade between new member states decreases after EU enlargement. This decrease can be explained by a large decrease in sow stocks in Easteuropean member states after 2005 (Marquer, 2010). The time fixed effects also seem reasonably to capture global market developments. The time fixed effects follow in tendency hog price developments lagged by one year (see Figure 2).¹⁶ That piglet producers can not immediately adjust their production to hog price developments seems obvious. 2006 is an exemption; good hog prices of 2005 were not immediately passed through which then caused a more restrained piglet production (Ernährungswirtschaft, 2010). Also the 2007 price bubble is immanent. The time fixed effect of 2008 has even a negative sign. In consequence of the high feed prices in 2007 many piglet producers closed business which decreases supply.

One question is still open the choice of the most appropriate model. Here, as discussed above for model selection QIC statistics are appropriate. The calculated QIC statistics¹⁷, as presented in Table 2 indicate that a two-part model specification which is estimated via

¹⁶Price charts can be found under <http://www.bordbia.ie/industryservices/pig/pages/prices.aspx>

¹⁷The size of QIC statistics is scale-dependent but not the ordering; so for the conclusion it is irrelevant in which unit the endogenous is measured as long as the same unit is used for each model.

Table 2: Overview Gravity Trade Model Estimation Results

	OLS	PQL	G2PM	
			PART 1	PART 2
INTERCEPT	10.170*** (4.465)	-0.031 (6.076)	-12.022*** (2.450)	5.657** (2.862)
log(DIST)	-0.008 (0.494)	0.263 (0.715)	1.016*** (0.273)	0.584* (0.350)
CONTIG	-0.024 (0.539)	-0.153 (0.599)	1.161*** (0.233)	-0.695** (0.284)
COMLANG	3.320*** (1.113)	1.330* (0.759)	-1.237*** (0.286)	1.427** (0.713)
NMS_inter	1.212 (1.298)	4.316*** (1.015)	2.624*** (0.731)	2.716*** (0.596)
NMS_intra	0.090 (1.393)	5.125*** (1.040)	3.363*** (0.705)	1.484*** (0.555)
FE_2000	0.556 (0.831)	3.222*** (0.771)	1.045 (0.665)	1.628*** (0.439)
FE_2001	2.683** (1.136)	4.303*** (0.695)	1.334* (0.716)	2.554*** (0.577)
FE_2002	1.356 (1.203)	6.618*** (0.878)	1.606*** (0.567)	2.236*** (0.678)
FE_2003	0.739 (1.166)	1.777** (0.730)	0.223 (0.603)	0.595 (0.601)
FE_2004	0.500 (1.591)	1.104 (0.765)	0.158 (0.690)	0.716 (0.614)
FE_2005	1.601 (1.262)	3.506*** (0.669)	0.472 (0.635)	2.315*** (0.800)
FE_2006	-0.370 (0.916)	1.958** (0.859)	0.158 (0.595)	0.212 (0.512)
FE_2007	4.037*** (1.194)	6.923*** (0.749)	0.858 (0.586)	4.386*** (0.502)
FE_2008	-1.643 (1.010)	-1.274 (0.916)	-0.254 (0.761)	-1.429** (0.572)
No. of Obs.	114	560	560	114
QIC	-	1.423e+09	524.98	3427.16

