

Aggregate Productivity Growth, Firm Turnover and New Varieties

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Many new products and services have a significant effect on consumer welfare and this impact should be included in a cost-of-living based inflation rate (Groshen et al. 2017). At least two conceptually different ways of doing this have been applied in the literature. For example, the key idea underlying the study by Hausman (1999) was to identify a virtual price for the new good before its appearance (in his case, cellular phones). The virtual price is defined by the price which sets the demand equal to zero. With knowledge about this virtual price, the price decline from having a new product available may be calculated. An alternative method is to calculate the consumer gain from new varieties directly. Typically, a Constant Elasticity of Substitution (CES) framework is applied. At first sight, the CES framework may look unsuitable to calculate the impact from new varieties since an infinite virtual price is required to set the demand to zero. However, as illustrated by Feenstra (1994), even though the virtual price that drives demand to zero is infinite within a CES framework, the consumer gain from having a new variety available is finite. Within this framework, a new variety will only yield an extra welfare gain if the new product holds some new characteristics, i.e. it is not perfectly substitutable with existing products. Given an estimate of the elasticity of substitution, the consumer gain from new varieties is easily calculated.

Several papers have applied the Feenstra (1994) framework to calculate consumer gains from new varieties. For example, Broda and Weinstein (2006) use it to analyse the value to U.S. consumers of expanded import product varieties. Harrigan and Barrows (2009) analyse how the end of the multifibre arrangement impacted prices and quality. Recently, Broda and Weinstein (2010) found that product turnover lowered a cost of-living index by 0.8 percentage points annually compared with a 'fixed goods' price index. The lowering of cost-of-living from new varieties should lead to an equal increase in output and, thus productivity, if these new varieties are produced domestically.

Despite there being a large literature on reallocation, firm turnover and aggregate productivity growth, this literature has not analysed and decomposed the contribution from new varieties to overall productivity growth, see e.g. Griliches and Regev (1995), Baily et al. (1992), Foster et al. (2001,2006), Foster et al. (2008). All of these studies consider a decomposition which is based on a weighted average of productivity levels.

When comparing productivity levels across firms it is implicitly assumed that products are comparable (perfect substitutes). But, new varieties yield extra welfare to consumers precisely because they hold some new characteristics, i.e. they are not perfectly substitutable with existing products. Two different strands of the literature thus need to be reconciled: the literature on how new goods impacts prices and the literature on aggregate productivity growth and firm turnover.

In this paper, we provide a fully consistent decomposition of aggregate productivity growth that identifies the contribution from new firms producing new varieties by utilising the CES approach adopted by Feenstra (1994). The decomposition we propose generalises the decomposition used in the literature on firm turnover as it allows for productivity gains caused by new variety creation.

We illustrate the decomposition using the case of firm turnover in Norway. Our data covers the period 2002 to 2014. Data on revenue and input usage are from the Register of Establishments and Enterprises and price data are from the price survey underlying the Producer Price Index. To estimate the elasticity of substitution in each product group we follow the lines of Soderbery (2015) who refined the structural estimator in Feenstra (1994) for estimating demand and supply elasticities. However, we extend the procedure used by Soderbery (2015) by generating a switching algorithm that estimates a level equation if the original procedure indicates that supply is inelastic, i.e. when endogeneity is not an issue.

Our preliminary results indicate that, on average, the elasticity of substitution between varieties is found to be about 2 and the difference between output and input shares of new varieties is 1 percentage point. Based on these estimates we find that aggregate productivity growth has on average been downward biased by about one percentage point.