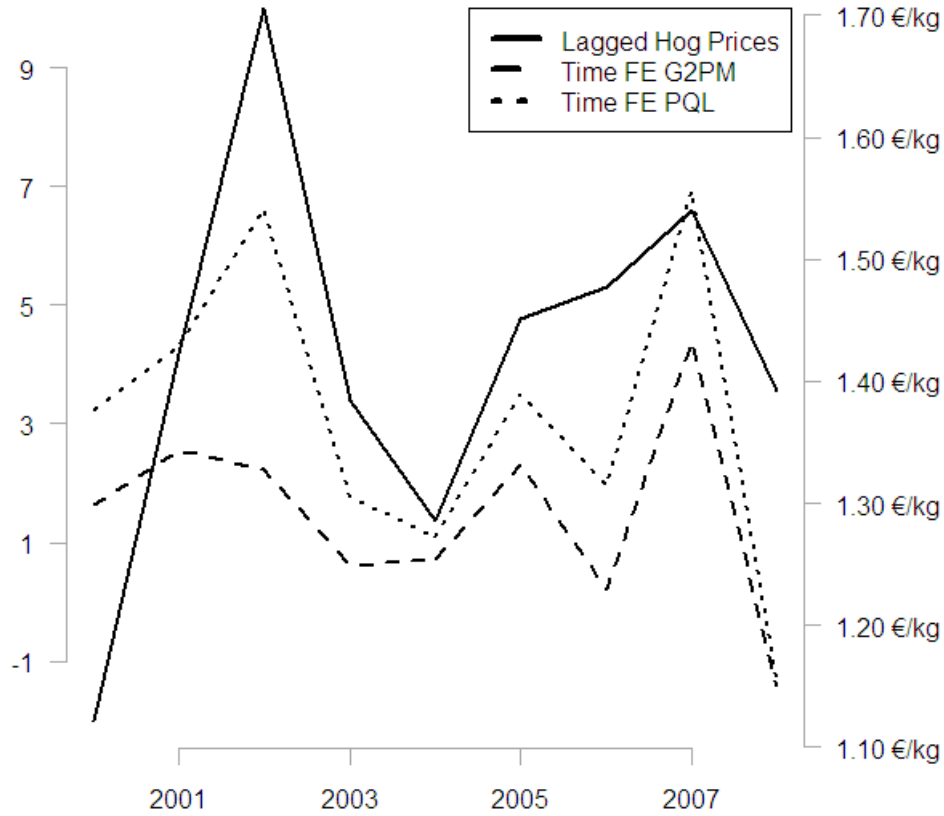
Notes: Importer, exporter, and time fixed effects. (Semi-) Robust standard errors (clustering by country pair).

Signif. levels: 0 '***' 0.01 '**' 0.05 '*' 0.1 ' ' 1

G2PM is the best choice.¹⁸ So, in conclusion intra-European piglet trade is best modeled by means of a two-part model estimated via G2PM!

¹⁸The QIC statistic of the alternative Modified Two-Part Model (M2PM) (see footnote 11) is 5.398e+08. Hence, G2PM is also preferable to M2PM.

Figure 2: Comparison Time Fixed Effects vs. Lagged Hog Prices



Source: Own representation.

5 Conclusions

Recently research focus in gravity trade model analysis shifted from an aggregate to a disaggregate gravity trade model. This shift was first empirically motivated, but now there is also a statistical interest. In a recent paper French (2011) analytically shows that the standard aggregate AvW Model is misspecified; the outward multilateral resistance term is misspecified. Gravity trade model analysis should be done at product level and then estimation results should be reaggregated. If however gravity trade model analysis is to be done at product level then also estimation issues in disaggregate gravity trade models should come to the fore. This paper therefore deals with estimation issues in disaggregate gravity trade models.

It is shown that previous estimators, when applied to disaggregate data suffer under different statistical problems; in end effect the estimators are inconsistent. This paper therefore proposes PQL and G2PM as reliable alternatives. Both estimators appropriately deal with statistical problems as excess zeros, heteroskedasticity and model misspecifica-

tion. Estimated within a GEE framework, both estimators are consistent and have more or less conservative test statistics. For model selection standard techniques are not applicable as these techniques are based on Likelihood functions. However, QIC statistics are appropriate alternatives as these statistics conform with GEE approaches. Both methods are based on Quasi-Likelihood functions.

To evaluate the empirical performance and applicability here both estimators PQL and G2PM are applied to intra-European piglet trade; a data set where with 80 % zero trade flows a problem of excess is immanent. The empirical application favours G2PM over PQL. This result however is not to be generalised rather research should always follow statistical testing procedures and exclude step by step different model alternatives. Both estimators PQL and G2PM and the model selection technique QIC should become standard tools for disaggregate gravity trade model estimation!

References

- Anderson, James E. (2010). *The incidence of gravity*. Boston College Working Papers in Economics.
- Anderson, James E. and Eric van Wincoop (2003). “Gravity with Gravitas: A Solution to the Border Puzzle.” In: *The American Economic Review* 93.1, pp. 170–192.
- (2004). “Trade Costs.” In: *Journal of Economic Literature* 42.3, pp. 691–751.
- Anderson, James E. and Yoto V. Yotov (2010). “The Changing Incidence of Geography.” In: *The American Economic Review* 100.5, pp. 2157–2186.
- Belenkiy, Maxim (2010). *The Extensive Margin in the Industry Trade: Estimation, Significance and Implications*. Working Paper.
- Bosquet, Clément and Hervé Boulhol (2010). *Scale-dependence of the Negative Binomial Pseudo-Maximum Likelihood Estimator*. Working Paper 2010.92. CES.
- Burger, Martijn, Frank van Oort, and Gert-Jan Linders (2009). “On the specification of the gravity model of trade: zeros, excess zeros and zero-inflated estimation.” In: *Spatial Economic Analysis* 4.2, pp. 167–190.
- Chai, High S. and Kent R. Bailey (2008). “Use of log-skew-normal distribution in analysis of continuous data with a discrete component at zero.” In: *Statistics in medicine* 27.18, pp. 3643–3655.
- Egger, Peter and Mario Larch (2011). “An assessment of the Europe agreements’ effects on bilateral trade, GDP, and welfare.” In: *European Economic Review* 55.2, pp. 263–279.
- Ernährungswirtschaft, LfL (2010). *AGRARMÄRKTE - Jahresheft 2006 - Teilauszug: Ferkel*. Schriftenreihe der Bayerischen Landesanstalt für Landwirtschaft.
- Felbermayr, Gabriel J. and Wilhelm Kohler (2010). “Modelling the Extensive Margin of World Trade: New Evidence on GATT and WTO Membership.” In: *The World Economy* 33.11, pp. 1430–1469.
- French, Scott (2011). *The Composition of Exports and Gravity*. Working Paper.
- Gourieroux, Christian, Alain Monfort, and Alain Trognon (1984a). “Pseudo Maximum Likelihood Methods: Theory.” In: *Econometrica* 52.3, pp. 681–700.
- (1984b). “Pseudo Maximum Likelihood Methods: Applications to Poisson Models.” In: *Econometrica* 52.3, pp. 701–720.
- Greene, William H. (1994). *Accounting for Excess Zeros and Sample Selection in Poisson and Negative Binomial Regression Models*. Working Paper No. EC-94-10. NYU.
- Helpman, Elhanan, Marc Melitz, and Yona Rubinstein (2008). “Estimating Trade Flows: Trading Partners and Trading Volumes.” In: *Quarterly Journal of Economics* 123.2, pp. 441–487.
- Hillberry, Russell H. (2002). “Aggregation bias, compositional change, and the border effect.” In: *Canadian Journal of Economics/Revue canadienne d’économique* 35.3, pp. 517–530.
- Kauermann, Göran and Raymond J. Carroll (2001). “The sandwich variance estimator: Efficiency properties and coverage probability of confidence intervals.” In: *Journal of the American Statistical Association* 96.456, pp. 1387–1396.
- Lee, Andy H., Liming Xiang, and Fumi Hirayama (2010). “Modeling Physical Activity Outcomes: A Two-part Generalized-estimating-equations Approach.” In: *Epidemiology* 21.5, pp. 626–630.
- Liang, Kung-Yee and Scott L. Zeger (1986). “Longitudinal data analysis using generalized linear models.” In: *Biometrika* 73.1, p. 13.

- Marquer, Pol (2010). *Pig farming in the EU, a changing sector*. eurostat Statistics in focus 8/2010.
- Mullahy, John (1998). “Much ado about two: reconsidering retransformation and the two-part model in health econometrics.” In: *Journal of health economics* 17.3, pp. 247–281.
- Pan, Wei (2001). “Akaike’s information criterion in generalized estimating equations.” In: *Biometrics* 57.1, pp. 120–125.
- Santos Silva, João M. C. and Silvana Tenreyro (2006). “The log of gravity.” In: *The Review of Economics and Statistics* 88.4, pp. 641–658.
- Staub, Kevin E. and Rainer Winkelmann (2010). *Consistent estimation of zero-inflated count models*. Working Paper.
- (2011). *Consistent estimation of zero-inflated count models*. Working Paper.
- Sun, Kai, Daniel J. Henderson, and Subal C. Kumbhakar (2011). “Biases in approximating log production.” In: *Journal of Applied Econometrics* 26.4, pp. 708–714.



Diskussionspapiere (2000 bis 31. Mai 2006: Institut für Agrarökonomie der Georg-August-Universität, Göttingen)

0001	Brandes, Wilhelm	Über Selbstorganisation in Planspielen: ein Erfahrungsbericht, 2000
0002	Von Cramon-Taubadel, Stephan u. Jochen Meyer	Asymmetric Price Transmission: Factor Artefact?, 2000
0101	Leserer, Michael	Zur Stochastik sequentieller Entscheidungen, 2001
0102	Molua, Ernest	The Economic Impacts of Global Climate Change on African Agriculture, 2001
0103	Birner, Regina et al.	„Ich kaufe, also will ich?": eine interdisziplinäre Analyse der Entscheidung für oder gegen den Kauf besonders tier- u. umweltfreundlich erzeugter Lebensmittel, 2001
0104	Wilkens, Ingrid	Wertschöpfung von Großschutzgebieten: Befragung von Besuchern des Nationalparks Unteres Odertal als Baustein einer Kosten-Nutzen-Analyse, 2001
		<u>2002</u>
0201	Grethe, Harald	Optionen für die Verlagerung von Haushaltsmitteln aus der ersten in die zweite Säule der EU-Agrarpolitik, 2002
0202	Spiller, Achim u. Matthias Schramm	Farm Audit als Element des Midterm-Review : zugleich ein Beitrag zur Ökonomie von Qualitätssicherungssystemen, 2002
		<u>2003</u>
0301	Lüth, Maren et al.	Qualitätssignaling in der Gastronomie, 2003
0302	Jahn, Gabriele, Martina Peupert u. Achim Spiller	Einstellungen deutscher Landwirte zum QS-System: Ergebnisse einer ersten Sondierungsstudie, 2003
0303	Theuvsen, Ludwig	Kooperationen in der Landwirtschaft: Formen, Wirkungen und aktuelle Bedeutung, 2003
0304	Jahn, Gabriele	Zur Glaubwürdigkeit von Zertifizierungssystemen: eine ökonomische Analyse der Kontrollvalidität, 2003
		<u>2004</u>
0401	Meyer, Jochen u. S. von Cramon-Taubadel	Asymmetric Price Transmission: a Survey, 2004
0402	Barkmann, Jan u. Rainer Marggraf	The Long-Term Protection of Biological Diversity: Lessons from Market Ethics, 2004
0403	Bahrs, Enno	VAT as an Impediment to Implementing Efficient Agricultural Marketing Structures in Transition Countries, 2004
0404	Spiller, Achim, Torsten Staack u. Anke Zühlsdorf	Absatzwege für landwirtschaftliche Spezialitäten: Potenziale des Mehrkanalvertriebs, 2004

0405	Spiller, Achim u. Torsten Staack	Brand Orientation in der deutschen Ernährungswirtschaft: Ergebnisse einer explorativen Online-Befragung, 2004
0406	Gerlach, Sabine u. Berit Köhler	Supplier Relationship Management im Agribusiness: ein Konzept zur Messung der Geschäftsbeziehungsqualität, 2004
0407	Inderhees, Philipp et al.	Determinanten der Kundenzufriedenheit im Fleischerfachhandel
0408	Lüth, Maren et al.	Köche als Kunden: Direktvermarktung landwirtschaftlicher Spezialitäten an die Gastronomie, 2004
		<u>2005</u>
0501	Spiller, Achim, Julia Engelken u. Sabine Gerlach	Zur Zukunft des Bio-Fachhandels: eine Befragung von Bio-Intensivkäufern, 2005
0502	Groth, Markus	Verpackungsabgaben und Verpackungslizenzen als Alternative für ökologisch nachteilige Einweggetränkeverpackungen?: eine umweltökonomische Diskussion, 2005
0503	Freese, Jan u. Henning Steinmann	Ergebnisse des Projektes 'Randstreifen als Strukturelemente in der intensiv genutzten Agrarlandschaft Wolfenbüttels', Nichtteilnehmerbefragung NAU 2003, 2005
0504	Jahn, Gabriele, Matthias Schramm u. Achim Spiller	Institutional Change in Quality Assurance: the Case of Organic Farming in Germany, 2005
0505	Gerlach, Sabine, Raphael Kennerknecht u. Achim Spiller	Die Zukunft des Großhandels in der Bio-Wertschöpfungskette, 2005
		<u>2006</u>
0601	Heß, Sebastian, Holger Bergmann u. Lüder Sudmann	Die Förderung alternativer Energien: eine kritische Bestandsaufnahme, 2006
0602	Gerlach, Sabine u. Achim Spiller	Anwohnerkonflikte bei landwirtschaftlichen Stallbauten: Hintergründe und Einflussfaktoren; Ergebnisse einer empirischen Analyse, 2006
0603	Glenk, Klaus	Design and Application of Choice Experiment Surveys in So-Called Developing Countries: Issues and Challenges, 2006
0604	Bolten, Jan, Raphael Kennerknecht u. Achim Spiller	Erfolgsfaktoren im Naturkostfachhandel: Ergebnisse einer empirischen Analyse, 2006 (entfällt)
0605	Hasan, Youssa	Einkaufsverhalten und Kundengruppen bei Direktvermarktern in Deutschland: Ergebnisse einer empirischen Analyse, 2006
0606	Lülf, Frederike u. Achim Spiller	Kunden(un-)zufriedenheit in der Schulverpflegung: Ergebnisse einer vergleichenden Schulbefragung, 2006
0607	Schulze, Holger, Friederike Albersmeier u. Achim Spiller	Risikoorientierte Prüfung in Zertifizierungssystemen der Land- und Ernährungswirtschaft, 2006
		<u>2007</u>
0701	Buchs, Ann Kathrin u. Jörg Jasper	For whose Benefit? Benefit-Sharing within Contractual ABC-Agreements from an Economic Perspective: the Example of Pharmaceutical Bioprospection, 2007
0702	Böhm, Justus et al.	Preis-Qualitäts-Relationen im Lebensmittelmarkt: eine Analyse auf Basis der Testergebnisse Stiftung Warentest, 2007

0703	Hurlin, Jörg u. Holger Schulze	Möglichkeiten und Grenzen der Qualitäts-sicherung in der Wildfleischvermarktung, 2007
	Ab Heft 4, 2007:	Diskussionspapiere(Discussion Papers), Department für Agrarökonomie und RURale Entwicklung der Georg-August-Universität, Göttingen (ISSN 1865-2697)
0704	Stockebrand, Nina u. Achim Spiller	Agrarstudium in Göttingen: Fakultätsimage und Studienwahlentscheidungen; Erstsemesterbefragung im WS 2006/2007
0705	Bahrs, Enno, Jobst-Henrik Held u. Jochen Thiering	Auswirkungen der Bioenergieproduktion auf die Agrarpolitik sowie auf Anreizstrukturen in der Landwirtschaft: eine partielle Analyse bedeutender Fragestellungen anhand der Beispielregion Niedersachsen
0706	Yan, Jiong, Jan Barkmann u. Rainer Marggraf	Chinese tourist preferences for nature based destinations – a choice experiment analysis
		<u>2008</u>
0801	Joswig, Anette u. Anke Zühlsdorf	Marketing für Reformhäuser: Senioren als Zielgruppe
0802	Schulze, Holger u. Achim Spiller	Qualitätssicherungssysteme in der europäischen Agri-Food Chain: Ein Rückblick auf das letzte Jahrzehnt
0803	Gille, Claudia u. Achim Spiller	Kundenzufriedenheit in der Pensionspferdehaltung: eine empirische Studie
0804	Voss, Julian u. Achim Spiller	Die Wahl des richtigen Vertriebswegs in den Vorleistungsindustrien der Landwirtschaft – Konzeptionelle Überlegungen und empirische Ergebnisse
0805	Gille, Claudia u. Achim Spiller	Agrarstudium in Göttingen. Erstsemester- und Studienverlaufsbefragung im WS 2007/08
0806	Schulze, Birgit, Christian Wocken u. Achim Spiller	(Dis)loyalty in the German dairy industry. A supplier relationship management view Empirical evidence and management implications
0807	Brümmer, Bernhard, Ulrich Köster u. Jens- Peter Loy	Tendenzen auf dem Weltgetreidemarkt: Anhaltender Boom oder kurzfristige Spekulationsblase?
0808	Schlecht, Stehanie, Friederike Albersmeier u. Achim Spiller	Konflikte bei landwirtschaftlichen Stallbauprojekten: Eine empirische Untersuchung zum Bedrohungspotential kritischer Stakeholder
0809	Lülfs-Baden, Friederike u. Achim Spiller	Steuerungsmechanismen im deutschen Schulverpflegungsmarkt: eine institutionenökonomische Analyse
0810	Deimel, Mark, Ludwig Theuvsen u. Christof Ebbeskotte	Von der Wertschöpfungskette zum Netzwerk: Methodische Ansätze zur Analyse des Verbundsystems der Veredelungswirtschaft Nordwestdeutschlands
0811	Albersmeier, Friederike u. Achim Spiller	Supply Chain Reputation in der Fleischwirtschaft

		<u>2009</u>
0901	Bahlmann, Jan, Achim Spiller u. Cord-Herwig Plumeyer	Status quo und Akzeptanz von Internet-basierten Informationssystemen: Ergebnisse einer empirischen Analyse in der deutschen Veredelungswirtschaft
0902	Gille, Claudia u. Achim Spiller	Agrarstudium in Göttingen. Eine vergleichende Untersuchung der Erstsemester der Jahre 2006-2009
0903	Gawron, Jana-Christina u. Ludwig Theuvsen	„Zertifizierungssysteme des Agribusiness im interkulturellen Kontext – Forschungsstand und Darstellung der kulturellen Unterschiede“
0904	Raupach, Katharina u. Rainer Marggraf	Verbraucherschutz vor dem Schimmelpilzgift Deoxynivalenol in Getreideprodukten Aktuelle Situation und Verbesserungsmöglichkeiten
0905	Busch, Anika u. Rainer Marggraf	Analyse der deutschen globalen Waldpolitik im Kontext der Klimarahmenkonvention und des Übereinkommens über die Biologische Vielfalt
0906	Zschache, Ulrike, Stephan v. Cramon-Taubadel und Ludwig Theuvsen	Die öffentliche Auseinandersetzung über Bioenergie in den Massenmedien Diskursanalytische Grundlagen und erste Ergebnisse
0907	Onumah, Edward E., Gabriele Hoerstgen-Schwark and Bernhard Brümmer	Productivity of hired and family labour and determinants of technical inefficiency in Ghana's fish farms
0908	Onumah, Edward E., Stephan Wessels, Nina Wildenhayn, Gabriele Hoerstgen-Schwark and Bernhard Brümmer	Effects of stocking density and photoperiod manipulation in relation to estradiol profile to enhance spawning activity in female Nile tilapia
0909	Steffen, Nina, Stephanie Schlecht u. Achim Spiller	Ausgestaltung von Milchlieferverträgen nach der Quote
0910	Steffen, Nina, Stephanie Schlecht u. Achim Spiller	Das Preisfindungssystem von Genossenschaftsmolkereien
0911	Granoszewski, Karol, Christian Reise, Achim Spiller und Oliver Mußhoff	Entscheidungsverhalten landwirtschaftlicher Betriebsleiter bei Bioenergie-Investitionen - Erste Ergebnisse einer empirischen Untersuchung -
0912	Albersmeier, Friederike, Daniel Mörlein und Achim Spiller	Zur Wahrnehmung der Qualität von Schweinefleisch beim Kunden
0913	Ihle, Rico, Bernhard Brümmer Und Stanley R. Thompson	Spatial Market Integration in the EU Beef and Veal Sector: Policy Decoupling and Export Bans

		<u>2010</u>
1001	Heß, Sebastian Stephan v. Cramon-Taubadel und Stefan Sperlich	Numbers for Pascal: Explaining differences in the estimated Benefits of the Doha Development Agenda
1002	Deimel, Ingke, Justus Böhm und Birgit Schulze	Low Meat Consumption als Vorstufe zum Vegetarismus? Eine qualitative Studie zu den Motivstrukturen geringen Fleischkonsums
1003	Franz, Annabell und Beate Nowak	Functional food consumption in Germany: A lifestyle segmentation study
1004	Deimel, Mark und Ludwig Theuvsen	Standortvorteil Nordwestdeutschland? Eine Untersuchung zum Einfluss von Netzwerk- und Clusterstrukturen in der Schweinefleischerzeugung
1005	Niens, Christine und Rainer Marggraf	Ökonomische Bewertung von Kindergesundheit in der Umweltpolitik Aktuelle Ansätze und ihre Grenzen
1006	Hellberg-Bahr, Anneke , Martin Pfeuffer, Nina Steffen, Achim Spiller und Bernhard Brümmer	Preisbildungssysteme in der Milchwirtschaft Ein Überblick über die Supply Chain Milch
1007	Steffen, Nina, Stephanie Schlecht, Hans-Christian Müller und Achim Spiller	Wie viel Vertrag braucht die deutsche Milchwirtschaft?- Erste Überlegungen zur Ausgestaltung des Contract Designs nach der Quote aus Sicht der Molkereien
1008	Prehn, Sörn, Bernhard Brümmer und Stanley R. Thompson	Payment Decoupling and the Intra – European Calf Trade
1009	Maza, Byron, Jan Barkmann, Frank von Walter und Rainer Marggraf	Modelling smallholders production and agricultural income in the area of the Biosphere reserve “Podocarpus - El Cóndor”, Ecuador
1010	Busse, Stefan, Bernhard Brümmer u. Rico Ihle	Interdependencies between Fossil Fuel and Renewable Energy Markets: The German Biodiesel Market
		<u>2011</u>
1101	Mylius, Donata, Simon Küest, Christian Klapp u. Ludwig Theuvsen	Der Großvieheinheitenschlüssel im Stallbaurecht. Überblick und vergleichende Analyse der Abstandsregelungen in der TA Luft und in den VDI-Richtlinien
1102	Klapp, Christian, Lukas Obermeyer u. Frank Thoms	Der Vieheinheitenschlüssel im Steuerrecht Rechtliche Aspekte und betriebswirtschaftliche Konsequenzen der Gewerblichkeit in der Tierhaltung
1103	Göser, Tim, Lilli Schroeder u. Christian Klapp	Agrarumweltprogramme: (Wann) lohnt sich die Teilnahme für landwirtschaftliche Betriebe?

1104	Plumeyer, Cord-Herwig, Friederike Albersmeier, Maximilian Freiherr von Oer, Carsten H. Emmann und Ludwig Theuvsen	Der niedersächsische Landpachtmarkt: Eine empirische Analyse aus Pächtersicht
1105	Voss, Anja und Ludwig Theuvsen	Geschäftsmodelle im deutschen Viehhandel: Konzeptionelle Grundlagen und empirische Ergebnisse
1106	Wendler, Cordula, Stephan von Cramon-Taubadel, Hardwig de Haen, Carlos Antonio Padilla Bravo u. Samir Jrad	Food security in Syria: Preliminary results based on the 2006/07 expenditure survey
1107	Prehn, Sören und Bernhard Brümmer	Estimation Issues in Disaggregate Gravity Trade Models



**Diskussionspapiere (2000 bis 31. Mai 2006: Institut für Rurale
Entwicklung der Georg-August-Universität, Göttingen)**

Ed. Winfried Manig (ISSN 1433-2868)

32	Dirks, Jörg J.	Einflüsse auf die Beschäftigung in nahrungsmittelverarbeitenden ländlichen Kleinindustrien in West-Java/Indonesien, 2000
33	Keil, Alwin	Adoption of Leguminous Tree Fallows in Zambia, 2001
34	Schott, Johanna	Women's Savings and Credit Co-operatives in Madagascar, 2001
35	Seeberg-Elberfeldt, Christina	Production Systems and Livelihood Strategies in Southern Bolivia, 2002
36	Molua, Ernest L.	Rural Development and Agricultural Progress: Challenges, Strategies and the Cameroonian Experience, 2002
37	Demeke, Abera Birhanu	Factors Influencing the Adoption of Soil Conservation Practices in Northwestern Ethiopia, 2003
38	Zeller, Manfred u. Julia Johannsen	Entwicklungshemmnisse im afrikanischen Agrarsektor: Erklärungsansätze und empirische Ergebnisse, 2004
39	Yustika, Ahmad Erani	Institutional Arrangements of Sugar Cane Farmers in East Java – Indonesia: Preliminary Results, 2004
40	Manig, Winfried	Lehre und Forschung in der Sozialökonomie der Ruralen Entwicklung, 2004
41	Hebel, Jutta	Transformation des chinesischen Arbeitsmarktes: gesellschaftliche Herausforderungen des Beschäftigungswandels, 2004
42	Khan, Mohammad Asif	Patterns of Rural Non-Farm Activities and Household Access to Informal Economy in Northwest Pakistan, 2005
43	Yustika, Ahmad Erani	Transaction Costs and Corporate Governance of Sugar Mills in East Java, Indonesia, 2005
44	Feulefack, Joseph Florent, Manfred Zeller u. Stefan Schwarze	Accuracy Analysis of Participatory Wealth Ranking (PWR) in Socio-economic Poverty Comparisons, 2006



Die Wurzeln der **Fakultät für Agrarwissenschaften** reichen in das 19. Jahrhundert zurück. Mit Ausgang des Wintersemesters 1951/52 wurde sie als siebente Fakultät an der Georgia-Augusta-Universität durch Ausgliederung bereits existierender landwirtschaftlicher Disziplinen aus der Mathematisch-Naturwissenschaftlichen Fakultät etabliert.

1969/70 wurde durch Zusammenschluss mehrerer bis dahin selbständiger Institute das **Institut für Agrarökonomie** gegründet. Im Jahr 2006 wurden das Institut für Agrarökonomie und das Institut für RURALE Entwicklung zum heutigen **Department für Agrarökonomie und RURALE Entwicklung** zusammengeführt.

Das Department für Agrarökonomie und RURALE Entwicklung besteht aus insgesamt neun Professuren mit folgenden Themenschwerpunkten:

- Agrarpolitik
- Betriebswirtschaftslehre des Agribusiness
- Internationale Agrarökonomie
- Landwirtschaftliche Betriebslehre
- Landwirtschaftliche Marktlehre
- Marketing für Lebensmittel und Agrarprodukte
- Soziologie Ländlicher Räume
- Umwelt- und Ressourcenökonomik
- Welternährung und rurale Entwicklung

In der Lehre ist das Department für Agrarökonomie und RURALE Entwicklung führend für die Studienrichtung Wirtschafts- und Sozialwissenschaften des Landbaus sowie maßgeblich eingebunden in die Studienrichtungen Agribusiness und Ressourcenmanagement. Das Forschungsspektrum des Departments ist breit gefächert. Schwerpunkte liegen sowohl in der Grundlagenforschung als auch in angewandten Forschungsbereichen. Das Department bildet heute eine schlagkräftige Einheit mit international beachteten Forschungsleistungen.

Georg-August-Universität Göttingen
Department für Agrarökonomie und RURALE Entwicklung
Platz der Göttinger Sieben 5
37073 Göttingen
Tel. 0551-39-4819
Fax. 0551-39-12398
Mail: biblio1@gwdg.de
Homepage : <http://www.uni-goettingen.de/de/18500.html>